SIX MONTHLY COMPLIANCE REPORT

OF

ENVIRONMENTAL CLEARANCES (EC)

3300 (5x660) MW THERMAL POWER PLANT
PHASE – I & II

At

TIRORA, DISTRICT GONDIA
MAHARASHTRA

Submitted to:

Regional Office (WCZ)
Ministry of Environment, Forests & Climate Change
Central Pollution Control Board, New Delhi &
Maharashtra Pollution Control Board, Mumbai.

Submitted By:

Environment Management Department
Adani Power Maharashtra Limited
Plot NO: A -1, Tirora Growth Centre
MIDC, Tirora, Gondia – 441911 (M.H)

PERIOD: **APRIL'2019 – SEPTEMBER'2019**

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1.0 Introduction

Adani Power Maharashtra Ltd, (APML), a wholly owned company of Adani Power Limited has established 3300 MW (5 x 660) Coal-based Thermal Power Plant at Tiroda, District Gondia in Maharashtra in two phases as below:

Phase I: 2 x 660 MW

Phase II: 3 x 660 MW

The plant site is located at Tiroda Growth Centre of MIDC (Maharashtra Industrial Development Corporation) developed area near Tiroda, District Gondia in Maharashtra. The Villages, Gumadhawara, Khairbodi, Chikhali, Churdi, Bhiwapur, Kachewani and Mendipur, surround the site. The power plant is based on supercritical, energy efficient & environment friendly technology.

APML has been granted Environmental Clearances from Ministry of Environment & Forest, Consent to Establish & Consent to Operate from Maharashtra Pollution Control Board for phase I & II (Unit 1, 2, 3, 4 & 5). As a part of the compliance of statutory requirements, environmental quality monitoring is being done regularly at locations suggested by Sub- Regional Officer, MPCB, Bhandara on the basis of micrometeorological parameters. Also, three nos. of Continuous Ambient Air Quality Monitoring System have been established in three different locations inside the plant boundary as per wind rose and suggested by SRO, MPCB Bhandara. Also environmental monitoring & analysis is being carried out by third party lab M/s Enviro Analyst & Engineers Pvt. Ltd, Mumbai.

Point wise compliance status of Environmental Clearance for Phase -I & II is furnished herewith.

Compliance status on Environmental Clearance

(Phase -1: 2 x660 MW Coal based Thermal Power Plant)

Letter No.J-13011/4/2008-1A-II (T) DATED 29.05.2008 and
Subséquent amendement in Environmental Clearance vide
Letter No. J-13011/4/2008-1A-II (T) DATED 21.03.2012

Sr. No.	Conditions	Compliance Status
(i)	The total land requirement for the project shall be restricted to 210 ha.	Complied. The project has undergone expansion. The total area has changed and the same has been approved by MoEF&CC. The total area required for all two phases is 565.84 ha.
(ii)	Sulphur and ash content in the coal to be used in the project shall not exceed 0.5 % and 29.57 % respectively.(Amendment dt. 21.03.2012)	Being Complied. Sulphur & ash contents are below 0.5 % and 32.24%, Ash content report is enclosed as Annexure-IV
(iii)	A bi-flue stack of 275 m height shall be provided with continuous online monitoring equipment's for SOx, NOx and Particulate matter. Exit velocity of flue gases shall not be less than 22 m/sec.	Bi-flue Stack containing two flues of phase-I of 275 meters is installed with On-line monitoring equipment for SO_2, NOx & PM. Exit velocity of flue gas is 23.6m/sec.
(iv)	High efficiency Electrostatic Precipitator (ESPs) shall be installed to ensure that particulate emission does not exceed 50 mg/Nm^3.	Highly efficient Electrostatic Precipitators with efficiency of 99.93 % have been installed for each boiler (ESPs) to meet particulate emission less than 50 mg/Nm3. Monitoring report is enclosed as **Annexure – I** MPCB has certified 5 Star rating to APML for maintaining Stack Emission Well within the norms at all time. MPCB Certificate is enclosed as **Annexure – XI**.
(v)	Space provision shall be kept for retrofitting of FGD, if required at a later date.	Space & provision have been provided for FGD in the plant layout. We are in process & progress to install FDG as per implementation schedule of CPCB as well as CEA.
(vi)	Adequate dust extraction system such as cyclones /bag filters and water spray system in dusty areas such as in coal handling and ash handling points, transfer areas and other vulnerable dusty areas shall be provided.	Adequate air pollution control measures such as dust extraction system (Cyclone followed by bag filters) in coal crusher and coal transfer points (JNTs), rain gun type dust suppression system in coal yard and dry fog type dust suppression system in belt conveyor have been provided.
(vii)	Fly ash shall be collected in dry form and storage facility (silos) shall be provided and its utilization to the maximum extant shall be ensured. 100% fly ash utilization shall be ensured from 5th year onward. Unutilized fly ash shall be disposed off in the ash pond in the form of High Concentrated Slurry and the bottom ash in conventional slurry mode.	Fly ash silos (06) established to collect dry ash for further utilization. Unutilized ash is being disposed off in the ash pond in lean slurry mode, with recirculation of ash water. HCSD system is also operational.

(viii)	Ash pond shall be lined with HDPE lining. Adequate safety measures shall also be implemented to protect the ash dyke from getting breached. Guard drains shall be provided all along the periphery of the ash dyke to avoid contamination of soil and surface water in case of run-off.	Well design Ash dyke with LDPE lining has been established. Adequate safety measures are being taken for any unforeseen incidents. Garland drains & guard pond established.
(ix)	Water requirement shall not exceed 36 MCM/year. No ground water shall be extracted for this power project including during construction phase.	This quantity is adequate to meet the plant's requirement. Monthly water consumption report is being submitted regularly to MPCB, Mumbai. Water allocation from Wainganga River for 70 MCM is already allotted for both phases of Tiroda TPP, this quantity is adequate to meet the plant's requirement, including lean season.
(x)	Closed cycle cooling system with cooling towers shall be provided. Cycle of concentration (COC) of at least 5.5 shall be adopted and the effluents treated as per the prescribed norms.	Being complied. COC of 5.5 is being maintained.
(xi)	The treated effluents confirming to the prescribed standards shall be re-circulated and reused within the plant. There shall be no discharge outside the plant boundary except during monsoon for storm water. Arrangements shall be made that effluents and storm water do not get mixed.	All the effluent treated adequately in the ETP and STP. Treated water is being reused within the plant. The concept of "Zero Discharge Condition" implemented except during monsoon period. Separate drainage network established for storm water.
(xii)	A sewage treatment plant shall be provided and the treated sewage shall be used for raising green belt/plantation.	Sewage Treatment Plants have been installed & treated water reused suitably within the plant premises for green belt development.
(xiii)	Rainwater harvesting should be adopted. Central Ground water Authority / Board shall be consulted for finalization of appropriate rainwater harvesting technology within a period of three months from the date of clearance and details shall be furnished.	Rain Water Harvesting study carried out & report submitted to Regional Director, Central Ground Water Board, Nagpur & Member Secretary- Central Ground Water Authority, New Delhi. Rainwater harvesting within the project has been constructed/ implemented to store the rain water.
(xiv)	Adequate safety measures shall be provided in the plant area to check/minimize spontaneous fires in coal yard, especially during summer season. Details of these measures along with location plant layout shall be submitted to Ministry as well as to the regional Office of the Ministry at Bhopal.	Adequate safety team with adequate safety measures is available in the plant site to take preventive control measures. Fire hydrant and rain gun type water sprinklers established in the coal yard. Copy of control measures and location plant layout has already submitted.
(xv)	Storage facilities for liquid fuel such as LDO to be used as auxiliary fuel in the project shall be made in the plant area where risk is minimum to the storage facilities. Adequate assessment of risk management shall be made in the Disaster management Plan for the same. Mock drills shall be conducted regularly as plan. Necessary clearance as may be applicable to such storage under HSM Rules shall be obtained.	The fuel LDO properly stored in minimum risk area & as per the norms fixed by the Chief Controller of Explosive. Disaster management plan and On-site emergency plan prepared & Mock drills are being conducted periodically.

(xvi)	Regular monitoring of ground water in and around the ash pond area shall be carried out, records maintained and periodic reports shall be furnished to the Regional Office of this Ministry.	Regular monitoring of ground water quality is being carried out around ash pond area. Monitoring results are being submitted to Regional Officer, MoEF&CC and MPCB regularly. Please Refer **Annexure – I**.
(xvii)	A green belt of adequate width and density shall be developed around the plant periphery covering at least 69.64 ha of project area preferably with local species.	Green belt development/ plantations are being carried out on available land. Our efforts are being made to develop more greenery in and around plant premises. We have already established our nursery to develop saplings for afforestation & horticultural activities. Besides this, we have also developed lawn & gardens to create aesthetic view inside the plant premises. APML have developed green belt/plantation in 246 ha land which is more than 33% of total land area. Please Refer **Annexure – VI.** APML successfully participated in **33 crore plantation** drive initiated by **Government of Maharashtra** and registered with **Green Army Web Portal.**
(xviii)	A plan for conservation of fauna reported in the study area shall be prepared in consultation with State Forests and Wildlife Department within 3 months and shall be implemented effectively.	Conservation plan of Fauna in the study area was prepared in consultation with State Forest dept. and submitted to Wildlife warden, Govt. of Maharashtra with compliance report.
(xix)	First aid and sanitation arrangements shall be made for the drivers and other contract workers during construction phase.	First Aid and sanitation facility provided for the drivers and contract workers during construction phase.
(xx)	Leq of Noise levels emanating from gas and steam turbines shall be limited to 75 dBA. For people working in the high noise area, requisite personal protective equipment like earplugs/ear muffs etc. shall be provided. Workers engaged in noisy areas such as steam & gas turbines etc. shall be periodically examined to maintain audiometric record and for treatment for any hearing loss including shifting to non-noisy/less noisy areas.	Necessary actions have been taken care to maintain ambient noise levels within 75 db(A) during plant operation. The personal protective equipments have been provided to workers & employees working in noisy areas. Noise level monitoring is being carried out regularly and reports submitted to the Board. A complete medical checkup with audiometric test of workers & employees are being carried out as per frequency. Please refer **Annexure – I & IA**
(xxi)	Regular monitoring of ground level concentration of SO_2, NOx, SPM and RSPM shall be carried out in the impact zone and records maintained. If at any stage these levels are found to exceed the prescribed limits, necessary control measures shall be provided immediately. The location of the monitoring stations and frequency of monitoring shall be decided in consultation with SPCB. Periodic reports (six monthly) shall be submitted to the Regional Office of this Ministry.	Being complied Regular monitoring of PM10, PM2.5, SO2 & NOx are being carried out & monitoring results are well within the norm. Monitoring results are being submitted to MPCB monthly. Ambient Air Quality monitoring stations established in consultation with Sub- Regional Officer, MPCB. Please refer **Annexure – I & IA**
(xxii)	The project proponent shall advertise in at least two local newspapers widely circulated in the region around the project, one of which	Complied. Copy of the same already submitted to your

<table>
<tr><td></td><td>shall be in the vernacular language of the locality concerned within seven days from the date of this clearance letter, informing that the project has been accorded environmental clearance and copies of clearance letter are available with the State Pollution Control Board/Committee and may also be seen at Website of the Ministry of Environment and Forests at http://envfor.nic.in.</td><td>good office.</td></tr>
<tr><td>(xxiii)</td><td>A separate environment management cell with qualified staff shall be set up for implementation of the stipulated environmental safeguards.</td><td>We have already established Environment Management Dept. headed by AGM & supported by Env. Engineer, Chemist & Horticulturist. Environmental laboratory has been established to monitor Environmental Quality Parameters for Ambient Air, Water, Stack emission monitoring etc.

Environmental Management System as per EMS ISO 14001:2015 implemented under Integrated Management System. Our Environmental lab is Accredited with NABL as per ISO/IEC 17025:2017 which is valid up to 27.06.2021. NABL Certificate is enclosed Annexure – XI.</td></tr>
<tr><td>(xxiv)</td><td>Half yearly report on the status of implementation of the stipulated conditions and environmental safeguards shall be submitted to this Ministry/Regional Office/CPCB/SPCB.</td><td>Six monthly compliance report is regularly submitted to MoEF&CC, CPCB & MPCB.

Last compliance report for period of Oct' 18 to Mar'2019 was submitted to MoEF&CC, MPCB & CPCB vide our letter no. APML/EMD/ MoEF&CC/EC/177/05/19 on 25.05.2019</td></tr>
<tr><td>(xxv)</td><td>Regional Office of the Ministry of Environment & Forests located at Bhopal will monitor the implementation of the stipulated conditions. A complete set of documents including Environmental Impact Assessment Report and Environment Management Plan along with the additional information submitted from time to time shall be forwarded to the Regional Office for their use during monitoring.</td><td>Complied.</td></tr>
<tr><td>(xxvi)</td><td>Separate funds shall be allocated for implementation of environmental protection measures along with item-wise break-up. These cost shall be included as part of the project cost. The funds earmarked for the environment protection measures shall not be diverted for other purposes and year-wise expenditure should be reported to the Ministry.</td><td>Separate fund has been already allocated for environmental protection.

Expenditure details in F.Y 2019-2020 :-
<table>
<tr><th>SL. No</th><th>Particulars</th><th>Cost (in Rs. Lakhs)</th></tr>
<tr><td>1</td><td>Pollution control equipment O &M</td><td>2453.09</td></tr>
<tr><td>2</td><td>Pollution Monitoring ,Study and analysis</td><td>54.85</td></tr>
<tr><td>3</td><td>Green belt Development</td><td>273.61</td></tr>
<tr><td>4</td><td>Rural Development/CSR</td><td>537.34</td></tr>
<tr><td>5</td><td>Legal & consent fees</td><td>375.07</td></tr>
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		6	Training & Awareness	1.53
		7	Waste Management	554.41
			Total	**4249.90**

(xxvii)	The project authorities shall inform the Regional Office as well as the Ministry regarding the date of financial closure and final approval of the project by the concerned authorities and the dates of start of land development work and commissioning of plant.	Complied.
(xxviii)	Full cooperation shall be extended to the Scientists/Officers from the Ministry / Regional Office of the Ministry at Bhopal /the CPCB/the SPCB who would be monitoring the compliance of environmental status.	We always extend full cooperation to the Scientists/Officers from the Ministry / Regional Office of the Ministry at Bhopal /the CPCB/the SPCB etc.
(xxix)	The project proponent shall upload the status of compliance of the conditions stipulated in the environmental clearance issued vide this Ministry's letter of even no. dated 30.03.2007, in its website and uploaded periodically and also simultaneously send the same by e-mail to the Regional Office of the Ministry of Environment and Forests.	Six monthly Environmental Clearance compliance status report is regularly submitted to MoEF&CC, CPCB and SPCB. The same is sent by email also. Compliance status updated on Company's website. www.adanipower.com
(xxx)	Criteria pollutant levels including NOx, RSPM, (PM10 & PM2.5), Sox (from Stack & ambient air) shall be regularly monitored and results displayed in your website and also at the main gate of the power plant.	Criteria pollutant viz. NOx, PM10, PM2.5 & SO_2 (from Stack & Ambient Air) are being continuous monitored and results are displayed at the main gate of the Power Plant. Please refer **Annexure – II & III**

Compliance Status of Environmental Clearance

(Phase- II (3X660) MW THERMAL POWER PLANT)

LETTER NO.J-13012/81/2008-1A-II (T) DATED 22.04.2010)
& Subsequent Amendment

Letter No. J – 13012/81/2008- IA.II (T) dated 30.03.2012 and
Letter No. J-13012/81/2008-IA.II (T) dated 13.03.2014

SL. NO.	CONDITIONS	COMPLIANCE
(i)	Only one unit of 1 x 660 MW shall be run on 100% domestic coal for which coal linkage from SECL is available and the other two units of 2 x 660 MW shall be run purely on imported coal, as per details in Para 2.	MoEF&CC vide letter no. J-13012/81/2008-1A-II (T) dtd. 13.03.2014 has amended the condition for change of source of Coal to indigenous Coal from subsidiary companies of "Coal India Limited" in place of Imported coal.
(ii)	Separate stacking arrangement shall be made for indigenous and imported coal.	EC is amended and the source of Coal is domestic. Separate stacking/ storage arrangement is not required.
(iii)	In case source of fuel supply is to be changed at a later stage for the 2 x 660 MW the project proponent shall come back to the ministry as the appraisal presently was done based on imported coal for 2 x 660 MW unit.	We had requested the MoEF&CC for Change of source of coal to indigenous Coal from subsidiary companies of "Coal India Limited" in place of imported coal. Subsequently the Environmental Clearance condition amended for change of coal source from imported to domestic/indigenous on 13/03/2014.
A	**Water & Waste Water Management**	
(iv)	No ground water shall be extracted for use in operation of the power plant even in lean season	Being Complied. We have already obtained permission from water resource department Govt. of Maharashtra for withdrawal of 70 MCM water for both phases from Wainganga river. The above quantity is adequate to meet the plant's requirement including lean season.
(v)	No water bodies including natural drainage system in the area shall be disturbed due to activities associated with the setting up / operation of the power plant	Complied. There is no water body within the plant site.
(vi)	Minimum required environmental flow suggested by the Competent Authority of the State Govt. shall be maintained in the Channel / Rivers (as applicable) even in lean season.	Water allocation is from Dhapewada Irrigation Project constructed and maintained by Vidarbha Irrigation Development Corporation. APML has no role in regulating the water flow downstream.
(vii)	Hydro-geological study of the area shall be reviewed annually and results submitted to the Ministry and concerned agency in the State Govt. In case adverse impact on ground water quality and quantity is observed, immediate mitigating steps to contain any adverse impact on ground water shall be undertaken	Hydro-geological study report was submitted to your good office along with Six Monthly compliance report for the period of Apr'18 – Sep'2018. Periodic review of the study is being carried out by M/s NEERI- Nagpur and work order for the same has been awarded to NEERI from May 2019 to March 2022. Quality of ground water is being monitored in and around the plant premises. Ground water level in nearby villages is

		also being monitored to know the seasonal fluctuations.
(viii)	Closed cycle cooling system with induced draft cooling towers shall be provided and COC of at least 5.5 shall be adopted.	Complied 5.5 COC is being maintained.
(ix)	The treated effluent confirming to the prescribed standards only shall be re-circulated and reused within the plant. There shall be no discharge outside the plant boundary except during monsoon. Arrangements shall be made that effluent and storm water do not get mixed.	Effluent treatment plant installed within the plant and treated water is being utilize/reuse within the premises to meet "Zero Discharge". Separate drainage system established for storm water.
(x)	Effluent from the desalination plant shall be first treated in a guard pond before discharged, if applicable.	Not Applicable The desalination plant is not required
(xi)	A sewage treatment plant shall be provided (as applicable) and the treated sewage shall be used for raising greenbelt/plantation.	Sewage Treatment Plants have been installed and treated water is being suitably reused within the plant premises for green belt development.
(xii)	Rainwater harvesting should be adopted. Central Groundwater Authority/ Board shall be consulted for finalization of appropriate rainwater harvesting technology within a period of three months from the date of clearance and details shall be furnished.	Rainwater Harvesting study carried out & report submitted to Regional Director, Central Ground Water Board, Nagpur & Member Secretary, Central Ground Water Board, New Delhi. Rain water harvesting practices adopted within the plant area.
(xiii)	Regular monitoring of ground water shall be carried out by establishing a network of existing wells and constructing new piezometers. Monitoring around the ash pond area shall be carried out particularly for heavy metals (Hg, Cr, As, Pb) and records maintained and submitted to the Regional Office of the Ministry. The data so obtained should be compared with the baseline data so as to ensure that the ground water quality is not adversely affected due to the project.	Regular monitoring of ground water quality including heavy metals is being carried out regularly in and around the project area. Piezometric wells are established around the ash pond area. Records are maintained and the same are submitted to Regional office of the Ministry at Bhopal. Please Refer **Annexure – I.**
B	**Air Pollution Control**	
(xiv)	Provision for installation of FGD shall be provided.	Space & provision have been provided for FGD in the plant layout. We are in process & progress to install FDG as per implementation schedule of CPCB & CEA.
(xv)	High Efficiency Electrostatic Precipitator (ESPs) shall be installed to ensure that particulate emission does not exceed 50 mg / Nm3.	ESP with efficiency of 99.93% (ESPs of 10 fields) installed for each boiler to meet permissible norm for particulate emission of less than 50 mg / Nm3. Please refer **Annexure – III.** MPCB has certified 5 Star rating to APML for maintaining Stack Emission Well within the norms at all time. MPCB Certificate is enclosed as **Annexure – XI**.

(xvi)	Adequate dust extraction system such as cyclones /bag filters and water spray system in dusty areas such as in coal handling and ash handling points, transfer areas and other vulnerable dusty areas shall be provided.	Adequate air pollution control measures such as dust extraction system (Cyclone followed by bag filters) in coal crushers and rain gun type dust suppression system in coal yard and dry fog type dust suppression system in the belt conveyor with insertable dust collector at transfer points have been installed to meet particulate matter emission within the norms.
(xvii)	Green Belt consisting of 3 tiers plantations of native species around plant and at least 100 m width shall be raised. Wherever 100 m width is not feasible a 50 m width Shall be raised and adequate justification shall be submitted to the ministry. Tree density shall not be less than 2500 per ha with survival rate not less than 70%.	Green belt development/ plantations are being carried out on available land. Our efforts are being made to develop more greenery in and around plant premises. We have already established our nursery to develop saplings for afforestation & horticultural activities. Besides this, we have also developed lawn & gardens to create aesthetic view inside the plant premises APML have developed green belt/plantation in 246 ha land which is more than 33%. Please refer **Annexure – VI.**
(xviii)	Noise level emanating from turbines shall be so controlled such that the noise in the work zone shall be limited to 75dBA. For people working in the high noise area, requisite personal protective equipment like earplugs/ear muffs etc. shall be provided. Workers engaged in noisy areas such as turbine area, air compressor etc. shall be periodically examined to maintain audiometric record and for treatment for any hearing loss including shifting to non noisy/less noisy areas.	Necessary actions has been taken care to maintain ambient noise levels within 75 db(A) during plant operation. The working personals provided with appropriate personal protective equipment and periodic audiometric check-up is being carried out and records are being maintained. The monitoring reports regularly submitted to the MPCB & MoEF&CC. Please refer **Annexure – I & IA**
C	**Fly Ash Management**	
(xix)	Utilization of 100% Fly Ash generated shall be made from 4th year of operation of the plant. Status of implementation shall be reported to the Regional Office of the Ministry from time to time.	Annual Ash generation and utilization status is regularly submitted to MoEF&CC, MPCB & CEA. Ash generation & utilization details enclosed as **Annexure- IV.**
(xx)	Fly ash shall be collected in dry form and storage facility (silos) shall be provided. Unutilized fly ash shall be disposed off in the ash pond in the form of slurry. Mercury and other heavy metals (As, Hg, Cr, Pb etc.) will be monitored in the bottom ash as also in the effluents emanating from the existing ash pond. No ash shall be disposed off in low lying area.	Compliance assured. APML has established 06 Nos. silos of 1700 ton capacity each for utilization of dry ash. Regular monitoring of heavy metals is being carried out. Please refer **Annexure – V.**
(xxi)	Ash pond shall be lined with HDP/LDP lining or any other suitable impermeable media such that no leachate takes place at any point of time. Adequate safety measures shall also be implemented to protect the ash dyke from getting	Compliance assured. Well-designed Ash dyke with LDPE lining have been established as per guidelines of MoEF&CC, CEA and CPCB. Regular monitoring is being carried out.

	breached.	
(xxii)	For disposal of Bottom Ash in abandoned mines (if proposed to be undertaken) it shall be ensured that the Bottom and sides of the mined out area are adequately lined with clay before Bottom Ash is filled up. The project proponent shall inform the State Pollution Control Board well in advance before undertaking the activity.	Noted. We will inform to Maharashtra Pollution Control Board well in advance.
(xxiii)	Regular monitoring of ground water level shall be carried out by establishing a network of existing wells and constructing new piezometers. Monitoring around the ash pond area shall be carried out particularly for heavy metals (Hg, Cr, As, Pb) and records maintained and submitted to the regional Office of this Ministry. The data so obtained should be compared with the baseline data so as to ensure that the ground water quality is not adversely affected due to the project.	Regular monitoring of ground water quality including heavy metals is being carried out in and around the project area. Piezometric wells are established around the ash pond. Records are maintained and the same being submitted along with compliance report. Please refer **Annexure – I**.
D	**Disaster Management**	
(xxiv)	Adequate safety measures shall be provided in the plant area to check/minimize spontaneous fires in coal yard, especially during summer season. Copy of these measures with full details along with location plant layout shall be submitted to Ministry as well as to the regional Office of the Ministry.	Adequate safety team with safety control measures is available in the plant site to take preventive control measures. Fire hydrant and rain gun type water sprinklers established in the coal yard. Details of control measures and location within the plant layout has been already submitted to your good office.
(xxv)	Storage facilities for auxiliary liquid fuel such as LDO and / HFO/LSHS shall be made in the plant area in consultation with Department of Explosive, Nagpur. Sulphur content in the liquid fuel will not exceed 0.5%. Disaster management plan shall be prepared to meet any eventuality in case of an accident taking place due to storage of oil.	The Fuel LDO is properly stored in minimum risk area & as per the norms fixed by the Chief Controller of Explosive. Disaster management plan and On-site emergency plan prepared & Mock drills are being conducted periodically.
E	**CSR/RCR Plan**	
(xxvi)	A good action plan for R & R (if applicable) with package for the project affected persons be submitted and implemented as per prevalent R7R policy within three months from the date of the issue of this letter.	R&R plan approved by the State govt. and implemented.
(xxvii)	An amount of Rs. 66.0 Crores shall be earmarked as one time capital cost for CSR programme. Subsequently a recurring expenditure of Rs. 13.20 Crore per annum shall be earmarked as recurring expenditure for CSR activities.	A separate budget earmarked for CSR activities. Need Base Assessment study carried out and report already submitted to the Ministry. We have established well qualified team with village mobilizers to take care of CSR activities. CSR report with expenditure details for period of

	Details of the activities to be undertaken shall be submitted within one month along with road map for implementation.	April 2019 to September 2019 is enclosed as **Annexure – VII.**
(xxviii)	While identifying CSR programme the company shall conduct need based assessment for the nearby villages to study economic measures with action plan which can help in upliftment of poor section of society. Income generating projects consistent with the traditional skills of the people besides development of fodder farm, fruits bearing orchards, vocational training etc. can form a part of such programme. Company shall provide separate budget for community development activities and income generating programmes. This will be in addition to vocational training for individuals imparted to take up self employment and jobs. In addition a special scheme for upliftment of SC/ST's and marginalized population in the study area out of CSR programme shall be formulated and submitted to the Ministry within six months along with firm commitment of implementation. The scheme shall have an in – built monitoring mechanism.	Need Base Assessment Study for development of CSR plan prepared and report already submitted to MoEF&CC. Need Base plan implementation being done in nearby village for the individuals who are economically weak to undertake some economic activity that would help them to achieve sustainable livelihood and financial independence. We have established a Skill Development Center for skill development of SC/ST and marginalized populations from Gondia and Bhandara district. APML have trained 341 students in which 312 placed for good job. It also includes Nurse training (General Duty Assistance) of 34 and out of which 29 are placed for good job. Please refer **Annexure IX** for year wise training and placement details.
F	**General**	
(xxix)	Additional soil for leveling of the proposed site shall be generated within the site (to the extent possible) so that natural drainage system of the area is protected and improved.	Complied Natural drainage has not disturbed due to plant activities.
(xxx)	First aid and sanitation arrangements shall be made for the drivers and other contract workers during construction phase.	Complied First Aid and sanitation facilities were provided for the drivers and contract workers during construction period.
(xxxi)	Provision shall be made for the housing of construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.	Labour hutments were established with all required facilities & infrastructure for construction phase only.
(xxxii)	The project proponent shall advertise in at least two local newspapers widely circulated in the region around the project, one of which shall be in the vernacular language of the locality concerned within seven days from the date of this clearance letter, informing that the project has been accorded	Complied. Copy of the same already submitted to your good office with compliance report.

	environmental clearance and copies of clearance letter are available with the State Pollution Control Board/Committee and may also be seen at Website of the Ministry of Environment and Forests at http://envfor.nic.in.	
(xxxiii)	A copy of clearance letter shall be sent by the proponent to concern panchayat, Zila parisad/municipal corporation, urban local body and the local NG, if any from whom suggestions/representations, if any received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.	Complied. Copy of Environmental Clearance and other required documents provided to Zila Parishad & Gram Panchayat.
(xxxiv)	A separate environment management cell with qualified staff shall be setup for implementation of the stipulated safeguards.	We have already established Environment Management Dept. headed by AGM & supported by Environmental Engineer, Chemist & Horticulturist. Environmental laboratory has been established to monitor Environmental Quality Parameters for Ambient Air, Water, Stack emission monitoring etc. Environmental Management System as per EMS ISO 14001:2015 implemented under Integrated Management System. Our Environmental lab is Accredited with NABL as per ISO/IEC 17025:2017 which is valid up to 27.06.2021. Certificate is enclosed as **Annexure– XI**
(xxxv)	The proponent shall upload the status of compliance of stipulated EC conditions, including the results of monitoring data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional office of MoEF, the respective zone of CPCB & the SPCB. The criteria pollutant level namely; SPM, RSPM (PM10, PM2.5), SO2 and NOx (ambient level and stack emission) shall be displayed at the convenient location near the main gate of the company in the public domain.	Six monthly Environmental Clearance compliance status report is regularly submitted to MoEF&CC, CPCB and SPCB. The same is sent by email also. Compliance status updated on Company's website. Display board already installed in main gate.
(xxxvi)	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated environmental clearance conditions including results of monitored data (both in hard copies as well by e-mail) to the respective Regional Office of MOEF, the respective Zonal Office of CPCB and the SPCB	Six monthly compliance report is regularly submitted to MoEF&CC, CPCB & MPCB. The same is sent by email also. Last compliance report for the period of Oct '18 to Mar '19 was submitted to MoEFCC/ MPCB/CPCB vide our letter no. APML/ EMD/ MoEF/EC/177/05/19 on 25.05.2019
(xxxvii)	The environment statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned	Environment Statement for F.Y 2019 – 20 submitted through online portal of Maharashtra Pollution Control Board. Please Refer **Annexure – VIII**

<table>
<tr><td></td><td>State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of EC conditions and shall also be sent to the respective Regional Offices of the Ministry by e-mail</td><td></td></tr>
<tr><td>(xxxviii)</td><td>The project proponent shall submit six monthly reports on the status of the implementation of the stipulated environmental safeguards to the Ministry of Environment and Forests, its Regional Office, Central Pollution Control Board and State Pollution Control Board. The project proponent shall upload the status of compliance of the environment of the environmental clearance conditions on their website and update the same periodically and simultaneously send the same by e-mail to the Regional Office, Ministry of Environment and Forests.</td><td>Six monthly Environmental Clearance compliance status report is regularly submitted to MoEF&CC, CPCB and SPCB. The same is sent by email also.

Compliance status updated on Company's website. www.adanipower.com</td></tr>
<tr><td>(xxxix)</td><td>Regional Office of the Ministry of Environment & Forests will monitor the implementation of the stipulated conditions. A complete set of documents including Environmental Impact Assessment Report and Environment Management Plan along with the additional information submitted from time to time shall be forwarded to the Regional Office for their use during monitoring. Project proponent will up-load the compliance status in their website and up-date the same from time to time at least six monthly basis. Criteria pollutants levels including NOx (from stack & ambient air) shall be displayed at the main gate of the power plant.</td><td>Being Complied.

Six monthly Environmental Clearance compliance status report is regularly submitted to MoEF&CC, CPCB and SPCB. The same is sent by email also.

Compliance status updated on Company's website.
Display board already installed in main gate.</td></tr>
<tr><td>(xi)</td><td>Separate funds shall be allocated for implementation of environmental protection measures along with item-wise break-up. These cost shall be included as part of the project cost. The funds earmarked for the environment protection measures shall not be diverted for other purposes and year-wise expenditure should be reported to the Ministry</td><td>Separate fund has already been allocated and being utilize for Environmental Protection measures.

Expenditure details in F.Y. 2019 – 20:-
<table><tr><th>SL. No</th><th>Particulars</th><th>Cost (in Rs. Lakhs)</th></tr><tr><td>1</td><td>Pollution control equipment O &M</td><td>2453.09</td></tr><tr><td>2</td><td>Pollution Monitoring ,Study and analysis</td><td>54.85</td></tr><tr><td>3</td><td>Green belt Development</td><td>273.61</td></tr><tr><td>4</td><td>Rural Development/CSR</td><td>537.34</td></tr></table></td></tr>
</table>

		<table><tr><td>5</td><td>Legal & consent fees</td><td>375.07</td></tr><tr><td>6</td><td>Training & Awareness</td><td>1.53</td></tr><tr><td>7</td><td>Waste Management</td><td>554.41</td></tr><tr><td></td><td>**Total**</td><td>**4249.90**</td></tr></table>
(xii)	The project authorities shall inform the Regional Office as well as the Ministry regarding the date of financial closure and final approval of the project by the concerned authorities and the dates of start of land development work and commissioning of plant	Complied
(xiii)	Full cooperation shall be extended to the Scientists/Officers from the Ministry / Regional Office of the Ministry at Bangalore / CPCB/ SPCB who would be monitoring the compliance of environmental status.	Noted. Full cooperation always extended to MoEF&CC, CPCB & MPCB during plant visit/inspection.
Additional Conditions (EC Amendment)		
(xiv)	The coal transportation by road shall be through tarpaulin covered trucks for a maximum period of two years and hence forth shall be only through mechanically covered trucks.	Compliance Assured. At present, Coal is being transported by Rail through wagons and unloaded within our plant premises at wagon tippler & Track Hopers.
(xv)	Avenue plantation of 2/3 rows all along the road shall be carried out by the project proponent at its own expense.	Layer wise thick Plantation done in all around the boundary.
(xvi)	Periodic maintenance of the road shall be done by the project proponent at its own expense and shall also facilitate the traffic control on the road.	Complied. All internal roads are black topped or concreated and being maintained.
(xvii)	Sulphur and ash contents in the domestic coal to be used in the project shall not exceed 0.4 % and 33% at any given time. In case of variation of coal quantity at any point of time, fresh reference shall be made to the Ministry for suitable amendments to environmental clearance condition wherever necessary.	Being complied. We are using washed coal from SECL and blended with raw coal. We have also installed Real time Coal Ash Analyzers to monitor ash content. MPCB official also collect coal samples time to time and analysis results are well within the stipulated limit. Quarterly Ash content report is being sent to MoEF&CC regional office, Six monthly Average ash content is 31.54%
(xlvii)	A long term study of radio activity and heavy metals content on coal to be used shall be carried out through a reputed institute. Thereafter, mechanism for an in-built continuous monitoring for radio activity and heavy metals in coal and fly ash (including bottom ash) shall be put in place.	Being Complied. Radioactivity analysis in Coal and Ash sample being carried out from "Board of Radiation and Isotope Technology (BRIT)" Mumbai". Last report submitted to your good office along with our six monthly compliance report for the period of Apr'2018 – Sep'18.
(xviii)	Harnessing solar power within the premises of the plant particularly at available roof tops shall be undertaken and status of implementation shall be submitted periodically to the regional	10KW solar panel installed at the top of administrative building to cater power requirement of administrative building. In addition to above, solar street lights are installed along the ash dyke area. Under CSR activities, we

	office of the Ministry.	have installed more than 200 solar street lights in nearby villages.
(xix)	Mercury emission from the stack shall also be monitored on periodic basis.	Being complied. Mercury emission from the stack is being monitored & reports are being submitted. Please refer **Annexure – I.**
(l)	Fugitive emission shall be controlled to prevent impact on agricultural or non-agricultural land.	To control fugitive emission, rain gun type water sprinkling system has been installed in coal yard. All coal conveying belts conveyors are covered and fog type dust suppression system provided. Adequate water sprinkling arrangements made in wagon tripplers and track hoopers to mitigate dust emission during coal un-loading by rail. Closed coal conveyor belts have been established. Cyclones followed by bag filters are provided at each coal transfer points (JNT's). Additionally, mobile water sprinklers are deployed at CHP area to suppress fugitive dust while movement of vehicles.
(li)	Source sustainability study of water requirement shall be carried out by an institute of repute. The study shall also specify the source of water for meeting the requirement during lean season. The report shall be submitted to the Regional Office of the Ministry within six months.	VIDC has developed and is operating Dhapewada Barrage on River Wainganga for water supply. We have carried outsource sustainability study of River Wainganga through "Academy of Water Technology and Environ Management" Kolkata in Technical collaboration with Indian Institute of Social Welfare and Business Management-Kolkata and CSIR-CGCRI - Kolkata. Study report for the same is enclosed as **Annexure – XII**
(lii)	Fly ash shall not be used for agricultural purpose. No mine void filling will be undertaken as on option for ash utilization without adequate lining of mine with suitable media such that no leachate shall take place at any point of time. In case, the option of mine void filling is to be adopted, prior detailed study of soil characteristics of the mine area shall be undertaken from an institute of repute and adequate clay lining shall be ascertained by the State Pollution Control Board and implementation done in close co-ordination with the State Pollution Control Board.	As per Fly ash Notification 25th January, 2016; Ash may be utilized in Agriculture as a promotional activity. APML has engaged AMPRI (A division of CSIR) Bhopal & NEERI, Nagpur to explore the possibility of Ash utilization in different purpose to comply with Fly Ash Notification.
(liv)	Three tire green belt shall be developed all around Ash Pond over and above the Green Belt around the Plant Boundary.	Three tire plantation at Ash pond area is in progress. Plantation is also being done in the available open area along the plant boundary.
(lv)	Social audit for the CSR Scheme shall be carried out periodically by reputed university or an institution as per the CSR guidelines of Government of India and Details to be submitted to MoEF besides putting it on company's website.	Social Audit for the CSR Scheme has been carried out by reputed Indian Institute of Social Welfare & Business Management, **University of Kolkata.** The same has already been submitted to your good office with Oct'14 to Mar'15 compliance report. Further, Social Audit being carried out Indian

		Institute of Social Welfare & Business Management, **University of Kolkata.** Study report for the same is enclosed as **Annexure –XIV**
(lvi)	An Environmental Cell shall be created at the project site itself and shall be headed by an officer of the company of appropriate seniority and qualification. It shall be ensured that the head of the Cell shall directly report to Head of the Organization. The environmental Cell shall be responsible and accountable for implementation of all the conditions given in the EC including in the amendment letter.	We have already established Environment Management Dept. headed by AGM & supported by Environmental Engineer, Chemist & Horticulturist. Environmental laboratory **(NABL Accredited)** has been established to monitor Environmental Quality Parameters for Ambient Air, Water, Stack emission monitoring etc. Environmental Management System as per EMS ISO 14001:2015 implemented under Integrated Management System. Environmental Lab has been accredited with NABL ISO/IEC 17025:2017 and certificate which is valid up to 27.06.2021. Refer **Annexure - XI**
(lvii)	Monitoring of surface water quantity and quality shall also be regularly conducted and record maintained. The monitoring data shall be submitted to the Ministry regularly. Further, monitoring points shall be located between the plant and drainage in the direction of flow of ground water and records maintained. Monitoring for heavy metals in ground water shall be undertaken.	Monitoring of surface water and ground water quality including heavy metals is being done on regular basis and records maintained. Please refer **Annexure - I**
(lviii)	The environmental statement for each financial year ending 31st March in Form – V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliances of environmental clearance conditions and shall also be sent to the respective Regional Offices of the Ministry by e-mail.	Environmental statement is being submitted regularly to MPCB. Last Environmental Statement submitted to MPCB through online portal. Please refer **Annexure – VIII.**
(lix)	The project proponent shall formulate a well laid Corporate Environment Policy and identify and designate responsible officers at all levels of its hierarchy stipulated in this clearance letter and other applicable environment laws and regulations.	We have implemented ISO **14001:2015** under Integrated Management System consist of Environment, Health & Safety, Quality and Energy Management Systems. We have formulated a Corporate policy as per the requirement of **Integrated Management System (IMS).**

Annex - I

SIX MONTHLY ENVIRONMENTAL MONITORING REPORT

FOR

The Period of Apr.2019-Sept. 2019

of

ADANI POWER MAHARASHTRA LTD.

Tirora, Growth Center,

MIDC, Gondia – 441 911

Prepared by

Recognised by MoEF (GOI) under GSR No. 983 dated. 2.5.2014
NABET Accredited and ISO 9001: 2000Certified Organisation
Head Office: B-1003, Enviro House, 10 Flr. Western Edge II , W.E. Highway, Borivali (E), Mumbai-400 066

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Foreword

The protection of environment plays a crucial role in maintaining the local environment quality for any industry, throughout their production. Hence compliance of the statutory requirements becomes very important to conserve the ecological balance within and surrounding the plant area. Therefore, environment protection is becoming a prerequisite for sustainable development. In line with this requirement, the management of ***Adani Power Maharashtra Ltd****. has adopted a corporate responsibility of development and top priority is given for environment protection.*

In order to comply with the Environment protection act, to fulfill statutory requirement and to be in tune with Environmental Preservation and sustainable development ***Adani Power Maharashtra Ltd****., has retained* ***Enviro Analysts and Engineers Pvt. Ltd.*** *as Environment Consultants and for various Environmental issues related to their Power Plant.*

This report presents the Environmental Status for the period ***Apr.2019-Sept. 2019*** *as a compliance to the statutory requirements.*

The co-operation extended by the Staff and Management of Adani Power Maharashtra Ltd. during the work execution period is gratefully acknowledged.

For **ENVIRO ANALYSTS & ENGINEERS PVT. LTD.**

Authorized Signatory

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1.0 INTRODUCTION.

M/s. Adani Power Maharashtra Limited (APML) a wholly owned company of Adani Power Limited has established 3300 MW (5x660) Coal-based Thermal Power Plant at Tiroda, District Gondia in Maharashtra in two phases as below:

Phase I: 2 x 660 MW

Phase II: 3 x 660 MW

1.1 Scope of Work.

The scope of work includes the data generation for various environmental components viz Meteorology, Air, Noise, Water, Stack, Effluent and soil of Adani Power Maharashtra limited, Tirora.

To monitor the environmental parameters and data analysis in the vicinity of the power plant of 5x660MW at MIDC Area Tiroda, APML awarded the service to M/s Enviro Analysts & Engineers Pvt. Ltd. (EAEPL), Mumbai.

The present report incorporates data of various Environmental parameters for APR.2019-SEPT.2019

Chapter – 2

Details of sampling Locations

&

Methodology for sampling and analytical procedures

2.0 DETAILS OF SAMPLING LOCATIONS.

The details of sampling location w. r. t. Air, Water and Noise quality around the power plant are shown in the Sampling location Map as depicted in Figure.2.1

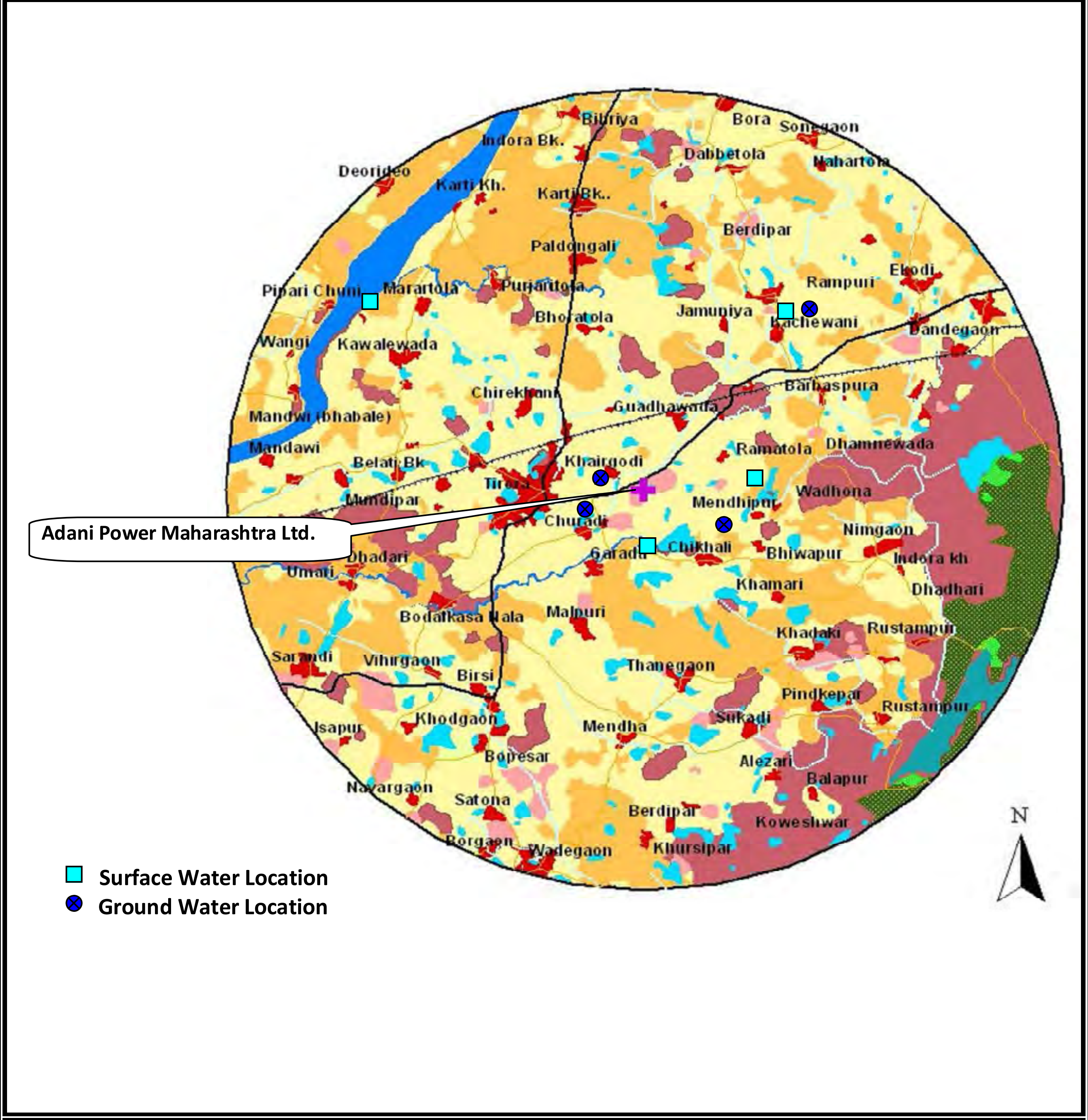
2.1 Meteorology and Ambient Air Quality.

Meteorological data was collected at one station concurrently with the ambient air quality monitoring. The weather station was placed on the roof top at a height of 10m. Wind speed, wind direction, relative humidity and temperature & Rainfall were recorded at hourly intervals contineously.

The sampling locations of Ambient Air Quality in the Power plant premises covering upwind and down wind direction . To assess the effect of industrial activity of power plant on the air, environmental parameters like Particulate Matter-PM_{10}, Particulate Matter-$PM_{2.5}$, Sulphur Dioxide-SO_2, Nitrogen Dioxide –NO_2 were monitored Details of the sampling locations with respect to the plant site are given below in **Table-2.1** .

Table 2.1 Ambient Air Quality Monitoring Location

Code	Name of the monitoring Station	Distance from plant boundry (km)	Direction with respect to plant	Environmental Setting	Remarks
A1	**Near AWRS**	Within Plant	-	Within Plant	Industrial area
A2	**Nr. Brick Plant**	Within Plant	-	Within Plant	Industrial area
A3	**Nr. China colony**	Within Plant	-	Within Plant	Industrial area



<u>**Figure : 2.1 SAMPLING LOCATIONS MAP**</u>

2.2 Water Quality

Water samples were collected at various locations within the area of 10 Km radius from the plant to assess the Physico-Chemical quality of Surface and Ground Quality water. Samples were collected as per the standard procedures. On site Parameters like Temperature, Electrical Conductivity, pH and Dissolved Oxygen were analyzed at-site using portable water analysis kit. Samples were collected by taking suitable precautions for preparation and transportation, particularly using sterilized bottles for bacteriological analysis. The details of the sampling locations are given in **Table-2.2** and **Figure.2.1** as depicted.

Water samples were collected on quarterly basis from 8 locations (Ground water 4, Surface water-4 Analytical methods mentioned in IS: 3025 and Standard Methods published by APHA were followed.

TABLE-2.2 WATER SAMPLING LOCATIONS

Surface Water				
Code	Name of the monitoring Station	Distance from plant boundry (km)	Direction respect to plant	Source
SW1	Wainganga River Water	7.0	NW	River
SW2	Mendipur Pond Water	2.0	SE	Pond
SW3	Garada Village Nalah water	3.0	SSW	Nalah water
SW4	Kachewani Pond water	3.0	NE	Pond water
Ground Water				
GW1	Kachewani Hand Pump	3.2	NE	Bore well
GW2	Mendipur Hand Pump	2.5	SE	Bore well
GW3	Garada Hand Pump	3.2	SW	Bore well
GW4	Chikhali Hand Pump	2.0	S	Bore well
Waste Water				
WW1	Cooling Tower Blow Down water Unit-1			In Plant
WW2	Cooling Tower Blow Down water Unit-2			In Plant
WW3	Cooling Tower Blow Down water Unit-3			In Plant
WW4	Cooling Tower Blow Down water Unit-4			In Plant
WW5	Cooling Tower Blow Down water Unit-5			In Plant
WW6	Condenser cooling water Unit -1			In Plant
WW7	Condenser cooling water Unit -2			In Plant
WW8	Condenser cooling water Unit -3			In Plant
WW9	Condenser cooling water Unit -4			In Plant
WW10	Condenser cooling water Unit -5			In Plant
Piezometric Well water				
P1	Near AWRPH			In Plant
P2	B/H Ash dyke -1			In Plant
P3	Near Raw Water pump house -02			In Plant

2.3 Noise Level:

Noise level at following in plant location and Buffer zone location were recorded by APML for the period of APR.2019-SEPT.2019. Location details are given in **Table-2.3**. and as depicted in **Figure.2.1**

TABLE: 2.3 NOISE LEVEL LOCATIONS FOR THE PERIOD OF Apr.2019- Sept.2019

Code	Location	Location type	Remarks
NL- 1	Inside the plant	Near Shanti Niketan I, II & III	Industrial
NL- 2		Near Labour Hutment	Industrial
NL- 3		Near Store Area	Industrial
NL- 4		Gate No.1	Industrial
NL- 5		Gate No.2	Industrial
NL- 6		Gate No.3	Industrial
NL-7		Near OHC	Industrial
NL-8		Railway Siding	Industrial
NL-9		Near Reservoir 2	Industrial
NL-10		Near Ash Water Recovery Pump House	Industrial
NL-11		In China Colony	Industrial

2.4 Methodology of Monitoring

2.4.1 Instruments Used

Samples were collected at *'Ambient Air'* monitoring locations' using standard *Fine dust sampler &* RDS sampler for monitoring PM_{10}, $PM_{2.5}$, SO_2, NO_2, concentrations and analyzed as per *USEPA / IS* methods in APML Laboratories at site

Also Continuous Ambient Air Monitoring station installed (CAAQMS) at APML make Tyledyne and Met One instrument approved by USEPA.

On site Micro-meteorological data for wind direction, wind Speed, Temp, Relative humidity and Rainfall collected from APML.

Ground water, Surface water & Effluent water were analyzed for onsite parameters likeTemperature, Electrical Conductivity, pH and Dissolved Oxygen were analyzed on-site using portable water analysis kit**.** Samples are collected, preserved and sent for further analysis to Enviro Analysts & Engineers Pvt. Ltd, where other parameters like total hardness, chlorides, sulphate etc and heavy metals are analyzed as per requirements IS 3025/APHA methods.
Soil samples were analyzed for physical, chemical and heavy metal concentrations, using analytical methods.
Noise was measured at site locations using a noise level meter to determine sound levels in a scale as dB (A) This is suitable for audible range of 20 to 20,000 Hz for human being. Sound level monitoring done by APML.
Stack Monitoring kit having sensor probe was used to monitor stack data like Flue gas velocity, Volumetric flow of flue gas, Temperature of flue gas, Moisture content and other parameters like SPM, SO_2, NO_2 make by ECOTECH

2.4.2 Method of Analysis

Air samples were analyzed as per standard methods specified by Central Pollution Control Board (CPCB), EPA & IS method.

2.4.2.1 Meteorology

Micro-meteorological data was observed for wind direction and speed using wind vane and anemometer using an automatic met logger. The data was recorded at 1 hour interval. Wind speed & wind direction, Temperature, Rain fall, Relative humidity were recorded by Weather Monitoring Station by APML.

2.4.2.2 Ambient Air Quality (AAQ)

Sampling was carried out at each station during the stipulated study period using pre-calibrated Respirable Dust Samplers and Fine Dust Sampler in each of the stations by APML.
Earmarked samples were collected for Particulate Matter-PM_{10}, Particulate Matter-$PM_{2.5}$, SO_2 and NO_2 for 24 hourly.

The baseline data of air environment is generated for the parameters namely: Particulate Matter-$PM_{10,}$ Particulate Matter-$PM_{2.5}$, Sulphur Dioxide $SO_{2,}$ and Nitrogen Dioxide NO_2 in APML

2.4.2.3 Stack Monitoring

Stack emission were analyzed with the help of stack Kit (ECOTECH Stack Kit & Prob set, quarterly basis at Boiler Stack situated in plant. Height of the Boiler Stack was noted as, 275 m and I.D. 7.4m.Flue gas, Velocity, Temperature, Volume & Qty, Moisture Content, PM, SO_2, NO_2, Hg were analyzed. The values obtained were then compared vis-a-vis with the standards prescribed by CPCB.
Iso-kinetic stack monitoring was conducted as per standard method IS 11255 (Part-3) specified in Emission Regulation Act Part to determine SPM, SO_2 and NO_2, Data was collected and analysis was done for other parameters like Flue gas Velocity, Temperature, Volumetric flow rate, Moisture contents.

2.4.2.4 Water/Waste Water Quality

Water/Waste water samples were collected for physico-chemical and bacteriological parameters taking suitable Precautions. Temperature, pH, Dissolved Oxygen and Electrical conductivity were measured in the field while collecting the samples. Sterilized bottles were used to collect samples for bacteriological analysis, stored in ice and transported to the Laboratory.

Ground and surface water samples were analysed as per IS: 10500 and Waste Water samples were analysed as per IS: 3025. The analytical methods mentioned in IS: 3025 and Standard Methods published by APHA were followed. MPN Index of coli forms was found as per standard methods (IS: 1622).

2.4.2.5 Noise Level

Noise is defined as unwanted sound that creates interferences in speech, communication, causes annoyance, disturbance in work concentration and sleep, thus deteriorating the quality of Noise environment. In the present study, Noise monitoring has been conducted regularly by APML Since loudness of sound is the important parameter to assess the effects of particular activities on human being, hence noise level is measured for noise environment assessment. Hourly Sound Pressure level (SPL) was recorded with Sound Level Meter for 24 hours.

2.5 Analytical Procedures

2.5.1 Meteorology

The data obtained from field is used to as certain the wind percentage frequencies in the sixteen directions for wind speeds using Beaufort's scale in the range of 0-1.8, 1.8-3.6, 3.6 – 7.2, 7.2 – 14.4, 14.4 – 28.8 and >28.8 kmph. Average wind roses at twenty four hourly are prepared from the data collected. Temperature, Relative Humidity is monitoring by Automatic Weather Monitor (WM 271, Envirotech) and Rain fall by using Rain Gauge of WM 271.

2.5.2 Ambient Air Quality

Whatman GF/A & PTFE filter paper was used in Respirable dust sampler RSPM and FDS and weighed in Mettler electronic balance and computed as per standard methods.
Ambient Air samples were analyzed for SO_2 concentration levels by using Improved West-Gaeke method using spectrophotometer (HACH DR 5000) at a wavelength of 560 nm. NO2 conc. levels were estimated using Jacob and Hocheiser modified (Na-As) method using spectrophotometer (HACH DR 5000) at a wavelength of 540 nm

Sampling and Analytical Techniques

The techniques used for ambient air quality monitoring and minimum detectable levels are given in **Table-2.4**

TABLE- 2.4 (TECHNIQUES USED FOR AMBIENT AIR QUALITY MONITORING)

Sr. No.	Parameter	Technique	Technical protocol	Minimum detectable limit ($\mu g/m^3$)
1	PM10	Respirable Dust Sampler (Gravimetric Method)	IS-5182 (Part-IV)	5.0
2	PM2.5	Fine Respirable Dust Sampler (Gravimetric Method)	IS-5182 (Part-IV)	5.0
3	Sulphur dioxide	Improved West & Gaeke Method	IS-5182 (Part-II)	4.0
4	Nitrogen dioxide	Modified Jacob & Hochheiser Method	IS-5182 (Part-VI)	4.0

Chapter – 3

DATA ANALYSIS

3.0 DATA ANALYSIS

Environmental monitoring for the period of APR.2019-SEPT.2019 consisted of collection and analysis of meteorological parameters, ambient air quality and ground water and surface water quality at different locations within study area selected for carrying out environmental monitoring around the plant site.

3.1 Meteorology

Meteorological data was collected by APML on hourly basis for wind speed, Wind direction, temperature and relative humidity continuously. Total Rain fall for monthly basis during the period of APR.2019-SEPT.2019 was measured and recorded and reported in the Environmental report .

Wind Pattern for the period APR.2019-SEPT.2019.

The data recorded during the study period was analyzed and the daily maximum, minimum and total of all the parameters were observed. The summary of all the meteorological observations is given in **Table-3.1**.

TABLE- 3.1 METEOROLOGICAL DATA MONITORED AT SITE

(for the period of APR.2019-SEPT.2019)

Month	Temperature (^{0}C)		Relative Humidity (%)		Rainfall (mm)
	Max	Min	Max	Min	(Total)
April 2019	44.8	19.5	86.3	12.8	0
May 2019	46.9	21.6	58.7	20.4	0
Jun. 2019	46.2	21.6	95.0	23.1	203.5
July 2019	39.8	21.4	94.9	35.0	290.9
Aug. 2019	37.9	21.9	99.9	42.9	551.6
Sept. 2019	38.1	21.1	99.8	43.0	417.9

Temperature

The Temperature for the month of APR.2019-SEPT.2019 was found to be within range of 19.5°C – 46.9°C.

Relative Humidity

The average relative humidity for the month of APR.2019-SEPT.2019 was found to be within range of 12.8-99.9%.

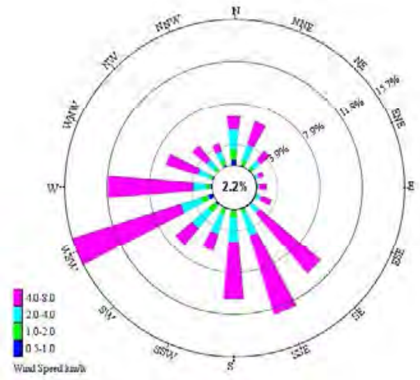
Rain Fall

Total Rain fall found the period of APR.2019-SEPT.2019 was 1463.9 mm

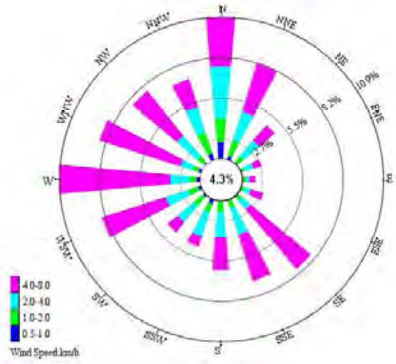
Wind Speed/Direction

The wind speed and direction data collected during the period of APR.2019-SEPT.2019. The wind roses plot using the collected data for APR.2019-SEPT.2019 is given in **Figure-3.1**

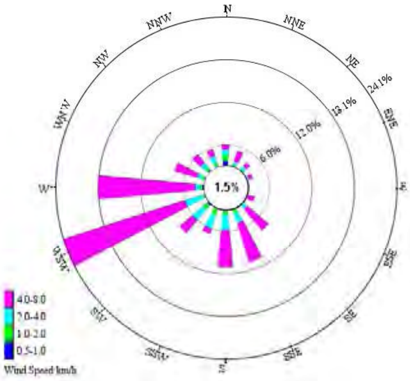
The first predominant wind direction during APR.2019-SEPT.2019 was WSW. The calm condition ranges from 0.3 to 4.3% .



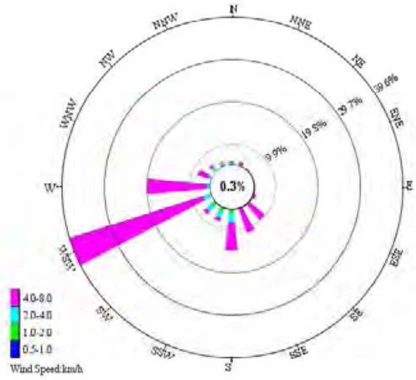
Wind rose for Apr. 2019



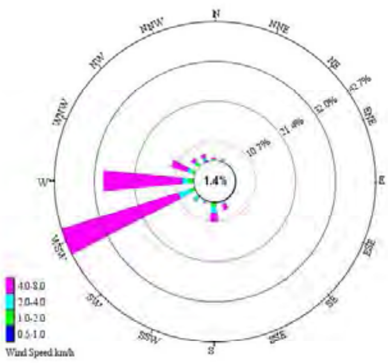
Wind rose for May 2019



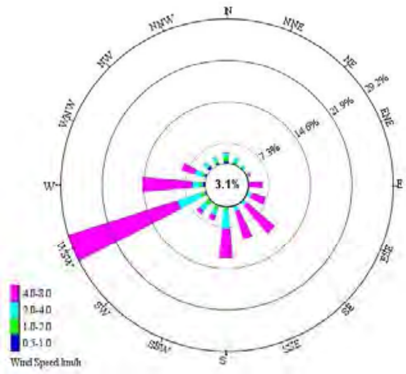
Wind rose for Jun. 2019



Wind rose for July. 2019



Wind rose for Aug. 2019



Wind rose for Sept. 2019

FIGURE-3.1 SITE SPECIFIC WINDROSE FOR APR.2019-SEPT.2019

3.2 Ambient Air Quality

Ambient air quality has been carried out within plant for the period of APR.2019-SEPT.2019. PM_{10}, $PM_{2.5}$, SO_2 & NO_2, sampling at all the locations is done for 24 hours average twice a week by APML. The values obtained were then compared vis-a-vis the standards prescribed by CPCB for Industrial/ Rural / Residential uses.

3.2.1 Presentation of Results.

The summary of Ambient Air Quality monitoring results for the period of APR.2019-SEPT.2019 are presented in detail in **Table 3.2** for Inside plant area. 98th percentile; maximum and minimum values etc have been computed from the collected raw data for all the AAQ monitoring station. The data has been compared with the standards prescribed by Central Pollution Control Board (CPCB)/NAAQ for residential and rural zone.

Particulate Matter-PM10

The minimum and maximum concentrations during APR.2019-SEPT.2019 in the plant area location for Particulate Matter-PM_{10} were recorded as 13.3 μg/m^3 and 84.1 μg/m^3 respectively. The minimum concentration was recorded at Near Brick Plant (A2) and maximum concentration at Near China colony (A3).

Particulate Matter-$PM_{2.5}$

The minimum and maximum concentrations in the plant area location for $PM_{2.5}$ were recorded as 4.2μg/m^3 and 52.6 μg/m^3 respectively. The minimum and maximum concentration was recorded at Near Chaina Colony (A3).

Sulphur Dioxide (SO_2)

The minimum and maximum SO_2 concentrations in the plant area location were recorded as 6.1 μg/m^3 and 17.8 μg/m^3 respectively. The minimum and maximum concentration was recorded at Near Brick Plant (A2) & Near Chaina Colony(A3)respectively.

Nitrogen Dioxide (NO_2)

The minimum and maximum NO_2 concentrations in the plant area location were recorded as 10.2 μg/m^3 and 34.6 μg/m^3 respectively. The minimum concentration was recorded at all Plant location and Near AWRS (A1)respectively.

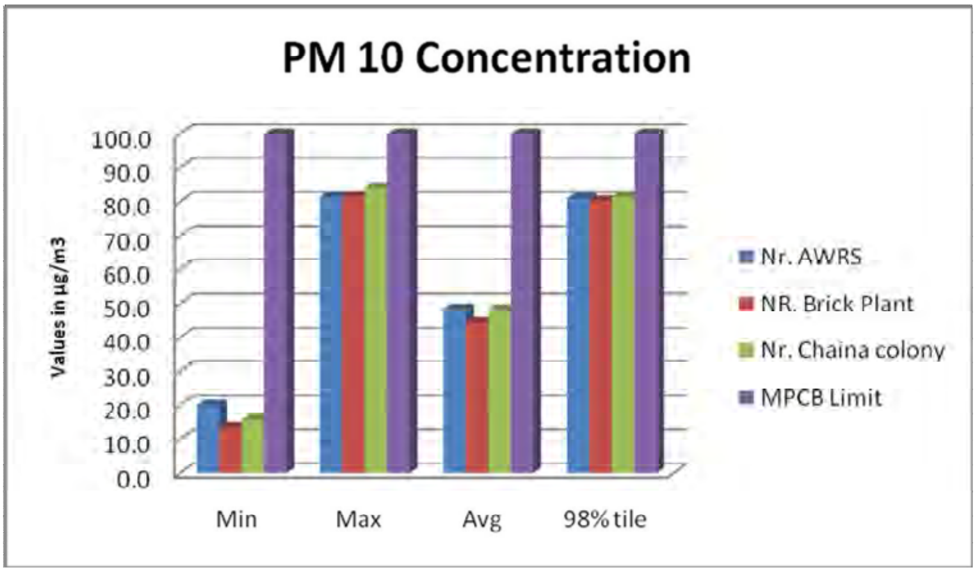
TABLE- 3.2 SUMMARY OF AMBIENT AIR QUALITY RESULT

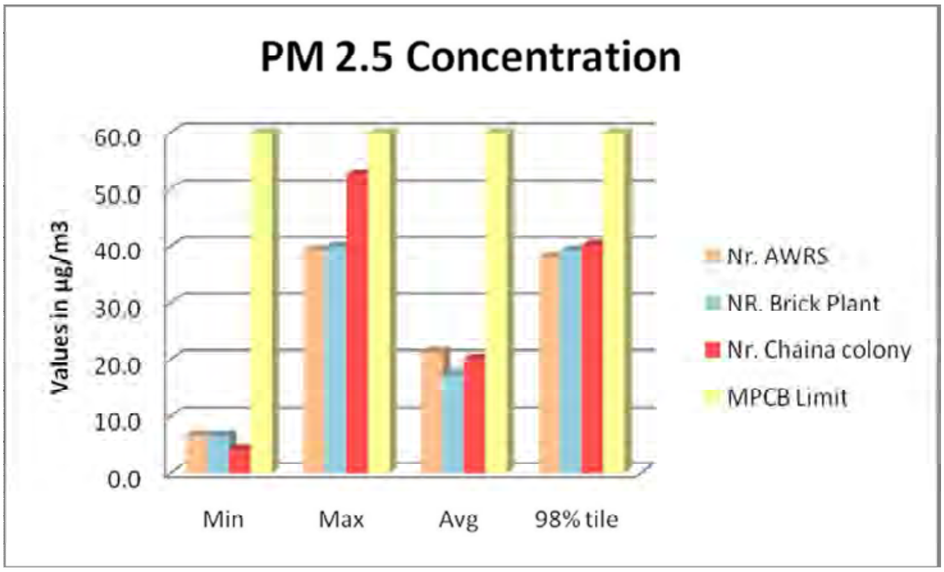
(Inside Plant Premises)

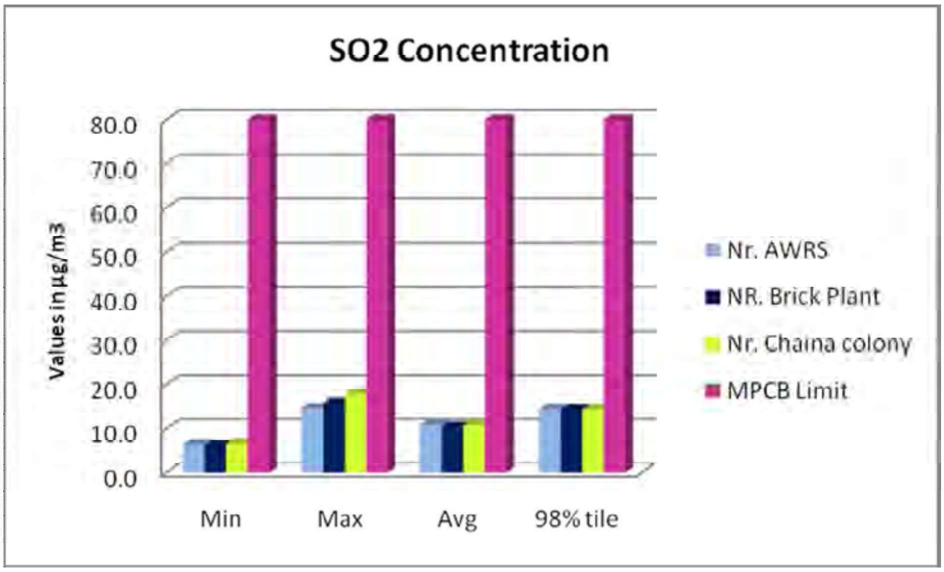
for the period of Apr 2019- Sept. 2019

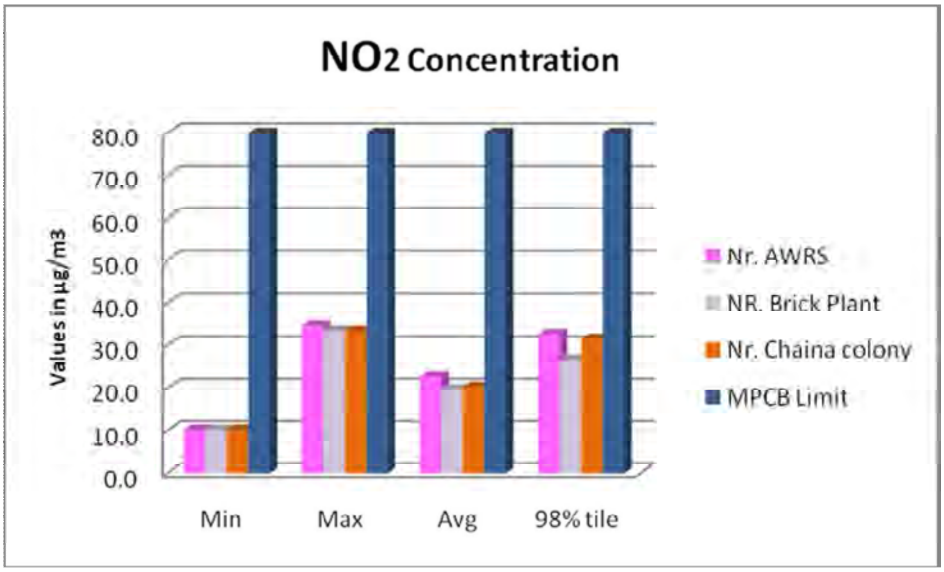
All values are µg/m3

Location	PM_{10}				$PM_{2.5}$				SO_2				NO_2			
	Min	Max	Avg	98% tile	Min	Max	Avg	98% tile	Min	Max	Avg.	98% tile	Min	Max	Avg.	98% tile
Nr. AWRS	20.1	81.5	48.4	81.0	6.6	39.3	21.3	38.0	6.3	14.7	10.9	14.4	10.2	34.6	22.7	32.7
Nr. Brick Plant	13.3	81.5	44.5	80.3	6.5	39.9	17.5	39.3	6.1	15.8	10.4	14.3	10.2	33.5	19.8	26.7
Nr. Chaina colony	15.8	84.1	48.2	81.4	4.2	52.6	20.2	40.2	6.6	17.8	10.8	14.4	10.2	33.5	20.3	31.6




PM 2.5 Concentration
Values in µg/m3
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Min
Max
Avg
98% tile
Nr. AWRS
NR. Brick Plant
Nr. Chaina colony
MPCB Limit


SO2 Concentration
Values in µg/m3
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Min
Max
Avg
98% tile
Nr. AWRS
NR. Brick Plant
Nr. Chaina colony
MPCB Limit



3.3 Stack Monitoring.

Stack monitoring is done with the help of stack Kit (ECOTECH Stack Kit) & Prob set, once in a quarter at Boiler Stack 1 to 5 situated in plant. Height of the Boiler Stack was noted as, 275m and I.D. 7.4m.Flue gas, Velocity, Temperature, Volume & Qty, SPM, SO_2, NO_x, Hg are analysed. The values obtained are then compared vis-a-vis with the standards prescribed by CPCB.

3.3.1 Presentation of Results.

The Stack analysis results for the period of APR.2019-SEPT.2019 are presented in detail for various parameters like Flue gas, Velocity, Temperature, Volume & Qty, SPM, SO_2, NOx, Hg values etc computed from the collected raw data for the Stack monitoring station. The summary of these results is presented below. The data has been compared with the standards prescribed by Central Pollution Control Board (CPCB)/MPCB

TABLE- 3.3 Stack Analysis Report for the period of Apr. 2019 - Sept.-2019

Power Plant (Unit-I to Unit 5)

PARAMETERS	CONCENTRATION									
	Unit I		Unit 2		Unit 3		Unit 4		Unit 5	
Date of Sampling	May2019	Aug. 2019	May2019	Aug. 2019	May2019	Aug. 2019	May2019	Aug. 2019	May2019	Aug. 2019
Diameter of Stack (M)	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Height of Stack (M)	275	275	275	275	275	275	275	275	275	275
Temp. of exit gas (0 C)	135	128	137	127	134	127	132	121	128	123
Velocity of exit gas (m/sec)	23.9	23.2	23.55	23.40	23.60	23.81	23.82	22.90	23.92	23.65
Flow of exit gas at stack temp. & Press.(m3/hr)	3698567.06	3590240.83	3644403.95	3621191.18	3652141.54	3684639.40	3686186.92	3543815.30	3701662.10	3659879.12
Flow of exit gas at NTP(Nm3/hr)	2566334.15	2534656.31	2516416.48	2562898.06	2540347.10	2607803.54	2576690.17	2546330.23	2613318.05	2616443.89
SPM (mg/Nm3)	44.2	42.7	41.8	44.2	44.0	35.6	40.6	43.7	42.8	44.7
Total dust emission (kg/hr)	113.43	108.23	105.19	113.28	111.77	92.83	104.61	111.27	111.85	116.96
SO2 (mg/Nm3)	1090.6	916.2	1106.8	936.3	1107.5	958.4	1094.77	865.07	1052.8	848.2
SO2 (kg/hr)	2798.84	2322.25	2785.17	2399.64	2813.43	2499.3	2820.88	2202.75	2751.30	2219.27
SO2 (TPD)	67.17	55.73	66.84	57.59	67.52	59.98	67.70	52.87	66.03	53.26
NOx (mg/Nm3)	296.7	277.4	295.9	278.8	291.7	285.4	298.2	266.7	283.5	281.4
Mercury (mg/Nm3)	0.0298	0.0285	0.0291	0.0295	0.0282	0.0287	0.0289	0.0291	0.0280	0.0274

3.4 Water Quality

Ground waters were collected at 4 locations and Surface water at 4 locations within the 10 km radial distance of power plant were analyzed as per IS 10500 to assess the quality of water for portability.

Presentation of Results

The results of the water quality monitored in the period of APR.2019-SEPT.2019, that of four surface water and four ground water samples and seven drinking water samples. The surface water quality results are given in **Table-3.4**, the results of ground water quality is given in **Table-3.5** and the results of Waste water quality are given in **Table-3.6** the findings are discussed below.

3.4.1 Ground Water Quality.

Most of the villages in the Nearby plant area have hand pumps, as most of the residents of these area use of this water for drinking and other domestic uses.

The analysis results indicate that the pH ranges from 7.10 to 8.30 the maximum and Minimum pH were observed at Kachewani Village (GW1) which is well within the specified standard of 6.5 to 8.5.

Total hardness was observed to be ranging from 170 to 522 mg/l. The maximum hardness 522 mg/l was recorded at Kachewani Village (GW1) and the minimum hardness of 170 mg/l was recorded at Chikhali village(GW4). which is well within the specified standard of 200(600) mg/l.

Chlorides were found to be in the range of 11.3 mg/l to 190mg/l, the maximum concentration of chlorides was observed at Kachewani Village (GW1) and the minimum concentration of chlorides was observed at Chikhali Village(GW4)

Sulphates were found to be in the range of 9.8 mg/l to 54.1 mg/l. The maximum value observed at Kachewani Village (GW1) and the minimum value observed at Chikhali Village(GW4).
The values of Chlorides and sulphates are acceptable limits.
The analysis results indicate all parameter including bacteriological and heavy metal parameters are well within the drinking water standards.

3.4.2 Surface Water Quality.

The analysis results indicate that the pH values in the range of 7.85 to 8.50 the minimum and maximum value was observed at Medipur Pond and Garada Nalah respectively which is well within the specified standard of 6.5 to 8.5.

TDS was observed in the range of 152 mg/l to 780 mg/l, the maximum TDS value was observed at Garada Nalah where as minimum value was observed in Wainganga River, where as TDS is within Desirable limits.

Chlorides and Sulphates were found to be in the range of 10.1 to 91.6 mg/l and 7.4 to 56.2 mg/l respectively. It is observed that value of chlorides and Sulphates are well within acceptable limits. It is evident from the above values that all the parameters are found to comply with the requirements of IS: 10500 specification of surface water except bacteriological parameters. The surface water quality does not indicate any industrial contamination.

Heavy metals concentrations for metals like Arsenic (As), Mercury (Hg), Lead (Pb), Cadmium (Cd), Chromium (Cr) and Copper (Cu) were found to be within the acceptable limits.

3.4.3 Waste Water Quality

Waste water samples were also collected from Cooling Tower Blodown of unit 1 to 5, Analytical methods mentioned in IS: 3025 and Standard Methods published by APHA were followed. The summary of waste water quality collected on quarterly basis for the period of Apr. 2019- Sept 2019 are given in **Table-3.6**

3.4.4 Pizo-Metric water

There were 3 Pizo meteric monitoried for water level and collected water samples were analyzed as per IS: 3025 and Standard Methods published by APHA were followed. The summary of pizo-metric water quality collected on quarterly basis for the period of Apr. 2019- Sept. 2019 are given in **Table-3.7**

3.5 Noise Level:

Noise level was measured by APML in basic units of dB(A) at eleven location inside the plant (industrial Area) during day time and Night time for 24Hrs.

Noise level was found within the acceptable limits during daytime as well as night time for all locations with reference to CPCB standard limits for Industrial area and Residential area.

Noise levels at following locations were recorded for the period of Apr. 2019- Sept. 2019 on monthly basis. The summary of Noise Level is given in **Table-3.8**

TABLE- 3.4 SURFACE WATER QUALITY

SW1: Wainganga River Water

Sr. No.	Test Parameters	Unit	As per IS 10500 : 2012	Results	
				May2019	Aug. 2019
1	**Apparent Colour**	Hazen units	5 (15)	0.3	1.5
2	**Odour**	-	Agreeable	Agreeable	Agreeable
3	**Taste**	-	Agreeable	-	-
4	**Turbidity NTU**	NTU	1(5)	0.2	0.5
5	**Total Dissolved Solid**	mg / l	500 (2000)	186	90
6	**Electrical Conductivity**	µS/cm	-	292	148
7	**Total Alkalinity**	mg / l	200 (600)	140	72
8	**pH Value** at 25°C	-	6.5 to 8.5	7.70	8.3
9	**Total Hardness (CaCO3)**	mg / l	200 (600)	118	70.5
10	**Calcium (as Ca)**	mg / l	75 (200)	35.8	20.8
11	**Magnesium (as Mg)**	mg / l	30 (100)	6.9	4.5
12	**Copper as(Cu)**	mg / l	0.05(1.5)	< 0.01	< 0.01
13	**Iron (as Fe)**	mg / l	0.3	0.080	< 0.07
14	**Manganese as (Mn)**	mg / l	0.1(0.3)	< 0.01	< 0.01
15	**Chlorides (as Cl)**	mg / l	250(1000)	13.4	8.8
16	**Sulphate (as SO4)**	mg / l	200 (400)	12.6	5.2
17	**Nitrates (as NO3)**	mg / l	45	2.85	2.10
18	**Fluoride (as F)**	mg / l	1.0 (1.5)	0.40	0.25
19	**Phenolic Compounds**	mg / l	0.001	BDL	BDL
20	**Mercury as (Hg)**	mg / l	0.001	< 0.0005	< 0.0005
21	**Cadmium as (Cd)**	mg / l	0.003	< 0.001	< 0.001
22	**Selenium as (Se)**	mg / l	0.01	< 0.001	< 0.001
23	**Arsenic as (As)**	mg / l	0.01 (0.05)	< 0.01	< 0.01
24	**Cyanide as (CN)**	mg / l	0.05	< 0.005	< 0.005
25	**Lead as (Pb)**	mg / l	0.01	< 0.001	< 0.001
26	**Zinc as (Zn)**	mg / l	5 (15)	0.17	0.10
27	**Total Chromium as (Cr)**	mg / l	0.05	< 0.03	< 0.03
28	**Mineral Oil**	mg / l	0.05	< 0.01	< 0.01
29	**Free Residual Chlorine**	mg / l	0.2 (1.0)	Nil	Nil
30	**Total Coliform**	MPN/100 ml	Absent	>16	>16
31	**E. Coli**	Nos./100 ml	Absent	12	>16

Note : Standards limit given as Acceptable Limit (Permissible Limit)

SW2: Mendipur Pond Water

Sr. No.	Test Parameters	Unit	As per IS 10500 : 2012	Results	
				May 2019	**Aug. 2019**
1	**Apparent Colour**	Hazen units	5 (15)	2.5	3.0
2	**Odour**	-	Agreeable	Agreeable	Agreeable
3	**Taste**	-	Agreeable	-	-
4	**Turbidity NTU**	NTU	1(5)	1.5	2.0
5	**Total Dissolved Solid**	mg / l	500 (2000)	226	138
6	**Electrical Conductivity**	µS/cm	-	352	226
7	**Total Alkalinity**	mg / l	200 (600)	172	108
8	**pH Value** at 25°C	-	6.5 to 8.5	8.3	8.1
9	**Total Hardness (CaCO3)**	mg / l	200 (600)	118	84.6
10	**Calcium (as Ca)**	mg / l	75 (200)	36.2	26.2
11	**Magnesium (as Mg)**	mg / l	30 (100)	6.68	4.6
12	**Copper as(Cu)**	mg / l	0.05(1.5)	< 0.01	< 0.01
13	**Iron (as Fe)**	mg / l	0.3	0.085	0.070
14	**Manganese as (Mn)**	mg / l	0.1(0.3)	0.013	0.010
15	**Chlorides (as Cl)**	mg / l	250(1000)	16.2	10.7
16	**Sulphate (as SO4)**	mg / l	200 (400)	11.8	8.1
17	**Nitrates (as NO3)**	mg / l	45	8.5	6.7
18	**Fluoride (as F)**	mg / l	1.0 (1.5)	0.50	0.35
19	**Phenolic Compounds**	mg / l	0.001	BDL	BDL
20	**Mercury as (Hg)**	mg / l	0.001	< 0.0005	< 0.0005
21	**Cadmium as (Cd)**	mg / l	0.003	< 0.001	< 0.001
22	**Selenium as (Se)**	mg / l	0.01	< 0.001	< 0.001
23	**Arsenic as (As)**	mg / l	0.01 (0.05)	< 0.01	< 0.01
24	**Cyanide as (CN)**	mg / l	0.05	< 0.005	< 0.005
25	**Lead as (Pb)**	mg / l	0.01	< 0.001	< 0.001
26	**Zinc as (Zn)**	mg / l	5 (15)	0.26	0.12
27	**Total Chromium as (Cr)**	mg / l	0.05	< 0.03	< 0.03
28	**Mineral Oil**	mg / l	0.05	< 0.01	< 0.01
29	**Free Residual Chlorine**	mg / l	0.2 (1.0)	Nil	Nil
30	**Total Coliform**	MPN/100 ml	Absent	> 16	> 16
31	**E. Coli**	Nos./100 ml	Absent	> 16	> 16

Note : Standards limit given as Acceptable Limit (Permissible Limit)

SW3: Garada Village Nalah water

Sr. No.	Test Parameters	Unit	As per IS 10500 : 2012	Results	
				May2019	Aug. 2019
1	**Apparent Colour**	Hazen units	5 (15)	1.5	2.5
2	**Odour**	-	Agreeable	Agreeable	Agreeable
3	**Taste**	-	Agreeable	-	-
4	**Turbidity NTU**	NTU	1(5)	1.0	1.5
5	**Total Dissolved Solid**	mg / l	500 (2000)	780	202
6	**Electrical Conductivity**	µS/cm	-	1210	330
7	**Total Alkalinity**	mg / l	200 (600)	234	146
8	**pH Value** at 25^{o}C	-	6.5 to 8.5	8.15	8.0
9	**Total Hardness (CaCO3)**	mg / l	200 (600)	292	148
10	**Calcium (as Ca)**	mg / l	75 (200)	70.2	38.8
11	**Magnesium (as Mg)**	mg / l	30 (100)	28.3	12.4
12	**Copper as(Cu)**	mg / l	0.05(1.5)	< 0.01	< 0.01
13	**Iron (as Fe)**	mg / l	0.3	0.20	0.09
14	**Manganese as (Mn)**	mg / l	0.1(0.3)	< 0.01	< 0.01
15	**Chlorides (as Cl)**	mg / l	250(1000)	61.8	13.6
16	**Sulphate (as SO4)**	mg / l	200 (400)	30.4	9.4
17	**Nitrates (as NO3)**	mg / l	45	7.0	5.4
18	**Fluoride (as F)**	mg / l	1.0 (1.5)	0.75	0.40
19	**Phenolic Compounds**	mg / l	0.001	BDL	BDL
20	**Mercury as (Hg)**	mg / l	0.001	< 0.0005	< 0.0005
21	**Cadmium as (Cd)**	mg / l	0.003	< 0.001	< 0.001
22	**Selenium as (Se)**	mg / l	0.01	< 0.001	< 0.001
23	**Arsenic as (As)**	mg / l	0.01 (0.05)	< 0.01	< 0.01
24	**Cyanide as (CN)**	mg / l	0.05	< 0.005	< 0.005
25	**Lead as (Pb)**	mg / l	0.01	< 0.001	< 0.001
26	**Zinc as (Zn)**	mg / l	5 (15)	0.52	0.18
27	**Total Chromium as (Cr)**	mg / l	0.05	< 0.03	< 0.03
28	**Mineral Oil**	mg / l	0.05	< 0.01	< 0.01
29	**Free Residual Chlorine**	mg / l	0.2 (1.0)	Nil	Nil
30	**Total Coliform**	MPN/100 ml	Absent	> 16	> 16
31	**E. Coli**	Nos./100 ml	Absent	> 16	> 16

Note : Standards limit given as Acceptable Limit (Permissible Limit)

SW4: Kachewani Pond water

Sr. No.	Test Parameters	Unit	As per IS 10500 : 2012	Results	
				May 2019	Aug. 2019
1	**Apparent Colour**	Hazen units	5 (15)	2.0	3.2
2	**Odour**	-	Agreeable	Agreeable	Agreeable
3	**Taste**	-	Agreeable	-	-
4	**Turbidity NTU**	NTU	1(5)	1.0	2.0
5	**Total Dissolved Solid**	mg / l	500 (2000)	250	214
6	**Electrical Conductivity**	µS/cm	-	390	348
7	**Total Alkalinity**	mg / l	200 (600)	174	166
8	**pH Value** at 25^{o}C	-	6.5 to 8.5	7.85	8.2
9	**Total Hardness (CaCO3)**	mg / l	200 (600)	152	128
10	**Calcium (as Ca)**	mg / l	75 (200)	40.8	34.8
11	**Magnesium (as Mg)**	mg / l	30 (100)	12.1	9.9
12	**Copper as(Cu)**	mg / l	0.05(1.5)	< 0.01	< 0.01
13	**Iron (as Fe)**	mg / l	0.3	0.085	0.070
14	**Manganese as (Mn)**	mg / l	0.1(0.3)	< 0.01	< 0.01
15	**Chlorides (as Cl)**	mg / l	250(1000)	18.6	11.7
16	**Sulphate (as SO4)**	mg / l	200 (400)	14.2	9.8
17	**Nitrates (as NO3)**	mg / l	45	5.2	4.7
18	**Fluoride (as F)**	mg / l	1.0 (1.5)	0.55	0.30
19	**Phenolic Compounds**	mg / l	0.001	BDL	BDL
20	**Mercury as (Hg)**	mg / l	0.001	< 0.0005	< 0.0005
21	**Cadmium as (Cd)**	mg / l	0.003	< 0.001	< 0.001
22	**Selenium as (Se)**	mg / l	0.01	< 0.001	< 0.001
23	**Arsenic as (As)**	mg / l	0.01 (0.05)	< 0.01	< 0.01
24	**Cyanide as (CN)**	mg / l	0.05	< 0.005	< 0.005
25	**Lead as (Pb)**	mg / l	0.01	< 0.001	< 0.001
26	**Zinc as (Zn)**	mg / l	5 (15)	0.27	0.15
27	**Total Chromium as (Cr)**	mg / l	0.05	< 0.03	< 0.03
28	**Mineral Oil**	mg / l	0.05	< 0.01	< 0.01
29	**Free Residual Chlorine**	mg / l	0.2 (1.0)	Nil	Nil
30	**Total Coliform**	MPN/100 ml	Absent	> 16	> 16
31	**E.Coli**	Nos./100 ml	Absent	> 16	> 16

Note : Standards limit given as Acceptable Limit (Permissible Limit)

TABLE- 3.5 GROUND WATER REPORT

Monitoring Date: 10.05.2019

STATIC WATER LEVEL OF OPEN WELL						
Name of village	**Plinth Height (m)**	**Diameter (m)**	**Water level from G.L. (m)**	**Shape**	**Total Depth of well from G.L (m)**	**Landmark**
Mendipur	0.85	1.45	9.20	Round	11.00	**Near Vitoba Ahinshak Suryavanshi Residence**
Khairbori	1.10	1.83	8.35	Round	10.10	**Near Hanuman Temple, Durga Temple**
Churadi	1.20	2.60	9.45	Round	11.60	**Near Primary School**
Kachewani	1.5	4.80	dry	Round	12.30	**Opp. ZP. school**

Monitoring Date: 26.08.2019

STATIC WATER LEVEL OF OPEN WELL						
Name of village	**Plinth Height (m)**	**Diameter (m)**	**Water level from G.L. (m)**	**Shape**	**Total Depth of well from G.L (m)**	**Landmark**
Mendipur	0.85	1.45	2.15	Round	11.00	**Near Vitoba Ahinshak Suryavanshi Residence**
Khairbori	1.10	1.83	1.10	Round	10.10	**Near Hanuman Temple, Durga Temple**
Churadi	1.20	2.60	1.90	Round	11.60	**Near Primary School**
Kachewani	1.5	4.80	1.55	Round	12.30	**Opp. ZP. school**

GROUND WATER QUALITY

GW1: Kachewani Hand Pump water

Sr. No.	Test Parameters	Unit	As per IS 10500 : 2012	Results	
				May 2019	Aug. 2019
1	**Apparent Colour**	Hazen units	5 (15)	0.1	0.1
2	**Odour**	-	Agreeable	Agreeable	Agreeable
3	**Taste**	-	Agreeable	Agreeable	Agreeable
4	**Turbidity NTU**	NTU	1(5)	0.1	0.1
5	**Total Dissolved Solid**	mg / l	500 (2000)	1014	924
6	**Electrical Conductivity**	µS/cm	-	1578	1490
7	**Total Alkalinity**	mg / l	200 (600)	216	182
8	**pH Value** at 25^{o}C	-	6.5 to 8.5	8.0	7.5
9	**Total Hardness (CaCO3)**	mg / l	200 (600)	540	468
10	**Calcium (as Ca)**	mg / l	75 (200)	120.8	112.2
11	**Magnesium (as Mg)**	mg / l	30 (100)	57.8	45.5
12	**Copper as(Cu)**	mg / l	0.05(1.5)	< 0.01	< 0.01
13	**Iron (as Fe)**	mg / l	0.3	0.25	0.15
14	**Manganese as (Mn)**	mg / l	0.1(0.3)	0.010	0.010
15	**Chlorides (as Cl)**	mg / l	250(1000)	246	217
16	**Sulphate (as SO4)**	mg / l	200 (400)	190	138
17	**Nitrates (as NO3)**	mg / l	45	3.8	2.95
18	**Fluoride (as F)**	mg / l	1.0 (1.5)	0.95	0.80
19	**Phenolic Compounds**	mg / l	0.001	BDL	BDL
20	**Mercury as (Hg)**	mg / l	0.001	< 0.0005	< 0.0005
21	**Cadmium as (Cd)**	mg / l	0.003	< 0.001	< 0.001
22	**Selenium as (Se)**	mg / l	0.01	< 0.001	< 0.001
23	**Arsenic as (As)**	mg / l	0.01 (0.05)	< 0.01	< 0.01
24	**Cyanide as (CN)**	mg / l	0.05	< 0.005	< 0.005
25	**Lead as (Pb)**	mg / l	0.01	< 0.001	< 0.001
26	**Zinc as (Zn)**	mg / l	5 (15)	1.2	0.92
27	**Total Chromium as (Cr)**	mg / l	0.05	< 0.03	< 0.03
28	**Mineral Oil**	mg / l	0.05	< 0.01	< 0.01
29	**Free Residual Chlorine**	mg / l	0.2 (1.0)	< 0.1	< 0.1
30	**Total Coliform**	MPN/100 ml	Absent	Absent	Absent
31	**E. Coli**	Nos./100 ml	Absent	Absent	Absent

Note : Standards limit given as Acceptable Limit (Permissible Limit)

GW2: Mendipur Hand Pump water

Sr. No.	Test Parameters	Unit	As per IS 10500 :2012	Results	
				May 2019	Aug. 2019
1	**Apparent Colour**	Hazen units	5 (15)	0.1	0.1
2	**Odour**	-	Agreeable	Agreeable	Agreeable
3	**Taste**	-	Agreeable	Agreeable	Agreeable
4	**Turbidity NTU**	NTU	1(5)	0.1	0.1
5	**Total Dissolved Solid**	mg / l	500 (2000)	582	302
6	**Electrical Conductivity**	µS/cm	-	990	494
7	**Total Alkalinity**	mg / l	200 (600)	192	192
8	**pH Value** at 25^{o}C	-	6.5 to 8.5	7.70	7.90
9	**Total Hardness (CaCO3)**	mg / l	200 (600)	282	196
10	**Calcium (as Ca)**	mg / l	75 (200)	70.2	58.8
11	**Magnesium (as Mg)**	mg / l	30 (100)	25.9	11.9
12	**Copper as(Cu)**	mg / l	0.05(1.5)	< 0.01	< 0.01
13	**Iron (as Fe)**	mg / l	0.3	0.11	0.08
14	**Manganese as (Mn)**	mg / l	0.1(0.3)	0.010	< 0.01
15	**Chlorides (as Cl)**	mg / l	250(1000)	62.4	39.7
16	**Sulphate (as SO4)**	mg / l	200 (400)	23.2	16.2
17	**Nitrates (as NO3)**	mg / l	45	2.80	2.20
18	**Fluoride (as F)**	mg / l	1.0 (1.5)	0.80	0.65
19	**Phenolic Compounds**	mg / l	0.001	BDL	BDL
20	**Mercury as (Hg)**	mg / l	0.001	< 0.0005	< 0.0005
21	**Cadmium as (Cd)**	mg / l	0.003	< 0.001	< 0.001
22	**Selenium as (Se)**	mg / l	0.01	< 0.001	< 0.001
23	**Arsenic as (As)**	mg / l	0.01 (0.05)	< 0.01	< 0.01
24	**Cyanide as (CN)**	mg / l	0.05	< 0.005	< 0.005
25	**Lead as (Pb)**	mg / l	0.01	< 0.001	< 0.001
26	**Zinc as (Zn)**	mg / l	5 (15)	0.45	0.30
27	**Total Chromium as (Cr)**	mg / l	0.05	< 0.03	< 0.03
28	**Mineral Oil**	mg / l	0.05	< 0.01	< 0.01
29	**Free Residual Chlorine**	mg / l	0.2 (1.0)	< 0.1	< 0.1
30	**Total Coliform**	MPN/100 ml	Absent	Absent	Absent
31	**E.Coli**	Nos./100 ml	Absent	Absent	Absent

Note : Standards limit given as Acceptable Limit (Permissible Limit)

GW3: Garada Hand Pump water

Sr. No.	Test Parameters	Unit	As per IS 10500 : 2012	Results	
				May 2019	Aug. 2019
1	**Apparent Colour**	Hazen units	5 (15)	0.1	0.1
2	**Odour**	-	Agreeable	Agreeable	Agreeable
3	**Taste**	-	Agreeable	Agreeable	Agreeable
4	**Turbidity NTU**	NTU	1(5)	0.1	0.1
5	**Total Dissolved Solid**	mg / l	500 (2000)	788	662
6	**Electrical Conductivity**	µS/cm	-	1210	1060
7	**Total Alkalinity**	mg / l	200 (600)	194	182
8	**pH Value** at 25°C	-	6.5 to 8.5	7.70	7.60
9	**Total Hardness (CaCO3)**	mg / l	200 (600)	316	294
10	**Calcium (as Ca)**	mg / l	75 (200)	81.8	76.8
11	**Magnesium (as Mg)**	mg / l	30 (100)	27.1	24.8
12	**Copper as(Cu)**	mg / l	0.05(1.5)	< 0.01	< 0.01
13	**Iron (as Fe)**	mg / l	0.3	0.15	0.12
14	**Manganese as (Mn)**	mg / l	0.1(0.3)	< 0.01	< 0.01
15	**Chlorides (as Cl)**	mg / l	250(1000)	130.2	114.6
16	**Sulphate (as SO4)**	mg / l	200 (400)	37.8	29.6
17	**Nitrates (as NO3)**	mg / l	45	2.55	2.30
18	**Fluoride (as F)**	mg / l	1.0 (1.5)	0.90	0.80
19	**Phenolic Compounds**	mg / l	0.001	BDL	BDL
20	**Mercury as (Hg)**	mg / l	0.001	< 0.0005	< 0.0005
21	**Cadmium as (Cd)**	mg / l	0.003	< 0.001	< 0.001
22	**Selenium as (Se)**	mg / l	0.01	< 0.001	< 0.001
23	**Arsenic as (As)**	mg / l	0.01 (0.05)	< 0.01	< 0.01
24	**Cyanide as (CN)**	mg / l	0.05	< 0.005	< 0.005
25	**Lead as (Pb)**	mg / l	0.01	< 0.001	< 0.001
26	**Zinc as (Zn)**	mg / l	5 (15)	0.42	0.35
27	**Total Chromium as (Cr)**	mg / l	0.05	< 0.03	< 0.03
28	**Mineral Oil**	mg / l	0.05	< 0.01	< 0.01
29	**Free Residual Chlorine**	mg / l	0.2 (1.0)	< 0.1	< 0.1
30	**Total Coliform**	MPN/100 ml	Absent	Absent	Absent
31	**E. Coli**	Nos./100 ml	Absent	Absent	Absent

Note : Standards limit given as Acceptable Limit (Permissible Limit)

GW4: Chikhali Hand Pump water

Sr. No.	Test Parameters	Unit	As per IS 10500 : 2012	Results	
				May 2019	Aug. 2019
1	Apparent Colour	Hazen units	5 (15)	0.1	0.1
2	Odour	-	Agreeable	Agreeable	Agreeable
3	Taste	-	Agreeable	Agreeable	Agreeable
4	Turbidity NTU	NTU	1(5)	0.1	0.1
5	Total Dissolved Solid	mg / l	500 (2000)	276	219
6	Electrical Conductivity	µS/cm	-	480	358
7	Total Alkalinity	mg / l	200 (600)	190	190
8	pH Value at 25^{o}C	-	6.5 to 8.5	8.2	7.8
9	Total Hardness (CaCO3)	mg / l	200 (600)	184	146
10	Calcium (as Ca)	mg / l	75 (200)	48.0	42.8
11	Magnesium (as Mg)	mg / l	30 (100)	15.55	9.48
12	Copper as(Cu)	mg / l	0.05(1.5)	< 0.01	< 0.01
13	Iron (as Fe)	mg / l	0.3	0.10	0.08
14	Manganese as (Mn)	mg / l	0.1(0.3)	< 0.01	< 0.01
15	Chlorides (as Cl)	mg / l	250(1000)	13.7	11.3
16	Sulphate (as SO4)	mg / l	200 (400)	10.5	9.2
17	Nitrates (as NO3)	mg / l	45	2.15	2.10
18	Fluoride (as F)	mg / l	1.0 (1.5)	0.60	0.55
19	Phenolic Compounds	mg / l	0.001	BDL	BDL
20	Mercury as (Hg)	mg / l	0.001	< 0.0005	< 0.0005
21	Cadmium as (Cd)	mg / l	0.003	< 0.001	< 0.001
22	Selenium as (Se)	mg / l	0.01	< 0.001	< 0.001
23	Arsenic as (As)	mg / l	0.01 (0.05)	< 0.01	< 0.01
24	Cyanide as (CN)	mg / l	0.05	< 0.005	< 0.005
25	Lead as (Pb)	mg / l	0.01	< 0.001	< 0.001
26	Zinc as (Zn)	mg / l	5 (15)	0.15	0.12
27	Total Chromium as (Cr)	mg / l	0.05	< 0.03	< 0.03
28	Mineral Oil	mg / l	0.05	< 0.01	< 0.01
29	Free Residual Chlorine	mg / l	0.2 (1.0)	< 0.1	< 0.1
30	Total Coliform	MPN/100 ml	Absent	Absent	Absent
31	E. Coli	Nos./100 ml	Absent	Absent	Absent

Note : Standards limit given as Acceptable Limit (Permissible Limit)

TABLE- 3.6 WASTE WATER QUALITY (May2019- Aug. 2019)

Sample Category : Unit-1- Cooling Tower Blow Down water (WW-1)

Sr. No.	Parameters	Unit	MPCB Limit	Results	
				May2019	Aug. 2019
1.	Free Available Chlorine	mg / l	0.5	0.30	0.25
2.	Zinc as (Zn)	mg / l	1.0	0.36	0.27
3.	Total Chromium as (Cr)	mg / l	0.2	0.018	0.015
4.	Phosphate as (PO4)	mg/ l	5.0	1.40	1.32

Sample Category : Unit-2- Cooling Tower Blow Down water (WW-2)

Sr. No.	Parameters	Unit	MPCB Limit	Results	
				May2019	Aug. 2019
1.	Free Available Chlorine	mg / l	0.5	0.25	0.22
2.	Zinc as (Zn)	mg / l	1.0	0.28	0.30
3.	Total Chromium as (Cr)	mg / l	0.2	0.016	0.011
4.	Phosphate as (PO4)	mg/ l	5.0	1.37	1.35

Sample Category : Unit-3- Cooling Tower Blow Down water (WW-3)

Sr. No.	Parameters	Unit	MPCB Limit	Results	
				May2019	Aug. 2019
1.	Free Available Chlorine	mg / l	0.5	0.22	0.27
2.	Zinc as (Zn)	mg / l	1.0	0.20	0.25
3.	Total Chromium as (Cr)	mg / l	0.2	0.017	0.013
4.	Phosphate as (PO4)	mg/ l	5.0	1.42	1.38

Sample Category : Unit-4-Cooling Tower Blow Down water (WW-4)

Sr. No.	Parameters	Unit	MPCB Limit	Results	
				May2019	Aug. 2019
1.	Free Available Chlorine	mg / l	0.5	0.30	0.24
2.	Zinc as (Zn)	mg / l	1.0	0.24	0.21
3.	Total Chromium as (Cr)	mg / l	0.2	0.013	0.012
4.	Phosphate as (PO4)	mg/ l	5.0	1.35	1.40

Sample Category : Unit-5- Cooling Tower Blow Down water (WW-5)

Sr. No.	Parameters	Unit	MPCB Limit	Results	
				May2019	Aug. 2019
1.	Free Available Chlorine	mg / l	0.5	0.24	0.30
2.	Zinc as (Zn)	mg / l	1.0	0.20	0.22
3.	Total Chromium as (Cr)	mg / l	0.2	0.012	0.016
4.	Phosphate as (PO4)	mg/ l	5.0	1.38	1.41

TABLE- 3.7 Pizo-metric well water Report

For the month May 2019

Name of village	STATIC WATER LEVEL OF PIZO. WELL			
	Water level from B.G.L. (m)	Total Depth of Pizo well from G.L (m)	Total Depth of Pizo well with Casing (m)	Landmark
Pizo well (P1)	3.0	18.6	19.8	Near AWRPH
Pizo well (P2)	3.5	20.0	21.0	B/H Ash dyke -1
Pizo well (P3)	3.5	20.0	20.7	Near Raw Water pump house -02

Pizo-metric well water Analysis Report

Sr. No.	Test Parameters	Unit	As per IS : 10500 : 2012	Pizo well (P1) Near AWRPH	Pizo well (P2) B/H Ash dyke -1	Pizo -well (P3) Near Raw Water pump house -02
1	pH		6.5 to 8.5	7.8	8.0	7.70
2	Total Dissolved Solid	mg / l	500 (2000)	674	714	748
3	Electrical Conductivity	µS/cm	-	1040	1106	1164
4	Copper as(Cu)	mg / l	0.05 (1.5)	< 0.01	< 0.01	< 0.01
5	Iron (as Fe)	mg / l	0.3 (1.0)	0.18	0.20	0.15
6	Manganese as (Mn)	mg / l	0.1 (0.3)	0.095	0.092	0.091
7	Mercury as (Hg)	mg / l	0.001	< 0.0005	< 0.0005	< 0.0005
8	Cadmium as (Cd)	mg / l	0.01	0.0021	0.0033	0.0014
9	Selenium as (Se)	mg / l	0.01	0.0018	0.0025	0.0020
10	Arsenic as (As)	mg / l	0.05	0.014	0.016	0.012
11	Cyanide as (CN)	mg / l	0.05	< 0.005	< 0.005	< 0.005
12	Lead as (Pb)	mg / l	0.05	0.0032	0.0031	0.0018
13	Zinc as (Zn)	mg / l	5 (15)	3.8	4.7	4.3
14	Total Chromium as (Cr)	mg / l	0.05	< 0.010	< 0.010	< 0.010

TABLE- 3.8 Noise Level (Within Plant area)

SL. NO.	LOCATION	RESULT (dBA)					
		DAY					
		April 2019	May 2019	Jun. 2019	Jul. 2019	Aug. 2019	Sept. 2019
1	Near Shanti Niketan I, II & III	58.0	56.5	53.4	56.1	52.9	58.0
2	Near Labour Hutment	59.2	62.6	61.8	66.0	61.4	59.2
3	Near Store Area	59.9	59.0	57.9	62.0	61.9	59.9
4	Gate No.1	58.9	59.3	56.7	58.0	63.5	58.9
5	Gate No.2	64.4	64.0	62.4	66.4	71.9	64.4
6	Gate No.3	57.8	63.5	61.9	69.0	67.3	57.8
7	Near OHC	66.4	57.2	54.3	60.3	61.9	66.4
8	Railway Siding	69.1	66.9	59.8	59.2	67.6	69.1
9	Near Reservoir 2	60.0	55.1	59.4	63.0	57.1	60.0
10	Near Ash Water Recovery Pump House	67.4	63.2	61.9	55.8	71.0	67.4
11	In China Colony	48.1	44.0	51.6	51.7	50.8	48.1
CPCB Standards							
Industrial Area		75					

SL. NO.	LOCATION	RESULT (dBA)					
		NIGHT					
		April 2019	May 2019	Jun. 2019	Jul. 2019	Aug. 2019	Sept. 2019
1	Near Shanti Niketan I II & III	48.1	52.2	49.0	47.0	46.0	48.1
2	Near Labour Hutment	50.4	55.2	56.7	51.2	51.0	50.4
3	Near Store Area	49.5	50.4	48.6	49.5	49.2	49.5
4	Gate No.1	44.3	48.8	46.3	45.0	46.2	44.3
5	Gate No.2	54.5	60.2	59.8	49.8	53.5	54.5
6	Gate No.3	50.1	58.4	57.3	51.2	52.1	50.1
7	Near OHC	45.3	42.2	45.4	44.4	48.4	45.3
8	Railway Siding	50.2	58.6	59.4	41.0	47.0	50.2
9	Near Reservoir 2	49.0	52.0	51.3	48.5	49.5	49.0
10	Near Ash Water Recovery Pump House	42.4	56.4	53.4	43.4	41.4	42.4
11	In China Colony	39.4	41.8	42.6	41.0	40.3	39.4
CPCB Standards							
Industrial Area		70					

Annexure I - On site Meteorological Data for Apr. 2019- Sept. 2019

Apr. 2019

Date	Wind Direction (Blowing From)	Wind Speed (Km/hr)		Temperature (°C)			Humidity (%)			Atm. Pressure (mm Hg)	Rainfall (mm)
		Max.	Avg.	Max	Min	Avg.	Max	Min	Avg	(Average)	
01.04.19	-	-	-	-	-	-	-	-	-	-	-
02.04.19	-	-	-	-	-	-	-	-	-	-	-
03.04.19	-	32.6	5.1	41.9	25.3	31.6	51.2	22.6	38.3	978.6	0.0
04.04.19	-	41.5	7.8	40.0	28.9	34.4	49.7	30.8	38.3	980.4	0.0
05.04.19	-	40.5	7.6	40.9	27.4	35.3	59.2	44.4	25.6	981.0	0.0
06.04.19	-	42.0	4.7	40.8	27.7	34.0	77.8	42.8	55.6	980.1	0.0
07.04.19	-	42.2	9.7	40.0	29.0	34.3	75.5	56.3	41.3	979.3	0.0
08.04.19	-	31.4	4.5	40.8	28.8	34.5	71.7	56.0	46.6	979.1	0.0
09.04.19	-	37.3	6.9	42.0	40.4	39.2	63.0	12.8	44.4	981.8	0.0
10.04.19	-	26.2	8.4	40.3	25.7	33.5	86.3	21.4	52.0	983.0	0.0
11.04.19	-	50.4	5.7	40.4	23.0	29.9	53.4	21.9	36.9	980.4	0.0
12.04.19	-	63.0	6.3	41.2	22.1	29.7	51.5	23.5	35.2	980.6	0.0
13.04.19	-	41.5	6.0	40.0	22.4	29.8	48.1	22.0	22.2	980.8	0.0
14.04.19	-	37.5	7.1	41.1	23.8	30.5	47.6	21.6	33.9	980.5	0.0
15.04.19	-	63.0	8.4	38.3	23.0	28.7	52.7	25.5	37.3	980.8	0.0
16.04.19	-	63.0	9.9	33.2	23.0	26.1	51.9	31.2	42.6	982.0	0.0
17.04.19	-	62.5	7.9	35.3	19.5	25.8	70.1	26.2	47.5	982.5	0.0
18.04.19	-	33.8	5.5	35.5	19.8	27.0	67.3	30.0	45.1	981.9	0.0
19.04.19	-	35.6	4.5	37.5	21.2	27.8	52.6	26.4	38.1	980.4	0.0
20.04.19	-	36.8	6.1	37.7	21.4	28.2	58.1	27.2	41.0	978.8	0.0
21.04.19	-	43.7	6.0	37.0	21.9	28.0	61.7	28.1	44.1	978.3	0.0
22.04.19	-	63.0	5.3	40.0	21.3	28.2	80.0	23.8	41.6	979.1	0.0
23.04.19	-	36.8	5.2	43.0	22.6	29.5	52.3	20.5	36.4	980.0	0.0
24.04.19	-	39.3	5.8	42.9	21.9	29.9	53.2	21.4	36.1	980.6	0.0
25.04.19	-	33.6	5.1	41.5	23.9	31.2	53.7	23.1	33.6	980.2	0.0
26.04.19	-	27.7	3.5	43.6	23.5	31.5	52.4	20.9	34.4	978.8	0.0
27.04.19	-	35.6	3.6	44.8	24.2	31.8	48.4	20.8	33.2	978.3	0.0
28.04.19	-	30.9	4.0	43.0	26.6	35.5	46.1	22.0	28.8	977.0	0.0
29.04.19	-	38.5	7.0	42.2	24.3	31.2	52.3	23.0	37.0	977.6	0.0
30.04.19	-	38.3	7.7	44.6	26.2	32.1	48.6	20.7	35.8	976.2	0.0

May 2019

Date	Wind Direction (Blowing From)	Wind Speed (Km/hr)		Temperature (°C)			Humidity (%)			Atm. Pressure (mm Hg)	Rainfall (mm)
		Max.	Avg.	Max	Min	Avg.	Max	Min	Avg	(Average)	
01.05.19	NNW	36.1	6.9	44.1	25.3	32.0	51.2	21.1	34.9	975.3	0.0
02.05.19	NNW	58.0	6.2	43.0	25.0	31.0	49.7	23.4	37.1	975.0	0.0
03.05.19	N	36.8	5.3	41.8	22.7	30.1	57.7	22.7	39.0	975.4	0.0
04.05.19	ESE	48.2	5.9	40.5	24.0	29.0	52.2	25.6	38.1	978.0	0.0
05.05.19	ESE	31.6	3.4	41.3	23.2	29.7	58.7	22.7	38.2	980.7	0.0
06.05.19	NNW	33.3	3.6	42.6	21.6	30.2	52.0	21.2	32.6	979.7	0.0
07.05.19	SSW	28.9	3.3	43.1	24.1	33.3	48.5	21.1	31.8	975.5	0.0
08.05.19	SE	7.9	2.5	44.0	30.1	34.9	32.0	23.1	27.2	975.9	0.0
09.05.19	SW	49.9	4.9	41.1	23.0	30.9	53.7	20.4	30.3	977.6	0.0
10.05.19	SSW	36.6	4.0	43.3	22.4	31.1	52.5	21.0	30.2	978.3	0.0
11.05.19	S	40.0	5.1	41.0	23.9	31.0	51.8	23.8	34.8	979.6	0.0
12.05.19	N	50.4	6.4	42.7	24.7	30.8	50.3	22.0	34.3	978.6	0.0
13.05.19	SE	40.0	6.2	41.5	24.5	30.4	44.3	22.3	33.0	977.9	0.0
14.05.19	SSE	37.0	5.4	42.1	24.2	30.7	50.5	21.7	32.8	977.8	0.0
15.05.19	N	3.0	1.6	42.0	24.6	30.5	55.0	34.3	44.8	976.4	0.0
16.05.19	N	20.6	9.0	42.5	24.0	28.7	58.5	39.2	50.0	973.3	0.0
17.05.19	N	43.7	4.6	41.3	24.3	31.2	51.7	22.0	32.2	979.2	0.0
18.05.19	SSE	39.8	4.7	41.9	24.5	30.8	45.9	22.7	31.4	979.2	0.0
19.05.19	NNW	32.1	3.7	39.0	22.6	30.7	52.6	23.6	32.2	979.7	0.0
20.05.19	NW	44.2	5.0	43.5	23.9	31.7	50.4	23.0	31.8	979.7	0.0
21.05.19	NNW	48.5	4.1	44.2	27.2	34.2	48.0	26.1	35.0	974.5	0.0
22.05.19	NNW	32.6	4.0	43.7	28.4	34.2	51.5	27.1	38.7	974.4	0.0
23.05.19	NNW	33.3	5.6	44.2	26.6	32.6	47.5	23.5	34.9	977.1	0.0
24.05.19	N	57.8	10.1	44.3	26.6	32.1	52.8	24.8	35.7	977.6	0.0
25.05.19	SE	47.2	6.8	44.7	26.3	32.4	40.8	21.6	30.1	976.3	0.0
26.05.19	SW	37.3	4.1	44.0	24.7	32.8	51.1	23.7	31.9	975.9	0.0
27.05.19	SE	35.5	5.5	46.9	27.7	30.7	50	33.5	39.8	971.6	0.0
28.05.19	SW	36.5	4.0	46.2	30.0	31.0	51.0	32.2	33.0	971.0	0.0
29.05.19	SE	35.0	4.4	46.0	27.2	31.4	53.0	35.2	43.9	974.7	0.0
30.05.19	S	12.6	5.3	44.7	27.1	32.9	55.5	29.5	41.6	975.3	0.0
31.05.19	SE	25.7	5.0	42.5	26.5	31.0	59.0	29.0	40.2	975.0	0.0

Jun. 2019

Date	Wind Direction (Blowing From)	Wind Speed (Km/hr)		Temperature (°C)			Humidity (%)			Atm. Pressure (mm Hg)	Rainfall (mm)
		Max.	Avg.	Max	Min	Avg.	Max	Min	Avg	(Average)	
01.06.19	S	16.1	7.1	42.2	29.6	32.3	58.5	38.1	46.5	976.1	0.0
02.06.19	SE	7.8	1.8	44.3	26.2	33.9	64.6	28.0	43.1	975.5	0.0
03.06.19	NNW	17.1	9.4	44.1	30.2	35.0	58.5	28.1	40.5	974.9	0.0
04.06.19	NNW	14.4	7.8	44.2	27.0	33.5	61.0	30.1	45.0	975.6	0.0
05.06.19	N	29.9	4.2	46.2	29.2	36.0	53.4	25.0	37.4	972.4	0.0
06.06.19	NNW	34.1	5.4	45.3	29.2	35.3	43.6	23.1	32.9	973.7	0.0
07.06.19	NNW	63.0	10.5	43.5	27.4	32.8	60.0	27.7	42.5	975.6	0.0
08.06.19	NNW	46.2	6.3	39.8	26.3	31.8	53.7	28.7	41.3	976.3	0.0
09.06.19	N	63.0	6.1	42.4	26.5	32.4	55.5	26.3	40.4	974.5	0.0
10.06.19	N	62.7	6.8	43.9	26.7	33.4	54.3	23.5	36.7	972.5	0.0
11.06.19	N	52.4	10.4	41.6	28.3	33.6	49.5	27.2	37.9	972.8	0.0
12.06.19	N	57.6	10.5	41.0	29.2	34.1	47.9	30.3	38.7	973.2	0.0
13.06.19	N	49.4	13.4	40.6	29.9	34.2	58.8	30.9	39.9	974.4	0.0
14.06.19	SE	54.3	8.9	40.3	26.1	33.1	76.2	30.6	45.6	974.6	0.0
15.06.19	SE	62.5	9.4	40.6	23.6	30.8	89.2	31.1	57.1	974.9	14.0
16.06.19	SE	62.0	7.3	39.0	25.5	29.7	79.4	35.4	62.5	975.9	0.5
17.06.19	N	61.8	7.5	38.5	23.4	29.5	90.8	37.0	62.0	976.3	17.5
18.06.19	NNW	57.8	6.0	41.2	25.5	31.4	80.2	31.2	55.1	975.6	0.0
19.06.19	SE	43.7	8.3	40.3	26.0	32.4	70.7	32.2	47.4	973.8	0.0
20.06.19	S	58.8	6.9	39.7	26.3	32.8	70.3	33.4	47.7	974.5	0.0
21.06.19	NNW	44.2	4.9	40.0	24.9	31.4	78.3	32.7	53.7	975.2	0.0
22.06.19	N	42.5	7.6	37.1	26.6	30.2	64	39.2	54.8	973.9	0.0
23.06.19	NNW	57.3	7.1	37.3	22.4	27.3	92.8	40.3	70.0	974.4	36.0
24.06.19	NNW	30.6	4.1	35.8	23.7	28.5	89.9	42.9	67.9	976.8	0.0
25.06.19	NNW	62.7	7.5	38.2	25.1	31.0	78.5	38.8	57.1	977.0	1.5
26.06.19	N	45.0	6.5	41.1	30.7	31.8	92.0	52.8	56.7	975.8	13.5
27.06.19	N	60.0	6.7	37.1	23.9	29.5	92	42.6	63.4	974.5	1.5
28.06.19	n	53.8	6.2	34.1	23.0	25.6	94.1	49.8	82.6	974.2	30.5
29.06.19	n	63.0	8.6	35.0	21.6	26.5	94.8	47.6	78.2	973.5	57.0
30.06.19	NNW	62.0	5.9	34.1	22.2	26.7	95.0	51.0	77.9	973.5	31.5

July 2019

Date	Wind Direction (Blowing From)	Wind Speed (Km/hr)		Temperature (°C)			Humidity (%)			Atm. Pressure (mm Hg)	Rainfall (mm)
		Max.	Avg.	Max	Min	Avg.	Max	Min	Avg	(Average)	
01.07.19	N	59.3	7.3	34.5	21.4	25.4	94.9	45.5	80.8	973.1	16.5
02.07.19	N	36.1	7.4	26.3	21.4	23.3	94.9	90.9	81.5	972.3	60.5
03.07.19	N	32.1	7.1	25.3	22.0	23.8	-	-	-	972.8	27.0
04.07.19	NNW	40.3	9.5	26.9	23.8	25.1	93.0	76.6	86.8	971.7	10.5
05.07.19	N	46.9	13.8	27.0	22.9	24.6	94.1	75.9	87.1	970.2	10.5
06.07.19	NNW	61.0	15.2	28.1	22.5	23.9	94.1	70.3	87.6	970.6	19.0
07.07.19	NNW	55.8	13.5	30.8	22.7	25.2	93.9	58.9	81.9	972.2	2.0
08.07.19	NNW	49.0	11.1	31.5	25.3	22.9	93.7	59.1	83.7	973.9	22.5
09.07.19	NNW	47.7	11.5	31.1	23.6	26.1	92.5	58.0	79.9	974.2	0.0
10.07.19	NNW	41.5	9.8	30.6	23.6	26.6	88.2	60.3	76.3	974.2	0.6
11.07.19	NNW	41.5	7.5	34.3	22.8	26.8	88.5	51.1	76.3	975.6	0.0
12.07.19	NNW	38.8	7.5	34.0	23.6	28.3	88.6	47.9	70.3	977.5	0.0
13.07.19	NNW	37.3	7.3	35.3	24.2	28.9	85.5	46.9	66.1	978.0	0.0
14.07.19	NNW	63.0	10.2	35.1	24.9	28.9	82.7	43.4	64.8	976.9	0.0
15.07.19	NW	43.2	8.7	34.6	2.8	28.7	86.8	46.2	65.8	975.5	0.0
16.07.19	NNW	37.3	5.9	36.7	25.1	30.4	82.2	39.8	58.8	976.6	0.0
17.07.19	NW	30.4	3.9	39.8	25.2	31.7	75.9	35.0	54.8	976.2	0.0
18.07.19	WNW	34.1	4.8	38.9	24.4	30.2	88.2	37.6	62.0	975.4	0.6
19.07.19	WSW	42.0	3.8	37.4	24.1	28.1	91.8	40.9	70.7	975.1	2.2
20.07.19	W	38.3	6.5	35.2	23.6	28.6	91.4	47.3	68.8	974.7	0.0
21.07.19	WSW	43.0	9.6	35.9	23.6	28.6	94.2	45.6	71.7	975.7	0.0
22.07.19	S	32.1	7.3	36.7	25.5	29.7	82.3	42.9	65.5	975.8	0.0
23.07.19	SSE	34.8	7.0	37.8	26.0	30.4	78.8	40.8	62.3	975.5	0.0
24.07.19	S	62.5	9.1	37.8	26.0	30.1	77.1	41.6	62.6	975.5	0.0
25.07.19	NNW	63.0	6.3	34.7	21.9	27.2	94.3	50.8	75.0	975.6	58.0
26.07.19	NNW	45.4	11.0	27.7	22.4	24.8	94.3	71.6	84.8	974.3	2.5
27.07.19	WSW	58.8	12.5	27.5	23.8	24.1	93.6	86.4	87.8	973.1	12.5
28.07.19	WSW	46.2	12.3	24.8	23.2	23.4	94.1	91.1	91.8	972.8	26.5
29.07.19	WSW	47.7	19.9	32.3	30.0	28.6	94.5	94.2	94.4	972.5	5.5
30.07.19	WSW	62.7	18.1	25.2	22.5	23.4	94.2	80.5	91.0	971.9	10.5
31.07.19	WSW	63.0	18.7	23.8	22.4	23.8	93.8	89.7	90.6	974.6	3.5

Aug. 2019

Date	Wind Direction (Blowing From)	Wind Speed (Km/hr)		Temperature (°C)			Humidity (%)			Atm. Pressure (mm Hg)	Rainfall (mm)
		Max.	Avg.	Max	Min	Avg.	Max	Min	Avg	(Average)	
01.08.19	WNW	37.5	10.6	28.0	21.9	23.7	95.5	70.5	88.5	974.3	12.5
02.08.19	WNW	38.8	11.1	27.9	22.8	24.1	94.6	73.8	89.9	972.6	21.0
03.08.19	WNW	39.5	11.9	25.6	22.8	23.7	94.9	82.2	90.7	972.9	13.5
04.08.19	WNW	42.5	9.3	31.0	23.0	25.7	91.8	59.3	80.0	973.3	0.5
05.08.19	WSW	41.0	10.8	31.1	22.9	25.7	93.7	61.8	82.4	971.6	0.4
06.08.19	WNW	40.3	9.2	29.6	25.1	23.2	93.9	67.1	86.2	970.6	3.5
07.08.19	WNW	61.8	13.9	26.8	22.8	24.6	93.8	78.7	88.1	968.4	13.0
08.08.19	WNW	59.5	20.7	23.8	22.0	22.8	95.4	89.9	93.7	965.6	59.5
09.08.19	WNW	51.1	8.6	27.8	22.1	23.9	95.2	72.9	88.1	971.0	20.5
10.08.19	WNW	32.6	13.4	32.8	30.6	31.4	92.0	91.0	91.4	976.5	0.5
11.08.19	WNW	35.1	8.6	35.2	31.8	33.6	90.9	87.8	88.9	977.8	10.5
12.08.19	NW	30.6	13.4	35.5	33.3	34.0	89.1	88.4	88.4	977.6	1.5
13.08.19	NW	17.5	8.9	28.0	23.0	23.2	96.0	95.4	95.2	975.9	168.5
14.08.19	NWN	51.6	18.4	24.3	23.9	24.1	95.4	95.1	95.3	977.8	26.5
15.08.19	NNW	52.9	17.3	32.0	29.1	30.7	91.2	89.9	90.7	979.3	14.5
16.08.19	NWN	39.8	17.9	32.2	23.6	32.0	93.1	92.2	92.6	979.6	2.7
17.08.19	NWN	32.1	14.8	34.0	23.5	33.3	91.5	89.8	90.6	980.0	0.0
18.08.19	NWN	33.3	8.6	37.9	24.1	37.1	91.0	90.0	90.6	981.4	1.0
19.08.19	NWN	42.2	17.1	34.2	23.7	32.2	89.8	50.0	86.9	981.5	1.0
20.08.19	NW	58.0	13.2	31.9	22.4	31.2	94.4	58.4	94.3	980.3	51.8
21.08.19	NW	62.2	13.2	32.7	21.9	31.1	96.3	57.3	96.0	978.8	56.0
22.08.19	NW	26.4	5.4	33.5	22.3	24.5	99.9	52.7	87.2	976.7	4.2
23.08.19	NNW	26.9	3.2	35.8	22.1	26.5	94.1	47.6	78.6	976.7	0.0
24.08.19	NNW	53.4	6.6	35.3	26.3	26.7	92.7	80.1	78.4	976.5	10.5
25.08.19	NNW	36.3	10.5	31.3	24.4	24.7	93.8	85.7	87.1	975.2	5.0
26.08.19	NNW	44.0	10.6	29.4	22.8	24.1	94.3	66.9	90.2	974.9	18.5
27.08.19	NNW	35.3	11.3	28.5	22.0	23.9	95.9	67.1	86.5	975.7	29.5
28.08.19	NNW	31.6	6.9	32.3	26.4	26.1	92.1	74.9	76.6	977.6	0.0
29.08.19	NNW	31.9	6.4	37.4	23.8	27.6	93.1	42.9	75.6	978.1	0.0
30.08.19	NNW	30.6	5.0	32.3	25.9	26.3	93.2	80.5	82.2	975.5	0.5
31.08.19	NNW	43.0	4.7	33.4	25.3	25.7	94.3	84.3	85.8	973.8	4.5

Sept. 2019

Date	Wind Direction (Blowing From)	Wind Speed (Km/hr)		Temperature (°C)			Humidity (%)			Atm. Pressure (mm Hg)	Rainfall (mm)
		Max.	Avg.	Max	Min	Avg.	Max	Min	Avg	(Average)	
01.09.19	NNW	19.0	3.4	36.9	26.4	26.9	92.4	77.7	79.7	975.3	0.0
02.09.19	NNW	36.8	5.5	32.7	25.4	25.8	94.8	82.7	84.3	976.2	13.0
03.09.19	NNW	44.5	6.0	33.9	22.8	25.1	94.9	55.0	86.6	975.4	36.5
04.09.19	NNW	20.3	3.6	31.0	22.8	24.9	95.4	64.7	89.1	973.5	3.0
05.09.19	NNW	35.8	5.1	36.6	23.3	27.1	93.9	47.0	78.8	973.0	0.5
06.09.19	NNW	34.6	4.6	31.2	24.0	25.6	92.5	63.1	85.1	972.6	0.5
07.09.19	NNW	46.9	7.9	32.8	22.8	25.6	94.3	58.4	86.3	973.6	48.5
08.09.19	NNW	45.9	11.9	26.6	23.2	24.5	95.0	75.1	89.5	974.5	34.5
09.09.19	NNW	46.2	10.0	30.3	22.8	24.8	94.9	64.5	87.0	974.7	4.5
10.09.19	NNW	62.7	25.0	28.8	22.9	27.7	95.4	70.2	95.1	977.4	89.0
11.09.19	NNW	47.3	8.9	26.1	23.5	24.1	95.2	82.8	92.4	976.7	19.0
12.09.19	NNW	44.0	9.5	28.5	24.3	24.5	95.5	88.3	89.3	977.3	12.0
13.09.19	NNW	50.9	6.7	31.1	22.8	25.4	95.4	58.7	82.3	978.6	2.5
14.09.19	NNE	44.7	18.6	25.8	22.4	25.4	93.9	80.1	93.5	981.0	0.0
15.09.19	NNE	47.4	13.9	34.1	23.0	31.0	91.8	52.3	91.2	981.4	0.5
16.09.19	NNE	37.3	7.4	32.8	23.6	26.0	93.0	56.7	82.6	978.2	0.5
17.09.19	NNE	34.3	3.7	30.5	24.1	25.7	94.2	67.9	86.8	977.7	19.0
18.09.19	N	30.1	5.6	36.7	23.1	28.5	92.3	44.8	70.3	980.3	0.0
19.09.19	WNW	40.0	7.5	34.3	24.1	28.3	85.4	48.5	68.8	981.4	0.0
20.09.19	N	29.1	6.3	36	23.7	28.7	92.0	46.2	70.7	981.3	0.0
21.09.19	N	53.1	3.6	38.1	22.4	26.7	95.6	43.0	80.1	980.9	23.5
22.09.19	N	30.4	3.9	36.1	22.3	26.8	93.1	46.7	76.3	982.0	0.5
23.09.19	N	29.1	2.5	37.4	23.3	28.4	92.8	45.3	71.9	982.5	4.4
24.09.19	NNW	32.6	4.2	34.1	23.1	27.3	92.9	51.1	75.1	981.8	1.5
25.09.19	NNW	40.0	6.9	26.1	22.5	23.9	93.9	79.7	88.1	982.8	16.5
26.09.19	N	48.2	8.6	32.8	22.5	25.6	94.1	52.0	80.8	985.4	4.0
27.09.19	N	41.0	9.1	34.9	23.5	26.5	87.3	49.4	75.1	986.0	0.0
28.09.19	N	40.3	5.0	31.9	24.1	24.5	99.8	83.7	85.5	984.5	69.5
29.09.19	N	41.0	6.2	31.3	23.8	24.3	99.8	86.7	88.7	984.9	7.0
30.09.19	N	31.4	5.4	33.5	21.1	26.4	95.8	49.7	75.2	984.6	7.5

Annex - IA

adani ENVIRONMENT LABORATORY

ADANI POWER MAHARASHTRA LIMITED

TIRORA

Format No: APML/ENV-LB/7.8/F01

URL No : TC519319000000401F

Date 01.05.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Ambient Air Quality (Plant)
Sample Collected by :	Environment Dept. APML

Test Report

Station	Sampling Location	Sampling Date	Analysis Starting Date	Parameters			
				PM 10	PM 2.5	SO2	NOx
				μg/m3	μg/m3	μg/m3	μg/m3
AAQ 1	Near AWRS	01.04.2019	02.04.2019	62.6	27.7	12.5	28.3
		05.04.2019	06.04.2019	65.1	23.5	11.7	28.2
		08.04.2019	09.04.2019	60.3	24.4	10.1	20.2
		12.04.2019	13.04.2019	59.4	25.5	11.0	30.7
		15.04.2019	16.04.2019	81.0	20.6	10.7	29.9
		19.04.2019	20.04.2019	63.4	23.3	14.4	27.6
		22.04.2019	23.04.2019	63.5	21.8	11.5	24.2
		26.04.2019	27.04.2019	58.8	19.6	13.2	26.0
		29.04.2019	30.04.2019	66.2	25.0	11.0	28.3
AAQ 2	Near Brick Plant	01.04.2019	02.04.2019	56.1	11.0	10.0	16.8
		05.04.2019	06.04.2019	59.0	13.3	12.4	25.4
		08.04.2019	09.04.2019	60.9	15.1	9.4	19.6
		12.04.2019	13.04.2019	57.5	14.7	10.4	16.9
		15.04.2019	16.04.2019	58.5	16.1	11.1	17.8
		19.04.2019	20.04.2019	51.8	13.0	14.1	19.0
		22.04.2019	23.04.2019	59.6	12.1	11.5	17.0
		26.04.2019	27.04.2019	57.2	14.7	10.8	33.5
		29.04.2019	30.04.2019	62.3	15.3	9.9	23.8
AAQ 3	China Colony	01.04.2019	02.04.2019	62.4	25.3	12.3	22.8
		05.04.2019	06.04.2019	60.5	28.5	13.0	24.2
		08.04.2019	09.04.2019	68.5	20.9	11.4	24.4
		12.04.2019	13.04.2019	63.2	15.0	13.5	24.7
		15.04.2019	16.04.2019	65.7	17.2	13.4	27.8
		19.04.2019	20.04.2019	84.1	21.4	14.3	25.7
		22.04.2019	23.04.2019	66.6	27.3	17.8	33.5
		26.04.2019	27.04.2019	62.5	52.6	10.8	28.8
		29.04.2019	30.04.2019	59.1	21.1	9.7	24.4
NAAQMS Standard				100	60	80	80

End of the Report

Note: Tested results are well within the permissible limits of National Ambient Air Quality Monitoring Stanadard (NAAQMS)

1. The report is referring only to the tested sample and for applicable parameter.
2. This report is not to be reproducing wholly or in part, and can't be used as evidence in court of law.

01/05/19

Authorized Signatory
(Technical Manager)

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adani **ENVIRONMENT LABORATORY**

ADANI POWER MAHARASHTRA LIMITED

TIRORA

Format No: APML/ENV-LB/7.8/F01

URL No : TC519319000000427F	Date: 15.04.2019
TEST REPORT	
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -1
2	Date of Sampling	:	13.04.2019
3	Time of Sampling	:	4:25 PM
4	Load (MW)	:	658
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{0} C)	:	129
9	Flue Gas Velocity (M/sec)	:	23.65
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2611673

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	46
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	974.6
			75.2	TPD	62.7
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	288

End of the Report

Note Tested results are well within the permissible limits of MPCB.

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3. This report is not to be reproducing wholly or in part, and can't be used as evidence in court of law

15/04/19

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adani ENVIRONMENT LABORATORY
ADANI POWER MAHARASHTRA LIMITED
TIRORA

Format No: APML/ENV-LB/7.8/F01

URL No : TC5193190000000428F	Date: 25.04.2019
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -2
2	Date of Sampling	:	22.04.2019
3	Time of Sampling	:	4:57 PM
4	Load (MW)	:	646
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{0}C)	:	127
9	Flue Gas Velocity (M/sec)	:	24.11
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2675713

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results *
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	36
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	995.5
			75.2	TPD	64.8
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	283

* Results are corrected with 6% oxygen

End of the Report

Note Tested results are well within the permissible limits of MPCB.

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25/04/19

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adani ENVIRONMENT LABORATORY

ADANI POWER MAHARASHTRA LIMITED

TIRORA

Format No: APML/ENV-LB/7.8/F01

URL No : TC519319000000329F	Date: 25.04.2019
TEST REPORT	
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -3
2	Date of Sampling	:	22.04.2019
3	Time of Sampling	:	5:30 PM
4	Load (MW)	:	626
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{0} C)	:	131
9	Flue Gas Velocity (M/sec)	:	23.45
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2576868

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	38
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	981.61
			80.2	TPD	60.7
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	274

* *Results are corrected with 6% oxygen*

End of the Report

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25/04/19

Authorized Signatory
(Technical Manager)

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Format No: APML/ENV-LB/7.8/F01

URL No : TC5193190000000430F	27.04.2019
TEST REPORT	
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -4
2	Date of Sampling	:	25.04.2019
3	Time of Sampling	:	10:45 AM
4	Load (MW)	:	624
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{0}C)	:	128
9	Flue Gas Velocity (M/sec)	:	24.28
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2688229

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results *
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	47
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	964.75
			80.2	TPD	62.2
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	282

** Results are corrected with 6% oxygen*

End of the Report

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27/04/19

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adani ENVIRONMENT LABORATORY

ADANI POWER MAHARASHTRA LIMITED
TIRORA

Format No: APML/ENV-LB/7.8/F01

URL No : TC519319000000431F	Date: 27.04.2019
TEST REPORT	
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment-Dept. APML

1	Sampling Location	:	Unit -5
2	Date of Sampling	:	25.04.2019
3	Time of Sampling	:	11:20 AM
4	Load (MW)	:	644
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{0} C)	:	130
9	Flue Gas Velocity (M/sec)	:	24.14
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2659383

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	44
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	920
			80.2	TPD	58.7
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	289

* *Results are corrected with 6% oxygen*

End of the Report

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27/04/19

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ADANI POWER MAHARASHTRA LIMITED
TIRORA

Format No: APML/ENV-L8/7.8/F01

URL NO :TC519319000000413F

Date: 30.04.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911		
Sample Collection Date	17.04.2019	Analysis Starting Date :	17.04.2019
Quantity received	1 Ltr / Sample	Sampled by :	Environment Dept. APML
Sample Particulars : Condenser Cooling Water (Waste Water)			
Location of sample : Unit1,Unit-2,Unit-3,Unit-4 & Unit-5			

TEST REPORT

Sr no	Parameter	Unit	Test Methods	MPCB Standards	Results				
					U # 1	U # 2	U # 3	U # 4	U # 5
1	pH Value	---	APHA-22nd - 4500-H+B Electrometric Method	6.5-8.5	8.3	8.2	8.4	8.1	8.3
2	Temperature	Deg C	APHA-22nd - 2550 B	---	35	36	36	35	35
3	Free Available Chlorine	PPM	APHA 22nd- Iodometric Method I, 4500-Cl B.	0.5	0.2	0.1	0.2	0.4	0.1

End of the Report

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30/04/19

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Format No: APML/ENV-LB/7.8/F01

URL: TC519319000000414F

Date: 30.04.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911		
Sample Collection Date	17.04.2019	Analysis Starting Date :	17.04.2019
Quantity received	1 Ltr / Sample	Sampled by :	Environment Dept. APML
Sample Particulars : Cooling tower blowdown (Waste Water)			
Location of sample : Unit1,Unit-2,Unit-3,Unit-4 & Unit-5.			

TEST REPORT

Sr no	Parameter (NABL SCOPE)	Unit	Test Methods	MPCB Standards	Results				
					U # 1	U # 2	U # 3	U # 4	U # 5
1	Free Available Chlorine	mg/l	APHA 23rd Edition Iodometric Method I. 4500-Cl B.	0.5	0.1	0.4	0.2	0.1	0.3
2	Phosphate as (PO4)	mg/l	APHA-23rd -4500-P D Stannous Chloride Method	5	2.5	1.9	3.2	2.1	1.7
3	Zinc as (Zn)	mg/l	----	1	BDL	BDL	BDL	BDL	BDL
4	Total Chromium as (Cr)	mg/l	----	0.2	BDL	BDL	BDL	BDL	BDL

"*End of the Report*"

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(Technical Manager)

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adani ENVIRONMENT LABORATORY

ADANI POWER MAHARASHTRA LIMITED
TIRORA

Format No: APML/ENV-L8/7.8/F01

URL:TC519319000000415F Date: 30.04.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist Gondia – 441 911		
Sample Collection Date	17.04.2019	Analysis Starting Date	17.04.2019
Quantity received	3 Lit /Sample	Sampled by	Environment Dept. APML
Sample Particulars : Treated Effluent Water			
Location of sample : DM Plant N-Pit , ETP Outlet			

TEST REPORT

Sr no	Parameter (NABL SCOPE)	Unit	Test Methods	MPCB Standards	Results	
					N-pit	ETP Outlet
1	pH Value	---	APHA-22nd -4500-H+B Electrometric Method	5.5-9.0	7.4	7.3
2	TSS	mg / l	APHA-22nd - 2540 D	100	24	28
3	TDS	mg / l	APHA-22nd - 2540 C	2100	440	236
4	COD	mg / l	APHA-22nd Ed 2012-5220B Open Reflux Method	250	32	42
5	BOD at 27^{0}C for 3 days	mg / l	IS: 3025 (P-44)-1993 R-1999 Ad.1 BOD 3-days at 27 °C	30	12	16
6	Oil & Grease	mg / l	APHA-22nd Ed 2012-5520 B Liquid Liquid Partition Gravemetric method	10	0.6	1.1

End of the Report

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30/04/19

Authorized Signatory
(Technical Manager)

adani ENVIRONMENT LABORATORY

ADANI POWER MAHARASHTRA LIMITED

TIRORA

Format No: APML/ENV-LB/7.8/F01

URL:TC519319000000417F

Date: 30.04.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911		
Sample Collection Date	17.04.2019	Analysis Starting Date	17.04.2019
Quantity received	3 Lit /Sample	Sampled by	Environment Dept.
Sample Particulars : Treated Waste Water			
Location of sample : STP -1 & 2 Out Let			

TEST REPORT

Sr no	Parameter (NABL SCOPE)	Unit	Test Methods	MPCB Standards	Results	
					STP-1	STP-2
1	pH Value	--	APHA-22nd -4500-H+B Electrometric Method	5.5-9.0	7.4	7.7
2	TSS	mg / l	APHA-22nd - 2540 D	500	36	32
3	TDS	mg / l	APHA-22nd - 2540 C	2100	388	420
4	COD	mg / l	APHA-22nd Ed 2012-5220B Open Reflux Method	100	42	56
5	BOD at 27°C for 3 days	mg / l	IS: 3025 (P-44)-1993 R-1999 Ad.1 BOD 3-days at 27 °C	30	14	19

End of the Report

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30/04/19

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Format No: APML/ENV-L8/7.8/F01

URL No. : TC519319000000423F

Date: 30.04.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Ambient Noise Level (Plant)
Sample Collected by :	Environment Dept. APML
Date of Sampling:	06.04.2019

Test Report

S. No	Locations	Day Time in dB (A) (6.00 a.m. to 10.00 p.m.)	Night Time in dB (A) (10.00 p.m. to 06.00 a.m.)
1	Near Shanti Niketan I II & III	57.7	41.5
2	Near Labour Hutment	66.3	43.8
3	Near Store Area	57.4	40.2
4	Gate No.1	58.8	42.1
5	Gate No.2	59.5	44.0
6	Gate No.3	71.3	45.2
7	Near OHC	55.9	41.0
8	Railway Siding	65.3	41.8
9	Near Reservoir 2	52.9	39.0
10	Near Ash Water Recovery Pump House	68.5	43.7
11	In China Colony	51.8	38.4
	CPCB Standards (Industrial Area)	75	70

*** End Of the Report***

Note: Tested results are well within the permissible limits of MPCB / CPCB.

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30/04/19

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(Technical Manager)

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MONTHLY ENERGY CONSUMPTION FOR POLLUTION CONTROL EQUIPMENTS

Month: Apr'19

Pollution control equipment	Initial Energy Meter Reading as on First Date of the Month (MWH)	Final Energy Meter Reading as on Last Date of the Month (MWH)	Total (MWH)	Total Electricity Consumption (MWH)	Remark, If Abnormal
Dust Extraction System (DES)/Bag Filters at crusher house					
1A	415.1	487.2	72.1	145.6	-
1B	719.9	793.4	73.5		
Dust Extraction System (DES)/Bag Filters at Coal Transfer Points (JNT's) & Bunkers					
2A	163.7	168.5	4.800	57.8	-
2B	103.26	110.6	7.340		
2C	82.3	87.05	4.750		
2D	80.3	86.12	5.820		
2E	40.79	43.76	2.970		
2F	27.63	32.41	4.780		
2G	42.86	42.86	0.000		
2H	0.056	0.05645	0.000		
2I	3.854	3.854	0.000		
2J	20.15	21.73	1.580		
2K	1.949	2.329	0.380		
2L	8.137	9.836	1.699		
2M	42.33	49.3	6.970		
3A	23.76	28.86	5.100		
3B	11.34	15.76	4.420		
3C	4.781	4.782	0.001		
3D	6.632	8.045	1.413		
3E	5.599	5.971	0.372		
3F	10.46	10.46	0.000		
3G	10.83	11.24	0.410		
3H	8.945	9.331	0.386		
3I	10.86	11.72	0.860		
3J	7.253	8.761	1.508		
3K	1.651	1.712	0.061		
3L	14.37	14.87	0.500		
3M	6.265	6.265	0.000		
3N	18.6	18.6	0.000		
3O	0.015	0.015	0.000		
3P	1.223	1.223	0.000		
3Q	1.219	1.313	0.094		
3R	0.5449	0.5449	0.000		
3S	4.616	4.747	0.131		
3T	7.628	9.105	1.477		
			Total	203.4	

Prepared By

30/04/19
Checked By

MONTHLY ENERGY CONSUMPTION FOR POLLUTION CONTROL EQUIPMENTS

Month : APR '19

Pollution Control Equipment	Initial Energy Meter Reading as on First Date of the Month (KWH)		Final Energy Meter Reading as on Last Date of the Month (KWH)		Total Consumption (KWH)		Total Electricity Consumption (KWH)	Remarks, if abnormal
	I/C1	I/C2	I/C1	I/C2	I/C1	I/C2		-
ETP	3558	15330.0	3647	15550.0	89.00	220.0	309.0	-
STP-1	66775.0	103930.0	69781.0	107378.0	3006.00	3448.0	6454.0	
STP-2	106198.0	0.0	110221.0	0.0	4023.00	0.0	4023.0	-
						Grand Total	10786.0	-

Remarks:

I/C: Incomer

KWH : Kilowatt/Hr

NA: Not Applicable

Prepard By

30/04/19

Checked By

ADANI POWER MAHARASHTRA LIMITED - TIRODA
MONTHLY ENERGY CONSUMPTION FOR AIR POLLUTION CONTROL EQUIPMENTS

Month : Apr-19

Pollution Control Equipment	Initial Energy Meter Reading as on First Date of the Month (MWH)						Final Energy Meter Reading as on Last Date of the Month (MWH)						Total Consumption (MWH)						Multiplying Factor (for MWH to KWH)	Total Electricity Consumption (MWH)	Remarks, if abnormal
	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6			
ESP Unit -1	22420.5	1158.7	22267.9	22420.2	650.7	22801.1	22740.3	1160.0	22591.9	22741.6	652.6	23113.2	319.8	1.3	324.0	321.4	1.9	312.1	1000	1280.5	-
ESP Unit - 2	19723.9	1028.1	17650.4	17974.1	3194.8	16234.7	19968.4	1029.7	17956.0	18226.3	3310.0	16407.6	244.5	1.6	305.6	252.2	115.2	172.9	1000	1092.0	-
ESP Unit - 3	23862.6	201.3	22964.0	21378.5	1679.8	22432.5	24201.0	203.0	23267.6	21694.2	1681.8	23180.3	338.4	1.7	303.6	315.7	2.0	747.8	1000	1709.2	-
ESP Unit - 4	19950.3	466.8	17886.2	17047.1	261.1	18525.3	20239.0	469.4	18164.5	17270.3	263.1	18809.2	288.7	2.6	278.3	223.2	2.0	283.9	1000	1078.7	-
ESP Unit - 5	16387.2	381.6	17442.1	17930.1	500.4	16795.3	16621.3	383.6	17727.4	18213.0	502.9	17059.5	234.1	2.0	285.3	282.9	2.5	264.2	1000	1071.0	-
																				6231.4	

Remarks
T: Transformer
KWH : Kilowatt/Hr
NA: Not Applicable

Prepared By

30/04/19

Checked By

adani **ENVIRONMENT LABORATORY**

ADANI POWER MAHARASHTRA LIMITED

TIRORA

Format No: APML/ENV-LB/7.8/F01

URL No : TC519319000000501F

Date 31.05.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Ambient Air Quality (Plant)
Sample Collected by .	Environment Dept. APML

Test Report

Station	Sampling Location	Sampling Date	Analysis Starting Date	Parameters			
				PM 10	PM 2.5	SO2	NOx
				µg/m3	µg/m3	µg/m3	µg/m3
AAQ 1	Near AWRS	03.05.2019	04.05.2019	73.5	32.1	11.1	20.5
		06.05.2019	07.05.2019	75.4	33.3	9.4	22.7
		10.05.2019	11.05.2019	70.1	30.2	12.6	23.3
		13.05.2019	14.05.2019	72.4	31.4	13.5	24.5
		17.05.2019	18.05.2019	80.8	34.2	11.1	28.8
		20.05.2019	21.05.2019	81.5	36.3	10.0	22.9
		24.05.2019	25.05.2019	76.8	29.2	13.2	21.0
		27.05.2019	28.05.2019	78.7	38.0	10.5	19.0
		30.05.2019	31.05.2019	77.1	39.3	12.1	22.0
AAQ 2	Near Brick Plant	03.05.2019	04.05.2019	77.0	31.3	9.1	19.4
		06.05.2019	07.05.2019	80.3	38.4	10.5	20.9
		10.05.2019	11.05.2019	74.6	32.9	11.0	21.2
		13.05.2019	14.05.2019	71.9	31.4	12.3	22.8
		17.05.2019	18.05.2019	81.5	39.3	14.3	23.8
		20.05.2019	21.05.2019	75.9	29.2	12.4	20.7
		24.05.2019	25.05.2019	73.0	35.5	10.9	21.8
		27.05.2019	28.05.2019	78.8	39.9	13.6	18.6
		30.05.2019	31.05.2019	76.2	34.6	12.2	21.8
AAQ 3	China Colony	03.05.2019	04.05.2019	79.5	33.7	10.8	19.1
		06.05.2019	07.05.2019	77.7	34.6	9.4	22.2
		10.05.2019	11.05.2019	72.1	31.5	13.8	20.8
		13.05.2019	14.05.2019	81.3	37.2	11.5	21.4
		17.05.2019	18.05.2019	74.1	29.9	12.0	18.2
		20.05.2019	21.05.2019	70.9	30.0	13.2	19.7
		24.05.2019	25.05.2019	78.7	35.2	14.1	23.1
		27.05.2019	28.05.2019	75.0	36.0	12.4	20.9
		30.05.2019	31.05.2019	80.7	40.0	9.8	16.0
NAAQMS Standard				100	60	80	80

End of the Report

Note: Tested results are well within the permissible limits of National Ambient Air Quality Monitoring Standard (NAAQMS)

1 The report is referring only to the tested sample and for applicable parameter.

2 This report is not to be reproducing wholly or in part, and can't be used as evidence in court of law.

31/05/19

Authorized Signatory
(Technical Manager)

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adani ENVIRONMENT LABORATORY

ADANI POWER MAHARASHTRA LIMITED
TIRORA

Format No: APML/ENV-LB/7.8/F01

URL No : TC519319000000527F	Date: 11.05.2019

TEST REPORT

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location		Unit -1
2	Date of Sampling	:	09.05.2019
3	Time of Sampling	:	12:01 PM
4	Load (MW)	:	610
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel		Coal
8	Flue Gas Temperature (^{0}C)	:	135
9	Flue Gas Velocity (M/sec)	:	23.93
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2603461

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	45
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	950.4
			75.2	TPD	60.2
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	278

End of the Report

Note Tested results are well within the permissible limits of MPCB.

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12/05/19

Authorized Signatory
(Technical Manager)

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adani **ENVIRONMENT LABORATORY**

ADANI POWER MAHARASHTRA LIMITED

TIRORA

Format No: APML/ENV-LB/7.8/F01

URL No : TC5193190000000528F	Date: 11.05.2019
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -2
2	Date of Sampling	:	09.05.2019
3	Time of Sampling	:	1:10 PM
4	Load (MW)	:	595
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{0} C)	:	138
9	Flue Gas Velocity (M/sec)	:	24.60
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2657554

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results *
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	33
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	941.4
			75.2	TPD	59.3
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	280

* Results are corrected with 6% oxygen

*** End of the Report ***

Note Tested results are well within the permissible limits of MPCB.

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ADANI POWER MAHARASHTRA LIMITED

TIRORA

Format No: APML/ENV-LB/7.8/F01

URL No : TC5193190000000529F	Date: 11.05.2019
TEST REPORT	
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -3
2	Date of Sampling	:	09.05.2019
3	Time of Sampling	:	12:35 PM
4	Load (MW)	:	590
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{o}C)	:	131
9	Flue Gas Velocity (M/sec)	:	23.77
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2611708

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	36
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	949
			80.2	TPD	59.5
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	279

* Results are corrected with 6% oxygen

End of the Report

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ADANI POWER MAHARASHTRA LIMITED
TIRORA

Format No: APML/ENV-LB/7.8/F01

URL No : TC519319000000530F	Date: 11.05.2019
TEST REPORT	
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -4
2	Date of Sampling	:	09.05.2019
3	Time of Sampling	:	4:02 PM
4	Load (MW)	:	624
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{0}C)	:	139
9	Flue Gas Velocity (M/sec)	:	24.68
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2659220

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results *
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	45
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	962
			80.2	TPD	61.4
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	284

* Results are corrected with 6% oxygen

End of the Report

Note Tested results are well within the permissible limits of MPCB.

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adani ENVIRONMENT LABORATORY

ADANI POWER MAHARASHTRA LIMITED

TIRORA

Format No: APML/ENV-LB/7.8/F01

URL No : TC519319000000531F	Date: 11.05.2019
TEST REPORT	
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -5
2	Date of Sampling	:	09.05.2019
3	Time of Sampling	:	4:40 PM
4	Load (MW)	:	644
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{0} C)	:	134
9	Flue Gas Velocity (M/sec)	:	24.50
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2672820

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results
1	PM	IS 11255 (Part- 1) 1985	50	Mg/Nm^3	43
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	930
			80.2	TPD	59.7
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	289

* *Results are corrected with 6% oxygen*

End of the Report

Note Tested results are well within the permissible limits of MPCB.

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adani **ENVIRONMENT LABORATORY**

ADANI POWER MAHARASHTRA LIMITED

TIRORA

Format No: APML/ENV-LB/7.8/F01

URL:TC519319000000513F

Date: 31.05.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia - 441 911		
Sample Collection Date	22.05.2019	Analysis Starting Date	22.05.2019
Quantity received	3 Lit /Sample	Sampled by	Environment Dept.
Sample Particulars : Treated Waste Water			
Location of sample . STP-1 & 2 Out Let			

TEST REPORT

Sr no	Parameter (NABL SCOPE)	Unit	Test Methods	MPCB Standards	Results	
					STP-1	STP-2
1	pH Value	--	APHA-22nd -4500-H+B Electrometric Method	5.5-9.0	7.4	7.2
2	TSS	mg / l	APHA-22nd - 2540 D	500	28	37
3	TDS	mg / l	APHA-22nd - 2540 C	2100	256	292
4	COD	mg / l	APHA-22nd Ed 2012-5220B Open Reflux Method	100	32	41
5	BOD at 27°C for 3 days	mg / l	IS: 3025 (P-44)-1993 R-1999 Ad.1 BOD 3-days at 27 °C	30	10	11

End of the Report

Note: Tested results are well within the permissible limits of MPCB

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4. # Indicates this parameter is not covered in our NABL scope

Abmy 31/05/19

Authorized Signatory
(Technical Manager)

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adani ENVIRONMENT LABORATORY

ADANI POWER MAHARASHTRA LIMITED
TIRORA

Format No: APML/ENV-LB/7.B/F01

URL·TC519319000000511F

Date: 31.05.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911		
Sample Collection Date	22.05.2019	Analysis Starting Date	22.05.2019
Quantity received	3 Lit /Sample	Sampled by	Environment Dept. APML
Sample Particulars : Treated Effluent Water			
Location of sample : DM Plant N-Pit , ETP Outlet			

TEST REPORT

Sr no	Parameter (NABL SCOPE)	Unit	Test Methods	MPCB Standards	Results	
					N-pit	ETP Outlet
1	pH Value	---	APHA 22nd -4500-H+B Electrometric Method	5.5-9.0	7.8	7.9
2	TSS	mg / l	APHA 22nd 2540 D	100	32	48
3	TDS	mg / l	APHA-22nd 2540 C	2100	292	388
4	COD	mg / l	APHA 22nd Ed 2012-5220B Open Reflux Method	250	38	45
5	BOD at 27°C for 3 days	mg / l	IS: 3025 (P 44) 1993 R-1999 Ad.1 BOD 3-days at 27 °C	30	11	12
6	Oil & Grease	mg / l	APHA-22nd Ed 2012-5520 B Liquid Liquid Partition Gravemetric method	10	BDL	2.2

End of the Report

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31/05/19

Authorized Signatory
(Technical Manager)

adani ENVIRONMENT LABORATORY

ADANI POWER MAHARASHTRA LIMITED

TIRORA

Format No: APML/ENV-LB/7.8/F01

URL. TC519319000000510F

Date: 31.05.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911		
Sample Collection Date	22.05.2019	Analysis Starting Date :	22.05.2019
Quantity received	1 Ltr / Sample	Sampled by :	Environment Dept. APML
Sample Particulars : Cooling tower blowdown (Waste Water)			
Location of sample : Unit1,Unit 2,Unit-3,Unit-4 & Unit-5			

TEST REPORT

Sr no	Parameter (NABL SCOPE)	Unit	Test Methods	MPCB Standards	Results				
					U # 1	U # 2	U # 3	U # 4	U # 5
1	Free Available Chlorine	mg/l	APHA 23rd Edition Iodometric Method I 4500-Cl B.	0.5	0.2	0.1	0.1	0.3	0.1
2	Phosphate as (PO4)	mg/l	APHA-23rd -4500-P D Stannous Chloride Method	5	1.8	1.2	1.6	1.4	1.0
3	Zinc as (Zn)	mg/l	....	1	BDL	BDL	BDL	BDL	BDL
4	Total Chromium as (Cr)	mg/l	....	0.2	BDL	BDL	BDL	BDL	BDL

End of the Report

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31/05/19

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(Technical Manager)

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adani **ENVIRONMENT LABORATORY**

ADANI POWER MAHARASHTRA LIMITED

TIRORA

Format No: APML/ENV-LB/7.8/F01

URL NO .TC519319000000509F

Date: 31.05.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911		
Sample Collection Date	22.05.2019	Analysis Starting Date :	22.05.2019
Quantity received	1 Ltr / Sample	Sampled by :	Environment Dept. APML
Sample Particulars : Condenser Cooling Water (Waste Water)			
Location of sample : Unit1,Unit-2,Unit-3,Unit-4 & Unit-5			

TEST REPORT

Sr no	Parameter	Unit	Test Methods	MPCB Standards	Results				
					U # 1	U # 2	U # 3	U # 4	U # 5
1	pH Value	---	APHA-22nd - 4500-H+B Electrometric Method	6.5-8.5	8.2	8.1	8.3	8.0	8.1
2	Temperature	Deg C	APHA-22nd - 2550 B	---	35	34	37	36	37
3	Free Available Chlorine	PPM	APHA 22nd-Iodometric Method I 4500-Cl B.	0.5	0.3	0.4	0.3	0.4	0.4

End of the Report

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31/05/19

Authorized Signatory
(Technical Manager)

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adani **ENVIRONMENT LABORATORY**

ADANI POWER MAHARASHTRA LIMITED

TIRORA

Format No: APML/ENV-LB/7.8/F01

URL No. : TC519319000000519F

Date: 31.05.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Ambient Noise Level (Plant)
Sample Collected by :	Environment Dept. APML
Date of Sampling:	04.05.2019

Test Report

S. No	Locations	Day Time in dB (A) (6.00 a.m. to 10.00 p.m.)	Night Time in dB (A) (10.00 p.m. to 06.00 a.m.)
1	Near Shanti Niketan I II & III	56.5	52.2
2	Near Labour Hutment	62.6	55.2
3	Near Store Area	59.0	50.4
4	Gate No.1	59.3	48.8
5	Gate No.2	64.0	60.2
6	Gate No.3	63.5	58.4
7	Near OHC	57.2	42.2
8	Railway Siding	66.9	58.6
9	Near Reservoir 2	55.1	52.0
10	Near Ash Water Recovery Pump House	63.2	56.4
11	In China Colony	44.0	41.8
	CPCB Standards (Industrial Area)	75	70

*** End Of the Report***

Note: Tested results are well within the permissible limits of MPCB / CPCB.

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ADANI POWER MAHARASHTRA LIMITED - TIRODA

MONTHLY ENERGY CONSUMPTION FOR AIR POLLUTION CONTROL EQUIPMENTS

Month May 19

Pollution Control Equipment	Initial Energy Meter Reading as on First Date of the Month (MWH)						Final Energy Meter Reading as on Last Date of the Month (MWH)						Total Consumption (MWH)						Multiplying Factor (for MWH to KWH)	Total Electricity Consumption (MWH)	Remarks if abnormal
	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6			
ESP Unit 1	22740.3	1160.0	22591.9	22741.6	652.6	23113.2	23045.8	[illegible]	22890.2	23033.1	654.5	23401.6	305.5	1.3	298.3	291.5	1.9	288.4	1000	1186.9	-
ESP Unit 2	19968.4	1029.7	17956.0	18226.3	3310.0	16407.6	20216.9	[illegible]	18268.9	18480.4	3311.6	16708.4	248.5	1.6	312.9	254.1	1.6	300.8	1000	1119.5	-
ESP Unit 3	24201.0	203.0	23267.6	21694.2	1681.8	23180.3	24552.8	205.0	23577.9	22002.1	1683.8	23531.4	351.8	2.0	310.3	307.9	2.0	351.1	1000	1325.1	
ESP Unit 4	20239.0	469.4	18164.5	17270.3	263.1	18809.2	20567.9	474.9	18478.1	17532.6	268.3	19132.2	328.9	5.5	313.6	262.3	5.2	323.0	1000	1238.5	
ESP Unit 5	16621.3	383.6	17727.4	18223	503.9	17059.5	16870.2	389.7	18019.9	18499.5	509.2	17331.4	248.9	6.1	292.5	275.5	6.3	270.6	1000	1105.2	
																				5975.2	

Remark:

T Transformer

KWH Kilowatt/Hr

NA Not Applicable

Prepared By

Checked By

MONTHLY ENERGY CONSUMPTION FOR POLLUTION CONTROL EQUIPMENTS

Month : MAY '19

Pollution Control Equipment	Initial Energy Meter Reading as on First Date of the Month (KWH)		Final Energy Meter Reading as on Last Date of the Month (KWH)		Total Consumption (KWH)		Total Electricity Consumption (KWH)	Remarks, if abnormal
	I/C1	I/C2	I/C1	I/C2	I/C1	I/C2		-
ETP	3647	15550.0	3716	15850.0	69.00	300.0	369.0	
STP-1	69781.0	107378.0	72740.0	111150.0	2959.00	3772.0	6731.0	
STP-2	110221.0	0.0	114600.0	0.0	4379.00	0.0	4379.0	
						Grand Total	11479.0	

Remarks:

I/C: Incomer

KWH : Kilowatt/Hr

NA: Not Applicable

Prepard By

Checked By

MONTHLY ENERGY CONSUMPTION FOR POLLUTION CONTROL EQUIPMENTS

Month: MAY'19

Pollution control equipment	Initial Energy Meter Reading as on First Date of the Month (MWH)	Final Energy Meter Reading as on Last Date of the Month (MWH)	Total (MWH)	Total Electricity Consumption (MWH)	Remark , If Abnormal
Dust Extraction System (DES)/Bag Filters at crusher house					
1A	487.2	537.3	50.1	107	-
1B	793.4	850.3	56.9		
Dust Extraction System (DES)/Bag Filters at Coal Transfer Points (JNT's) & Bunkers					
2A	168.5	175.7	7.200	28.8	-
2B	110.6	111.635	1.035		
2C	87.05	89.32	2.270		
2D	86.12	91.03	4.910		
2E	43.76	46.01	2.250		
2F	32.41	32.8	0.390		
2G	42.86	42.86	0.000		
2H	0.05645	0.05699	0.001		
2I	3.854	3.854	0.000		
2J	21.73	22.84	1.110		
2K	2.329	2.495	0.166		
2L	9.836	11.75	1.914		
2M	49.3	49.89	0.590		
3A	28.86	31.61	2.750		
3B	15.76	18.19	2.430		
3C	4.782	4.782	0.000		
3D	8.045	8.05	0.005		
3E	5.971	6.383	0.412		
3F	10.46	10.66	0.200		
3G	11.24	11.78	0.540		
3H	9.331	9.77	0.439		
3I	11.72	11.75	0.030		
3J	8.761	8.961	0.200		
3K	1.712	1.712	0.000		
3L	14.87	14.87	0.000		
3M	6.265	6.265	0.000		
3N	18.6	18.6	0.000		
3O	0.015	0.015	0.000		
3P	1.223	1.223	0.000		
3Q	1.313	1.313	0.000		
3R	0.5449	0.5449	0.000		
3S	4.747	4.747	0.000		
3T	9.105	9.105	0.000		
			Total	135.8	

Prepared By

Checked By

adani ENVIRONMENT LABORATORY

ADANI POWER MAHARASHTRA LIMITED

TIRORA

Format No: APML/ENV-LB/7.8/F01

URL No TC5193190000000601F

Date 29.06.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Ambient Air Quality (Plant)
Sample Collected by :	Environment Dept. APML

Test Report

Station	Sampling Location	Sampling Date	Analysis Starting Date	Parameters			
				PM 10	PM 2.5	SO2	NOx
				µg/m3	µg/m3	µg/m3	µg/m3
AAQ 1	Near AWRS	03.06.2019	04.06.2019	62.7	30.5	11.3	29.4
		07.06.2019	08.06.2019	63.4	23.7	14.0	34.6
		10.06.2019	11.06.2019	60.4	29.1	9.4	23.4
		14.06.2019	15.06.2019	61.9	19.9	13.8	32.6
		17.06.2019	18.06.2019	60.0	31.0	8.2	20.4
		21.06.2019	22.06.2019	61.7	15.1	10.2	24.0
		24.06.2019	25.06.2019	58.5	20.2	11.8	29.4
		27.06.2019	28.06.2019	55.7	16.0	12.2	27.3
AAQ 2	Near Brick Plant	03.06.2019	04.06.2019	58.7	15.6	12.4	23.8
		07.06.2019	08.06.2019	55.8	20.1	14.3	25.6
		10.06.2019	11.06.2019	61.8	24.2	11.1	19.4
		14.06.2019	15.06.2019	41.7	7.4	14.0	26.6
		17.06.2019	18.06.2019	50.0	22.6	12.1	20.4
		21.06.2019	22.06.2019	56.1	19.8	8.5	14.7
		24.06.2019	25.06.2019	46.5	16.3	12.8	23.0
		27.06.2019	28.06.2019	58.3	17.4	10.9	15.8
AAQ 3	China Colony	03.06.2019	04.06.2019	64.0	19.0	9.8	21.1
		07.06.2019	08.06.2019	62.3	22.4	11.7	28.6
		10.06.2019	11.06.2019	61.4	16.7	9.9	19.9
		14.06.2019	15.06.2019	63.0	20.5	13.6	24.7
		17.06.2019	18.06.2019	67.6	25.3	11.9	31.5
		21.06.2019	22.06.2019	65.3	15.5	12.7	22.1
		24.06.2019	25.06.2019	59.3	14.2	12.0	24.2
		27.06.2019	28.06.2019	56.8	13.4	13.0	22.4
NAAQMS Standard				100	60	80	80

End of the Report

Note: Tested results are well within the permissible limits of National Ambient Air Quality Monitoring Stanadard (NAAQMS)

1. The report is referring only to the tested sample and for applicable parameter.
2. This report is not to be reproducing wholly or in part, and can't be used as evidence in court of law.

Authorized Signatory
(Technical Manager)

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adani **ENVIRONMENT LABORATORY**

ADANI POWER MAHARASHTRA LIMITED

TIRORA

Format No: APML/ENV-LB/7.8/F01

URL No : TC519318000000627F	28.06.2019
TEST REPORT	
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -1
2	Date of Sampling	:	27.06.2019
3	Time of Sampling	:	3:00 PM
4	Load (MW)	:	454
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{0}C)	:	123
9	Flue Gas Velocity (M/sec)	:	23.74
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2662082

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results *
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	44
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	910.34
			75.2	TPD	58.2
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	268

* Results are corrected with 6% oxygen

End of the Report

Note: Tested results are well within the permissible limits of MPCB.

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ADANI POWER MAHARASHTRA LIMITED

TIRORA

Format No: APML/ENV-LB/7.8/F01

URL No : TC519318000000628F	Date: 28.06.2019
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -2
2	Date of Sampling	:	27.06.2019
3	Time of Sampling	:	3:45 PM
4	Load (MW)	:	654
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{0}C)	:	124
9	Flue Gas Velocity (M/sec)	:	22.87
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2558113

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results *
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	30
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	970.80
			75.2	TPD	57.3
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	287

* Results are corrected with 6% oxygen

End of the Report

Note Tested results are well within the permissible limits of MPCB.

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ENVIRONMENT LABORATORY

ADANI POWER MAHARASHTRA LIMITED
TIRORA

Format No: APML/ENV-L8/7.8/F01

	Date: 28.06.2019
TEST REPORT	
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -5
2	Date of Sampling	:	27.06.2019
3	Time of Sampling	:	4:45 PM
4	Load (MW)	:	475
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{0} C)	:	119
9	Flue Gas Velocity (M/sec)	:	23.33
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2641996

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	41
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	832
			80.2	TPD	52.8
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	264

* Results are corrected with 6% oxygen

End of the Report

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Format No: APML/ENV-LB/7.8/F01

URL NO TC519319000000607F

Date: 29.06.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911		
Sample Collection Date	12.06.2019	Analysis Starting Date :	12.06.2019
Quantity received	1 Ltr / Sample	Sampled by :	Environment Dept. APML
Sample Particulars : Condenser Cooling Water (Waste Water)			
Location of sample : Unit1,Unit-2,Unit-3,Unit-4 & Unit-5			

TEST REPORT

Sr no	Parameter	Unit	Test Methods	MPCB Standards	Results				
					U # 1	U # 2	U # 3	U # 4	U # 5
1	pH Value	---	APHA-22nd - 4500-H+B Electrometric Method	6.5-8.5	8.3	8.3	8.2	8.2	8.3
2	Temperature	Deg C	APHA-22nd - 2550 B	---	33	33	32	32	33
3	Free Available Chlorine	PPM	APHA 22nd- Iodometric Method I. 4500-Cl B.	0.5	0.2	0.3	0.2	0.3	0.3

End of the Report

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adani **ENVIRONMENT LABORATORY**

ADANI POWER MAHARASHTRA LIMITED

TIRORA

Format No: APML/ENV-LB/7.8/F01

URL: TC519319000000612F

Date: 29.06.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC - Tirora, Dist. Gondia - 441 911		
Sample Collection Date	12.06.2019	Analysis Starting Date	12.06.2019
Quantity received	3 Lit /Sample	Sampled by	Environment Dept.
Sample Particulars : Treated Waste Water			
Location of sample : STP -1 & 2 Out Let			

TEST REPORT

Sr no	Parameter (NABL SCOPE)	Unit	Test Methods	MPCB Standards	Results	
					STP-1	STP-2
1	pH Value	--	APHA-22nd -4500-H+B Electrometric Method	5.5-9.0	7.8	7.4
2	TSS	mg / l	APHA-22nd - 2540 D	500	34	46
3	TDS	mg / l	APHA-22nd - 2540 C	2100	220	248
4	COD	mg / l	APHA-22nd Ed 2012-5220B Open Reflux Method	100	42	54
5	BOD at 27°C for 3 days	mg / l	IS: 3025 (P-44)-1993 R-1999 Ad.1 BOD 3-days at 27 °C	30	12	14

End of the Report

Note: Tested results are well within the permissible limits of MPCB.

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adani ENVIRONMENT LABORATORY

ADANI POWER MAHARASHTRA LIMITED

TIRORA

Format No: APML/ENV-LB/7.8/F01

URL: TC519319000000630F | Date: 29 06.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911		
Sample Collection Date	25.06.2019	Analysis Starting Date :	26.06.2019
Quantity received	1 Ltr / Sample	Sampled by :	Environment Dept. APML
Sample Particulars ; Boiler blowdown (Waste Water)			
Location of sample : Unit-3			

TEST REPORT

Sr no	Parameter (NABL SCOPE)	Unit	Test Methods	MPCB Standards	Results
					U # 3
1	TSS	mg / l	APHA-22nd - 2540 D	100	5.0
2	Oil & Grease	mg / l	APHA-22nd Ed 2012- 5520 B Liquid Liquid Partition Gravemetric method	10	BDL
3	Copper (Total)	mg/l	----	1	BDL
4	Iron (Total)	mg/l	APHA-22nd-3500-Fe-B	1	BDL

End of the Report

Note: Tested results are well within the permissible limits of MPCB.

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adani ENVIRONMENT LABORATORY

ADANI POWER MAHARASHTRA LIMITED
TIRORA

Format No. APML/ENV-LB/7.8/F01

URL:TC519319000000612F

Date: 29.06.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911		
Sample Collection Date	12.06.2019	Analysis Starting Date	12.06.2019
Quantity received	3 Lit /Sample	Sampled by	Environment Dept. APML
Sample Particulars : Treated Effluent Water			
Location of sample : DM Plant N-Pit , ETP Outlet			

TEST REPORT

Sr no	Parameter (NABL SCOPE)	Unit	Test Methods	MPCB Standards	Results	
					N-pit	ETP Outlet
1	pH Value	---	APHA-22nd -4500-H+B Electrometric Method	5.5-9.0	7.7	7.8
2	TSS	mg / l	APHA-22nd - 2540 D	100	56	64
3	TDS	mg / l	APHA-22nd - 2540 C	2100	324	412
4	COD	mg / l	APHA-22nd Ed 2012-5220B Open Reflux Method	250	28	38
5	BOD at 27°C for 3 days	mg / l	IS: 3025 (P-44)-1993 R-1999 Ad.1 BOD 3-days at 27 °C	30	8	10
6	Oil & Grease	mg / l	APHA-22nd Ed 2012-5520 B Liquid-Liquid Partition Gravemetric method	10	2.0	3.4

End of the Report

Note. Tested results are well within the permissible limits of MPCB.

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ENVIRONMENT LABORATORY

ADANI POWER MAHARASHTRA LIMITED

TIRORA

Format No: APML/ENV-LB/7.8/F01

URL: TC519319000000608F

Date: 29.06.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC - Tirora, Dist. Gondia - 441 911		
Sample Collection Date	12.06.2019	Analysis Starting Date :	12.06.2019
Quantity received	1 Ltr / Sample	Sampled by :	Environment Dept. APML
Sample Particulars : Cooling tower blowdown (Waste Water)			
Location of sample : Unit1,Unit-2,Unit-3,Unit-4 & Unit-5.			

TEST REPORT

Sr no	Parameter (NABL SCOPE)	Unit	Test Methods	MPCB Standards	Results				
					U # 1	U # 2	U # 3	U # 4	U # 5
1	Free Available Chlorine	mg/l	APHA 23rd Edition Iodometric Method I. 4500-Cl B.	0.5	0.3	0.3	0.2	0.3	0.3
2	Phosphate as (PO4)	mg/l	APHA-23rd -4500-P D Stannous Chloride Method	5	2.1	1.8	2.0	1.8	1.8
3	Zinc as (Zn)	mg/l	....	1	BDL	BDL	BDL	BDL	BDL
4	Total Chromium as (Cr)	mg/l	....	0.2	BDL	BDL	BDL	BDL	BDL

End of the Report

Note: Tested results are well within the permissible limits of MPCB.

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Format No: APML/ENV-LB/7.8/F01

URL No. : TC519319000000624F

Date: 29.06.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC - Tirora, Dist. Gondia - 441 911
Sample Particulars :	Ambient Noise Level (Plant)
Sample Collected by :	Environment Dept. APML
Date of Sampling:	08.06.2019

Test Report

S. No	Locations	Day Time in dB (A) (6.00 a.m. to 10.00 p.m.)	Night Time in dB (A) (10.00 p.m. to 06.00 a.m.)
1	Near Shanti Niketan I II & III	53.4	49.0
2	Near Labour Hutment	61.8	56.7
3	Near Store Area	57.9	48.6
4	Gate No.1	56.7	46.3
5	Gate No.2	62.4	59.8
6	Gate No.3	61.9	57.3
7	Near OHC	54.3	45.4
8	Railway Siding	59.8	51.6
9	Near Reservoir 2	59.4	51.3
10	Near Ash Water Recovery Pump House	61.9	53.4
11	In China Colony	51.6	42.6
	CPCB Standards (Industrial Area)	75	70

*** End Of the Report ***

Note: Tested results are well within the permissible limits of MPCB / CPCB.

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MONTHLY ENERGY CONSUMPTION FOR POLLUTION CONTROL EQUIPMENTS

Month : June '19

Pollution Control Equipment	Initial Energy Meter Reading as on First Date of the Month (KWH)		Final Energy Meter Reading as on Last Date of the Month (KWH)		Total Consumption (KWH)		Total Electricity Consumption (KWH)	Remarks, if abnormal
	I/C1	I/C2	I/C1	I/C2	I/C1	I/C2		-
ETP	3716	15850.0	3766	16101.0	50.00	251.0	301.0	-
STP-1	72740.0	111150.0	75835.0	114716.0	3095.00	3566.0	6661.0	
STP-2	114600.0	0.0	117343.0	0.0	2743.00	0.0	2743.0	
						Grand Total	9705.0	-

Remarks:

I/C: Incomer
KWH : Kilowatt/Hr
NA: Not Applicable

Prepard By

Checked By

MONTHLY ENERGY CONSUMPTION FOR POLLUTION CONTROL EQUIPMENTS

Month: June'19

Pollution control equipment	Initial Energy Meter Reading as on First Date of the Month (MWH)	Final Energy Meter Reading as on Last Date of the Month (MWH)	Total (MWH)	Total Electricity Consumption (MWH)	Remark , If Abnormal
Dust Extraction System (DES)/Bag Filters at crusher house					
1A	537.3	540.2	2.9	6.5	-
1B	850.3	853.9	3.6		
Dust Extraction System (DES)/Bag Filters at Coal Transfer Points (JNT's) & Bunkers					
2A	175.7	175.8	0.100	17.1	Coal wet due to rainfall
2B	111.635	111.635	0.000		
2C	89.32	90.97	1.650		
2D	91.03	93.16	2.130		
2E	46.01	46.49	0.480		
2F	32.8	33.19	0.390		
2G	42.86	42.86	0.000		
2H	0.05699	0.05699	0.000		
2I	3.854	3.854	0.000		
2J	22.84	23.15	0.310		
2K	2.495	2.495	0.000		
2L	11.75	12.17	0.420		
2M	49.89	49.89	0.000		
3A	31.61	35.64	4.030		
3B	18.19	21.39	3.200		
3C	4.782	4.782	0.000		
3D	8.05	8.34	0.290		
3E	6.383	6.383	0.000		
3F	10.66	10.66	0.000		
3G	11.78	12.84	1.060		
3H	9.77	11.62	1.850		
3I	11.75	11.75	0.000		
3J	8.961	9.71	0.749		
3K	1.712	1.712	0.000		
3L	14.87	14.87	0.000		
3M	6.265	6.265	0.000		
3N	18.6	18.6	0.000		
3O	0.015	0.015	0.000		
3P	1.223	1.223	0.000		
3Q	1.313	1.369	0.056		
3R	0.5449	0.5449	0.000		
3S	4.747	4.958	0.211		
3T	9.105	9.318	0.213		
			Total	23.6	

Prepared By

Checked By

ADANI POWER MAHARASHTRA LIMITED - TIRODA
MONTHLY ENERGY CONSUMPTION FOR AIR POLLUTION CONTROL EQUIPMENTS

Month. Jun-19

Pollution Control Equipment	Initial Energy Meter Reading as on First Date of the Month (MWH)						Final Energy Meter Reading as on Last Date of the Month (MWH)						Total Consumption (MWH)						Multiplying Factor (for MWH to KWH)	Total Electricity Consumption (MWH)	Remarks, if abnormal
	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6			
ESP Unit -1	23045.8	1161.3	22690.2	23033.1	654.5	23401.6	23348.7	1161.6	23195.3	23820.9	656.2	23695.2	302.9	0.3	305.1	787.8	1.7	293.6	1000	1691.4	-
ESP Unit - 2	20216.9	1031.3	18268.9	18480.4	3311.6	16708.4	20472.9	1032.9	18593.9	18747.1	3313.1	17010.8	256.0	1.6	325.0	266.7	1.5	302.4	1000	1153.2	-
ESP Unit - 3	24552.8	205.0	23577.9	22002.1	1683.8	23531.4	24851.3	206.8	23858.3	22256.8	1685.8	23849.1	298.5	1.8	280.4	264.7	2.0	317.7	1000	1165.1	-
ESP Unit - 4	20563.9	474.9	18476.1	17532.6	268.3	19132.2	20783.1	476.3	18711.1	17712.7	270.9	19357.6	215.2	1.4	233.0	180.1	2.6	225.4	1000	857.7	-
ESP Unit - 5	16870.2	389.7	18019.9	18492.5	509.2	17331.4	17096.9	391.8	18295.6	18749	511.2	17585.3	226.7	2.1	275.7	256.5	2.0	253.9	1000	1016.9	-
																				5884.3	

Remarks:

T- Transformer
KWH Kilowatt/Hr
NA Not Applicable

Prepared By

Checked By

M/s Adani Power Maharashtra Limited
A – 1, Tirora Growth Centre, MIDC
Dist. Gondia – 441 911

Sample Collection Date : 11.05.2019
Sample Analysis Date : 12.05.2019
Sample Type . Surface Water
Sample Collected by , Enviro Analyst & Engineers Pvt. Ltd representative
Sample Tested at : Enviro Analyst & Engineers Pvt Ltd , Nagpur

TEST RESULTS

Sr. No.	Test Parameters	Unit	As per IS : 10500 : 2012 (Drinking Water - Specification)		Results	
			Permissible Requirement	Acceptable Limit	Mendipur Pond water	Kachewani Pond Water
1	Apparent Colour	Hazen units	15	5	2.5	2.0
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	-	Agreeable	Agreeable	-	-
4	Turbidity NTU	NTU	5	1	1.5	1.0
5	Total Dissolved Solid	mg / l	2000	500	226	250
6	Electrical Conductivity	μS/cm	-	-	352	390
7	Total Alkalinity	mg / l	600	200	172	174
8	pH Value	-	No relaxation	6.5 to 8.5	8.3	7.85
9	Total Hardness ($CaCO_3$)	mg / l	600	200	118	152
10	Calcium (as Ca)	mg / l	200	75	36.2	40.8
11	Magnesium (as Mg)	mg / l	100	30	6.68	12.1
12	Copper as(Cu)	mg / l	1.5	0.05	< 0.01	< 0.01
13	Iron (as Fe)	mg / l	No relaxation	0.3	0.085	0.085
14	Manganese as (Mn)	mg / l	0.3	0.1	0.013	< 0.01
15	Chlorides (as Cl)	mg / l	1000	250	16.2	18.6
16	Sulphate (as SO_4)	mg / l	400	200	11.8	14.2
17	Nitrates (as NO_3)	mg / l	No relaxation	45	8.5	5.2
18	Fluoride (as F)	mg / l	1.5	1.0	0.50	0.55
19	Phenolic Compounds	mg / l	0.002	0.001	BDL	BDL
20	Mercury as (Hg)	mg / l	No relaxation	0.001	< 0.0005	< 0.0005
21	Cadmium as (Cd)	mg / l	No relaxation	0.003	< 0.001	< 0.001
22	Selenium as (Se)	mg / l	No relaxation	0.01	< 0.001	< 0.001
23	Arsenic as (As)	mg / l	0.05	0.01	BDL	BDL
24	Cyanide as (CN)	mg / l	No relaxation	0.05	< 0.005	< 0.005
25	Lead as (Pb)	mg / l	No relaxation	0.01	< 0.001	< 0.001
26	Zinc as (Zn)	mg / l	15	5	0.26	0.27
27	Chromium as (Cr^{+6})	mg / l	No relaxation	0.05	< 0.03	< 0.03
28	Mineral Oil	mg / l	No relaxation	0.05	< 0.01	< 0.01
29	Residual Chlorine	mg / l	1.0	0.2	Nil	Nil
30	Total Coliform	MPN/100 ml	Absent	Absent	> 16	> 16
31	E.Coli	Nos./100 ml	Absent	Absent	> 16	> 16

Environment Dept.
Adani Power Maharashtra Limited

M/s Adani Power Maharashtra Limited
A – 1, Tirora Growth Centre, MIDC
Dist. Gondia – 441 911

Sample Collection Date	:	11.05.2019
Sample Analysis Date	:	12.05.2019
Sample Type	:	Ground Water
Sample Collected by	:	Enviro Analyst & Engineers Pvt. Ltd representative
Sample Tested at	:	Enviro Analyst & Engineers Pvt. Ltd , Nagpur

TEST RESULTS

Sr. No	Test Parameters	Unit	As per IS : 10500 : 2012 (Drinking Water - Specification)		Results	
			Permissible Requirement	Acceptable Limit	Mendipur Hand Pump	Kachewani Hand Pump
1	Apparent Colour	Hazen units	15	5	0.1	0.1
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity NTU	NTU	5	1	0.1	0.1
5	Total Dissolved Solid	mg / l	2000	500	582	1014
6	Electrical Conductivity	μS/cm	-	-	990	1578
7	Total Alkalinity	mg / l	600	200	192	216
8	pH Value	-	No relaxation	6.5 to 8.5	7.70	8.0
9	Total Hardness ($CaCO_3$)	mg / l	600	200	282	540
10	Calcium (as Ca)	mg / l	200	75	70.2	120.8
11	Magnesium (as Mg)	mg / l	100	30	25.9	57.8
12	Copper as(Cu)	mg / l	1.5	0.05	< 0.01	< 0.01
13	Iron (as Fe)	mg / l	No relaxation	0.3	0.11	0.25
14	Manganese as (Mn)	mg / l	0.3	0.1	0.010	0.010
15	Chlorides (as Cl)	mg / l	1000	250	62.4	246
16	Sulphate (as SO_4)	mg / l	400	200	23.2	190
17	Nitrates (as NO_3)	mg / l	No relaxation	45	2.80	3.8
18	Fluoride (as F)	mg / l	1.5	1.0	0.80	0.95
19	Phenolic Compounds	mg / l	0.002	0.001	BDL	BDL
20	Mercury as (Hg)	mg / l	No relaxation	0.001	< 0.0005	< 0.0005
21	Cadmium as (Cd)	mg / l	No relaxation	0.003	< 0.001	< 0.001
22	Selenium as (Se)	mg / l	No relaxation	0.01	< 0.001	< 0.001
23	Arsenic as (As)	mg / l	0.05	0.01	BDL	BDL
24	Cyanide as (CN)	mg / l	No relaxation	0.05	< 0.005	< 0.005
25	Lead as (Pb)	mg / l	No relaxation	0.01	< 0.001	< 0.001
26	Zinc as (Zn)	mg / l	15	5	0.45	1.20
27	Chromium as (Cr^{+6})	mg / l	No relaxation	0.05	< 0.03	< 0.03
28	Mineral Oil	mg / l	No relaxation	0.05	< 0.01	< 0.01
29	Residual Chlorine	mg / l	1.0	0.2	< 0.1	< 0.1
30	Total Coliform	MPN/100 ml	Absent	Absent	Absent	Absent
31	E.Coli	Nos./100 ml	Absent	Absent	Absent	Absent

Environment Dept.
Adani Power Maharashtra Limited

M/s Adani Power Maharashtra Limited
A – 1, Tirora Growth Centre, MIDC
Dist. Gondia – 441 911

Sample Collection Date : 11.05.2019
Sample Analysis Date : 12.05.2019
Sample Type : Ground Water
Sample Collected by : Enviro Analyst & Engineers Pvt. Ltd representative
Sample Tested at : Enviro Analyst & Engineers Pvt Ltd , Nagpur

TEST RESULTS

Sr. No	Test Parameters	Unit	As per IS : 10500 : 2012 (Drinking Water - Specification)		Results	
			Permissible Requirement	Acceptable Limit	Garada Hand Pump	Chikhali Hand Pump
1	Apparent Colour	Hazen units	15	5	0.1	0.1
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity NTU	NTU	5	1	0.1	0.1
5	Total Dissolved Solid	mg / l	2000	500	788	276
6	Electrical Conductivity	µS/cm	-	-	1210	480
7	Total Alkalinity	mg / l	600	200	194	190
8	pH Value	-	No relaxation	6.5 to 8.5	7.70	8.2
9	Total Hardness ($CaCO_3$)	mg / l	600	200	316	184
10	Calcium (as Ca)	mg / l	200	75	81.8	48.0
11	Magnesium (as Mg)	mg / l	100	30	27.1	15.55
12	Copper as(Cu)	mg / l	1.5	0.05	< 0.01	< 0.01
13	Iron (as Fe)	mg / l	No relaxation	0.3	0.15	0.10
14	Manganese as (Mn)	mg / l	0.3	0.1	< 0.01	< 0.01
15	Chlorides (as Cl)	mg / l	1000	250	130.2	13.7
16	Sulphate (as SO_4)	mg / l	400	200	37.8	10.5
17	Nitrates (as NO_3)	mg / l	No relaxation	45	2.55	2.15
18	Fluoride (as F)	mg / l	1.5	1.0	0.90	0.60
19	Phenolic Compounds	mg / l	0.002	0.001	BDL	BDL
20	Mercury as (Hg)	mg / l	No relaxation	0.001	< 0.0005	< 0.0005
21	Cadmium as (Cd)	mg / l	No relaxation	0.003	< 0.001	< 0.001
22	Selenium as (Se)	mg / l	No relaxation	0.01	< 0.001	< 0.001
23	Arsenic as (As)	mg / l	0.05	0.01	BDL	BDL
24	Cyanide as (CN)	mg / l	No relaxation	0.05	< 0.005	< 0.005
25	Lead as (Pb)	mg / l	No relaxation	0.01	< 0.001	< 0.001
26	Zinc as (Zn)	mg / l	15	5	0.42	0.15
27	Chromium as (Cr^{+6})	mg / l	No relaxation	0.05	< 0.03	< 0.03
28	Mineral Oil	mg / l	No relaxation	0.05	< 0.01	< 0.01
29	Residual Chlorine	mg / l	1.0	0.2	< 0.1	< 0.1
30	Total Coliform	MPN/100 ml	Absent	Absent	Absent	Absent
31	E.Coli	Nos./100 ml	Absent	Absent	Absent	Absent

Environment Dept.
Adani Power Maharashtra Limited

M/s Adani Power Maharashtra Limited
A – 1, Tirora Growth Centre, MIDC
Dist. Gondia – 441 911

Sample Collection Date	:	11.05.2019
Sample Analysis Date	:	12.05.2019
Sample Type	:	Surface Water
Sample Collected by	:	Enviro Analyst & Engineers Pvt. Ltd representative
Sample Tested at	:	Enviro Analyst & Engineers Pvt. Ltd , Nagpur

TEST RESULTS

Sr. No.	Test Parameters	Unit	As per IS : 10500 : 2012 (Drinking Water - Specification)		Results	
			Permissible Requirement	Acceptable Limit	Waingangа River Water	Garada Village Pond Water
1	Apparent Colour	Hazen units	15	5	0.3	1.5
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	-	Agreeable	Agreeable	-	-
4	Turbidity NTU	NTU	5	1	0.2	1.0
5	Total Dissolved Solid	mg / l	2000	500	186	780
6	Electrical Conductivity	µS/cm	-	-	292	1210
7	Total Alkalinity	mg / l	600	200	140	234
8	pH Value	-	No relaxation	6.5 to 8.5	7.70	8.15
9	Total Hardness ($CaCO_3$)	mg / l	600	200	118	292
10	Calcium (as Ca)	mg / l	200	75	35.8	70.2
11	Magnesium (as Mg)	mg / l	100	30	6.9	28.3
12	Copper as(Cu)	mg / l	1.5	0.05	< 0.01	< 0.01
13	Iron (as Fe)	mg / l	No relaxation	0.3	0.080	0.20
14	Manganese as (Mn)	mg / l	0.3	0.1	< 0.01	< 0.01
15	Chlorides (as Cl)	mg / l	1000	250	13.4	61.8
16	Sulphate (as SO_4)	mg / l	400	200	12.6	30.4
17	Nitrates (as NO_3)	mg / l	No relaxation	45	2.85	7.0
18	Fluoride (as F)	mg / l	1.5	1.0	0.40	0.75
19	Phenolic Compounds	mg / l	0.002	0.001	BDL	BDL
20	Mercury as (Hg)	mg / l	No relaxation	0.001	< 0.0005	< 0.0005
21	Cadmium as (Cd)	mg / l	No relaxation	0.003	< 0.001	< 0.001
22	Selenium as (Se)	mg / l	No relaxation	0.01	< 0.001	< 0.001
23	Arsenic as (As)	mg / l	0.05	0.01	BDL	BDL
24	Cyanide as (CN)	mg / l	No relaxation	0.05	< 0.005	< 0.005
25	Lead as (Pb)	mg / l	No relaxation	0.01	< 0.001	< 0.001
26	Zinc as (Zn)	mg / l	15	5	0.17	0.52
27	Chromium as (Cr^{+6})	mg / l	No relaxation	0.05	< 0.03	< 0.03
28	Mineral Oil	mg / l	No relaxation	0.05	< 0.01	< 0.01
29	Residual Chlorine	mg / l	1.0	0.2	Nil	Nil
30	Total Coliform	MPN/100 ml	Absent	Absent	< 16	> 16
31	E.Coli	Nos./100 ml	Absent	Absent	12	> 16

Environment Dept.
Adani Power Maharashtra Limited

Format No: APML/ENV-LB/7.8/F01

URL No : TC519319000000701F Date 30.07.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC - Tirora, Dist. Gondia - 441 911
Sample Particulars :	Ambient Air Quality (Plant)
Sample Collected by :	Environment Dept. APML

Test Report

Station	Sampling Location	Sampling Date	Analysis Starting Date	Parameters			
				PM 10	PM 2.5	SO2	NOx
				µg/m3	µg/m3	µg/m3	µg/m3
AAQ 1	Near AWRS	01.07.2019	02.07.2019	32.8	17.8	6.3	22.2
		05.07.2019	06.07.2019	20.1	10.8	8.4	20.4
		08.07.2019	09.07.2019	37.2	19.2	9.6	19.2
		12.07.2019	13.07.2019	24.1	18.0	10.6	25.1
		15.07.2019	16.07.2019	27.1	11.1	9.4	21.5
		19.07.2019	20.07.2019	25.1	12.0	13.2	18.0
		22.07.2019	23.07.2019	29.9	18.8	9.5	20.6
		26.07.2019	27.07.2019	23.7	17.0	11.7	21.0
		29.07.2019	30.07.2019	MONITORING NOT DONE DUE TO RAINFALL			
AAQ 2	Near Brick Plant	01.07.2019	02.07.2019	21.6	17.6	8.6	22.4
		05.07.2019	06.07.2019	15.1	6.5	11.1	18.8
		08.07.2019	09.07.2019	13.3	7.7	10.4	24.8
		12.07.2019	13.07.2019	25.5	16.1	8.5	23.0
		15.07.2019	16.07.2019	32.9	19.9	9.3	21.7
		19.07.2019	20.07.2019	35.8	13.3	15.8	25.0
		22.07.2019	23.07.2019	24.1	14.7	7.4	22.3
		26.07.2019	27.07.2019	18.7	7.4	9.4	20.5
		29.07.2019	30.07.2019	MONITORING NOT DONE DUE TO RAINFALL			
AAQ 3	China Colony	01.07.2019	02.07.2019	17.4	12.3	12.3	21.7
		05.07.2019	06.07.2019	15.8	14.6	13.3	19.2
		08.07.2019	09.07.2019	23.1	21.2	9.9	17.7
		12.07.2019	13.07.2019	23.6	4.2	8.2	20.5
		15.07.2019	16.07.2019	29.9	16.9	7.8	21.0
		19.07.2019	20.07.2019	18.3	7.5	11.7	19.9
		22.07.2019	23.07.2019	21.3	10.9	10.4	27.7
		26.07.2019	27.07.2019	16.4	11.0	9.3	25.6
		29.07.2019	30.07.2019	MONITORING NOT DONE DUE TO RAINFALL			
NAAQMS Standard				100	60	80	80

End of the Report

Note: Tested results are well within the permissible limits of National Ambient Air Quality Monitoring Stanadard (NAAQMS).

1 The report is referring only to the tested sample and for applicable parameter.

2. This report is not to be reproducing wholly or in part, and can't be used as evidence in court of law.

Environmental Laboratory TC-5190 (NABL Certificate No) Adani Power Maharashtra Limited, Tiroda

30/07/19

Authorized Signatory
(Technical Manager)

Plot No. A-1,Tiroda Growth Centre, M.I.D.C., Dist: Gondia - 441911, Maharashtra, India
Tel +917198255983, Fax: +917198253971, E-mail:arunpratap.singh@adani.com
Website:www.adani.com

adani **ENVIRONMENTAL LABORATORY**
(Accredited by NABL)

ADANI POWER MAHARASHTRA LIMITED, TIRODA

Format No: APML/ENV-LB/7.8/F01

URL No : TC519318000000729F	Date: 27.07.2019
TEST REPORT	
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -1
2	Date of Sampling	:	25.07.2019
3	Time of Sampling	:	11:45 AM
4	Load (MW)	:	477
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{o}C)	:	118
9	Flue Gas Velocity (M/sec)	:	22.84
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2593078

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results *
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	41
2	SO_2	IS 11255 (Part 2) 1985	--	Mg/Nm^3	908.22
			75.2	TPD	56.5
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	267

* *Results are corrected with 6% oxygen*

End of the Report

Note Tested results are well within the permissible limits of MPCB.

1 The report is referring only to the tested sample and for applicable parameter
2 The sample will be destroyed after retention time unless otherwise specified specially.
3 This report is not to be reproducing wholly or in part, and can't be used as evidence in court of law.

27.07.19

Authorized Signatory
(Technical Manager)

Plot No. A-1,Tiroda Growth Centre, M.I.D.C., Dist: Gondia - 441911, Maharashtra, India
Tel : +917198255983, Fax +917198253971, E-mail:arunpratap.singh@adani.com

Format No: APML/ENV-LB/7.8/F01

URL No : TC5193180000000730F	Date: 27.07.2019
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -2
2	Date of Sampling	:	25.07.2019
3	Time of Sampling	:	12:52 PM
4	Load (MW)	:	556
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{o} C)	:	121
9	Flue Gas Velocity (M/sec)	:	24.12
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2717921

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results *
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	29
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	893.59
			75.2	TPD	55.7
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	262

* Results are corrected with 6% oxygen

End of the Report

Note Tested results are well within the permissible limits of MPCB.

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27/07/19
Authorized Signatory
(Technical Manager)

Plot No. A-1,Tiroda Growth Centre, M.I.D.C., Dist. Gondia - 441911, Maharashtra, India
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ENVIRONMENTAL LABORATORY

(Accredited by NABL)

ADANI POWER MAHARASHTRA LIMITED, TIRODA

Format No: APML/ENV-LB/7.8/F01

URL No : TC519318000000731F	Date: 27.07.2019
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -3
2	Date of Sampling	:	25.07.2019
3	Time of Sampling	:	12:20 PM
4	Load (MW)	:	538
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature ($^{\circ}$C)	:	121
9	Flue Gas Velocity (M/sec)	:	23.67
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2667441

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results *
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	32
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	897.33
			75.2	TPD	55.2
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	264

* Results are corrected with 5% oxygen

End of the Report

Note Tested results are well within the permissible limits of MPCB.

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2. The sample will be destroyed after retention time unless otherwise specified specially.
3. This report is not to be reproducing wholly or in part, and can't be used as evidence in court of law.

27.7.19

Authorized Signatory
(Technical Manager)

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adani **ENVIRONMENTAL LABORATORY**

(Accredited by NABL)

ADANI POWER MAHARASHTRA LIMITED, TIRODA

Format No: APML/ENV-LB/7.8/F01

URL No : TC519318000000728F	Date: 15.07.2019

TEST REPORT

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia - 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -4
2	Date of Sampling	:	11.07.2019
3	Time of Sampling	:	5:03 PM
4	Load (MW)	:	457
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{0}C)	:	115
9	Flue Gas Velocity (M/sec)	:	23.57
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2696841

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	42
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	890
			80.2	TPD	57.6
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	269

** Results are corrected with 6% oxygen*

End of the Report

Note Tested results are well within the permissible limits of MPCB

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15/07/19

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(Technical Manager)

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adani ENVIRONMENTAL LABORATORY
(Accredited by NABL)

ADANI POWER MAHARASHTRA LIMITED, TIRODA

TC-5193

Format No: APML/ENV-LB/7.8/F01

URL No : TC519318000000727F	Date: 15.07.2019
TEST REPORT	
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -5
2	Date of Sampling	:	11.07.2019
3	Time of Sampling	:	4:25 PM
4	Load (MW)	:	456
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{0} C)	:	116
9	Flue Gas Velocity (M/sec)	:	23.78
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2713742

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	40
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	853
			80.2	TPD	55.6
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	260

* Results are corrected with 6% oxygen

End of the Report

Note Tested results are well within the permissible limits of MPCB.

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Environmental Laboratory TC-5193 Tiroda

15/07/19

Authorized Signatory
(Technical Manager)

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Format No: APML/ENV-LB/7.8/F01

URL No. : TC519319000000725F

Date: 30.07.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC - Tirora, Dist. Gondia - 441 911
Sample Particulars :	Ambient Noise Level (Plant)
Sample Collected by :	Environment Dept. APML
Date of Sampling:	06.07.2019

Test Report

S. No	Locations	Day Time in dB (A) (6.00 a.m. to 10.00 p.m.)	Night Time in dB (A) (10.00 p.m. to 06.00 a.m.)
1	Near Shanti Niketan I II & III	56.1	47.0
2	Near Labour Hutment	66.0	51.2
3	Near Store Area	62.0	49.5
4	Gate No.1	58.0	45.0
5	Gate No.2	66.4	49.8
6	Gate No.3	69.0	51.2
7	Near OHC	60.3	44.4
8	Railway Siding	59.2	41.0
9	Near Reservoir 2	63.0	48.5
10	Near Ash Water Recovery Pump House	55.8	43.4
11	In China Colony	51.7	41.0
	CPCB Standards (Industrial Area)	75	70

*** End Of the Report ***

Note: Tested results are well within the permissible limits of MPCB / CPCB.

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30-07-19

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(Technical Manager)

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adani **ENVIRONMENTAL LABORATORY**
(Accredited by NABL)

ADANI POWER MAHARASHTRA LIMITED, TIRODA

Format No: APML/ENV-LB/7.8/F01

URL NO :TC519319000000707F

Date: 30.07.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC - Tirora, Dist. Gondia - 441 911		
Sample Collection Date	10.7.2019	Analysis Starting Date :	10.7.2019
Quantity received	1 Ltr / Sample	Sampled by :	Environment Dept. APML
Sample Particulars : Condenser Cooling Water (Waste Water)			
Location of sample : Unit1,Unit-2,Unit-3,Unit-4 & Unit-5			

TEST REPORT

Sr no	Parameter	Unit	Test Methods	MPCB Standards	Results				
					U # 1	U # 2	U # 3	U # 4	U # 5
1	pH Value	---	APHA-23rd - 4500-H+B Electrometric Method	6.5-8.5	8.0	8.1	8.0	8.3	8.2
2	Temperature	Deg C	APHA-23rd - 2550 B	---	30	29	30	28	27
3	Free Available Chlorine	PPM	APHA 23rd- Iodometric Method I. 4500-Cl B.	0.5	0.2	0.4	0.1	0.2	0.3

End of the Report

Note: Tested results are well within the permissible limits of MPCB.

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30.07.19

Authorized Signatory
(Technical Manager)

Page 1 Of 1

ENVIRONMENTAL LABORATORY

(Accredited by NABL)

ADANI POWER MAHARASHTRA LIMITED, TIRODA

Format No: APML/ENV-LB/7.8/F01

URL:TC519319000000712F

Date: 30.07.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911		
Sample Collection Date	10.07.2019	Analysis Starting Date	10.07.2019
Quantity received	3 Lit /Sample	Sampled by	Environment Dept. APML
Sample Particulars : Treated Effluent Water			
Location of sample : DM Plant N-Pit , ETP Outlet			

TEST REPORT

Sr no	Parameter (NABL SCOPE)	Unit	Test Methods	MPCB Standards	Results	
					N-pit	ETP Outlet
1	pH Value	---	APHA-23rd -4500-H+B Electrometric Method	5.5-9.0	7.7	7.8
2	TSS	mg / l	APHA-23rd - 2540 D	100	40	48
3	TDS	mg / l	APHA-23rd - 2540 C	2100	421	341
4	COD	mg / l	APHA-23rd Ed 2017-5220B Open Reflux Method	250	52	56
5	BOD at 27°C for 3 days	mg / l	IS: 3025 (P-44)-1993 R-1999 Ad.1 BOD 3-days at 27 °C	30	12	10
6	Oil & Grease	mg / l	APHA-23rd Ed 2017-5520 B Liquid Liquid Partition Gravemetric method	10	0.8	2.4

End of the Report

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30.07.19

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ENVIRONMENTAL LABORATORY
(Accredited by NABL)

ADANI POWER MAHARASHTRA LIMITED, TIRODA

TC-5193

Format No: APML/ENV-LB/7.B/F01

URL: TC519319000000710F

Date: 30.07.2019

Issued To:	APML , Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911		
Sample Collection Date	10.07.2019	Analysis Starting Date	10.07.2019
Quantity received	3 Lit /Sample	Sampled by	Environment Dept.
Sample Particulars : Treated Waste Water			
Location of sample : STP -1 & 2 Out Let			

TEST REPORT

Sr no	Parameter (NABL SCOPE)	Unit	Test Methods	MPCB Standards	Results	
					STP-1	STP-2
1	pH Value	--	APHA-23rd -4500-H+B Electrometric Method	5.5-9.0	7.1	7.6
2	TSS	mg / l	APHA-23rd - 2540 D	500	52	36
3	TDS	mg / l	APHA-23rd - 2540 C	2100	266	292
4	COD	mg / l	APHA-23rd Ed 2017-5220B Open Reflux Method	100	60	70
5	BOD at 27°C for 3 days	mg / l	IS: 3025 (P-44)-1993 R-1999 Ad.1 BOD 3-days at 27 °C	30	11	12

End of the Report

- Note. Tested results are well within the permissible limits of MPCB.

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4. # indicates this parameter is not covered in our NABL scope

30.07.19

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(Technical Manager)

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TC 3193

Format No: APML/ENV-L8/7.8/F01

URL: TC519319000000708F

Date: 30.07.2019

Issued To:	APML,Plot No A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911		
Sample Collection Date	10.07.2019	Analysis Starting Date :	10.07.2019
Quantity received	1 Ltr / Sample	Sampled by :	Environment Dept. APML
Sample Particulars : Cooling tower blowdown (Waste Water)			
Location of sample : Unit1,Unit-2,Unit-3,Unit-4 & Unit-5.			

TEST REPORT

Sr no	Parameter (NABL SCOPE)	Unit	Test Methods	MPCB Standards	Results				
					U # 1	U # 2	U # 3	U # 4	U # 5
1	Free Available Chlorine	mg/l	APHA 23rd Edition Iodometric Method 1, 4500-Cl B.	0.5	0.2	0.3	0.4	0.1	0.4
2	Phosphate as (PO4)	mg/l	APHA-23rd -4500-P D Stannous Chloride Method	5	1.7	1.6	1.2	1.8	2.0
3	Zinc as (Zn)#	mg/l	APHA-23rd -3500-Zn Zincon Method	1	BDL	BDL	BDL	BDL	BDL
4	Total Chromium as (Cr)#	mg/l	APHA-23rd -3500-Cr Colorimetric Method	0.2	BDL	BDL	BDL	BDL	BDL

End of the Report

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30-7-19

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(Technical Manager)

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MONTHLY ENERGY CONSUMPTION FOR POLLUTION CONTROL EQUIPMENTS

Month: July'19

Pollution control equipment	Initial Energy Meter Reading as on First Date of the Month (MWH)	Final Energy Meter Reading as on Last Date of the Month (MWH)	Total (MWH)	Total Electricity Consumption (MWH)	Remark, If Abnormal
Dust Extraction System (DES)/Bag Filters at crusher house					
1A	540.2	540.2	0	0	-
1B	853.9	853.9	0		
Dust Extraction System (DES)/Bag Filters at Coal Transfer Points (JNT's) & Bunkers					
2A	175.8	175.8	0.000	0.0	Coal wet due to rainfall
2B	111.635	111.635	0.000		
2C	90.97	90.97	0.000		
2D	93.16	93.16	0.000		
2E	46.49	46.49	0.000		
2F	33.19	33.19	0.000		
2G	42.86	42.86	0.000		
2H	0.05699	0.05699	0.000		
2I	3.854	3.854	0.000		
2J	23.15	23.15	0.000		
2K	2.495	2.495	0.000		
2L	12.17	12.17	0.000		
2M	49.89	49.89	0.000		
3A	35.64	35.64	0.000		
3B	21.39	21.39	0.000		
3C	4.782	4.782	0.000		
3D	8.34	8.34	0.000		
3E	6.383	6.383	0.000		
3F	10.66	10.66	0.000		
3G	12.84	12.84	0.000		
3H	11.62	11.62	0.000		
3I	11.75	11.75	0.000		
3J	9.71	9.71	0.000		
3K	1.712	1.712	0.000		
3L	14.87	14.87	0.000		
3M	6.265	6.265	0.000		
3N	18.6	18.6	0.000		
3O	0.015	0.015	0.000		
3P	1.223	1.223	0.000		
3Q	1.369	1.369	0.000		
3R	0.5449	0.5449	0.000		
3S	4.958	4.958	0.000		
3T	9.318	9.318	0.000		
			Total	0.0	

Prepared By

Checked By

ADANI POWER MAHARASHTRA LIMITED - TIRODA
MONTHLY ENERGY CONSUMPTION FOR AIR POLLUTION CONTROL EQUIPMENTS

Month Jul-19

Pollution Control Equipment	Initial Energy Meter Reading as on First Date of the Month (MWH)						Final Energy Meter Reading as on Last Date of the Month (MWH)						Total Consumption (MWH)						Multiplying Factor (for MWH to KWH)	Total Electricity Consumption (MWH)	Remarks, if abnormal
	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6			
ESP Unit -1	23348.7	1161.6	23195.3	23320.9	656.2	23695.2	23644.4	1277.4	23377.8	23602.4	657,9	23977.4	295.7	115.8	182.5	281.5	1.7	282.2	1000	1159.4	-
ESP Unit - 2	20472.9	1032.9	18593.9	18747.1	3313.1	17010.8	20742,9	1034.3	18902.8	19033.4	3314.6	17319.3	270.0	1.4	308.9	286.3	1.5	308.5	1000	1176.6	
ESP Unit - 3	24851.3	206.8	23858.3	22266.8	1685.8	23849.1	25196.2	208.6	24169.2	22544.3	1687,8	24211,4	344.9	1,8	310.9	277.5	2.0	362.3	1000	1299.4	-
ESP Unit - 4	20783.1	476.3	18731.1	17712.7	270.9	19357.6	21093.6	478,1	18984.2	17951.9	293,5	19602.0	310.5	1.8	273.1	239.2	22.6	244.4	1000	1031.6	-
ESP Unit - 5	17096.9	391.8	18295.6	18749	513.2	17585.3	17337,1	393.2	18558,1	19016.9	513.2	17854,9	240.2	1.4	262.5	267.9	2.0	269.6	1000	1043.6	-
																				5770.6	

Remarks:

T Transformer
KWH Kilowatt/Hr
NA Not Applicable

Prepared By

Checked By

MONTHLY ENERGY CONSUMPTION FOR POLLUTION CONTROL EQUIPMENTS

Month : July '19

Pollution Control Equipment	Initial Energy Meter Reading as on First Date of the Month (KWH)		Final Energy Meter Reading as on Last Date of the Month (KWH)		Total Consumption (KWH)		Total Electricity Consumption (KWH)	Remarks, if abnormal
	I/C1	I/C2	I/C1	I/C2	I/C1	I/C2		-
ETP	3766	16101.0	3800	16410.0	34.00	309.0	343.0	-
STP-1	75835.0	114716.0	79210.0	118610.0	3375.00	3894.0	7269.0	
STP-2	117343.0	0.0	122568.0	0.0	5225.00	0.0	5225.0	
						Grand Total	12837.0	-

Remarks:

I/C: Incomer

KWH : Kilowatt/Hr

NA: Not Applicable

Prepard By

Checked By

Format No: APML/ENV-LB/7.8/F01

URL No : TC519319000000801F

Date 31.08.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Ambient Air Quality (Plant)
Sample Collected by :	Environment Dept. APML

Test Report

Station	Sampling Location	Sampling Date	Analysis Starting Date	Parameters			
				PM 10	PM 2.5	SO2	NOx
				μg/m3	μg/m3	μg/m3	μg/m3
AAQ 1	Near AWRS	02.08.2019	03.08.2019	25.8	16.9	12.3	19.8
		05.08.2019	06.08.2019	33.6	17.8	11.5	20.6
		09.08.2019	10.08.2019	MONITORING NOT DONE DUE TO RAINFALL			
		12.08.2019	13.08.2019	28.5	18.2	10.8	21.6
		16.08.2019	17.08.2019	29.9	15.7	14.7	24.8
		19.08.2019	20.08.2019	30.2	12.7	13.0	23.0
		23.08.2019	24.08.2019	32.1	14.0	11.0	21.0
		26.08.2019	27.08.2019	31.8	22.0	9.4	19.2
		30.08.2019	31.08.2019	30.0	17.1	7.4	23.5
AAQ 2	Near Brick Plant	02.08.2019	03.08.2019	23.6	16.6	8.2	23.6
		05.08.2019	06.08.2019	25.1	8.2	7.7	20.2
		09.08.2019	10.08.2019	MONITORING NOT DONE DUE TO RAINFALL			
		12.08.2019	13.08.2019	22.3	9.7	6.7	20.8
		16.08.2019	17.08.2019	20.1	9.0	9.5	24.1
		19.08.2019	20.08.2019	26.4	12.8	8.1	25.6
		23.08.2019	24.08.2019	27.3	10.6	10.2	19.2
		26.08.2019	27.08.2019	20.8	13.3	12.5	11.4
		30.08.2019	31.08.2019	25.2	7.8	6.9	14.1
AAQ 3	China Colony	02.08.2019	03.08.2019	23.2	11.5	9.8	20.4
		05.08.2019	06.08.2019	31.7	15.7	8.0	16.3
		09.08.2019	10.08.2019	MONITORING NOT DONE DUE TO RAINFALL			
		12.08.2019	13.08.2019	36.4	14.0	6.6	13.3
		16.08.2019	17.08.2019	35.1	18.5	7.9	15.6
		19.08.2019	20.08.2019	30.9	14.9	8.9	14.5
		23.08.2019	24.08.2019	33.1	15.2	10.4	17.4
		26.08.2019	27.08.2019	31.2	19.5	12.4	21.0
		30.08.2019	31.08.2019	27.4	13.7	7.4	12.1
NAAQMS Standard				100	60	80	80

End of the Report

Note: Tested results are well within the permissible limits of National Ambient Air Quality Monitoring Standard (NAAQMS)

1. The report is referring only to the tested sample and for applicable parameter.
2. This report is not to be reproducing wholly or in part, and can't be used as evidence in court of law.

31/08/19

Authorized Signatory
(Technical Manager)

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Format No: APML/ENV-LB/7.8/F01

URL No : TC519319000000829F	Date: 24.08.2019

TEST REPORT

Issued To:	APML, Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -1
2	Date of Sampling	:	23.08.2019
3	Time of Sampling	:	3:30 PM
4	Load (MW)	:	640
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature ($^{\circ}$C)	:	131
9	Flue Gas Velocity (M/sec)	:	23.69
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2602926

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results *
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	46
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	973.59
			75.2	TPD	60.8
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	287

** Results are corrected with 6% oxygen*

End of the Report

Note Tested results are well within the permissible limits of MPCB.

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25/08/19

Authorized Signatory
(Technical Manager)

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ADANI POWER MAHARASHTRA LIMITED, TIRODA

TC-5193

Format No: APML/ENV-LB/7.8/F01

URL No : TC519319000000830F	Date: 24.08.2019
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -2
2	Date of Sampling	:	23.08.2019
3	Time of Sampling	:	4:05 PM
4	Load (MW)	:	648
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{0}C)	:	126
9	Flue Gas Velocity (M/sec)	:	22.49
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2501954

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results *
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	48
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	968.23
			75.2	TPD	57.0
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	284

** Results are corrected with 6% oxygen*

End of the Report

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ADANI POWER MAHARASHTRA LIMITED, TIRODA

TC-5193

Format No: APML/ENV-L8/7.8/F01

URL No : TC519319000000831F	Date: 24.08.2019
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -3
2	Date of Sampling	:	23.08.2019
3	Time of Sampling	:	4:35 PM
4	Load (MW)	:	642
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{0} C)	:	128
9	Flue Gas Velocity (M/sec)	:	23.51
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2602400

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results *
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	34
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	879.16
			75.2	TPD	51.8
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	257

* Results are corrected with 6% oxygen

End of the Report

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25/08/19

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TC-5193

Format No: APML/ENV-LB/7.8/F01

TC519319000000828F	Date: 10.08.2019
TEST REPORT	
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -4
2	Date of Sampling	:	08.08.2019
3	Time of Sampling	:	12:45 PM
4	Load (MW)	:	510
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{o} C)	:	114
9	Flue Gas Velocity (M/sec)	:	22.69
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2603063

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	41
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	896
			80.2	TPD	55.9
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	262

** Results are corrected with 6% oxygen*

End of the Report

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11/08/19

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(Technical Manager)

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ADANI POWER MAHARASHTRA LIMITED, TIRODA

TC-5193

Format No: APML/ENV-LB/7.8/F01

TC519319000000827F	Date: 10.08.2019
TEST REPORT	
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -5
2	Date of Sampling	:	08.08.2019
3	Time of Sampling	:	11:55 AM
4	Load (MW)	:	459
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{0} C)	:	112
9	Flue Gas Velocity (M/sec)	:	23.09
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2663058

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	38
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	842
			80.2	TPD	53.8
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	269

** Results are corrected with 6% oxygen*

End of the Report

-Note Tested results are well within the permissible limits of MPCB

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11/08/19

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Format No: APML/ENV-LB/7.8/F01

URL NO :TC519319000000803F

Date: 31.08.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911		
Sample Collection Date	07.08.2019	Analysis Starting Date :	07.08.2019
Quantity received	1 Ltr / Sample	Sampled by :	Environment Dept. APML
Sample Particulars : Condenser Cooling Water (Waste Water)			
Location of sample : Unit1,Unit-3,Unit-4 & Unit-5			

TEST REPORT

Sr no	Parameter	Unit	Test Methods	MPCB Standards	Results U # 1	U # 2	U # 3	U # 4	U # 5
1	pH Value	---	APHA-23rd - 4500-H+B Electrometric Method	6.5-8.5	8.1	Unit Under Shut Down	8.0	8.4	8.3
2	Temperature	Deg C	APHA-23rd - 2550 B	---	25		26	25	25
3	Free Available Chlorine	PPM	APHA 23rd- Iodometric Method I. 4500-Cl B.	0.5	0.4		0.4	0.2	0.2

End of the Report

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31/08/19

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(Technical Manager)

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ADANI POWER MAHARASHTRA LIMITED, TIRODA

TC-5193

Format No: APML/ENV-LB/7.8/F01

URL: TC519319000000804F

Date: 31.08.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911		
Sample Collection Date	07.08.2019	Analysis Starting Date :	07.08.2019
Quantity received	1 Ltr / Sample	Sampled by :	Environment Dept. APML
Sample Particulars : Cooling tower blowdown (Waste Water)			
Location of sample : Unit1,Unit-3,Unit-4 & Unit-5.			

TEST REPORT

Sr no	Parameter (NABL SCOPE)	Unit	Test Methods	MPCB Standards	Results				
					U # 1	U # 2	U # 3	U # 4	U # 5
1	Free Available Chlorine	mg/l	APHA 23rd Edition Iodometric Method I. 4500-Cl B.	0.5	0.1	Unit Under Shut Down	0.3	0.2	0.1
2	Phosphate as (PO4)	mg/l	APHA-23rd -4500-P D Stannous Chloride Method	5	1.7		1.2	1.8	2.0
3	Zinc as (Zn)#	mg/l	APHA-23rd -3500-Zn Zincon Method	1	BDL		BDL	BDL	BDL
4	Total Chromium as (Cr)#	mg/l	APHA-23rd -3500-Cr Colorimetric Method	0.2	BDL		BDL	BDL	BDL

End of the Report

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4. # Indicates this parameter is not covered in our NABL scope

31/08/19

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(Technical Manager)

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Format No: APML/ENV-LB/7.8/F01

URL:TC519319000000808F

Date: 31.08.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911		
Sample Collection Date	07.08.2019	Analysis Starting Date	07.08.2019
Quantity received	3 Lit /Sample	Sampled by	Environment Dept. APML
Sample Particulars : Treated Effluent Water			
Location of sample : DM Plant N-Pit , ETP Outlet			

TEST REPORT

Sr no	Parameter (NABL SCOPE)	Unit	Test Methods	MPCB Standards	Results	
					N-pit	ETP Outlet
1	pH Value	---	APHA-23rd -4500-H+B Electrometric Method	5.5-9.0	7.3	7.5
2	TSS	mg / l	APHA-23rd - 2540 D	100	25	39
3	TDS	mg / l	APHA-23rd - 2540 C	2100	337	249
4	COD	mg / l	APHA-23rd Ed 2017-5220B Open Reflux Method	250	36	72
5	BOD at 27°C for 3 days	mg / l	IS: 3025 (P-44)-1993 R-1999 Ad.1 BOD 3-days at 27 °C	30	11	18
6	Oil & Grease	mg / l	APHA-23rd Ed 2017-5520 B Liquid Liquid Partition Gravemetric method	10	BDL	BDL

End of the Report

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01/09/19

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ADANI POWER MAHARASHTRA LIMITED, TIRODA

TC-5193

Format No: APML/ENV-LB/7.8/F01

URL: TC519319000000806F

Date: 31.08.2019

Issued To:	APML , Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911		
Sample Collection Date	07.08.2019	Analysis Starting Date	07.08.2019
Quantity received	3 Lit /Sample	Sampled by	Environment Dept.
Sample Particulars : Treated Waste Water			
Location of sample : STP -1 & 2 Out Let			

TEST REPORT

Sr no	Parameter (NABL SCOPE)	Unit	Test Methods	MPCB Standards	Results	
					STP-1	STP-2
1	pH Value	--	APHA-23rd -4500-H+B Electrometric Method	5.5-9.0	7.2	7.3
2	TSS	mg / l	APHA-23rd - 2540 D	500	32	34
3	TDS	mg / l	APHA-23rd - 2540 C	2100	342	373
4	COD	mg / l	APHA-23rd Ed 2017-5220B Open Reflux Method	100	50	40
5	BOD at 27°C for 3 days	mg / l	IS: 3025 (P-44)-1993 R-1999 Ad.1 BOD 3-days at 27 °C	30	14	11

End of the Report

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01/09/19

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Format No: APML/ENV-LB/7.8/F01

URL No. : TC519319000000826F Date: 31.08.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Ambient Noise Level (Plant)
Sample Collected by :	Environment Dept. APML
Date of Sampling:	03.08.2019

Test Report

S. No	Locations	Day Time in dB (A) (6.00 a.m. to 10.00 p.m.)	Night Time in dB (A) (10.00 p.m. to 06.00 a.m.)
1	Near Shanti Niketan I II & III	52.9	46.0
2	Near Labour Hutment	61.4	51.0
3	Near Store Area	61.9	49.2
4	Gate No.1	63.5	46.2
5	Gate No.2	71.9	53.5
6	Gate No.3	67.3	52.1
7	Near OHC	61.9	48.4
8	Railway Siding	67.6	47.0
9	Near Reservoir 2	57.1	49.5
10	Near Ash Water Recovery Pump House	71.0	41.4
11	In China Colony	50.8	40.3
	CPCB Standards (Industrial Area)	75	70

*** End of the Report ***

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(Technical Manager)

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MONTHLY ENERGY CONSUMPTION FOR POLLUTION CONTROL EQUIPMENTS

Month : Aug '19

Pollution Control Equipment	Initial Energy Meter Reading as on First Date of the Month (KWH)		Final Energy Meter Reading as on Last Date of the Month (KWH)		Total Consumption (KWH)		Total Electricity Consumption (KWH)	Remarks, if abnormal
	I/C1	I/C2	I/C1	I/C2	I/C1	I/C2		-
ETP	3800	16410.0	3848	16940.0	48.00	530.0	578.0	-
STP-1	79210.0	118610.0	82750.0	122680.0	3540.00	4070.0	7610.0	
STP-2	122568.0	0.0	126918.0	0.0	4350.00	0.0	4350.0	-
						Grand Total	**12538.0**	-

Remarks:

I/C: Incomer

KWH : Kilowatt/Hr

NA: Not Applicable

Prepard By

Checked By

ADANI POWER MAHARASHTRA LIMITED - TIRODA
MONTHLY ENERGY CONSUMPTION FOR AIR POLLUTION CONTROL EQUIPMENTS

Month : Aug-19

Pollution Control Equipment	Initial Energy Meter Reading as on First Date of the Month (MWH)						Final Energy Meter Reading as on Last Date of the Month (MWH)						Total Consumption (MWH)						Multiplying Factor (for MWH to KWH)	Total Electricity Consumption (MWH)	Remarks, if abnormal
	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6			
ESP Unit -1	23644.4	1277.4	23377.8	23602.4	657.9	23977.4	23989.8	1622.5	23379.4	23942.5	659.7	24312.3	345.4	345.1	1.6	340.1	1.8	334.9	1000	1368.9	-
ESP Unit - 2	20742.9	1034.3	18902.8	19033.4	3314.6	17319.3	20914.5	1037.1	19102.2	19169.6	3322.8	17513.2	171.6	2.8	199.4	136.2	8.2	193.9	1000	712.1	-
ESP Unit - 3	25196.2	208.6	24169.2	22544.3	1687.8	24211.4	25557.3	210.4	24496.3	22857.7	1689.8	24595.6	361.1	1.8	327.1	313.4	2.0	384.2	1000	1389.6	-
ESP Unit - 4	21093.6	478.1	18984.2	17951.9	293.5	19602.0	21338.2	480.0	19323.3	18236.1	295.3	19892.4	244.6	1.9	339.1	284.2	1.8	290.4	1000	1162.0	-
ESP Unit - 5	17337.1	393.2	18558.1	19016.9	513.2	17854.9	17583.8	395.8	18827.3	19289.3	515.3	18142.1	246.7	2.6	269.2	272.4	2.1	287.2	1000	1080.2	-
																				5712.8	

Remarks:

T: Transformer
KWH : Kilowatt/Hr
NA: Not Applicable

Prepared By

Checked By

MONTHLY ENERGY CONSUMPTION FOR POLLUTION CONTROL EQUIPMENTS

Month: Aug'19

Pollution control equipment	Initial Energy Meter Reading as on First Date of the Month (MWH)	Final Energy Meter Reading as on Last Date of the Month (MWH)	Total (MWH)	Total Electricity Consumption (MWH)	Remark , If Abnormal
Dust Extraction System (DES)/Bag Filters at crusher house					
1A	540.2	540.2	0	0	-
1B	853.9	853.9	0		
Dust Extraction System (DES)/Bag Filters at Coal Transfer Points (JNT's) & Bunkers					
2A	175.8	175.8	0.000	0.0	Coal wet due to rainfall
2B	111.635	111.635	0.000		
2C	90.97	90.97	0.000		
2D	93.16	93.16	0.000		
2E	46.49	46.49	0.000		
2F	33.19	33.19	0.000		
2G	42.86	42.86	0.000		
2H	0.05699	0.05699	0.000		
2I	3.854	3.854	0.000		
2J	23.15	23.15	0.000		
2K	2.495	2.495	0.000		
2L	12.17	12.17	0.000		
2M	49.89	49.89	0.000		
3A	35.64	35.64	0.000		
3B	21.39	21.39	0.000		
3C	4.782	4.782	0.000		
3D	8.34	8.34	0.000		
3E	6.383	6.383	0.000		
3F	10.66	10.66	0.000		
3G	12.84	12.84	0.000		
3H	11.62	11.62	0.000		
3I	11.75	11.75	0.000		
3J	9.71	9.71	0.000		
3K	1.712	1.712	0.000		
3L	14.87	14.87	0.000		
3M	6.265	6.265	0.000		
3N	18.6	18.6	0.000		
3O	0.015	0.015	0.000		
3P	1.223	1.223	0.000		
3Q	1.369	1.369	0.000		
3R	0.5449	0.5449	0.000		
3S	4.958	4.958	0.000		
3T	9.318	9.318	0.000		
			Total	0.0	

Prepared By

Checked By

Format No: APML/ENV-LB/7.8/F01

URL No : TC519319000000901F   Date 01.10.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Ambient Air Quality (Plant)
Sample Collected by :	Environment Dept. APML

Test Report

Station	Sampling Location	Sampling Date	Analysis Starting Date	Parameters			
				PM 10	PM 2.5	SO2	NOx
				µg/m3	µg/m3	µg/m3	µg/m3
AAQ 1	Near AWRS	06.09.2019	07.09.2019	22.5	15.4	11.7	17.6
		09.09.2019	10.09.2019	27.3	18.3	10.3	14.9
		13.09.2019	14.09.2019	28.6	12.1	11.2	20.4
		16.09.2019	15.09.2019	23.8	11.9	8.2	18.6
		20.09.2019	21.09.2019	25.5	13.1	10.2	16.2
		23.09.2019	24.09.2019	29.4	14.3	6.7	12.6
		27.09.2019	28.09.2019	20.4	6.6	9.4	10.2
		30.09.2019	01.10.2019	27.3	12.7	8.6	13.8
AAQ 2	Near Brick Plant	06.09.2019	07.09.2019	28.2	11.7	8.8	14.4
		09.09.2019	10.09.2019	29.5	10.3	7.2	11.5
		13.09.2019	14.09.2019	26.1	14.4	9.4	13.2
		16.09.2019	15.09.2019	21.1	11.9	6.1	12.6
		20.09.2019	21.09.2019	24.5	12.0	8.4	10.2
		23.09.2019	24.09.2019	28.6	15.1	9.0	11.4
		27.09.2019	28.09.2019	24.8	13.1	11.0	15.6
		30.09.2019	01.10.2019	22.1	14.4	10.0	13.8
AAQ 3	China Colony	06.09.2019	07.09.2019	29.4	11.1	9.8	10.2
		09.09.2019	10.09.2019	22.0	10.1	10.0	11.4
		13.09.2019	14.09.2019	25.3	15.2	8.4	13.2
		16.09.2019	15.09.2019	24.8	14.8	9.0	14.4
		20.09.2019	21.09.2019	29.7	10.3	8.2	10.8
		23.09.2019	24.09.2019	26.7	12.5	9.2	12.0
		27.09.2019	28.09.2019	27.2	15.8	7.0	12.6
		30.09.2019	01.10.2019	28.1	12.1	7.8	13.8
-	NAAQMS Standard			100	60	80	80

End of the Report

Note: Tested results are well within the permissible limits of National Ambient Air Quality Monitoring Standard (NAAQMS)

1. The report is referring only to the tested sample and for applicable parameter.
2. This report is not to be reproducing wholly or in part, and can't be used as evidence in court of law.

Environmental Laboratory TC-5193

01/10/19

Authorized Signatory
(Technical Manager)

Plot No. A-1,Tiroda Growth Centre, M.I.D.C., Dist: Gondia - 441911, Maharashtra, India
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ADANI POWER MAHARASHTRA LIMITED, TIRODA

TC-5193

Format No: APML/ENV-LB/7.8/F01

URL No : TC519318000000929F	Date: 14.09.2019
TEST REPORT	
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -1
2	Date of Sampling	:	13.09.2019
3	Time of Sampling	:	3:28 PM
4	Load (MW)	:	450
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{o} C)	:	116
9	Flue Gas Velocity (M/sec)	:	22.13
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2525993

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results *
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	44
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	899.1
			75.2	TPD	54.5
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	269

** Results are corrected with 6% oxygen*

End of the Report

Note Tested results are well within the permissible limits of MPCB.

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Environmental Laboratory TC-5193 (NABL Certificate No.) Adani Power Maharashtra Limited, Tiroda

14/09/19

Authorized Signatory
(Technical Manager)

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ADANI POWER MAHARASHTRA LIMITED, TIRODA

TC-5193

Format No: APML/ENV-LB/5.10/F01

URL No : TC519318000000930F	Date: 14.09.2019
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -2
2	Date of Sampling	:	13.09.2019
3	Time of Sampling	:	4:10 PM
4	Load (MW)	:	445
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{o} C)	:	117
9	Flue Gas Velocity (M/sec)	:	22.78
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2593514

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results *
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	43
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	902.73
			75.2	TPD	53.3
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	271

Results are corrected with 6% oxygen

End of the Report

Note Tested results are well within the permissible limits of MPCB.

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Environmental Laboratory TC-5193 (NABL Certificate No.) Adani Power Maharashtra Limited Tiroda

14/09/19

Authorized Signatory
(Technical Manager)

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Format No: APML/ENV-LB/7.8/F01

URL No : TC519319000000931F	Date: 27.09.2019
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -3
2	Date of Sampling	:	26.09.2019
3	Time of Sampling	:	3:25 PM
4	Load (MW)	:	458
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)		7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{o}C)	:	121
9	Flue Gas Velocity (M/sec)	:	24.25
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2731979

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results *
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	31
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	887.87
			75.2	TPD	56.0
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	259

** Results are corrected with 6% oxygen*

End of the Report

Note Tested results are well within the permissible limits of MPCB.

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Environmental Laboratory TC-5193 (NABL Certificate No.)

27/09/19

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(Technical Manager)

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(Accredited by NABL)

ADANI POWER MAHARASHTRA LIMITED, TIRODA

TC-5193

Format No: APML/ENV-LB/7.8/F01

TC519319000000928F	Date: 14.09.2019
TEST REPORT	
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -4
2	Date of Sampling	:	12.09.2019
3	Time of Sampling	:	11:14 AM
4	Load (MW)	:	455
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{o}C)	:	116
9	Flue Gas Velocity (M/sec)	:	23.08
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2634170

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	42
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	901
			80.2	TPD	57.0
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	264

** Results are corrected with 6% oxygen*

End of the Report

Note Tested results are well within the permissible limits of MPCB.

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Environmental Laboratory TC - 5193 Adani Power Maharashtra Limited, Tiroda

14/09/19

Authorized Signatory
(Technical Manager)

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ADANI POWER MAHARASHTRA LIMITED, TIRODA

TC-5193

Format No: APML/ENV-LB/7.8/F01

TC519319000000927F	14.09.2019
TEST REPORT	
Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Stack Monitoring
Sample Collected by :	Environment Dept. APML

1	Sampling Location	:	Unit -5
2	Date of Sampling	:	12.09.2019
3	Time of Sampling	:	10:45 AM
4	Load (MW)	:	453
5	Height of Stack (Meter)	:	275
6	Diameter of Stack (Meter)	:	7.4
7	Type of Fuel	:	Coal
8	Flue Gas Temperature (^{0}C)	:	117
9	Flue Gas Velocity (M/sec)	:	24.07
10	Flow of Exit Gas at NTP (NM^3/Hr)	:	2740037

Sr. No	Test Parameters	Test Method	MPCB Standards	Units	Results
1	PM	IS 11255 (Part- 1):1985	50	Mg/Nm^3	40
2	SO_2	IS 11255 (Part 2) 1985	---	Mg/Nm^3	835
			80.2	TPD	54.9
3	NOx	IS 11255 (Part 7) 2005	---	Mg/Nm^3	261

* Results are corrected with 6% oxygen

End of the Report

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Environmental Laboratory TC - 5193 (NABL Certificate No.) Adani Power Maharashtra Limited Tiroda

14/09/19

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(Technical Manager)

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ADANI POWER MAHARASHTRA LIMITED, TIRODA

TC-5193

Format No: APML/ENV-LB/7.8/F01

URL No. : TC519319000000924F

Date: 30.09.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911
Sample Particulars :	Ambient Noise Level (Plant)
Sample Collected by :	Environment Dept. APML
Date of Sampling:	07.09.2019

Test Report

S. No	Locations	Day Time in dB (A) (6.00 a.m. to 10.00 p.m.)	Night Time in dB (A) (10 00 p.m. to 06.00 a.m.)
1	Near Shanti Niketan I II & III	58.0	48.1
2	Near Labour Hutment	59.2	50.4
3	Near Store Area	59.9	49.5
4	Gate No.1	58.9	44.3
5	Gate No.2	64.4	54.5
6	Gate No.3	57.8	50.1
7	Near OHC	66.4	45.3
8	Railway Siding	69.1	50.2
9	Near Reservoir 2	60.0	49.0
10	Near Ash Water Recovery Pump House	67.4	42.4
11	In China Colony	48.1	39.4
CPCB Standards (Industrial Area)		75	70

*** End Of the Report ***

Note: Tested results are well within the permissible limits of MPCB / CPCB.

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Environmental Laboratory TC-5193 (NABL Certificate No.) Tiroda

30/09/19

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(Technical Manager)

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Format No: APML/ENV-LB/7.8/F01

URL: TC519319000000916F

Date: 30.09.2019

Issued To:	APML, Plot No. A-1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911		
Sample Collection Date	18.09.2019	Analysis Starting Date	18.09.2019
Quantity received	3 Lit /Sample	Sampled by	Environment Dept.
Sample Particulars : Treated Waste Water			
Location of sample : STP-1 & 2 Out Let			

TEST REPORT

Sr no	Parameter (NABL SCOPE)	Unit	Test Methods	MPCB Standards	Results	
					STP-1	STP-2
1	pH Value	--	APHA-23rd -4500-H+B Electrometric Method	5.5-9.0	7.5	7.1
2	TSS	mg / l	APHA-23rd - 2540 D	500	34	24
3	TDS	mg / l	APHA-23rd - 2540 C	2100	431	178
4	COD	mg / l	APHA-23rd Ed 2017-5220B Open Reflux Method	100	60	30
5	BOD at 27°C for 3 days	mg / l	IS: 3025 (P-44)-1993 R-1999 Ad.1 BOD 3-days at 27 °C	30	15	16

End of the Report

Note: Tested results are well within the permissible limits of MPCB.

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Environmental Laboratory TC-5193 (NABL Certificate No.) Adani Power Maharashtra Limited, Tiroda

30/09/19

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Format No: APML/ENV-LB/7.8/F01

URL:TC51931900000918F Date: 30.09.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911		
Sample Collection Date	18.09.2019	Analysis Starting Date	18.09.2019
Quantity received	3 Lit /Sample	Sampled by	Environment Dept. APML
Sample Particulars : Treated Effluent Water			
Location of sample : DM Plant N-Plt , ETP Outlet			

TEST REPORT

Sr no	Parameter (NABL SCOPE)	Unit	Test Methods	MPCB Standards	Results	
					N-plt	ETP Outlet
1	pH Value	---	APHA-23rd -4500-H+B Electrometric Method	5.5-9.0	7.6	7 4
2	TSS	mg / l	APHA-23rd - 2540 D	100	23	18
3	TDS	mg / l	APHA-23rd - 2540 C	2100	310	206
4	COD	mg / l	APHA-23rd Ed 2017-5220B Open Reflux Method	250	39	42
5	BOD at 27°C for 3 days	mg / l	IS: 3025 (P-44)-1993 R-1999 Ad.1 BOD 3-days at 27 °C	30	10	20
6	Oil & Grease	mg / l	APHA-23rd Ed 2017-5520 B Liquid Liquid Partition Gravemetric method	10	BDL	BDL

End of the Report

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Environmental Laboratory TC-5193 (NABL Certificate No.) Adani Power Maharashtra Ltd. Tiroda

30/09/19

Authorized Signatory
(Technical Manager)

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Format No: APML/ENV-LB/7.8/F01

URL: TC519319000000914F

Date: 30.09.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora, Dist. Gondia – 441 911		
Sample Collection Date	18.09.2019	Analysis Starting Date :	18.09.2019
Quantity received	1 Ltr / Sample	Sampled by :	Environment Dept. APML
Sample Particulars : Cooling tower blowdown (Waste Water)			
Location of sample : Unit1,Unit-2,Unit-4 & Unit-5.			

TEST REPORT

Sr no	Parameter (NABL SCOPE)	Unit	Test Methods	MPCB Standards	Results				
					U # 1	U # 2	U # 3	U # 4	U # 5
1	Free Available Chlorine	mg/l	APHA 23rd Edition Iodometric Method I. 4500-Cl B.	0.5	0.2	0.3	Unit Under Shut Down	0.1	0.4
2	Phosphate as (PO4)	mg/l.	APHA-23rd -4500-P D Stannous Chloride Method	5	1.3	1.8		1.9	2.2
3	Zinc as (Zn)#	mg/l	APHA-23rd -3500-Zn Zincon Method	1	BDL	BDL		BDL	BDL
4	Total Chromium as (Cr)#	mg/l	APHA-23rd -3500-Cr Colorimetric Method	0.2	BDL	BDL		BDL	BDL

End of the Report

Note, Tested results are well within the permissible limits of MPCB.

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3. This report is not to be reproducing wholly or in part, and can't be used as evidence in court of law.
4. # Indicates this parameter is not covered in our NABL scope

Environmental Laboratory TC - 5193 (NABL Certificate No) Tiroda

30/09/19

Authorized Signatory
(Technical Manager)

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Format No: APML/ENV-LB/7.8/F01

URL NO :TC519319000000913F Date: 30.09.2019

Issued To:	APML,Plot No. A -1, Tirora Growth Centre, MIDC – Tirora. Dist. Gondia – 441 911		
Sample Collection Date	18.09.2019	Analysis Starting Date :	18.09.2019
Quantity received	1 Ltr / Sample	Sampled by :	Environment Dept. APML
Sample Particulars : Condenser Cooling Water (Waste Water)			
Location of sample : Unit1,Unit-2,Unit-4 & Unit-5			

TEST REPORT

Sr no	Parameter	Unit	Test Methods	MPCB Standards	Results				
					U # 1	U # 2	U # 3	U # 4	U # 5
1	pH Value	---	APHA-23rd - 4500-H+B Electrometric Method	6.5-8.5	7.7	8.0	Unit Under Shut Down	8.1	8.3
2	Temperature	Deg C	APHA-23rd - 2550 B	---	35	35		32	33
3	Free Available Chlorine	PPM	APHA 23rd- Iodometric Method I. 4500-Cl B.	0.5	0.1	0.2		0.4	0.3

End of the Report

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Environmental Laboratory TC-5193 Adani Power Maharashtra Limited, Tiroda

30/09/19

Authorized Signatory
(Technical Manager)

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MONTHLY ENERGY CONSUMPTION FOR POLLUTION CONTROL EQUIPMENTS

Month : Sep '19

Pollution Control Equipment	Initial Energy Meter Reading as on First Date of the Month (KWH)		Final Energy Meter Reading as on Last Date of the Month (KWH)		Total Consumption (KWH)		Total Electricity Consumption (KWH)	Remarks, if abnormal
	I/C1	I/C2	I/C1	I/C2	I/C1	I/C2		-
ETP	3848	16940.0	3949	17270.0	101.00	330.0	431.0	-
STP-1	82750.0	122680.0	86010.0	126835.0	3260.00	4155.0	7415.0	
STP-2	126918.0	0.0	131183.0	0.0	4265.00	0.0	4265.0	
						Grand Total	12111.0	-

Remarks:

I/C: Incomer

KWH : Kilowatt/Hr

NA: Not Applicable

Prepard By

Checked By

MONTHLY ENERGY CONSUMPTION FOR POLLUTION CONTROL EQUIPMENTS

Month: Sep'19

Pollution control equipment	Initial Energy Meter Reading as on First Date of the Month (MWH)	Final Energy Meter Reading as on Last Date of the Month (MWH)	Total (MWH)	Total Electricity Consumption (MWH)	Remark, If Abnormal
Dust Extraction System (DES)/Bag Filters at crusher house					
1A	540.2	540.2	0	0	-
1B	853.9	853.9	0		
Dust Extraction System (DES)/Bag Filters at Coal Transfer Points (JNT's) & Bunkers					
2A	175.8	175.8	0.000	1.4	Coal wet due to rainfall
2B	101.2	101.2	0.000		
2C	90.97	90.97	0.000		
2D	93.16	93.16	0.000		
2E	46.49	46.49	0.000		
2F	33.19	33.94	0.750		
2G	42.86	42.86	0.000		
2H	0.05699	0.05699	0.000		
2I	3.854	3.854	0.000		
2J	23.15	23.15	0.000		
2K	2.495	2.495	0.000		
2L	12.17	12.77	0.600		
2M	11.75	11.75	0.000		
3A	35.64	35.64	0.000		
3B	21.39	21.39	0.000		
3C	4.782	4.782	0.000		
3D	8.343	8.343	0.000		
3E	6.383	6.383	0.000		
3F	10.66	10.66	0.000		
3G	12.89	12.89	0.000		
3H	11.62	11.62	0.000		
3I	11.75	11.75	0.000		
3J	9.71	9.71	0.000		
3K	1.712	1.712	0.000		
3L	14.87	14.87	0.000		
3M	6.265	6.265	0.000		
3N	18.6	18.6	0.000		
3O	0.015	0.015	0.000		
3P	1.223	1.223	0.000		
3Q	1.369	1.369	0.000		
3R	0.5449	0.5449	0.000		
3S	4.95	4.95	0.000		
3T	9.318	9.318	0.000		
			Total	1.4	

Prepared By

Checked By

ADANI POWER MAHARASHTRA LIMITED - TIRODA
MONTHLY ENERGY CONSUMPTION FOR AIR POLLUTION CONTROL EQUIPMENTS

Month : Sep-19

Pollution Control Equipment	Initial Energy Meter Reading as on First Date of the Month (MWH)						Final Energy Meter Reading as on Last Date of the Month (MWH)						Total Consumption (MWH)						Multiplying Factor (for MWH to KWH)	Total Electricity Consumption (MWH)	Remarks, if abnormal
	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6			
ESP Unit -1	23989.8	1622.5	23379.4	23942.5	659.7	24312.3	24194.4	1817.1	23384.9	24136.2	662.4	24510.8	204.6	194.6	5.5	193.7	2.7	198.5	1000	799.6	-
ESP Unit 2	20914.5	1037.1	19102.2	19169.6	3322.8	17513.2	21163.7	1038.6	19432.7	19381.0	3324.1	17865.4	249.2	1.5	330.5	211.4	1.3	352.2	1000	1146.1	-
ESP Unit - 3	25557.3	210.4	24496.3	22857.7	1689.8	24595.6	25717.9	213.2	24694.0	23051.9	1692.6	24811.8	160.6	2.8	197.7	194.2	2.8	216.2	1000	774.3	-
ESP Unit - 4	21338.2	480.0	19323.3	18236.1	295.3	19892.4	21622.7	481.8	19632.1	18482.6	297.0	20168.0	284.5	1.8	308.8	246.5	1.7	275.6	1000	1118.9	-
ESP Unit - 5	17583.8	395.8	18827.3	19289.3	515.3	18142.1	17813.2	397.2	19074.6	19528.2	517.4	18402.1	229.4	1.4	247.3	238.9	2.1	260.0	1000	979.1	-
																				4818.0	

Remarks:

T: Transformer

KWH : Kilowatt/Hr

NA: Not Applicable

Prepared By

Checked By

M/s Adani Power Maharashtra Limited
A – 1, Tirora Growth Centre, MIDC
Dist. Gondia – 441 911

Sample Collection Date : 28.08.2019
Sample Analysis Date : 29.08.2019
Sample Type : Ground Water
Sample Collected by : Enviro Analyst & Engineers Pvt. Ltd representative
Sample Tested at : Enviro Analyst & Engineers Pvt. Ltd , Nagpur

TEST RESULTS

Sr. No.	Test Parameters	Unit	As per IS : 10500 : 2012 (Drinking Water - Specification)		Results	
			Permissible Requirement	Acceptable Limit	Mendipur Hand Pump	Kachewani Hand Pump
1	Apparent Colour	Hazen units	15	5	0.1	0.1
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity NTU	NTU	5	1	0.1	0.1
5	Total Dissolved Solid	mg / l	2000	500	302	924
6	Electrical Conductivity	μS/cm	-	-	494	1490
7	Total Alkalinity	mg / l	600	200	192	182
8	pH Value	-	No relaxation	6.5 to 8.5	7.90	7.5
9	Total Hardness ($CaCO_3$)	mg / l	600	200	196	468
10	Calcium (as Ca)	mg / l	200	75	58.8	112.2
11	Magnesium (as Mg)	mg / l	100	30	11.9	45.5
12	Copper as(Cu)	mg / l	1.5	0.05	< 0.01	< 0.01
13	Iron (as Fe)	mg / l	No relaxation	0.3	0.08	0.15
14	Manganese as (Mn)	mg / l	0.3	0.1	< 0.01	0.010
15	Chlorides (as Cl)	mg / l	1000	250	39.7	217
16	Sulphate (as SO_4)	mg / l	400	200	16.2	138
17	Nitrates (as NO_3)	mg / l	No relaxation	45	2.20	2.95
18	Fluoride (as F)	mg / l	1.5	1.0	0.65	0.80
19	Phenolic Compounds	mg / l	0.002	0.001	BDL	BDL
20	Mercury as (Hg)	mg / l	No relaxation	0.001	< 0.0005	< 0.0005
21	Cadmium as (Cd)	mg / l	No relaxation	0.003	< 0.001	< 0.001
22	Selenium as (Se)	mg / l	No relaxation	0.01	< 0.001	< 0.001
23	Arsenic as (As)	mg / l	0.05	0.01	BDL	BDL
24	Cyanide as (CN)	mg / l	No relaxation	0.05	< 0.005	< 0.005
25	Lead as (Pb)	mg / l	No relaxation	0.01	< 0.001	< 0.001
26	Zinc as (Zn)	mg / l	15	5	0.30	0.92
27	Chromium as (Cr^{+6})	mg / l	No relaxation	0.05	< 0.03	< 0.03
28	Mineral Oil	mg / l	No relaxation	0.05	< 0.01	< 0.01
29	Residual Chlorine	mg / l	1.0	0.2	< 0.1	< 0.1
30	Total Coliform	MPN/100 ml	Absent	Absent	Absent	Absent
31	E.Coli	Nos./100 ml	Absent	Absent	Absent	Absent

Environment Dept.
Adani Power Maharashtra Limited

M/s Adani Power Maharashtra Limited
A – 1, Tirora Growth Centre, MIDC
Dist. Gondia – 441 911

Sample Collection Date : 28.08.2019
Sample Analysis Date : 29.08.2019
Sample Type : Ground Water
Sample Collected by : Enviro Analyst & Engineers Pvt. Ltd representative
Sample Tested at : Enviro Analyst & Engineers Pvt. Ltd , Nagpur

TEST RESULTS

Sr. No.	Test Parameters	Unit	As per IS : 10500 : 2012 (Drinking Water - Specification)		Results	
			Permissible Requirement	Acceptable Limit	Garada Hand Pump	Chikhali Hand Pump
1	Apparent Colour	Hazen units	15	5	0.1	0.1
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity NTU	NTU	5	1	0.1	0.1
5	Total Dissolved Solid	mg / l	2000	500	662	219
6	Electrical Conductivity	µS/cm	-	-	1060	358
7	Total Alkalinity	mg / l	600	200	182	190
8	pH Value	-	No relaxation	6.5 to 8.5	7.60	7.8
9	Total Hardness ($CaCO_3$)	mg / l	600	200	294	146
10	Calcium (as Ca)	mg / l	200	75	76.8	42.8
11	Magnesium (as Mg)	mg / l	100	30	24.8	9.48
12	Copper as(Cu)	mg / l	1.5	0.05	< 0.01	< 0.01
13	Iron (as Fe)	mg / l	No relaxation	0.3	0.12	0.08
14	Manganese as (Mn)	mg / l	0.3	0.1	< 0.01	< 0.01
15	Chlorides (as Cl)	mg / l	1000	250	114.6	11.3
16	Sulphate (as SO_4)	mg / l	400	200	29.6	9.2
17	Nitrates (as NO_3)	mg / l	No relaxation	45	2.30	2.10
18	Fluoride (as F)	mg / l	1.5	1.0	0.80	0.55
19	Phenolic Compounds	mg / l	0.002	0.001	BDL	BDL
20	Mercury as (Hg)	mg / l	No relaxation	0.001	< 0.0005	< 0.0005
21	Cadmium as (Cd)	mg / l	No relaxation	0.003	< 0.001	< 0.001
22	Selenium as (Se)	mg / l	No relaxation	0.01	< 0.001	< 0.001
23	Arsenic as (As)	mg / l	0.05	0.01	BDL	BDL
24	Cyanide as (CN)	mg / l	No relaxation	0.05	< 0.005	< 0.005
25	Lead as (Pb)	mg / l.	No relaxation	0.01	< 0.001	< 0.001
26	Zinc as (Zn)	mg / l	15	5	0.35	0.12
27	Chromium as (Cr^{+6})	mg / l	No relaxation	0.05	< 0.03	< 0.03
28	Mineral Oil	mg / l	No relaxation	0.05	< 0.01	< 0.01
29	Residual Chlorine	mg / l	1.0	0.2	< 0.1	< 0.1
30	Total Coliform	MPN/100 ml	Absent	Absent	Absent	Absent
31	E.Coli	Nos./100 ml	Absent	Absent	Absent	Absent

Environment Dept.
Adani Power Maharashtra Limited

M/s Adani Power Maharashtra Limited
A – 1, Tirora Growth Centre, MIDC
Dist. Gondia – 441 911

Sample Collection Date	:	28.08.2019
Sample Analysis Date	:	29.08.2019
Sample Type	:	Surface Water
Sample Collected by	:	Enviro Analyst & Engineers Pvt. Ltd representative
Sample Tested at	:	Enviro Analyst & Engineers Pvt. Ltd , Nagpur

TEST RESULTS

Sr. No.	Test Parameters	Unit	As per IS : 10500 : 2012 (Drinking Water - Specification)		Results	
			Permissible Requirement	Acceptable Limit	Mendipur Pond water	Kachewani Pond Water
1	Apparent Colour	Hazen units	15	5	3.0	3.2
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	-	Agreeable	Agreeable	-	-
4	Turbidity NTU	NTU	5	1	2.0	2.0
5	Total Dissolved Solid	mg / l	2000	500	138	214
6	Electrical Conductivity	μS/cm	-	-	226	348
7	Total Alkalinity	mg / l	600	200	108	166
8	pH Value	-	No relaxation	6.5 to 8.5	8.1	8.2
9	Total Hardness ($CaCO_3$)	mg / l	600	200	84.6	128
10	Calcium (as Ca)	mg / l	200	75	26.2	34.8
11	Magnesium (as Mg)	mg / l	100	30	4.6	9.9
12	Copper as(Cu)	mg / l	1.5	0.05	< 0.01	< 0.01
13	Iron (as Fe)	mg / l	No relaxation	0.3	0.070	0.070
14	Manganese as (Mn)	mg / l	0.3	0.1	0.010	< 0.01
15	Chlorides (as Cl)	mg / l	1000	250	10.7	11.7
16	Sulphate (as SO_4)	mg / l	400	200	8.1	9.8
17	Nitrates (as NO_3)	mg / l	No relaxation	45	6.7	4.7
18	Fluoride (as F)	mg / l	1.5	1.0	0.35	0.30
19	Phenolic Compounds	mg / l	0.002	0.001	BDL	BDL
20	Mercury as (Hg)	mg / l	No relaxation	0.001	< 0.0005	< 0.0005
21	Cadmium as (Cd)	mg / l	No relaxation	0.003	< 0.001	< 0.001
22	Selenium as (Se)	mg / l	No relaxation	0.01	< 0.001	< 0.001
23	Arsenic as (As)	mg / l	0.05	0.01	BDL	BDL
24	Cyanide as (CN)	mg / l	No relaxation	0.05	< 0.005	< 0.005
25	Lead as (Pb)	mg / l	No relaxation	0.01	< 0.001	< 0.001
26	Zinc as (Zn)	mg / l	15	5	0.12	0.15
27	Chromium as (Cr^{+6})	mg / l	No relaxation	0.05	< 0.03	< 0.03
28	Mineral Oil	mg / l	No relaxation	0.05	< 0.01	< 0.01
29	Residual Chlorine	mg / l	1.0	0.2	Nil	Nil
30	Total Coliform	MPN/100 ml	Absent	Absent	> 16	> 16
31	E.Coli	Nos./100 ml	Absent	Absent	> 16	> 16

Environment Dept.
Adani Power Maharashtra Limited

M/s Adani Power Maharashtra Limited
A – 1, Tirora Growth Centre, MIDC
Dist. Gondia – 441 911

Sample Collection Date	:	28.08.2019
Sample Analysis Date	:	29.08.2019
Sample Type	:	Surface Water
Sample Collected by	:	Enviro Analyst & Engineers Pvt. Ltd representative
Sample Tested at	:	Enviro Analyst & Engineers Pvt. Ltd , Nagpur

TEST RESULTS

Sr. No.	Test Parameters	Unit	As per IS : 10500 : 2012 (Drinking Water - Specification)		Results	
			Permissible Requirement	Acceptable Limit	Wainganga River Water	Garada Village Pond Water
1	Apparent Colour	Hazen units	15	5	1.5	2.5
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	-	Agreeable	Agreeable	-	-
4	Turbidity NTU	NTU	5	1	0.5	1.5
5	Total Dissolved Solid	mg / l	2000	500	90	202
6	Electrical Conductivity	µS/cm	-	-	148	330
7	Total Alkalinity	mg / l	600	200	72	146
8	pH Value	-	No relaxation	6.5 to 8.5	8.3	8.0
9	Total Hardness ($CaCO_3$)	mg / l	600	200	70.5	148
10	Calcium (as Ca)	mg / l	200	75	20.8	38.8
11	Magnesium (as Mg)	mg / l	100	30	4.5	12.4
12	Copper as(Cu)	mg / l	1.5	0.05	< 0.01	< 0.01
13	Iron (as Fe)	mg / l	No relaxation	0.3	< 0.07	0.09
14	Manganese as (Mn)	mg / l	0.3	0.1	< 0.01	< 0.01
15	Chlorides (as Cl)	mg / l	1000	250	8.8	13.6
16	Sulphate (as SO_4)	mg / l	400	200	5.2	9.4
17	Nitrates (as NO_3)	mg / l	No relaxation	45	2.10	5.4
18	Fluoride (as F)	mg / l	1.5	1.0	0.25	0.40
19	Phenolic Compounds	mg / l	0.002	0.001	BDL	BDL
20	Mercury as (Hg)	mg / l	No relaxation	0.001	< 0.0005	< 0.0005
21	Cadmium as (Cd)	mg / l	No relaxation	0.003	< 0.001	< 0.001
22	Selenium as (Se)	mg / l	No relaxation	0.01	< 0.001	< 0.001
23	Arsenic as (As)	mg / l	0.05	0.01	BDL	BDL
24	Cyanide as (CN)	mg / l	No relaxation	0.05	< 0.005	< 0.005
25	Lead as (Pb)	mg / l	No relaxation	0.01	< 0.001	< 0.001
26	Zinc as (Zn)	mg / l	15	5	0.10	0.18
27	Chromium as (Cr^{+6})	mg / l	No relaxation	0.05	< 0.03	< 0.03
28	Mineral Oil	mg / l	No relaxation	0.05	< 0.01	< 0.01
29	Residual Chlorine	mg / l	1.0	0.2	Nil	Nil
30	Total Coliform	MPN/100 ml	Absent	Absent	>16	> 16
31	E.Coli	Nos./100 ml	Absent	Absent	> 16	> 16

Environment Dept.
Adani Power Maharashtra Limited

	ADANI POWER MAHARASHTRA LIMITED												
	5 x 660 MW Thermal Power Plant , Tirora, Gondia												
	Station:	AAQMS 1 AAQMS 2 AAQMS 3				Report Type: Mean			Time Base: 1Hr		Month- APR - 2019		
Month		AAQMS-1 (Labour Hutment)				AAQMS-2 (China Colony)				AAQMS-3 (Gate no -2)			
		PM 10	PM 2.5	SO2	NOx	PM10	PM2.5	SO2	NOX	PM10	PM2.5	SO2	NOX
		ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ppm	ug/m3	ug/m3	ug/m3	ppm
1-Apr-19	Max	57.2	26.2	14.2	25.6	62.0	30.5	12.6	22.7	61.4	34.0	22.5	28.0
	Min	29.2	14.5	11.2	19.2	26.2	17.2	10.1	18.2	42.4	22.0	17.2	15.5
	AVG	43.2	20.4	12.7	22.4	44.1	23.9	11.4	20.4	51.9	28.0	19.9	21.8
2-Apr-19	Max	59.4	29.7	19.4	34.9	61.2	20.2	13.4	17.1	58.2	32.0	22.6	29.1
	Min	35.6	16.2	9.6	18.3	51.2	13.4	10.9	11.8	30.4	17.2	16.3	14.0
	AVG	47.5	23.0	14.5	26.6	56.2	16.8	12.2	14.5	44.3	24.6	19.5	21.6
3-Apr-19	Max	65.8	33.9	16.6	31.0	72.0	30.2	13.8	17.5	53.0	29.0	18.6	20.4
	Min	31.7	19.6	10.2	18.4	49.8	15.8	10.9	11.8	40.1	12.2	13.4	10.5
	AVG	48.8	26.8	13.4	24.7	60.9	23.0	12.4	14.7	46.6	20.6	16.0	15.5
4-Apr-19	Max	58.0	36.2	15.0	27.0	64.2	30.9	16.0	19.0	55.0	53.0	21.6	29.0
	Min	20.2	17.4	10.3	19.3	47.2	18.5	13.6	14.5	36.4	18.6	12.4	13.4
	AVG	39.1	26.8	12.7	23.2	55.7	24.7	14.8	16.8	45.7	35.8	17.0	21.2
5-Apr-19	Max	61.0	31.5	17.5	26.4	61.7	25.5	12.0	17.5	57.0	38.9	19.0	25.0
	Min	15.0	18.2	9.2	17.0	43.2	14.0	9.8	13.7	33.9	17.7	13.9	11.4
	AVG	38.0	24.9	13.4	21.7	52.5	19.8	10.9	15.6	45.5	28.3	16.5	18.2
6-Apr-19	Max	68.0	31.0	19.5	27.0	64.2	37.1	19.0	22.7	60.4	45.5	24.6	29.9
	Min	49.0	16.2	11.3	21.0	46.3	21.4	16.5	17.4	16.4	17.2	11.5	12.2
	AVG	58.5	23.6	15.4	24.0	55.3	29.3	17.8	20.1	38.4	31.4	18.1	21.1
7-Apr-19	Max	64.0	33.0	18.0	27.1	67.0	24.0	16.0	22.0	62.4	55.6	23.6	20.6
	Min	31.0	17.0	12.3	12.0	47.5	18.0	12.0	14.2	32.0	22.1	13.1	11.7
	AVG	47.5	25.0	15.2	19.6	57.3	21.0	14.0	18.1	47.2	38.9	18.4	16.2
8-Apr-19	Max	61.0	30.2	18.8	27.5	60.4	25.2	20.8	24.6	59.5	48.7	26.5	25.4
	Min	42.0	21.0	10.2	16.1	36.9	12.0	15.4	20.4	20.4	26.4	16.6	15.0
	AVG	51.5	25.6	14.5	21.8	48.7	18.6	18.1	22.5	40.0	37.6	21.6	20.2
9-Apr-19	Max	68.0	22.6	17.0	25.7	67.6	22.3	16.5	25.6	54.8	33.3	17.2	27.7
	Min	44.0	18.2	12.2	18.0	43.2	12.4	10.2	20.4	21.2	24.3	13.8	14.6
	AVG	56.0	20.4	14.6	21.9	55.4	17.4	13.4	23.0	38.0	28.8	15.5	21.2
10-Apr-19	Max	63.0	40.6	16.9	27.3	69.2	22.3	21.2	28.0	53.0	46.2	19.1	28.7
	Min	32.0	20.3	8.9	18.4	41.0	14.2	16.3	15.6	22.6	23.6	13.2	12.8
	AVG	47.5	30.5	12.9	22.9	55.1	18.3	18.8	21.8	37.8	34.9	16.2	20.8
11-Apr-19	Max	65.2	25.0	18.3	28.5	69.6	32.5	21.0	25.8	50.2	56.0	11.8	16.4
	Min	32.0	15.5	8.9	18.7	55.8	16.3	16.9	18.0	20.7	25.6	8.8	12.8
	AVG	48.6	20.3	13.6	23.6	62.7	24.4	19.0	21.9	35.5	40.8	10.3	14.6
12-Apr-19	Max	68.5	26.5	17.9	30.0	68.0	25.5	19.0	28.2	62.5	26.0	18.2	23.3
	Min	49.0	21.0	10.6	20.1	56.4	20.8	10.9	14.2	20.9	22.9	13.4	11.7
	AVG	58.8	23.8	14.3	25.1	62.2	23.2	15.0	21.2	41.7	24.5	15.8	17.5
13-Apr-19	Max	61.2	26.4	19.0	29.9	65.8	32.0	20.8	24.9	59.9	37.2	16.4	25.2
	Min	36.0	19.0	12.0	17.5	36.0	21.0	12.2	13.0	21.0	26.6	10.6	16.2
	AVG	48.6	22.7	15.5	23.7	50.9	26.5	16.5	19.0	40.5	31.9	13.5	20.7
14-Apr-19	Max	60.0	20.0	14.5	30.2	62.0	23.0	20.2	29.2	59.4	29.0	18.5	28.4
	Min	21.0	12.8	9.8	18.6	20.7	19.4	13.4	13.8	28.6	18.5	18.6	18.2
	AVG	40.5	16.4	12.2	24.4	41.4	21.2	16.8	21.5	44.0	23.8	18.6	23.3
15-Apr-19	Max	67.2	20.6	19.1	21.4	59.5	23.5	21.0	20.4	62.4	18.8	17.2	24.4
	Min	34.5	12.8	13.4	19.2	28.3	14.2	18.3	15.4	30.5	14.5	13.8	14.3
	AVG	50.9	16.7	16.3	20.3	43.9	18.9	19.7	17.9	46.5	16.7	15.5	19.4
16-Apr-19	Max	63.5	31.6	18.2	28.3	61.3	34.0	20.6	24.7	57.2	34.3	20.7	27.3
	Min	31.2	18.2	11.5	9.5	29.4	18.2	14.9	16.4	22.6	27.2	20.6	14.6
	AVG	47.4	24.9	14.9	18.9	45.4	26.1	17.8	20.6	39.9	30.8	20.7	21.0
17-Apr-19	Max	68.0	30.0	17.0	24.8	63.0	31.0	21.0	24.8	50.4	25.0	20.5	26.8
	Min	34.1	26.9	10.6	18.3	35.4	22.4	15.2	12.9	23.0	12.4	15.2	12.4
	AVG	51.1	28.5	13.8	21.6	49.2	26.7	18.1	18.9	36.7	18.7	17.9	19.6
18-Apr-19	Max	67.4	30.3	17.9	29.4	62.6	42.9	14.8	19.0	58.2	39.0	27.3	30.4
	Min	34.7	23.4	9.8	18.3	35.4	19.4	12.0	13.4	45.3	25.6	16.2	15.3
	AVG	51.1	26.9	13.9	23.9	49.0	31.2	13.4	16.2	51.8	32.3	21.8	22.9

19-Apr-19	Max	71.0	38.0	18.1	22.6	69.0	31.2	20.4	26.4	70.0	50.1	24.1	28.6
	Min	41.0	23.4	8.9	18.6	34.6	25.0	12.0	13.5	42.7	26.4	13.9	15.4
	AVG	56.0	30.7	13.5	20.6	51.8	28.1	16.2	20.0	56.4	38.3	19.0	22.0
20-Apr-19	Max	67.0	30.0	19.0	30.0	62.1	35.2	20.4	28.4	52.6	36.0	20.6	26.4
	Min	29.0	21.2	11.3	19.0	32.8	22.9	10.4	15.2	45.6	20.4	12.7	14.2
	AVG	48.0	25.6	15.2	24.5	47.5	29.1	15.4	21.8	49.1	28.2	16.7	20.3
21-Apr-19	Max	72.5	39.4	19.1	26.5	70.0	31.2	22.4	29.9	69.5	37.2	20.2	26.6
	Min	47.2	28.8	11.2	18.8	32.5	19.0	11.0	13.0	30.6	17.3	15.2	11.6
	AVG	59.9	34.1	15.2	22.7	51.3	25.1	16.7	21.5	50.1	27.3	17.7	19.1
22-Apr-19	Max	68.8	30.3	18.0	26.6	66.8	45.8	20.2	26.7	67.0	44.4	21.1	28.9
	Min	41.7	20.0	11.3	19.4	38.9	19.7	10.8	14.3	58.2	25.0	13.0	14.0
	AVG	55.3	25.2	14.7	23.0	52.9	32.8	15.5	20.5	62.6	34.7	17.1	21.5
23-Apr-19	Max	62.4	29.6	17.6	22.1	60.6	30.9	21.0	30.3	59.0	44.3	20.7	27.3
	Min	21.4	12.3	9.2	19.7	22.9	16.8	12.0	14.2	49.6	27.2	18.5	14.6
	AVG	41.9	21.0	13.4	20.9	41.8	23.9	16.5	22.3	54.3	35.8	19.6	21.0
24-Apr-19	Max	70.6	40.2	19.1	24.0	70.7	30.3	20.7	22.6	50.0	36.2	20.6	26.4
	Min	41.1	13.8	11.4	19.2	19.7	22.4	16.2	17.0	45.6	20.4	12.7	20.0
	AVG	55.9	27.0	15.3	22.0	45.2	26.4	18.5	19.8	52.2	28.3	16.7	23.2
25-Apr-19	Max	67.0	30.2	17.2	26.0	69.0	29.0	20.2	25.5	58.8	47.0	20.6	30.1
	Min	26.1	14.2	11.2	19.0	23.6	15.4	11.6	13.2	16.4	19.4	10.4	19.4
	AVG	46.6	22.2	14.2	22.5	46.3	22.2	15.9	19.4	37.6	33.2	15.5	24.8
26-Apr-19	Max	69.0	38.1	18.1	26.7	66.2	32.0	16.4	26.3	59.9	45.0	20.6	25.3
	Min	38.3	24.6	15.2	18.0	39.4	20.8	13.6	18.3	30.9	22.9	13.4	18.4
	AVG	53.7	31.4	16.7	22.4	52.8	26.4	15.0	22.3	45.4	34.0	17.0	21.9
27-Apr-19	Max	68.5	28.0	18.5	30.5	61.5	32.0	21.0	29.9	68.1	37.2	21.1	31.1
	Min	37.5	19.2	12.6	19.7	39.4	21.4	11.6	13.9	23.6	14.2	11.7	18.9
	AVG	53.0	23.6	15.6	25.1	50.5	26.7	16.3	21.9	45.9	25.7	16.4	25.0
28-Apr-19	Max	65.5	28.2	16.2	28.0	69.0	26.0	21.0	28.3	56.2	32.2	17.5	25.3
	Min	24.5	14.8	11.0	17.2	26.4	16.4	12.8	12.9	36.8	22.9	10.3	19.2
	AVG	45.0	21.5	13.6	22.6	47.7	21.2	16.9	20.6	46.5	27.6	13.9	22.3
29-Apr-19	Max	64.0	29.0	18.2	25.1	68.0	31.0	19.5	25.0	51.1	36.2	19.0	24.3
	Min	18.5	16.4	10.2	19.5	21.1	15.9	10.2	13.0	26.0	15.4	11.2	18.6
	AVG	41.3	22.7	14.2	22.3	44.6	23.5	14.9	19.0	38.6	25.8	15.1	21.5
30-Apr-19	Max	61.4	30.2	16.9	28.8	60.6	33.2	18.6	21.3	50.4	43.0	18.2	21.8
	Min	15.5	15.8	11.2	19.2	13.9	17.9	11.3	14.2	27.5	17.4	10.8	16.8
	AVG	38.5	23.0	14.1	24.0	37.3	25.6	15.0	17.8	39.0	30.2	14.5	19.3

	ADANI POWER MAHARASHTRA LIMITED												
	5 x 660 MW Thermal Power Plant , Tirora, Gondia												
	Station:	AAQMS 1 AAQMS 2 AAQMS 3				Report Type: Mean			Time Base: 1Hr		Month-MAY - 2019		
Month		AAQMS-1 (Labour Hutment)				AAQMS-2 (China Colony)				AAQMS-3 (Gate no -2)			
		PM 10	PM 2.5	SO2	NOx	PM10	PM2.5	SO2	NOX	PM10	PM2.5	SO2	NOX
		ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ppm	ug/m3	ug/m3	ug/m3	ppm
1-May-19	Max	78.9	32.0	20.4	28.5	77.4	37.8	20.3	25.1	76.6	33.0	19.9	29.3
	Min	64.0	22.2	10.4	22.1	64.3	18.7	14.9	18.5	62.0	26.0	14.4	21.1
	AVG	71.5	27.1	15.4	25.3	70.9	28.3	17.6	21.8	69.3	29.5	17.2	25.2
2-May-19	Max	73.1	35.1	18.2	30.5	71.4	39.6	22.4	27.7	73.3	31.9	22.1	30.2
	Min	63.0	14.4	10.0	22.9	61.1	22.1	14.9	20.1	60.0	19.4	12.5	21.1
	AVG	68.1	24.8	14.1	26.7	66.3	30.9	18.7	23.9	66.7	25.7	17.3	25.7
3-May-19	Max	79.2	38.5	22.4	29.9	71.1	39.0	21.3	28.8	78.5	49.0	22.0	30.4
	Min	62.9	23.9	14.2	20.9	61.2	21.4	12.7	20.1	63.0	17.6	16.4	22.3
	AVG	71.1	31.2	18.3	25.4	66.2	30.2	17.0	24.5	70.8	33.3	19.2	26.4
4-May-19	Max	69.6	31.0	17.4	29.4	65.1	32.0	22.0	31.0	75.5	32.8	20.4	28.0
	Min	25.5	14.5	11.2	22.8	50.3	18.2	12.6	21.1	63.3	22.0	10.4	24.1
	AVG	47.6	22.8	14.3	26.1	57.7	25.1	17.3	26.1	69.4	27.4	15.4	26.1
5-May-19	Max	70.5	33.6	25.0	33.1	80.2	38.6	20.6	26.9	80.0	33.5	20.2	29.5
	Min	60.2	20.2	17.5	21.1	64.3	30.4	18.7	21.0	62.9	13.4	9.0	22.9
	AVG	65.4	26.9	21.3	27.1	72.3	34.5	19.7	24.0	71.5	23.5	14.6	26.2
6-May-19	Max	85.5	32.0	24.4	35.0	82.0	39.7	20.3	25.4	80.2	31.0	20.4	30.8
	Min	66.2	22.9	11.2	23.6	69.2	26.5	16.2	19.7	62.9	23.9	14.2	20.9
	AVG	75.9	27.5	17.8	29.3	75.6	33.1	18.3	22.6	71.6	27.5	17.3	25.9
7-May-19	Max	81.2	32.6	20.3	24.3	78.6	39.1	18.7	28.6	66.6	32.7	16.4	28.4
	Min	66.4	29.4	10.4	21.0	66.3	23.8	16.8	19.9	62.4	13.5	10.2	21.8
	AVG	73.8	31.0	15.4	22.7	72.5	31.5	17.8	29.7	64.5	23.1	13.3	25.1
8-May-19	Max	89.0	45.3	18.6	24.9	81.4	39.5	18.5	21.8	79.5	32.6	20.2	23.1
	Min	64.7	30.3	12.3	23.4	61.0	17.2	13.2	20.0	61.0	13.2	14.2	20.1
	AVG	76.9	37.8	15.5	24.2	71.2	28.4	15.9	20.9	70.3	22.9	17.2	21.6
9-May-19	Max	81.0	39.0	20.5	32.2	82.0	41.1	20.1	30.5	80.0	38.4	23.5	35.3
	Min	63.0	22.6	18.3	21.3	60.1	32.4	15.6	23.9	66.2	22.9	11.2	23.6
	AVG	72.0	30.8	19.4	26.8	71.1	36.8	17.9	27.2	73.1	30.7	17.4	29.5
10-May-19	Max	80.1	39.5	20.0	30.4	76.4	39.8	18.9	29.6	77.0	32.6	20.3	24.3
	Min	62.4	30.5	17.2	22.3	63.8	17.7	13.9	21.0	66.4	29.4	10.4	21.0
	AVG	71.3	35.0	18.6	26.4	70.1	28.8	16.4	25.3	71.7	31.0	15.4	22.7
11-May-19	Max	79.8	31.5	19.9	32.4	78.8	36.0	19.0	29.5	78.0	45.3	18.6	24.9
	Min	61.8	26.4	10.6	20.1	59.9	23.5	12.6	23.3	64.7	30.3	12.3	23.4
	AVG	70.8	29.0	15.3	26.3	69.4	29.8	15.8	26.4	71.4	37.8	15.5	24.2
12-May-19	Max	81.4	45.0	19.0	31.2	83.4	35.7	18.6	29.5	80.0	39.0	19.0	28.0
	Min	63.5	35.4	12.3	24.3	60.0	22.6	13.4	21.0	63.0	22.6	18.3	21.3
	AVG	72.5	40.2	15.7	27.8	71.7	29.2	16.0	25.3	71.5	30.8	18.7	24.7
13-May-19	Max	81.3	41.0	18.6	30.4	80.0	36.0	20.3	29.9	77.0	39.5	20.0	30.4
	Min	60.0	29.4	14.6	22.5	61.9	29.2	12.8	20.1	62.4	30.5	17.2	22.3
	AVG	70.7	35.2	16.6	26.5	71.0	32.6	16.6	25.0	69.7	35.0	18.6	26.4
14-May-19	Max	84.3	35.5	22.5	32.2	83.4	36.2	17.2	28.9	77.0	49.8	20.2	30.4
	Min	42.0	19.2	16.6	21.3	40.5	21.5	16.6	21.3	41.8	26.4	9.6	20.1
	AVG	63.2	27.4	19.6	20.0	62.0	28.9	16.9	20.0	59.4	38.1	14.9	25.3
15-May-19	Max	79.2	40.2	19.7	27.2	78.0	38.2	18.7	27.8	80.0	44.0	19.0	30.2
	Min	63.2	22.0	12.0	21.0	64.2	23.9	12.4	21.3	30.4	29.2	12.0	24.3
	AVG	71.2	31.1	15.9	24.1	71.1	31.1	15.6	24.6	55.2	36.6	15.5	27.3

16-May-19	Max	83.4	38.7	20.1	26.4	83.4	38.7	20.1	26.4	79.2	45.2	12.6	28.3
	Min	60.9	18.4	16.4	23.6	60.9	18.4	16.4	23.6	62.0	20.4	8.4	21.2
	Max	72.2	28.6	18.3	25.0	72.2	28.6	18.3	25.0	70.6	32.8	10.5	24.8
17-May-19	Max	85.2	39.2	18.9	28.1	85.2	39.2	18.9	28.1	80.0	42.2	19.9	29.6
	Min	66.2	13.6	11.3	22.0	66.2	13.6	11.3	22.0	69.1	25.8	9.9	21.2
	Max	75.7	26.4	15.1	25.1	75.7	26.4	15.1	25.1	74.6	34.0	14.9	25.4
18-May-19	Max	93.0	48.0	27.0	36.0	91.5	46.0	21.0	36.0	75.5	44.4	18.6	25.6
	Min	67.2	15.3	12.6	20.1	67.2	15.3	12.6	20.1	65.7	16.8	13.0	20.0
	Max	80.1	31.7	19.8	28.1	79.4	30.7	16.8	28.1	70.6	30.6	15.8	22.8
19-May-19	Max	84.3	38.5	19.5	30.4	75.5	38.0	18.8	30.5	70.5	40.5	20.0	30.5
	Min	59.9	22.9	11.2	23.4	59.9	22.9	11.2	23.4	62.2	23.3	15.3	21.1
	AVG	72.1	30.7	15.4	26.9	67.7	30.5	15.0	27.0	66.4	31.9	17.7	25.8
20-May-19	Max	79.9	40.0	22.1	26.3	79.8	39.9	21.1	29.9	68.6	31.0	18.2	28.0
	Min	59.2	11.4	10.2	21.9	59.2	11.4	10.2	21.9	62.1	28.6	15.3	22.3
	AVG	69.6	25.7	16.2	24.1	69.5	25.7	15.7	25.9	65.4	29.8	16.8	25.2
21-May-19	Max	79.0	42.0	17.0	28.8	79.1	34.2	19.8	29.2	79.0	36.4	20.3	29.7
	Min	69.8	25.2	13.5	22.3	61.0	22.7	15.6	23.0	65.2	22.3	10.8	24.2
	AVG	74.4	33.6	15.3	25.6	70.1	28.5	17.7	26.1	72.1	29.4	15.6	27.0
22-May-19	Max	81.2	42.0	19.0	30.5	83.4	40.1	21.0	30.2	78.9	31.0	18.9	30.0
	Min	64.0	18.0	13.4	21.6	60.2	33.0	18.6	20.7	62.1	30.4	13.4	19.4
	Max	72.6	30.0	16.2	26.1	71.8	36.6	19.8	25.5	70.5	30.7	16.2	24.7
23-May-19	Max	80.2	35.6	16.0	26.4	81.0	35.9	19.7	28.6	79.2	33.9	19.7	25.6
	Min	66.7	19.4	13.0	22.7	60.5	23.6	13.4	21.9	62.5	18.5	16.3	22.2
	Max	73.5	27.5	14.5	24.6	70.8	29.8	16.6	25.3	70.9	26.2	18.0	23.9
24-May-19	Max	80.2	36.6	18.2	26.8	75.6	40.3	20.6	24.3	73.4	32.5	20.0	24.0
	Min	65.7	30.3	14.3	24.1	68.3	24.1	17.2	20.3	63.9	26.4	18.5	22.3
	Max	73.0	33.5	16.3	25.5	72.0	32.2	18.9	22.3	68.7	29.5	19.3	23.2
25-May-19	Max	89.0	31.0	21.0	36.6	87.6	41.0	23.2	30.0	76.0	49.0	21.0	34.8
	Min	49.0	25.0	13.6	22.1	47.5	17.2	16.8	21.3	40.2	22.9	10.9	21.2
	Max	69.0	28.0	17.3	29.4	67.6	29.1	20.0	25.7	58.1	36.0	16.0	28.0
26-May-19	Max	80.0	45.0	19.0	31.2	80.4	35.7	18.6	29.5	79.0	39.0	19.0	28.0
	Min	63.5	35.4	12.3	24.3	60.0	22.6	13.4	21.0	63.0	22.6	18.3	21.3
	Max	71.8	40.2	15.7	27.8	70.2	29.2	16.0	25.3	71.0	30.8	18.7	24.7
27-May-19	Max	85.5	41.0	18.6	30.4	82.2	36.0	20.3	29.9	79.5	39.5	20.0	30.4
	Min	60.0	29.4	14.6	22.5	61.9	29.2	12.8	20.1	62.4	30.5	17.2	22.3
	AVG	72.8	35.2	16.6	26.5	72.1	32.6	16.6	25.0	71.0	35.0	18.6	26.4
28-May-19	Max	84.0	35.5	22.5	32.2	83.5	36.2	17.2	28.9	79.0	49.8	20.2	30.4
	Min	42.0	19.2	16.6	21.3	25.5	21.5	16.6	21.3	41.8	26.4	9.6	20.1
	AVG	63.0	27.4	19.6	20.0	54.5	28.9	16.9	20.0	60.4	38.1	14.9	25.3
29-May-19	Max	89.5	33.7	20.0	29.0	76.8	36.5	20.2	30.5	79.0	47.5	21.0	38.5
	Min	65.0	19.5	13.8	22.4	61.0	15.9	10.2	17.5	62.0	29.6	18.3	20.1
	Max	77.3	26.6	16.9	25.7	68.9	26.2	15.2	24.0	70.5	38.6	19.7	29.3
30-May-19	Max	90.6	48.7	25.7	35.5	89.6	48.7	27.0	37.7	79.0	43.0	24.9	39.3
	Min	66.0	25.5	13.7	23.3	58.0	20.8	16.9	22.3	63.3	26.4	15.2	22.3
	Max	78.3	37.1	19.7	29.4	73.8	34.8	22.0	30.0	71.2	34.7	20.1	30.8
31-May-19	Max	89.3	55.0	24.4	34.2	81.2	47.7	23.3	35.6	79.0	45.2	24.1	31.8
	Min	66.2	14.8	14.3	22.1	50.0	10.6	16.4	20.1	62.0	26.4	14.2	22.0
	Max	77.8	34.9	19.4	28.2	65.6	33.2	19.9	27.9	70.5	35.8	19.2	26.9

		ADANI POWER MAHARASHTRA LIMITED											
		5 x 660 MW Thermal Power Plant , Tirora, Gondia											
	Station:	AAQMS 1 AAQMS 2 AAQMS 3				Report Type: Mean			Time Base: 1Hr	Month- June-19			
Month		AAQMS-1 (Labour Hutment)				AAQMS-2 (China Colony)				AAQMS-3 (Gate no -2)			
		PM 10	PM 2.5	SO2	NOx	PM10	PM2.5	SO2	NOX	PM10	PM2.5	SO2	NOX
		ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ppm	ug/m3	ug/m3	ug/m3	ppm
1-Jun-19	Max	65.4	30.0	15.0	18.7	63.6	34.0	13.8	17.5	61.0	31.4	14.6	18.3
	Min	28.0	15.4	10.5	13.4	36.3	24.0	19.1	12.2	33.7	17.0	12.1	13.0
	AVG	46.7	22.7	12.8	16.1	50.0	29.0	16.5	14.9	47.4	24.2	13.4	15.7
2-Jun-19	Max	68.3	48.6	10.8	14.5	66.5	44.9	7.1	10.8	68.9	45.3	7.5	11.2
	Min	41.0	13.2	8.3	9.2	39.2	9.5	4.6	5.5	41.6	9.9	5.0	5.9
	AVG	54.7	30.9	9.6	11.9	52.9	27.2	5.9	8.2	55.3	27.6	6.3	8.6
3-Jun-19	Max	69.0	47.4	12.4	16.1	67.2	18.2	19.6	23.3	69.6	48.0	12.5	16.2
	Min	38.2	17.4	11.8	10.8	35.1	17.5	12.6	18.0	32.9	16.8	11.9	10.9
	AVG	53.6	32.4	12.1	13.5	51.2	17.9	16.1	20.7	51.3	32.4	12.2	13.6
4-Jun-19	Max	67.0	42.4	16.4	20.1	65.2	42.6	14.8	18.5	67.6	40.0	12.2	15.9
	Min	39.7	17.0	12.1	14.8	37.9	7.2	2.3	13.2	40.3	14.6	9.7	10.6
	AVG	53.4	29.7	14.3	17.5	51.6	24.9	8.6	15.9	54.0	27.3	11.0	13.3
5-Jun-19	Max	62.3	37.7	14.0	19.7	60.5	38.9	13.4	17.1	62.9	37.3	18.5	22.2
	Min	35.0	18.9	11.0	14.4	33.2	13.5	11.4	11.8	35.6	19.8	14.9	16.9
	AVG	48.7	28.3	12.5	17.1	46.9	26.2	12.4	14.5	49.3	28.6	16.7	19.6
6-Jun-19	Max	71.0	44.4	22.0	25.7	69.2	41.6	13.8	17.5	71.6	43.0	18.5	22.2
	Min	43.7	19.4	14.5	20.4	29.0	17.4	12.5	14.2	23.5	17.6	12.7	16.9
	AVG	57.4	31.9	18.3	23.1	49.1	29.5	13.2	15.9	47.6	30.3	15.6	19.6
7-Jun-19	Max	68.0	37.2	18.4	22.1	66.2	40.6	17.2	20.9	68.6	38.4	19.5	23.2
	Min	38.7	19.7	15.6	15.6	38.9	15.2	10.3	18.4	31.2	13.3	8.4	17.9
	AVG	53.4	28.5	17.0	18.9	52.6	27.9	13.8	19.7	49.9	25.9	14.0	20.6
8-Jun-19	Max	74.3	40.7	15.9	19.6	72.5	44.2	21.7	25.4	73.7	54.3	16.5	20.2
	Min	47.0	10.3	8.4	14.3	45.2	18.7	17.2	20.1	46.4	18.9	14.0	14.9
	AVG	60.7	25.5	12.2	17.0	58.9	31.5	19.5	22.8	60.1	36.6	15.3	17.6
9-Jun-19	Max	71.3	41.9	10.1	13.8	69.5	38.9	7.1	10.8	71.9	41.5	8.7	12.1
	Min	44.0	11.5	6.6	8.5	42.2	12.5	11.6	9.8	38.5	6.1	5.2	7.1
	AVG	57.7	26.7	8.4	11.2	55.9	25.7	9.4	10.3	55.2	23.8	7.0	9.8
10-Jun-19	Max	74.0	52.4	14.6	18.3	72.2	51.6	13.8	17.5	74.6	52.0	14.2	17.9
	Min	46.7	17.0	12.1	13.0	44.9	16.2	11.3	12.2	47.3	16.6	11.7	12.6
	AVG	60.4	34.7	13.4	15.7	58.6	33.9	12.6	14.9	61.0	34.3	13.0	15.3
11-Jun-19	Max	73.3	30.7	16.1	19.8	71.5	31.4	16.4	20.1	73.9	35.8	13.8	17.5
	Min	23.4	19.4	15.6	14.5	29.2	18.2	13.3	14.8	37.1	14.2	12.2	14.2
	AVG	48.4	25.1	15.9	17.2	50.4	24.8	14.9	17.5	55.5	25.0	13.0	15.9
12-Jun-19	Max	71.0	42.4	17.4	21.1	69.2	40.6	20.4	24.1	71.6	42.0	19.8	23.5
	Min	43.7	20.4	15.5	15.8	41.9	18.6	13.7	18.8	44.3	23.2	21.3	18.2
	AVG	57.4	31.4	16.5	18.5	55.6	29.6	17.1	21.5	58.0	32.6	20.6	20.9
13-Jun-19	Max	76.1	53.5	15.7	19.4	77.9	51.2	13.4	17.1	76.8	55.2	17.4	21.1
	Min	48.8	23.5	16.6	14.1	50.6	15.8	10.9	11.8	49.5	19.8	14.9	15.8
	AVG	62.5	38.5	16.2	16.8	64.3	33.5	12.2	14.5	63.2	37.5	16.2	18.5
14-Jun-19	Max	73.2	50.6	12.8	16.5	75.0	51.2	13.4	17.1	72.0	50.4	12.6	16.3
	Min	38.2	15.2	8.3	11.2	47.7	15.8	10.9	11.8	44.7	15.0	10.1	11.0
	AVG	55.7	32.9	10.6	13.9	61.4	33.5	12.2	14.5	58.4	32.7	11.4	13.7
15-Jun-19	Max	77.2	54.6	16.8	20.5	79.0	51.2	13.4	17.1	76.0	54.4	16.6	20.3
	Min	49.9	19.2	12.3	15.2	51.7	15.8	10.9	11.8	48.7	19.0	14.1	15.0
	AVG	63.6	36.9	14.6	17.9	65.4	33.5	12.2	14.5	62.4	36.7	15.4	17.7

16-Jun-19	Max	69.8	47.2	25.2	28.9	71.6	51.2	13.4	17.1	68.6	47.0	21.5	25.2
	Min	42.5	21.8	14.9	23.6	44.3	15.8	10.9	11.8	41.3	21.6	16.7	19.9
	AVG	56.2	34.5	20.1	26.3	58.0	33.5	12.2	14.5	55.0	34.3	19.1	22.6
17-Jun-19	Max	70.6	48.0	25.8	29.5	72.4	51.2	13.4	17.1	69.4	47.8	10.0	13.7
	Min	43.3	27.8	20.9	27.6	45.1	15.8	10.9	11.8	42.1	12.4	7.5	8.4
	AVG	57.0	37.9	23.4	28.6	58.8	33.5	12.2	14.5	55.8	30.1	8.7	11.1
18-Jun-19	Max	65.7	22.3	15.5	19.2	67.5	21.5	16.3	20.0	64.5	22.5	15.3	19.0
	Min	28.4	19.3	12.4	13.9	26.8	19.3	14.4	17.3	27.2	12.9	9.7	13.7
	AVG	47.1	20.8	14.0	16.6	47.2	20.4	15.4	18.7	45.9	17.7	12.5	16.4
19-Jun-19	Max	63.4	40.8	25.3	29.0	65.2	51.2	13.4	17.1	62.2	40.6	15.1	18.8
	Min	36.1	25.3	18.4	18.8	37.9	15.8	10.9	11.8	34.9	18.1	13.2	13.5
	AVG	49.8	33.1	21.9	23.9	51.6	33.5	12.2	14.5	48.6	29.4	14.2	16.2
20-Jun-19	Max	62.4	40.8	13.4	17.1	60.6	40.0	12.3	16.0	63.0	40.4	18.2	21.9
	Min	35.1	16.4	11.5	11.8	33.3	14.6	5.8	10.7	35.7	20.2	13.3	16.6
	AVG	48.8	28.6	12.5	14.5	47.0	27.3	9.1	13.4	49.4	30.3	15.8	19.3
21-Jun-19	Max	66.7	23.9	17.9	20.6	63.9	21.3	16.0	19.7	66.3	19.7	16.2	19.9
	Min	28.4	11.5	16.4	15.3	26.6	14.1	11.5	17.4	29.0	15.2	8.9	15.3
	AVG	47.6	17.7	17.2	18.0	45.3	17.7	13.8	18.6	47.7	17.5	12.6	17.6
22-Jun-19	Max	67.4	44.8	17.0	20.7	69.2	51.2	23.4	27.1	66.2	44.6	16.8	20.5
	Min	40.1	19.4	12.5	15.4	41.9	15.8	10.9	21.8	38.9	19.2	14.3	15.2
	AVG	53.8	32.1	14.8	18.1	55.6	33.5	17.2	24.5	52.6	31.9	15.6	17.9
23-Jun-19	Max	71.1	45.9	20.9	23.6	68.3	46.7	18.9	22.6	70.7	46.1	23.8	27.5
	Min	42.8	20.5	15.6	18.3	41.0	21.3	16.4	20.3	43.4	23.7	14.5	22.9
	AVG	57.0	33.2	18.3	21.0	54.7	34.0	17.7	21.5	57.1	34.9	19.1	25.2
24-Jun-19	Max	76.8	51.6	19.8	22.5	74.0	52.4	14.6	18.3	76.4	54.8	12.5	16.2
	Min	48.5	16.2	11.3	17.2	46.7	17.0	12.1	16.0	49.1	19.4	10.2	11.6
	AVG	62.7	33.9	15.6	19.9	60.4	34.7	13.4	17.2	62.8	37.1	11.3	13.9
25-Jun-19	Max	79.2	52.0	14.2	17.9	77.4	55.8	18.0	21.7	79.8	58.2	15.9	19.6
	Min	35.0	16.6	11.7	12.6	50.1	20.4	15.5	16.4	52.5	22.8	13.6	13.0
	AVG	57.1	34.3	13.0	15.3	63.8	38.1	16.8	19.1	66.2	40.5	14.7	16.3
26-Jun-19	Max	64.8	30.6	17.2	23.4	68.9	18.1	15.7	21.0	67.9	46.3	16.6	20.3
	Min	28.4	18.9	14.0	18.1	21.0	17.3	12.4	15.7	24.3	15.8	14.0	13.7
	AVG	46.6	24.8	15.6	20.8	45.0	17.7	14.1	18.4	46.1	31.1	15.3	17.0
27-Jun-19	Max	69.4	42.2	13.8	17.5	71.2	26.8	13.5	19.4	68.2	30.2	13.2	19.4
	Min	22.3	16.8	9.9	12.2	21.9	17.1	12.2	14.1	20.9	16.6	11.7	14.1
	AVG	45.9	29.5	11.9	14.9	46.6	22.0	12.9	16.8	44.6	23.4	12.5	16.8
28-Jun-19	Max	67.8	31.2	17.6	21.3	69.6	32.2	13.4	17.1	66.6	31.2	13.8	17.5
	Min	25.5	21.2	14.3	16.0	22.3	13.9	11.4	11.8	19.3	16.2	11.3	12.2
	AVG	46.7	26.2	16.0	18.7	46.0	23.1	12.4	14.5	43.0	23.7	12.6	14.9
29-Jun-19	Max	66.3	44.7	13.1	19.8	64.5	43.9	11.6	18.5	66.9	21.1	13.2	28.4
	Min	19.0	13.2	8.3	14.5	27.2	11.5	6.6	13.2	29.6	13.5	13.4	20.7
	AVG	42.7	29.0	10.7	17.2	45.9	27.7	9.1	15.9	48.3	17.3	13.3	24.6
30-Jun-19	Max	69.9	17.8	14.0	21.2	67.1	45.5	13.4	21.7	69.5	19.9	12.4	16.1
	Min	29.2	17.2	12.3	15.9	27.4	12.3	11.2	19.4	29.8	15.5	11.2	11.5
	AVG	49.6	17.5	13.2	18.6	47.3	28.9	12.3	20.6	49.7	17.7	11.8	13.8

	ADANI POWER MAHARASHTRA LIMITED												
	5 x 660 MW Thermal Power Plant , Tirora, Gondia												
	Station:	AAQMS 1 AAQMS 2 AAQMS 3			Report Type: Mean			Time Base: 1Hr		Month-July - 19			
Month		AAQMS-1 (Labour Hutment)				AAQMS-2 (China Colony)				AAQMS-3 (Gate no -2)			
		PM 10	PM 2.5	SO2	NOx	PM10	PM2.5	SO2	NOX	PM10	PM2.5	SO2	NOX
		ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ppm	ug/m3	ug/m3	ug/m3	ppm
1-Jul-19	Max	62.0	30.4	15.5	23.2	60.2	39.6	18.8	21.9	62.6	40.0	14.4	20.3
	Min	40.5	15.0	10.1	17.9	39.2	19.0	14.1	16.6	40.3	18.9	11.0	15.0
	AVG	51.3	22.7	12.8	20.6	49.7	29.3	16.5	19.3	51.5	29.5	12.7	17.7
2-Jul-19	Max	65.8	30.0	11.8	22.5	64.0	42.4	15.1	18.1	66.4	42.8	10.2	23.9
	Min	40.8	28.2	8.6	21.3	41.7	20.0	10.4	10.2	41.9	20.5	9.7	18.6
	AVG	53.3	29.1	10.2	21.9	52.9	31.2	12.8	14.2	54.2	31.7	10.0	21.3
3-Jul-19	Max	75.5	53.9	19.9	24.6	73.7	54.1	13.7	19.2	76.1	54.5	9.6	21.1
	Min	42.2	21.2	10.0	19.3	39.2	21.3	12.2	11.0	41.0	21.9	7.8	17.2
	AVG	58.9	37.6	15.0	22.0	56.5	37.7	13.0	15.1	58.6	38.2	8.7	19.2
4-Jul-19	Max	66.4	20.1	8.9	14.4	64.6	25.0	6.8	10.5	67.0	18.8	9.0	14.7
	Min	35.2	17.5	5.8	9.1	33.8	14.8	5.9	9.8	35.2	16.8	8.7	10.7
	AVG	50.8	18.8	7.4	11.8	49.2	19.9	6.4	10.2	51.1	17.8	8.9	12.7
5-Jul-19	Max	58.0	36.4	10.2	14.8	56.2	18.1	10.5	15.5	58.6	18.1	11.2	14.3
	Min	20.2	13.5	5.4	13.2	24.4	17.3	8.4	14.8	25.0	17.3	9.3	9.8
	AVG	39.1	25.0	7.8	14.0	40.3	17.7	9.5	15.2	41.8	17.7	10.3	12.1
6-Jul-19	Max	55.8	15.8	9.7	13.3	54.0	15.5	9.4	13.5	56.4	14.4	8.8	13.8
	Min	34.2	14.6	8.8	10.5	33.7	14.3	8.0	12.0	20.0	11.2	7.2	11.0
	AVG	45.0	15.2	9.3	11.9	43.9	14.9	8.7	12.8	38.2	12.8	8.0	12.4
7-Jul-19	Max	59.6	17.2	8.9	16.6	57.8	20.0	7.7	18.4	60.2	20.1	8.7	17.4
	Min	33.3	16.5	7.8	11.3	35.2	19.1	6.2	11.5	38.7	18.8	7.7	15.5
	AVG	46.5	16.9	8.4	14.0	46.5	19.6	7.0	15.0	49.5	19.5	8.2	16.5
8-Jul-19	Max	54.8	17.2	8.8	14.0	53.0	19.0	8.7	15.2	54.2	18.2	9.6	13.5
	Min	23.2	16.8	6.9	12.7	22.8	17.5	6.9	13.8	23.5	17.3	8.5	11.2
	AVG	39.0	17.0	7.9	13.4	37.9	18.3	7.8	14.5	38.9	17.8	9.1	12.4
9-Jul-19	Max	57.1	19.2	9.6	15.7	55.3	17.8	8.5	18.6	57.7	17.3	8.7	14.2
	Min	26.8	17.3	5.8	15.2	23.8	11.0	7.0	17.8	23.4	15.4	7.1	13.0
	AVG	42.0	18.3	7.7	15.5	39.6	14.4	7.8	18.2	40.6	16.4	7.9	13.6
10-Jul-19	Max	56.6	20.4	10.6	21.1	54.8	19.7	9.1	18.8	57.2	18.6	10.2	19.2
	Min	21.1	15.5	8.7	17.2	21.0	15.8	7.2	13.5	36.4	16.8	8.7	13.9
	AVG	38.9	18.0	9.7	19.2	37.9	17.8	8.2	16.2	46.8	17.7	9.5	16.6
11-Jul-19	Max	58.2	18.0	11.5	15.2	56.4	18.4	9.4	15.5	58.8	18.4	10.4	14.2
	Min	23.0	17.0	7.9	14.9	23.3	14.4	8.4	14.3	26.1	17.2	6.0	13.8
	AVG	40.6	17.5	9.7	15.1	39.9	16.4	8.9	14.9	42.5	17.8	8.2	14.0
12-Jul-19	Max	57.1	17.5	7.3	18.5	55.3	24.7	9.8	16.8	57.7	20.0	10.7	15.9
	Min	26.2	11.2	8.5	14.2	23.5	13.8	8.1	15.5	34.1	16.5	6.9	10.6
	AVG	41.7	14.4	7.9	16.4	39.4	19.3	9.0	16.2	45.9	18.3	8.8	13.3
13-Jul-19	Max	56.0	20.1	11.6	16.6	54.6	15.1	11.7	21.2	57.0	18.0	9.1	14.6
	Min	22.5	15.7	5.8	12.9	23.8	10.4	5.9	9.6	35.0	16.8	8.7	10.2
	AVG	39.3	17.9	8.7	14.8	39.2	12.8	8.8	15.4	46.0	17.4	8.9	12.4
14-Jul-19	Max	59.0	17.1	8.9	16.6	57.5	20.0	10.2	18.3	40.2	20.2	8.6	17.3
	Min	20.5	11.3	7.8	11.3	22.0	19.1	6.1	11.2	38.0	18.6	7.6	15.2
	AVG	39.8	14.2	8.4	14.0	39.8	19.6	8.2	14.8	39.1	19.4	8.1	16.3
15-Jul-19	Max	55.7	15.2	9.7	16.6	60.0	15.5	10.4	13.5	56.4	14.4	8.8	13.8
	Min	21.4	11.3	8.8	14.4	23.7	10.4	8.3	12.1	33.1	11.2	7.2	12.9
	AVG	38.6	13.3	9.3	15.5	41.9	13.0	9.4	12.8	44.8	12.8	8.0	13.4

16-Jul-19	Max	56.6	19.3	9.8	22.5	54.0	22.4	15.4	19.0	58.0	22.8	10.2	23.9
	Min	21.3	12.2	8.6	21.3	21.7	18.5	10.0	12.2	21.9	20.5	9.7	18.6
	AVG	39.0	15.8	9.2	21.9	37.9	20.5	12.7	15.6	40.0	21.7	10.0	21.3
17-Jul-19	Max	62.0	20.4	8.9	23.2	30.2	19.6	8.2	21.9	42.6	20.0	14.0	20.3
	Min	30.5	15.0	10.1	17.9	29.2	19.0	14.1	16.6	40.3	18.9	11.0	19.8
	AVG	46.3	17.7	9.5	20.6	29.7	19.3	11.2	19.3	41.5	19.5	12.5	20.1
18-Jul-19	Max	68.7	30.2	19.0	22.7	70.5	51.2	13.4	17.1	67.5	45.9	8.1	11.8
	Min	21.0	18.8	11.9	17.4	35.2	15.8	10.9	11.8	40.2	10.5	5.6	6.5
	AVG	44.9	24.5	15.5	20.1	52.9	33.5	12.2	14.5	53.9	28.2	6.9	9.2
19-Jul-19	Max	66.5	43.9	11.1	14.8	68.3	51.2	13.4	17.1	65.3	43.7	5.9	9.6
	Min	39.2	13.5	6.6	9.5	41.0	15.8	10.9	11.8	38.0	12.3	7.4	4.3
	AVG	52.9	28.7	8.9	12.2	54.7	33.5	12.2	14.5	51.7	28.0	6.7	7.0
20-Jul-19	Max	69.7	48.1	10.3	14.0	67.9	47.3	9.5	13.2	70.3	47.7	9.9	13.6
	Min	42.4	12.7	7.8	8.7	40.6	11.9	7.0	7.9	43.0	12.3	5.4	8.3
	AVG	56.1	30.4	9.1	11.4	54.3	29.6	8.3	10.6	56.7	30.0	7.7	11.0
21-Jul-19	Max	69.0	43.8	12.0	14.7	66.2	44.6	13.8	17.5	68.6	47.0	24.7	28.4
	Min	40.7	13.4	8.5	9.4	38.9	14.2	9.3	15.2	41.3	21.6	12.4	23.8
	AVG	54.9	28.6	10.3	12.1	52.6	29.4	11.6	16.4	55.0	34.3	18.5	26.1
22-Jul-19	Max	57.0	16.6	10.5	14.8	54.5	18.1	9.7	15.5	57.8	18.1	11.2	14.3
	Min	24.1	13.5	5.4	13.2	22.0	17.3	8.4	14.8	26.0	12.2	9.3	9.8
	AVG	40.6	15.1	8.0	14.0	38.3	17.7	9.1	15.2	41.9	15.2	10.3	12.1
23-Jul-19	Max	55.3	15.8	11.0	16.6	54.0	15.5	9.4	13.5	56.4	14.4	8.8	13.8
	Min	23.4	14.6	8.8	10.0	23.3	14.3	8.3	12.1	33.1	11.2	7.2	12.9
	AVG	39.4	15.2	9.9	13.3	38.7	14.9	8.9	12.8	44.8	12.8	8.0	13.4
24-Jul-19	Max	57.1	17.5	7.3	18.5	55.3	24.7	9.8	16.8	57.7	20.0	10.7	15.9
	Min	26.2	11.2	8.5	14.2	23.5	13.8	8.1	15.5	34.1	16.5	6.9	10.6
	AVG	41.7	14.4	7.9	16.4	39.4	19.3	9.0	16.2	45.9	18.3	8.8	13.3
25-Jul-19	Max	56.0	20.1	11.6	16.6	54.6	15.1	11.7	21.2	57.0	18.0	9.1	14.6
	Min	22.5	15.7	5.8	12.9	23.8	10.4	5.9	9.6	35.0	16.8	8.7	10.2
	AVG	39.3	17.9	8.7	14.8	39.2	12.8	8.8	15.4	46.0	17.4	8.9	12.4
26-Jul-19	Max	59.0	17.1	8.9	16.6	57.5	20.0	10.2	18.3	40.2	20.2	8.6	17.3
	Min	20.5	11.3	7.8	11.3	22.0	19.1	6.1	11.2	38.0	18.6	7.6	15.2
	AVG	39.8	14.2	8.4	14.0	39.8	19.6	8.2	14.8	39.1	19.4	8.1	16.3
27-Jul-19	Max	55.7	15.2	9.7	16.6	60.0	15.5	10.4	13.5	56.4	14.4	8.8	13.8
	Min	21.4	11.3	8.8	14.4	23.7	10.4	8.3	12.1	33.1	11.2	7.2	12.9
	AVG	38.6	13.3	9.3	15.5	41.9	13.0	9.4	12.8	44.8	12.8	8.0	13.4
28-Jul-19	Max	56.6	19.3	9.8	22.5	54.0	22.4	15.4	19.0	58.0	22.8	10.2	23.9
	Min	21.3	12.2	8.6	21.3	21.7	18.5	10.0	12.2	21.9	20.5	9.7	18.6
	AVG	39.0	15.8	9.2	21.9	37.9	20.5	12.7	15.6	40.0	21.7	10.0	21.3
29-Jul-19	Max	69.1	47.5	9.7	13.4	67.3	46.7	8.9	12.6	69.7	47.1	9.3	13.0
	Min	41.8	12.1	7.2	8.1	40.0	11.3	6.4	7.3	42.4	11.7	4.8	7.7
	AVG	55.5	29.8	8.5	10.8	53.7	29.0	7.7	10.0	56.1	29.4	7.1	10.4
30-Jul-19	Max	70.0	44.8	23.0	25.7	67.2	45.6	7.8	11.5	69.6	48.0	25.7	29.4
	Min	31.7	19.4	14.5	20.4	39.9	10.2	5.3	9.2	42.3	22.6	13.4	24.8
	AVG	50.9	32.1	18.8	23.1	53.6	27.9	6.6	10.4	56.0	35.3	19.5	27.1
31-Jul-19	Max	69.0	41.8	9.0	12.7	67.2	56.8	19.0	22.7	69.6	48.0	15.7	19.4
	Min	28.2	11.4	6.5	7.4	39.9	21.4	16.5	17.4	33.3	22.6	13.4	12.8
	AVG	48.6	26.6	7.8	10.1	53.6	39.1	17.8	20.1	51.5	35.3	14.5	16.1

Month		ADANI POWER MAHARASHTRA LIMITED											
		5 x 660 MW Thermal Power Plant , Tirora, Gondia											
	Station:	AAQMS 1 AAQMS 2 AAQMS 3				Report Type: Mean			Time Base: 1Hr		Month- AUG-19		
		AAQMS-1 (Labour Hutment)				AAQMS-2 (China Colony)				AAQMS-3 (Gate no -2)			
		PM 10	PM 2.5	SO2	NOx	PM10	PM2.5	SO2	NOX	PM10	PM2.5	SO2	NOX
		ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ppm	ug/m3	ug/m3	ug/m3	ppm
1-Aug-19	Max	51.0	29.0	18.8	20.5	64.7	56.2	19.6	21.5	58.0	36.4	16.4	28.6
	Min	19.4	21.0	13.5	11.3	20.1	12.0	12.8	10.7	22.2	16.5	12.6	12.5
	AVG	35.2	25.0	16.2	15.9	42.4	34.1	16.2	16.1	40.1	26.5	14.5	20.6
2-Aug-19	Max	56.9	24.6	12.3	24.1	57.6	24.9	21.6	27.2	57.2	25.3	14.0	20.4
	Min	26.8	21.2	16.9	12.0	29.2	22.9	15.3	16.2	26.9	24.3	15.2	14.2
	AVG	41.9	22.9	14.6	18.1	43.4	23.9	18.5	21.7	42.1	24.8	14.6	17.3
3-Aug-19	Max	60.0	22.0	15.6	21.0	57.2	25.3	16.3	20.4	60.2	24.6	19.5	23.4
	Min	24.6	15.4	13.6	19.4	25.0	22.0	13.9	16.4	46.9	20.6	12.0	12.4
	AVG	63.5	43.7	19.6	25.3	62.2	41.4	20.1	23.4	58.6	31.6	16.2	17.9
4-Aug-19	Max	57.3	23.7	12 4	24.3	54 3	23.1	14.1	20 2	73 4	50 1	26 4	30.4
	Min	24.0	14.9	13.4	16.4	53.4	39.4	12.0	13.6	35.4	32.4	16.4	17.6
	AVG	40.7	19.3	12.9	20.4	53.9	31.3	13.1	16.9	54.4	41.3	21.4	24.0
5-Aug-19	Max	58.6	21.4	17.2	21.8	54.5	29.8	22.8	30.2	56.3	29.3	15.9	22.3
	Min	26.0	15.4	11.2	12.6	22.3	16.5	11.8	13.2	19.4	18.7	11.0	10.2
	AVG	42.3	18.4	14.2	17.2	38.4	23.2	17.3	21.7	37.9	24.0	13.5	16.3
6-Aug-19	Max	60.2	25.0	12.5	21.2	52.4	24.5	16.2	23.3	52.7	26.4	20.4	23.4
	Min	46.9	35.4	13 6	19.4	52 0	30.4	13 9	16.4	26.9	20.6	12 0	12 4
	AVG	53.6	30.2	13.1	20.3	52.2	27.5	15.1	19.9	39.8	23.5	16.2	17.9
7-Aug-19	Max	57.6	24.6	20.2	24.1	56.6	24.6	21.6	27.2	52.2	25.3	14.0	20.4
	Min	26.6	21.2	16.9	12.0	29.2	22.9	15.3	16.2	26.6	24.3	8.9	14.2
	AVG	42.1	22.9	18.6	18.1	42.9	23.8	18.5	21.7	39.4	24.8	11.5	17.3
8-Aug-19	Max	57.0	25.3	23.4	29.6	57.2	24.3	16.9	23.4	58.8	20.4	20.6	25.6
	Min	20.4	22.0	12.9	18.6	26.5	13.4	16.3	20.6	35.4	25.3	12.6	15.4
	AVG	38.7	23.7	18.2	24.1	41.9	18.9	16.6	22.0	47.1	22.9	16.6	20.5
9-Aug-19	Max	57.8	29.5	20.6	21.1	57.7	26.8	20.8	25.2	59.0	21.0	18.6	20.1
	Min	24.5	12.8	13.4	19.2	28.3	24.2	18.3	15.4	20.1	22.6	13.4	10.5
	AVG	41.2	21.2	17.0	20.3	43.0	25.5	19.6	20.3	39.6	23.3	16.0	15.5
10-Aug-19	Max	58.2	42.6	17.9	20.1	73.4	46.7	19.3	20.5	59.7	42.1	12.0	18.6
	Min	46.2	22.9	10.5	14.0	36.1	22.3	10.8	14.3	43.9	21.8	10.3	12.4
	AVG	52.2	32.8	14.2	17.1	54.8	34.5	15.1	17.4	51.8	32.0	11.2	15.5
11-Aug-19	Max	57.6	26.5	23.4	27.5	57.0	43.4	26.4	30.1	57.0	25.0	24.9	30.4
	Min	24.0	22.4	13.4	16.3	21.0	30.4	13.4	19.4	35.4	12.5	13.0	15.4
	AVG	40.8	24.5	18.4	21.9	39.0	36.9	19.9	24.8	46.2	18.8	19.0	22.9
12-Aug-19	Max	59.7	26.5	16.4	19.5	60.4	26.0	16.7	22.0	68.4	36.1	18.6	20.6
	Min	18.3	16.2	9.6	11.2	26.5	11.4	11.2	10.2	28.6	13.9	11.5	8.9
	AVG	39.0	21.4	13.0	15.4	43.5	18.7	14.0	16.1	48.5	25.0	15.1	14.8
13-Aug-19	Max	58.6	21.4	25.4	24.7	54.6	29.8	22.3	30.2	56.1	29.2	19.5	15.9
	Min	42.6	19.4	12.8	13.2	23.4	16.5	8.9	13.2	19.4	21.6	11.7	6.4
	AVG	50.6	20.4	19.1	19.0	39.0	23.2	15.6	21.7	37.8	25.4	15.6	11.2
14-Aug-19	Max	56.7	23.3	23.4	27.1	71.2	46.6	20.4	25.6	68.4	32.0	24.1	28.6
	Min	23.4	19.0	16.4	14.3	48.6	23.4	16.4	18.6	42.7	26.4	13.9	15.4
	AVG	40.1	21.2	19.9	20.7	59.9	35.0	18.4	22.1	55.6	29.2	19.0	22.0
15-Aug-19	Max	60.4	59.9	24.6	20.7	57.8	26.0	20.4	30.4	83.4	52.4	23.4	25.5
	Min	43.9	35.4	12.3	14.6	28.3	24.2	18.3	15.4	52.6	30.4	13.4	15.2
	AVG	52.2	47.7	18.5	17.7	43.1	25.1	19.4	22.9	68.0	41.4	18.4	20.4

16-Aug-19	Max	81.2	46.2	14.7	20.8	67.8	33.9	24.8	30.5	80.1	47.1	18.5	20.5
	Min	26.5	12.4	11.1	10.2	12.5	14.9	14.2	13.8	12.9	16.5	13.2	9.9
	AVG	53.9	29.3	12.9	15.5	40.2	24.4	19.5	22.2	46.5	31.8	15.9	15.2
17-Aug-19	Max	82.4	56.4	22.0	29.4	72.4	50.4	26.4	30.4	77.5	52.4	26.4	30.4
	Min	53.4	30.4	16.4	23.4	51.4	35.4	30.4	17.6	52.4	30.4	12.4	16.4
	AVG	67.9	43.4	19.2	26.4	61.9	42.9	28.4	24.0	65.0	41.4	19.4	23.4
18-Aug-19	Max	59.2	28.9	21.5	26.7	68.5	56.4	18.8	20.2	74.3	57.4	16.2	23.4
	Min	16.0	12.6	10.5	11.2	30.2	26.1	12.0	12.2	42.6	22.9	7.9	13.4
	AVG	37.6	20.8	16.0	19.0	49.4	41.3	15.4	16.2	58.5	40.2	12.1	18.4
19-Aug-19	Max	58.9	28.4	24.5	21.5	61.2	46.5	24.3	29.5	62.5	24.4	26.4	29.5
	Min	20.6	16.4	14.2	11.5	52.4	38.5	13.4	15.2	29.6	32.4	13.4	15.6
	AVG	39.8	22.4	19.4	16.5	56.8	42.5	18.9	22.4	46.1	28.4	19.9	22.6
20-Aug-19	Max	57.9	26.4	23.4	27.5	72.4	43.4	26.4	30.1	77.2	53.2	24.9	30.4
	Min	22.4	22.4	13.4	16.3	51.0	30.4	13.4	19.4	35.4	26.4	13.0	15.4
	AVG	40.2	24.4	18.4	21.9	61.7	36.9	19.9	24.8	56.3	39.8	19.0	22.9
21-Aug-19	Max	80.2	55.3	24.3	26.4	75.3	53.4	23.4	30.1	74.6	52.4	26.4	32.1
	Min	39.7	29.4	20.4	16.9	39.4	16.4	12.8	16.4	49.6	26.7	11.4	16.4
	AVG	60.0	42.4	22.4	21.7	57.4	34.9	18.1	23.3	62.1	39.6	18.9	24.3
22-Aug-19	Max	76.4	56.7	22.6	30.5	72.4	53.7	18.2	20.2	70.4	58.6	21.7	23.6
	Min	29.4	18.7	20.4	14.6	29.4	22.5	11.1	9.9	22.6	23.7	13.9	10.4
	AVG	52.9	37.7	21.5	22.6	50.9	38.1	14.7	15.1	46.5	41.2	17.8	17.0
23-Aug-19	Max	78.6	48.3	22.5	25.6	76.9	58.3	23.0	27.2	73.4	49.8	20.8	24.4
	Min	53.4	16.8	13.0	15.4	50.3	22.9	14.0	16.2	52.6	23.8	12.8	14.3
	AVG	66.0	32.6	17.8	20.5	63.6	40.6	18.5	21.7	63.0	36.8	16.8	19.4
24-Aug-19	Max	79.3	55.6	14.0	20.4	72.1	43.8	25.8	27.3	64.8	47.2	18.7	24.6
	Min	30.7	12.8	14.3	9.9	20.7	19.4	13.4	13.8	30.6	17.3	15.2	11.6
	AVG	55.0	34.2	14.2	15.2	46.4	31.6	19.6	20.6	47.7	32.3	17.0	18.1
25-Aug-19	Max	60.0	25.0	16.0	23.4	76.4	25.5	20.2	24.6	76.4	24.0	22.0	24.1
	Min	30.1	18.5	13.2	13.4	36.6	20.0	15.4	13.0	33.9	17.7	13.9	11.4
	AVG	45.1	21.8	14.6	18.4	56.5	22.8	17.8	18.8	55.2	20.9	18.0	17.8
26-Aug-19	Max	57..4	30.2	10.4	19.7	56.7	31.4	14.8	19.0	69.4	25.0	22.6	29.1
	Min	34.7	23.4	8.7	13.9	20.2	19.4	12.0	13.4	30.4	17.2	16.3	14.0
	AVG	34.7	46.3	17.4	16.8	54.0	35.5	13.4	16.2	49.9	34.6	19.5	21.6
27-Aug-19	Max	60.0	22.0	20.2	31.2	57.4	52.4	26.3	30.4	60.2	42.6	20.4	23.4
	Min	46.9	35.4	13.6	19.4	52.0	30.4	13.9	16.4	46.9	20.6	12.0	12.4
	AVG	53.5	28.7	16.9	25.3	54.7	41.4	20.1	23.4	53.6	31.6	16.2	17.9
28-Aug-19	Max	61.4	25.9	25.5	30.0	57.6	21.4	27.2	31.4	52.2	20.0	24.6	25.9
	Min	49.7	32.4	17.2	20.4	52.4	30.4	12.9	16.4	30.4	29.4	10.4	12.4
	AVG	55.6	29.2	21.4	25.2	55.0	25.9	20.1	23.9	41.3	24.7	17.5	19.2
29-Aug-19	Max	62.2	23.5	24.3	26.4	57.8	23.5	23.4	30.1	57.5	24.5	26.4	32.1
	Min	39.7	29.4	20.4	16.9	39.4	16.4	12.8	16.4	49.6	26.7	11.4	16.4
	AVG	51.0	26.5	22.4	21.7	48.6	20.0	18.1	23.3	53.6	25.6	18.9	24.3
30-Aug-19	Max	59.0	26.5	10.4	16.6	79.6	53.8	23.6	22.8	73.4	54.3	18.6	20.4
	Min	18.3	16.2	9.6	6.3	56.0	30.1	10.2	11.4	40.1	22.6	13.4	10.5
	AVG	38.7	21.4	10.0	11.5	67.8	42.0	16.9	17.1	56.8	38.5	16.0	15.5
31-Aug-19	Max	69.9	29.0	13.4	20.1	76.4	28.5	11.4	16.1	72.4	25.8	12.6	20.6
	Min	38.3	34.6	9.0	16.9	39.4	20.8	13.6	8.8	30.9	22.9	10.2	11.7
	AVG	54.1	31.8	11.2	18.5	57.9	24.7	12.5	12.5	51.7	24.4	11.4	16.2

	ADANI POWER MAHARASHTRA LIMITED													
	5 x 660 MW Thermal Power Plant , Tirora, Gondia													
	Station: AAQMS 1 AAQMS 2 AAQMS 3					Report Type: Mean			Time Base: 1Hr	Month- SEPT-19				
Month		AAQMS-1 (Labour Hutment)				AAQMS-2 (China Colony)				AAQMS-3 (Gate no -2)				
		PM 10	PM 2.5	SO2	NOx	PM10	PM2.5	SO2	NOX	PM10	PM2.5	SO2	NOX	
		ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ppm	ug/m3	ug/m3	ug/m3	ppm	
1-Sep-19	Max	56.0	34.4	10.8	14.5	55.5	29.9	12.5	16.2	51.9	30.3	14.8	18.5	
	Min	28.7	11.4	6.5	9.2	17.5	15.2	10.3	10.9	24.6	15.1	10.2	13.2	
	AVG	42.4	22.9	8.7	11.9	36.5	22.6	11.4	13.6	38.3	22.7	12.5	15.9	
2-Sep-19	Max	75.0	53.4	15.6	19.3	73.2	51.6	13.8	17.5	75.6	54.0	16.2	19.9	
	Min	47.7	18.0	13.1	14.0	45.9	16.2	11.3	12.2	48.3	18.6	13.7	14.6	
	AVG	61.4	35.7	14.4	16.7	59.6	33.9	12.6	14.9	62.0	36.3	15.0	17.3	
3-Sep-19	Max	73.0	51.4	13.6	17.3	71.2	49.6	11.8	15.5	73.6	52.0	14.2	17.9	
	Min	45.7	16.0	11.1	12.0	43.9	14.2	9.3	10.2	46.3	16.6	11.7	12.6	
	AVG	59.4	33.7	12.4	14.7	57.6	31.9	10.6	12.9	60.0	34.3	13.0	15.3	
4-Sep-19	Max	70.0	48.4	10.6	14.3	68.2	46.6	8.8	12.5	70.6	49.0	11.2	14.9	
	Min	42.7	13.0	8.1	9.0	40.9	11.2	6.3	7.2	43.3	13.6	8.7	9.6	
	AVG	56.4	30.7	9.4	11.7	54.6	28.9	7.6	9.9	57.0	31.3	10.0	12.3	
5-Sep-19	Max	68.0	46.4	11.3	15.0	66.2	44.6	13.2	16.9	68.6	43.0	18.2	21.9	
	Min	40.7	12.4	7.5	9.7	38.9	15.1	10.2	11.6	41.3	15.8	10.9	16.6	
	AVG	54.4	29.4	9.4	12.4	52.6	29.9	11.7	14.3	55.0	29.4	14.6	19.3	
6-Sep-19	Max	70.0	39.6	14.2	17.9	68.2	46.6	14.3	18.0	70.6	46.4	12.1	15.8	
	Min	42.7	40.9	36.0	12.6	40.9	13.6	8.7	12.7	43.3	12.2	7.3	10.5	
	AVG	56.4	40.3	25.1	15.3	54.6	30.1	11.5	15.4	57.0	29.3	9.7	13.2	
7-Sep-19	Max	65.0	34.2	6.4	10.1	63.2	47.6	9.8	13.5	65.6	35.4	7.6	11.3	
	Min	37.7	13.8	8.9	4.8	35.9	12.2	7.3	8.2	38.3	10.0	5.1	6.0	
	AVG	51.4	24.0	7.7	7.5	49.6	29.9	8.6	10.9	52.0	22.7	6.4	8.7	
8-Sep-19	Max	57.0	29.4	8.6	12.3	55.2	26.9	9.1	12.8	56.4	32.3	14.5	18.2	
	Min	29.7	14.0	9.1	7.0	27.9	11.5	6.6	7.5	29.1	13.9	9.0	12.9	
	AVG	43.4	21.7	8.9	9.7	41.6	19.2	7.9	10.2	42.8	23.1	11.8	15.6	
9-Sep-19	Max	59.0	29.6	11.8	15.5	57.2	26.6	8.8	12.5	59.6	29.2	11.4	15.1	
	Min	31.7	14.2	9.3	10.2	29.9	11.2	6.3	7.2	26.2	13.8	8.9	9.8	
	AVG	45.4	21.9	10.6	12.9	43.6	18.9	7.6	9.9	42.9	21.5	10.2	12.5	
10-Sep-19	Max	57.4	23.8	14.0	17.7	56.3	26.2	18.4	22.1	58.7	18.7	11.6	15.3	
	Min	30.1	15.4	10.5	12.4	29.0	11.9	7.0	16.8	24.5	14.4	9.5	10.0	
	AVG	43.8	19.6	12.3	15.1	42.7	19.1	12.7	19.5	41.6	16.6	10.6	12.7	
11-Sep-19	Max	61.3	30.7	13.9	17.6	59.5	37.9	20.1	23.8	61.9	31.5	13.7	17.4	
	Min	34.0	15.1	11.3	12.3	32.2	15.5	10.6	18.5	24.7	12.2	11.0	12.1	
	AVG	47.7	22.9	12.6	15.0	45.9	26.7	15.4	21.2	43.3	21.9	12.4	14.8	
12-Sep-19	Max	75.6	54.0	16.2	19.9	73.8	52.2	14.4	18.1	76.2	54.6	16.8	20.5	
	Min	48.3	18.6	13.7	14.6	46.5	16.8	11.9	12.8	39.0	19.2	14.3	15.2	
	AVG	62.0	36.3	15.0	17.3	60.2	34.5	13.2	15.5	57.6	36.9	15.6	17.9	
13-Sep-19	Max	72.3	50.7	12.9	16.6	74.1	52.5	14.7	18.4	76.5	54.9	17.1	20.8	
	Min	45.0	15.3	10.4	11.3	46.8	17.1	12.2	13.1	42.8	19.5	13.1	15.5	
	AVG	58.7	33.0	11.7	14.0	60.5	34.8	13.5	15.8	59.7	37.2	15.1	18.2	
14-Sep-19	Max	76.6	55.0	17.2	21.9	74.8	53.2	27.9	31.6	77.2	55.6	17.8	21.5	
	Min	49.3	19.6	14.7	21.7	47.5	23.8	18.9	26.3	49.9	20.2	15.3	16.2	
	AVG	63.0	37.3	16.0	21.8	61.2	38.5	23.4	29.0	63.6	37.9	16.6	18.9	
15-Sep-19	Max	74.8	53.2	15.4	19.1	73.0	51.4	33.6	37.3	75.4	53.8	16.0	19.7	
	Min	47.5	17.8	12.9	13.8	45.7	36.0	31.1	32.0	48.1	18.4	13.5	14.4	
	AVG	61.2	35.5	14.2	16.5	59.4	43.7	32.4	34.7	61.8	36.1	14.8	17.1	

16-Sep-19	Max	57.0	35.4	17.6	21.3	55.2	36.6	18.8	22.5	57.6	36.0	18.2	21.9
	Min	29.7	20.0	15.1	16.0	27.9	13.0	8.1	17.2	30.3	20.6	15.7	16.6
	AVG	43.4	27.7	16.4	18.7	41.6	24.8	13.5	19.9	44.0	28.3	17.0	19.3
17-Sep-19	Max	55.4	33.8	16.0	19.7	57.2	35.6	17.8	21.5	59.6	38.0	20.2	23.9
	Min	28.1	18.4	13.5	14.4	29.9	20.2	15.3	16.2	32.3	22.6	17.7	18.6
	AVG	41.8	26.1	14.8	17.1	43.6	27.9	16.6	18.9	46.0	30.3	19.0	21.3
18-Sep-19	Max	58.0	36.4	18.6	22.3	56.2	34.6	16.8	20.5	58.6	37.0	19.2	22.9
	Min	30.7	21.0	16.1	17.0	28.9	19.2	14.3	15.2	31.3	21.6	16.7	17.6
	AVG	44.4	28.7	17.4	19.7	42.6	26.9	15.6	17.9	45.0	29.3	18.0	20.3
19-Sep-19	Max	59.0	29.5	11.7	15.4	57.2	35.9	18.1	21.8	59.6	38.0	20.2	23.9
	Min	31.7	14.1	9.2	10.1	29.9	15.5	10.6	16.5	32.3	22.6	17.7	18.6
	AVG	45.4	21.8	10.5	12.8	43.6	25.7	14.4	19.2	46.0	30.3	19.0	21.3
20-Sep-19	Max	66.5	44.9	7.1	10.8	64.7	43.1	5.3	9.0	67.1	45.5	7.7	11.4
	Min	39.2	9.5	4.6	5.5	37.4	7.7	2.8	3.7	39.8	10.1	5.2	6.1
	AVG	52.9	27.2	5.9	8.2	51.1	25.4	4.1	6.4	53.5	27.8	6.5	8.8
21-Sep-19	Max	55.0	28.3	12.7	16.4	53.2	31.6	11.4	15.1	55.6	34.0	11.5	15.2
	Min	24.2	18.7	13.8	11.1	22.2	17.0	12.1	9.8	25.2	18.5	9.3	8.6
	AVG	39.6	23.5	13.3	13.8	37.7	24.3	11.8	12.5	40.4	26.3	10.4	11.9
22-Sep-19	Max	59.3	32.6	15.3	19.0	57.5	11.3	12.5	16.2	59.9	14.5	14.2	17.9
	Min	24.7	12.8	7.9	13.7	20.2	19.3	14.4	10.9	23.3	10.5	11.8	11.3
	AVG	42.0	22.7	11.6	16.4	38.9	15.3	13.5	13.6	41.6	12.5	13.0	14.6
23-Sep-19	Max	68.0	38.5	17.7	21.4	66.2	37.9	19.6	23.3	68.6	47.0	29.2	32.9
	Min	40.7	23.1	21.8	16.1	38.9	17.9	16.0	18.0	41.3	11.6	6.7	27.6
	AVG	54.4	30.8	19.8	18.8	52.6	27.9	17.8	20.7	55.0	29.3	18.0	30.3
24-Sep-19	Max	67.7	46.1	8.3	12.0	65.9	44.3	6.5	10.2	68.3	46.7	8.9	12.6
	Min	40.4	10.7	5.8	6.7	38.6	8.9	4.0	4.9	41.0	11.3	6.1	7.3
	AVG	54.1	28.4	7.1	9.4	52.3	26.6	5.3	7.6	54.7	29.0	7.7	10.0
25-Sep-19	Max	70.0	43.2	5.4	9.1	65.8	44.2	6.4	10.1	64.9	43.3	5.5	9.2
	Min	42.7	7.8	2.9	3.8	38.5	8.8	3.9	4.8	37.6	7.9	3.0	3.9
	AVG	56.4	25.5	4.2	6.5	52.2	26.5	5.2	7.5	51.3	25.6	4.2	6.5
26-Sep-19	Max	66.0	32.4	14.6	18.3	64.9	29.5	11.7	15.4	67.3	27.3	12.0	15.7
	Min	38.7	17.0	16.8	13.0	37.6	14.1	9.2	10.1	33.1	7.9	6.7	10.4
	AVG	52.4	24.7	15.7	15.7	51.3	21.8	10.5	12.8	50.2	17.6	9.4	13.1
27-Sep-19	Max	65.0	34.4	6.6	10.3	63.2	41.6	23.8	27.5	64.0	42.4	24.6	28.3
	Min	37.7	14.0	9.1	5.0	35.9	26.2	21.3	22.2	36.7	27.0	22.1	23.0
	AVG	51.4	24.2	7.9	7.7	49.6	33.9	22.6	24.9	50.4	34.7	23.4	25.7
28-Sep-19	Max	64.0	42.4	24.6	28.3	62.2	40.6	22.8	26.5	64.6	43.0	25.2	28.9
	Min	36.7	27.0	22.1	23.0	34.9	25.2	20.3	21.2	30.9	27.6	21.2	23.6
	AVG	50.4	34.7	23.4	25.7	48.6	32.9	21.6	23.9	47.8	35.3	23.2	26.3
29-Sep-19	Max	67.3	45.7	17.9	21.6	65.5	43.9	6.1	9.8	67.9	47.3	9.5	13.2
	Min	40.0	30.3	25.4	16.3	38.2	8.5	3.6	4.5	40.6	11.9	7.0	7.9
	AVG	53.7	38.0	21.7	19.0	51.9	26.2	4.9	7.2	54.3	29.6	8.3	10.6
30-Sep-19	Max	57.0	30.3	24.5	28.2	55.2	20.0	12.0	15.7	57.6	28.3	20.5	27.2
	Min	29.7	14.9	19.8	22.9	27.9	13.0	11.8	10.4	30.3	22.9	18.0	25.9
	AVG	43.4	22.6	22.2	25.6	41.6	16.5	11.9	13.1	44.0	25.6	19.3	26.6

CEMS DAYWISE VALUES FOR THE MONTH OF APR '2019										
S.NO.	S.NO.	UNIT# 1 LOAD(MW)	UNIT# 1 SOX(mg/nm3)			UNIT# 1 NOX(mg/nm3)			UNIT# 1 DUST(mg/nm3)	
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Apr-19	594.62	944.85	905.27	987.71	282.11	256.21	297.1	46.55	43.61	49.05
2	2-Apr-19	610.85	958.44	907.06	986.79	278.02	263.4	295.37	45.94	42.02	49.27
3	3-Apr-19	627.68	963.48	940.02	994.91	285.13	266.78	297.11	46.82	44.4	49.44
4	4-Apr-19	628.43	967.13	938.16	987.22	282.25	263.54	295.81	46.97	44.59	48.98
5	5-Apr-19	558.6	931.21	884.15	985.91	276.85	262.36	294.35	45.02	41.33	49.43
6	6-Apr-19	589.49	949.94	911.83	972.18	278.76	264.63	292.03	45.68	43.71	48.96
7	7-Apr-19	627.93	964.16	934.35	991.19	284.85	274.67	297.88	46.18	43.32	49.51
8	8-Apr-19	638.34	968.58	933.21	993.09	283.57	270.31	298.9	47.26	S.NO.	49.33
9	9-Apr-19	629.85	960.64	934.19	990.29	282.45	271.65	296.97	47.13	43.87	49.21
10	10-Apr-19	639.25	967.69	935.83	992.03	286.17	273.69	296.67	46.83	44.24	49.18
11	11-Apr-19	636.84	968.59	943.4	990.32	288.06	273.91	297.39	46.97	44.66	49.48
12	12-Apr-19	636.31	969.4	944.28	988.59	285.12	270.88	295.97	47.41	44.58	49.59
13	13-Apr-19	619.61	960.57	889.43	996.06	282.13	260.19	297.26	46.6	41.64	49.38
14	14-Apr-19	583.48	947.42	876.08	993.18	276.51	254.65	291.7	45.47	40.45	49.37
15	15-Apr-19	528.11	928.77	878.75	987.97	273.05	256.88	292.69	44.62	40.81	48.68
16	16-Apr-19	510.52	914.92	843.58	991.87	270.64	253.77	296.36	43.8	39.45	48.93
17	17-Apr-19	585.3	949.94	889.46	992.25	281.11	251.75	297.8	46.01	S.NO.	49.34
18	18-Apr-19	652.61	972.54	952.04	998.63	286.3	271.72	299.87	47.26	45.27	49.65
19	19-Apr-19	647.17	969.1	909.05	996.08	284.68	266.64	299.37	47.29	42.54	49.79
20	20-Apr-19	642.38	974.35	944.82	997.49	287.19	273.52	299.55	47.7	S.NO.	49.65
21	21-Apr-19	610.55	954.42	880.79	990.61	281.1	254.49	296.81	46.37	42.89	49.13
22	22-Apr-19	629.56	962.54	943.1	985.76	284.92	273.25	296.68	47.23	44.5	49.29
23	23-Apr-19	634.66	963.27	938.26	989.16	286.06	274.07	294.71	46.85	44.84	49.41
24	24-Apr-19	618.39	963.66	926.38	990.03	281.39	269.97	291.48	46.21	43.52	49.3
25	25-Apr-19	624.73	962.81	940.37	983.92	282.7	271.3	296.57	46.51	43.89	49
26	26-Apr-19	638.4	965.19	939.34	995.8	282.78	274.67	293.56	S.NO.	45.08	49.4
27	27-Apr-19	612.54	953.2	920.13	988.94	283.21	268.74	297.22	46.52	43.51	48.87
28	28-Apr-19	617.66	959.35	923.96	990.88	284.29	270.25	294.6	46.73	44.05	49.39
29	29-Apr-19	625.06	959.93	938.89	985.44	284.11	271.93	295.53	46.37	44.48	S.NO.
30	30-Apr-19	619.36	957.58	911.27	992.7	279.61	272.12	289.94	46.58	42.48	49.31

CEMS DAYWISE VALUES FOR THE MONTH OF MAY '2019											
S.NO.	**DATE**	**UNIT# 1 LOAD(MW)**	**UNIT# 1 SOX(mg/nm3)**			**UNIT# 1 NOX(mg/nm3)**			**UNIT# 1 DUST(mg/nm3)**		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-May-19	539.9	930.6	896.0	968.6	274.7	260.8	296.4	44.9	42.2	48.0
2	2-May-19	560.5	943.5	912.1	986.4	275.0	259.6	294.7	45.3	42.1	48.8
3	3-May-19	521.8	923.0	888.9	955.1	269.9	256.1	294.7	44.4	41.8	46.3
4	4-May-19	568.3	942.8	905.6	979.9	276.1	259.9	291.5	45.4	42.4	49.1
5	5-May-19	590.5	946.3	919.5	968.5	278.9	265.8	295.0	46.0	43.3	48.9
6	6-May-19	602.6	950.6	932.1	982.4	279.7	269.1	294.8	45.6	43.8	48.3
7	7-May-19	607.6	950.9	898.5	974.9	281.2	269.9	293.8	46.2	42.8	48.8
8	8-May-19	606.9	956.6	934.6	981.9	279.4	265.4	291.7	46.4	42.5	48.7
9	9-May-19	609.6	953.5	931.5	982.4	283.0	270.0	292.1	46.2	43.8	48.7
10	10-May-19	618.5	953.4	928.5	975.6	283.0	271.5	293.8	46.6	43.2	49.2
11	11-May-19	623.5	961.5	934.7	988.9	283.4	272.2	294.8	46.6	43.8	48.9
12	12-May-19	597.5	945.7	910.7	978.2	282.2	265.5	294.8	45.9	42.1	49.0
13	13-May-19	273.8	933.3	907.8	965.4	276.2	258.4	290.6	44.7	42.3	45.9
14	14-May-19	Unit in shutdown condition									
15	15-May-19	Unit in shutdown condition									
16	16-May-19	Unit in shutdown condition									
17	17-May-19	Unit in shutdown condition									
18	18-May-19	Unit in shutdown condition									
19	19-May-19	216.2	944.6	860.1	985.8	278.9	253.6	294.8	45.8	40.7	49.0
20	20-May-19	635.5	966.0	941.8	991.1	284.9	274.7	296.8	47.0	44.9	49.4
21	21-May-19	634.4	963.6	918.9	991.4	283.8	268.5	297.1	46.8	43.7	49.4
22	22-May-19	611.0	956.4	885.3	990.7	281.7	258.3	296.4	46.4	41.7	49.3
23	23-May-19	654.9	972.8	951.0	999.5	286.7	276.2	297.0	47.3	45.2	49.0
24	24-May-19	604.9	946.8	894.3	990.0	277.9	259.5	296.5	45.6	41.9	49.3
25	25-May-19	633.1	965.2	899.1	993.0	284.7	262.2	297.8	47.0	42.4	49.6
26	26-May-19	625.8	960.2	875.7	989.9	282.7	253.2	296.2	46.5	40.6	49.2
27	27-May-19	638.9	966.8	943.8	988.7	285.0	273.2	295.9	47.0	44.6	49.2
28	28-May-19	645.0	970.8	930.9	992.2	286.5	270.0	296.2	47.3	44.0	49.2
29	29-May-19	603.1	954.6	913.2	984.5	281.6	264.4	294.9	46.3	42.9	49.0
30	30-May-19	611.4	956.8	920.7	980.5	282.2	271.4	**S.NO.**	46.4	44.3	48.7
31	31-May-19	616.9	958.9	880.6	994.5	282.8	254.6	298.0	46.6	40.9	49.6

CEMS DAYWISE VALUES FOR THE MONTH OF JUN '2019										
S.NO.	S.NO.	UNIT# 1 LOAD(MW)	UNIT# 1 SOX(mg/nm3)			UNIT# 1 NOX(mg/nm3)			UNIT# 1 DUST(mg/nm3)	
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Jun-19	602.19	955.48	904.64	985.07	281.89	261.73	293.58	46.38	42.35	48.72
2	2-Jun-19	592.61	946.08	889.95	991.73	278.45	260.3	296.69	45.69	42.06	49.34
3	3-Jun-19	489.66	910.69	876.52	983.71	268.07	253.94	293.81	43.61	40.79	48.76
4	4-Jun-19	517.82	920.38	875.34	992.99	270.9	253.5	297.50	44.18	40.7	48.50
5	5-Jun-19	606.7	952.5	893.9	986.75	280.31	260.99	293.41	46.06	42.2	48.68
6	6-Jun-19	602.97	951.39	884.66	994.33	280.34	258.01	297.85	46.07	41.6	48.57
7	7-Jun-19	630.46	962.79	928.49	994.26	283.73	270.57	297.70	46.75	44.11	48.54
8	8-Jun-19	598.71	948.53	881.4	984.86	279.2	256.05	293.72	45.84	41.21	48.74
9	9-Jun-19	552.37	932.19	884.91	979.80	274.64	258.19	291.33	44.93	41.64	48.27
10	10-Jun-19	534.8	930.61	880.18	986.82	274.87	255.55	295.14	44.97	41.11	49.03
11	11-Jun-19	529.68	927.6	880.67	967.38	273.39	255.65	287.36	44.68	41.13	47.47
12	12-Jun-19	529.43	925.14	872.76	985.29	273.17	252.09	293.93	44.63	40.42	48.79
13	13-Jun-19	525.53	927.94	873.86	990.24	274.71	252.51	296.38	44.94	40.5	49.28
14	14-Jun-19	563.22	935.7	877.38	982.41	275.55	254.11	294.13	45.13	40.82	48.83
15	15-Jun-19	591.97	951.6	901.82	996.31	281.17	263.67	298.21	46.23	42.73	48.64
16	16-Jun-19	568.05	940.24	872.28	993.81	277.57	251.85	298.14	45.5	40.37	47.63
17	17-Jun-19	552.3	930.53	877.7	987.29	273.89	254.42	294.67	44.78	40.88	48.93
18	18-Jun-19	574.59	947.72	896.47	991.92	280.62	263.68	296.86	46.12	42.74	49.37
19	19-Jun-19	606.02	950.71	914.57	985.35	279.67	264.82	295.36	45.93	42.96	49.07
20	20-Jun-19	631.47	963.6	940.65	986.94	283.7	272.86	295.33	46.74	44.57	49.07
21	21-Jun-19	610.44	959.6	925.2	987.27	283.74	267.94	295.74	46.75	43.59	S.NO.
22	22-Jun-19	643.4	966.16	939.37	991.93	284.28	272.34	297.42	46.86	44.47	49.48
23	23-Jun-19	535.82	931.57	873.2	980.19	275.77	252.02	293.63	45.15	40.4	48.73
24	24-Jun-19	554.99	933.88	877.82	972.39	275.24	253.56	290.17	45.05	40.71	48.03
25	25-Jun-19	635.85	965.53	944.93	986.14	284.35	274.47	295.40	46.87	44.89	49.08
26	26-Jun-19	605.59	952.19	897.02	985.31	280.41	262.36	294.43	46.08	42.47	48.89
27	27-Jun-19	550.43	934.75	876.96	986.18	275.68	253.96	293.68	45.14	40.79	48.74
28	28-Jun-19	468.72	900.52	875.02	969.98	264.86	253.17	289.94	42.97	40.63	47.99
29	29-Jun-19	479.57	903.07	874.3	986.18	265.04	252.73	294.91	43.01	40.55	48.98
30	30-Jun-19	495.89	910.02	875.88	979.17	268.34	253.75	291.14	43.67	40.75	48.23

CEMS DAYWISE VALUES FOR THE MONTH OF JUL '2019											
S.NO.	DATE	UNIT# 1 LOAD(MW)	UNIT# 1 SOX(mg/nm3)			UNIT# 1 NOX(mg/nm3)			UNIT# 1 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Jul-19	502.38	495.47	880.47	554.35	187.99	174.84	198.25	42.29	35.45	48.44
2	2-Jul-19	519.71	457.48	842.48	588.84	186.97	166.93	244.22	48.5	48.44	48.94
3	3-Jul-19	544.96	475.86	860.86	585.69	191.41	158.64	246.56	48.59	48.45	48.98
4	4-Jul-19	538.5	481.93	866.93	587.16	249.93	191.6	299.5	48.63	48.47	48.98
5	5-Jul-19	514.72	581.76	966.76	649.05	275.26	204.49	299.3	48.55	48.55	48.55
6	6-Jul-19	475.35	558.02	943.02	665.96	193.87	170.26	273.15	48.55	48.55	48.55
7	7-Jul-19	460.82	562.91	947.91	660.01	213.29	170.38	259.12	48.55	48.55	48.55
8	8-Jul-19	498.6	632.69	1017.69	671.84	224.33	187.27	269.26	48.55	48.55	48.55
9	9-Jul-19	530.09	543.8	928.8	644.36	274.41	192.01	299.6	48.55	48.55	48.55
10	10-Jul-19	555.4	513.88	898.88	613.96	231.67	190.85	299.7	48.55	48.55	48.55
11	11-Jul-19	546.6	479.33	864.33	537.72	252.78	196.73	298.4	48.55	48.55	48.55
12	12-Jul-19	580.74	482.7	867.7	530.98	264.9	188.09	297.6	48.55	48.55	48.55
13	13-Jul-19	566.81	549.71	934.71	661.02	249.17	195.41	299.4	48.55	48.55	48.55
14	14-Jul-19	507.26	474.66	859.66	611.11	209.25	175.3	271.1	48.5	48.46	48.98
15	15-Jul-19	514.83	398.93	783.93	448.07	188.65	174.56	211.52	48.57	48.48	48.98
16	16-Jul-19	624.53	468.5	853.5	516.7	235.15	198.34	S.NO.	48.72	48.48	48.99
17	17-Jul-19	627.39	613.32	998.32	1089.56	235.31	189.4	277.52	48.56	48.49	49
18	18-Jul-19	643.88	952.19	832.19	1097.25	286.13	197.17	286.4	48.54	48.49	49
19	19-Jul-19	639.51	928.81	833.84	1045.6	254.02	193.76	291.9	48.5	48.5	48.5
20	20-Jul-19	629.41	836.61	701.08	1031.21	279.17	241.06	297.1	48.48	48.47	48.5
21	21-Jul-19	604.19	937.91	807.67	1012.64	258.04	194.75	294.28	48.47	48.47	48.47
22	22-Jul-19	612.18	871.1	787.71	979.68	289.69	254.43	289.3	48.5	48.47	48.99
23	23-Jul-19	606.73	1018.41	1004.85	1029.36	292.18	261.2	S.NO.	48.54	48.48	49
24	24-Jul-19	505.13	1031.81	1002.15	1059.37	295.37	244.75	298.3	48.5	48.5	48.5
25	25-Jul-19	460.09	999.42	895.43	1026.69	248.51	193.74	277.37	48.39	48.18	48.5
26	26-Jul-19	452.04	889.15	728.94	1010.51	178.99	164.74	196.79	48.18	48.18	48.18
27	27-Jul-19	458.23	919.15	799.1	1015.64	192.83	177.66	235.84	48.18	48.18	48.18
28	28-Jul-19	456.31	949.36	820.19	1021.83	189.94	178.65	199.15	48.18	48.18	48.18
29	29-Jul-19	464.18	934.98	861.25	1010.74	229.8	179.72	291.46	48.25	48.18	48.69
30	30-Jul-19	466.64	976.34	863.5	1027.35	206.4	180.25	288.27	48.69	48.69	48.69
31	31-Jul-19	493.66	845.08	772.26	937.16	239.26	172.84	293.93	48.69	48.69	48.69

CEMS DAYWISE VALUES FOR THE MONTH OF AUG '2019											
S.NO.	DATE	UNIT# 1 LOAD(MW)	UNIT# 1 SOX(mg/nm3)			UNIT# 1 NOX(mg/nm3)			UNIT# 1 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Aug-19	525.25	871.1	831.57	902.35	224.54	183.84	286.86	48.69	48.69	48.69
2	2-Aug-19	511.76	876.12	842.02	912.59	218.52	184.35	267.82	48.69	48.69	48.69
3	3-Aug-19	542.42	862.28	809.91	888.41	206.99	180.59	258.59	48.69	48.69	48.69
4	4-Aug-19	493.31	872.46	834.6	906.76	191.67	177.23	232.85	48.69	48.69	48.69
5	5-Aug-19	515.72	852.55	824.64	889.22	209.86	174.24	272.92	48.7	48.69	48.74
6	6-Aug-19	521.42	851.71	824.66	894.93	232.22	190.34	276.32	48.74	48.74	48.74
7	7-Aug-19	493.7	874.58	831.28	921.86	266.74	193.18	300	48.25	42.92	48.74
8	8-Aug-19	480.47	903.03	848.65	941.37	263.56	254.03	281.3	43.68	40.6	47.58
9	9-Aug-19	508.81	872.46	834.6	906.76	269.51	253.4	285.36	44.27	40.66	48.32
10	10-Aug-19	508.94	852.55	824.64	889.22	270.27	256.17	286.45	44.33	40.44	S.NO.
11	11-Aug-19	536.32	851.71	824.66	894.93	271.98	254.62	292.76	44.62	S.NO.	50.29
12	12-Aug-19	606.4	874.58	831.28	921.86	280.53	259.52	292.45	46.22	40.93	49.46
13	13-Aug-19	599.92	862.28	809.91	888.41	276.95	253.92	287.58	46.27	40.44	49.43
14	14-Aug-19	570.98	872.46	834.6	906.76	273.36	256.51	289.87	45.47	41.45	48.93
15	15-Aug-19	465.87	852.55	824.64	889.22	263.8	254.31	276.92	43.08	40.55	47.34
16	16-Aug-19	486.31	851.71	824.66	894.93	265.83	253.18	287.12	43.65	40.21	48.93
17	17-Aug-19	588.51	902.55	832.42	946.18	278.21	253.05	293.41	46.37	41.47	50.13
18	18-Aug-19	584.03	896.76	839.29	945.15	273.94	253.13	287.91	45.9	41.26	50.09
19	19-Aug-19	627.93	910.85	891.78	937.03	282.78	271.16	290.93	46.31	44.32	49.51
20	20-Aug-19	643.33	920.46	895.67	944.28	284.31	273.46	293.15	47.11	44.48	49.79
21	21-Aug-19	613.66	906.99	860.22	930.92	281.09	262.92	290.26	46.31	42.42	48.88
22	22-Aug-19	535.31	874.58	831.28	921.86	270.81	256.98	289.88	44.57	41.12	48.31
23	23-Aug-19	589.49	903.03	848.65	941.37	280.51	264.48	293.31	46.21	42.77	49.85
24	24-Aug-19	517.07	868.16	826.4	928.85	267.59	253.8	288.34	44.24	40.62	48.94
25	25-Aug-19	511.09	873.09	827.34	918.66	268.38	252.3	284.21	44.64	40.77	48.56
26	26-Aug-19	519.66	871.1	831.57	902.35	271.96	260.3	284.07	44.2	41.04	47.25
27	27-Aug-19	531.66	876.12	842.02	912.59	271.92	262.95	286.73	44.54	41.38	48.07
28	28-Aug-19	487.38	862.28	809.91	888.41	264	250.49	273.81	44.13	39.6	46.96
29	29-Aug-19	524.18	872.46	834.6	906.76	269.44	256.76	280.35	44.32	41.89	47.68
30	30-Aug-19	467.97	852.55	824.64	889.22	263.88	253.18	280.82	43.39	40.38	46.36
31	31-Aug-19	475.56	851.71	824.66	894.93	265.1	252.93	276.27	43.07	40.35	47.33

CEMS DAYWISE VALUES FOR THE MONTH OF SEP '2019										
S.NO.	S.NO.	UNIT# 1 LOAD(MW)	UNIT# 1 SOX(mg/nm3)			UNIT# 1 NOX(mg/nm3)			UNIT# 1 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Sep-19	496.79	866.24	829.66	910.67	267.17	255.32	280.79	44.35	41.27	47.93
2	2-Sep-19	509.03	862.75	824.26	921.42	267.83	255.17	284.27	43.58	40.35	48.15
3	3-Sep-19	555.34	890.96	835.16	922.28	274.31	257.32	287.53	45.83	41.33	48.52
4	4-Sep-19	530.22	876.67	826.78	924.58	269.59	255.74	285.33	44.92	40.7	48.93
5	5-Sep-19	496.78	859.77	823.79	904.47	267.02	254.64	283.7	43.68	40.4	47.4
6	6-Sep-19	475.27	848.77	821.55	904.38	263.37	251.97	276.59	42.8	40.16	47.07
7	7-Sep-19	425.06	838.18	800.63	863.27	259.76	250.76	270.07	42.89	39.27	45.23
8	8-Sep-19	400.93	823.54	792.48	845.16	254.01	244.71	267.52	41.69	38.53	44.38
9	9-Sep-19	403.6	826.31	799.97	851.27	258.03	247.49	267.39	S.NO.	39.08	44.65
10	10-Sep-19	413.22	833.29	806.65	851.52	256.46	249.42	267.24	42.57	39.26	44.88
11	11-Sep-19	S.NO.	828.53	804.47	853.65	257.96	249.25	266.98	41.87	39.26	44.61
12	12-Sep-19	464.65	844.23	816.96	879.21	263.15	254.92	272.34	42.47	40.03	46.32
13	13-Sep-19	454.55	847.55	827.41	869.74	261.37	252.81	270.6	43.27	40.9	45.97
14	14-Sep-19	452.14	842.24	820.8	869.05	263.21	256.14	270.77	42.62	40.2	45.83
15	15-Sep-19	452.26	850.68	824.62	870.79	261.22	252.46	271.8	43.59	40.49	46.02
16	16-Sep-19	S.NO.	878.07	822.1	913.22	270.53	253.66	282.32	S.NO.	40.31	47.67
17	17-Sep-19	574.86	888.67	868.78	914.87	276.91	266.12	285.98	44.95	42.76	48.18
18	18-Sep-19	568.49	893.38	859.64	920.1	274.59	260.41	285.02	45.73	42.7	48.38
19	19-Sep-19	70.25	825.95	786.56	865.35	256.99	254.16	259.82	42.01	38.61	45.41
20	20-Sep-19	Unit in shutdown condition									
21	21-Sep-19	Unit in shutdown condition									
22	22-Sep-19	Unit in shutdown condition									
23	23-Sep-19	Unit in shutdown condition									
24	24-Sep-19	Unit in shutdown condition									
25	25-Sep-19	Unit in shutdown condition									
26	26-Sep-19	Unit in shutdown condition									
27	27-Sep-19	Unit in shutdown condition									
28	28-Sep-19	Unit in shutdown condition									
29	29-Sep-19	Unit in shutdown condition									
30	30-Sep-19	Unit in shutdown condition									

CEMS DAYWISE VALUES FOR THE MONTH OF APR '2019											
S.NO.	S.NO.	UNIT# 2 LOAD(MW)	UNIT# 2 SOX(mg/nm3)			UNIT# 2 NOX(mg/nm3)			UNIT# 2 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Apr-19	651.21	972.97	945.49	995.96	287.59	275.06	299.32	32.83	30.7	34.87
2	2-Apr-19	654.76	973.38	948.6	997.31	289	274.33	298.89	S.NO.	30.39	34.4
3	3-Apr-19	649.26	967.36	946.16	992.92	286.27	274.01	297.48	32.26	29.9	34.92
4	4-Apr-19	644.91	967.36	939.87	994.26	285.9	275.73	295.73	32.46	30.04	34.7
5	5-Apr-19	619.76	956.04	929.42	985.19	282.62	272.73	297.43	32.08	29.2	34.11
6	6-Apr-19	605.61	951.64	914.08	982.32	282.9	268.68	295.9	32	29.89	34.34
7	7-Apr-19	650.69	971.7	949.35	995.31	287.24	275.24	298.53	32.62	30.08	34.8
8	8-Apr-19	656.38	973.96	948.48	996.33	285.58	275.36	298.62	33.6	30.62	35.02
9	9-Apr-19	639.23	964.59	939.97	992.18	284.8	272.59	296.51	31.77	29.74	34.24
10	10-Apr-19	652.61	971.43	947.98	996.89	287.37	274.65	298.7	32.72	30.6	34.9
11	11-Apr-19	313.47	952.25	847.85	990.4	286.65	257.76	297.44	32.13	26.59	34.66
12	12-Apr-19	Unit in shutdown condition									
13	13-Apr-19	Unit in shutdown condition									
14	14-Apr-19	259.24	953.66	837.34	987.09	282.95	248.53	297.74	31.77	26.77	34.8
15	15-Apr-19	651.19	974.99	948.56	997.21	284.41	274.79	298.1	31.75	S.NO.	34.97
16	16-Apr-19	653.09	975.69	950.99	998.29	286.19	275.49	298.91	31.98	S.NO.	34.77
17	17-Apr-19	653.56	975.26	946.88	997.59	285.98	274.98	297.23	32.43	30.13	34.47
18	18-Apr-19	431.22	957.96	870.29	996.81	283.22	250.46	298.72	31.89	26.85	34.55
19	19-Apr-19	648.87	973.34	947.73	995.73	288.01	273.41	298.55	32.79	30.22	34.8
20	20-Apr-19	647.91	973.26	948.52	993.98	287.08	274.41	298.17	32.17	30.2	34.53
21	21-Apr-19	652.71	974.89	948.58	995.66	286.68	274.14	298.35	32.61	30.47	34.92
22	22-Apr-19	651.27	969.77	946.75	998.06	286.64	276.29	298.66	32.57	30.04	35
23	23-Apr-19	651.73	966.87	947.03	994.05	286.77	273.15	298.84	32.77	30.09	34.78
24	24-Apr-19	650.97	971.18	947.76	992.56	285.73	276.05	299.95	32.5	30.1	34.93
25	25-Apr-19	649	970.23	951.37	989.75	287.62	272.85	298.88	32.37	29.9	34.71
26	26-Apr-19	648.46	967.56	946.58	994.95	284.48	274.81	298.17	S.NO.	30.18	34.94
27	27-Apr-19	643.98	971.75	949.5	992.36	285.5	273.5	296.2	32.27	29.62	34.77
28	28-Apr-19	652.62	972.77	946.37	991.24	287.45	274.85	298.4	32.64	30.17	34.99
29	29-Apr-19	654.33	973.06	949.74	998.67	285.89	275.38	299.07	32.8	30.69	35.12
30	30-Apr-19	652.15	976.32	950.99	996.24	287.75	S.NO.	297.91	32.61	30.33	34.8

CEMS DAYWISE VALUES FOR THE MONTH OF MAY '2019											
S.NO.	S.NO.	UNIT# 2 LOAD(MW)	UNIT# 2 SOX(mg/nm3)			UNIT# 2 NOX(mg/nm3)			UNIT# 2 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-May-19	553.84	933.63	877.78	991.87	275.59	252.28	298.6	30.98	27.41	34.7
2	2-May-19	622.27	959.65	878.59	996.52	285.04	267.29	299.22	31.84	S.NO.	34.54
3	3-May-19	585.45	947.95	880.84	990.24	276.84	260.31	290.24	S.NO.	29.11	33.99
4	4-May-19	563.35	946.32	904.24	981.76	279.23	266.8	292.52	31.87	S.NO.	33.65
5	5-May-19	600.08	952.23	922.97	979.8	282.46	268.89	297.57	31.89	30.04	33.81
6	6-May-19	598.93	953.41	924.22	985.16	279.56	268	294.85	31.63	29.17	34.49
7	7-May-19	616.18	953.48	921.26	995.84	282.05	266.71	297.03	32.66	30.35	34.91
8	8-May-19	606.38	951.23	921.58	985.77	280.52	268.99	291.36	S.NO.	29.69	34.15
9	9-May-19	616.68	959.92	929.98	995.06	282.87	267.24	299.14	S.NO.	29.33	34.9
10	10-May-19	614.62	956.1	933.39	986.05	281.74	266.87	291.21	31.54	29.24	34.65
11	11-May-19	635.32	966	926.16	997.3	284.02	267.66	296.91	31.9	29.15	34.3
12	12-May-19	604.54	951.06	923.77	994.36	278.67	268.65	290.02	31.48	29.19	33.69
13	13-May-19	625.69	964.96	922.4	996.53	285.78	267.39	298.77	32.46	29.02	34.78
14	14-May-19	653.22	973.42	948.34	998.26	288.43	273.81	298.35	32.4	30.2	34.75
15	15-May-19	643.71	968.37	948.31	994.17	286.15	273.88	297.35	32.5	30.12	34.83
16	16-May-19	653.33	972	948.41	996.87	287.29	275.1	298.27	32.47	30.08	34.84
17	17-May-19	653.15	974.05	951.22	997.46	285.07	274.66	296.2	32.33	S.NO.	34.46
18	18-May-19	652.04	970.66	946.11	996.42	283.74	273.96	297.92	32.59	30.14	35.04
19	19-May-19	652.42	975.27	950.54	995.69	289.53	278.1	298.43	32.63	30.54	34.41
20	20-May-19	639.74	961.67	922.36	991.11	285.15	274.12	297.27	S.NO.	29.72	34.39
21	21-May-19	652.55	974.85	948.51	998.14	285.22	274.42	299.07	32.49	30.16	34.97
22	22-May-19	655.33	970.75	953.96	996.34	286.31	274.2	297.22	32.42	30.15	35.03
23	23-May-19	652.17	971.91	947.99	995.94	284.92	274.72	295.75	32.26	29.98	34.76
24	24-May-19	495.48	967.06	920.42	997.13	286.68	275.22	297.91	33.04	30.47	35.02
25	25-May-19	Unit in shutdown condition									
26	26-May-19	Unit in shutdown condition									
27	27-May-19	Unit in shutdown condition									
28	28-May-19	365.76	956.57	837.8	996.38	282.05	241.5	298.8	31.97	25.64	34.97
29	29-May-19	635.83	962.23	940.93	992.82	282.84	273.56	297.12	31.89	29.97	34.65
30	30-May-19	650.74	970.33	951.68	995.45	285.91	277.32	298.51	32.41	S.NO.	34.93
31	31-May-19	650.53	972.17	947.78	996.17	286.8	274.62	298.58	32.58	30.15	34.92

CEMS DAYWISE VALUES FOR THE MONTH OF JUN '2019											
S.NO.	DATE	UNIT# 2 LOAD(MW)	UNIT# 2 SOX(mg/nm3)			UNIT# 2 NOX(mg/nm3)			UNIT# 2 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Jun-19	650.99	965.83	947.31	993.9	283.59	274.28	297.7	31.91	30.07	34.76
2	2-Jun-19	627.82	960.36	871.86	995.7	282.75	251.73	297.7	31.91	27.03	34.75
3	3-Jun-19	632.63	968.57	929.71	997.7	286.46	272.32	298.9	32.64	30.34	35.14
4	4-Jun-19	640.13	970.49	910.07	995.5	286.85	264.38	298.2	32.67	28.93	34.87
5	5-Jun-19	648.16	970.54	948.43	996.4	286.1	275.41	298.9	32.48	30.27	34.99
6	6-Jun-19	651.37	967.67	947.8	993.2	284.52	274.85	297.0	32.14	30.22	34.61
7	7-Jun-19	515.91	967.93	930.66	998.3	284.84	270.02	299.1	32.2	29.61	34.97
8	8-Jun-19	605.94	963.78	915.44	992.0	283.56	274.41	296.3	32.01	30.24	34.43
9	9-Jun-19	626.42	959.5	900.38	992.6	282.49	265.62	296.8	31.92	29.74	34.57
10	10-Jun-19	642.18	968.48	942.15	998.0	285.51	273.77	299.2	32.4	30	35.01
11	11-Jun-19	636.25	967.55	942.18	994.0	285.23	274.3	297.7	32.36	30.19	34.76
12	12-Jun-19	613.07	957.16	875.69	997.7	282.41	253.59	299.0	31.99	27.12	34.96
13	13-Jun-19	644	965.73	947.54	993.9	284.12	274.66	298.1	32.13	30.17	34.74
14	14-Jun-19	654.75	974.95	950.63	997.2	287.93	275.54	298.7	32.77	30.28	34.9
15	15-Jun-19	649.61	969.25	943.74	992.0	285.44	273.21	296.8	32.32	29.93	34.6
16	16-Jun-19	643.73	967.43	926.4	995.9	284.96	272.26	298.6	32.24	30.16	34.95
17	17-Jun-19	648.27	969.77	948.64	996.6	285.77	275.11	298.9	32.36	30.25	35.01
18	18-Jun-19	652.96	972.73	946.19	995.9	286.9	273.9	297.9	32.57	30.01	34.73
19	19-Jun-19	642.99	968.94	942.62	997.1	285.83	273.63	299.1	32.46	30.1	34.92
20	20-Jun-19	622.78	961.81	913.24	996.6	283.78	264.49	298.8	32.12	28.78	34.97
21	21-Jun-19	618.14	963.42	926.99	995.0	284.45	272.02	297.9	32.35	30.38	34.78
22	22-Jun-19	651.95	975.21	950.52	993.2	288.21	275.94	297.1	32.87	30.41	35.06
23	23-Jun-19	654.91	973.06	951.4	998.6	286.95	275.68	299.2	32.54	30.5	34.93
24	24-Jun-19	633.95	970.83	916.52	997.2	287.51	267.2	299.1	32.86	29.46	35.01
25	25-Jun-19	651.1	971.47	947.42	995.5	286.42	274.65	298.6	32.49	30.18	34.94
26	26-Jun-19	651.99	974.44	949.29	994.8	287.83	275.24	297.9	32.8	30.26	34.8
27	27-Jun-19	650.51	967.95	947.18	995.9	284.7	274.4	298.7	32.18	30.11	34.84
28	28-Jun-19	507.4	914.45	875.76	986.9	269.7	253.3	294.0	30.23	27.13	34.02
29	29-Jun-19	492.91	912.63	870.14	991.7	268.73	251.29	296.7	30.12	26.99	34.57
30	30-Jun-19	537.92	924.28	876.47	991.2	272.09	253.78	296.3	30.54	27.42	34.49

CEMS DAYWISE VALUES FOR THE MONTH OF JUL '2019											
S.NO.	DATE	[# 2 LOAD(	UNIT# 2 SOX(mg/nm3)			UNIT# 2 NOX(mg/nm3)			UNIT# 2 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Jul-19	561.09	939.15	878.54	995.21	277.07	254.49	298.24	31.3	27.72	34.86
2	2-Jul-19	633.01	958.36	923.97	995.8	281.32	269.55	298.56	31.61	29.46	34.93
3	3-Jul-19	602.89	953.34	896.07	988.71	281.29	263.36	295.8	31.85	29.31	34.45
4	4-Jul-19	593.05	948.48	875.62	988.28	279.66	253.65	294.83	31.62	27.42	34.38
5	5-Jul-19	573.85	941.72	873.59	994.2	277.88	252.51	297.73	31.37	27.18	34.77
6	6-Jul-19	563.42	938.22	879.28	991.16	276.98	255.03	295.96	31.34	27.65	34.38
7	7-Jul-19	521.92	919.46	880.07	973.89	270.97	255.4	291.24	30.46	27.86	33.82
8	8-Jul-19	545.22	924.98	878.35	983.2	271.84	254.83	293.64	30.41	27.59	34.08
9	9-Jul-19	573.18	941.63	890.62	992.26	277.68	258.22	297.23	31.4	28.05	34.71
10	10-Jul-19	632.27	963.26	931.06	989.94	283.92	270	296.62	32.15	29.59	34.67
11	11-Jul-19	567.28	935.67	874.38	984.23	275.06	252.56	292.58	30.86	27.15	33.72
12	12-Jul-19	657.73	970.17	945.58	996.11	285.3	273.92	298.08	32.22	30.05	34.77
13	13-Jul-19	621.61	958.74	S.NO.	994.74	282.54	253.11	297.77	31.95	27.26	34.79
14	14-Jul-19	595.95	954.14	888.04	990.47	282.3	259.74	296.26	32.1	28.62	34.5
15	15-Jul-19	621.64	957.64	879.27	994.98	281.9	255.3	298.17	31.8	27.73	34.85
16	16-Jul-19	653.49	971.9	954.8	998.47	286.46	277.88	299.14	32.49	30.87	34.97
17	17-Jul-19	655.95	971.92	946.4	995.51	286.27	273.97	297.9	32.41	30.02	34.49
18	18-Jul-19	651.57	974.79	942.03	997.06	288.07	272.64	298.76	32.83	29.84	35
19	19-Jul-19	651.54	971.95	952.97	996.42	286.61	276.74	298.84	32.56	30.53	34.98
20	20-Jul-19	653.8	970.93	950.26	997.35	285.95	275.79	299.01	32.41	30.37	34.99
21	21-Jul-19	529.72	958.48	880.97	997.11	282.52	262.62	299.12	31.98	29.82	35.03
22	22-Jul-19	Unit in shutdown condition									
23	23-Jul-19	Unit in shutdown condition									
24	24-Jul-19	320.82	935.97	871.6	988.86	275.73	258.13	294.75	31.15	28.83	34.13
25	25-Jul-19	537.46	922.59	874	978.43	271.31	252.72	290.67	30.41	27.22	33.89
26	26-Jul-19	505.95	918.52	874.67	985.02	271.4	253.07	295.17	30.61	27.29	34.44
27	27-Jul-19	477.49	904.14	875.46	965.63	265.76	253.44	286.56	29.64	27.37	32.83
28	28-Jul-19	512.15	923.59	879.48	991.72	272.97	255.29	296.42	30.84	27.72	34.49
29	29-Jul-19	559.73	934.43	880.13	985.31	275.38	255.92	294.26	31.05	27.87	34.16
30	30-Jul-19	S.NO.	922.67	875.52	980.74	271.88	253	293.13	30.5	27.23	34.05
31	31-Jul-19	570.26	942.67	883.52	991.2	278.18	257.83	295.98	31.43	28.28	34.39

CEMS DAYWISE VALUES FOR THE MONTH OF AUG '2019											
S.NO.	DATE	UNIT# 2 LOAD(MW)	UNIT# 2 SOX(mg/nm3)			UNIT# 2 NOX(mg/nm3)			UNIT# 2 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Aug-19	Unit in shutdown condition									
2	2-Aug-19	Unit in shutdown condition									
3	3-Aug-19	Unit in shutdown condition									
4	4-Aug-19	Unit in shutdown condition									
5	5-Aug-19	Unit in shutdown condition									
6	6-Aug-19	Unit in shutdown condition									
7	7-Aug-19	Unit in shutdown condition									
8	8-Aug-19	Unit in shutdown condition									
9	9-Aug-19	Unit in shutdown condition									
10	10-Aug-19	Unit in shutdown condition									
11	11-Aug-19	Unit in shutdown condition									
12	12-Aug-19	Unit in shutdown condition									
13	13-Aug-19	Unit in shutdown condition									
14	14-Aug-19	Unit in shutdown condition									
15	15-Aug-19	Unit in shutdown condition									
16	16-Aug-19	Unit in shutdown condition									
17	17-Aug-19	Unit in shutdown condition									
18	18-Aug-19	Unit in shutdown condition									
19	19-Aug-19	Unit in shutdown condition									
20	20-Aug-19	Unit in shutdown condition									
21	21-Aug-19	Unit in shutdown condition									
22	22-Aug-19	321.11	947.1	839.64	988.75	279.36	246.01	294.71	45.92	39.21	48.94
23	23-Aug-19	651.65	966.81	941.69	994.27	285.59	273.93	297.73	47.05	44.79	49.55
24	24-Aug-19	624.84	927.07	920.05	991.03	281.97	268.23	296.73	46.53	43.65	49.44
25	25-Aug-19	640.14	965.42	933.1	997.66	284.21	273.25	295.74	46.89	44.65	48.91
26	26-Aug-19	638.22	964.09	942.53	993.34	283.36	261.01	297.71	46.78	44.6	49.54
27	27-Aug-19	603.65	948.73	911.52	982.67	278.75	264.43	295.03	45.87	42.89	49.03
28	28-Aug-19	531.38	932.99	913.26	966.66	271.79	262.01	282.58	44.44	42.01	46.52
29	29-Aug-19	541.94	936.05	914.03	956.56	274.12	262.13	283.51	44.71	42.43	46.7
30	30-Aug-19	576.95	931.45	899.15	966.98	271.72	232.02	289.99	44.78	42.26	48
31	31-Aug-19										

CEMS DAYWISE VALUES FOR THE MONTH OF SEP '2019												
S.NO.	S.NO.	UNIT# 2 LOAD(MW)	UNIT# 2 SOX(mg/nm3)			UNIT# 2 NOX(mg/nm3)			UNIT# 2 DUST(mg/nm3)			
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX	
1	1-Sep-19	570.64	939.36	876.11	990.92	276.45	253.74	296.30	45.3	40.8	49.3	
2	2-Sep-19	602.14	959.43	892.22	990.48	284.10	261.73	296.12	46.8	42.4	49.3	
3	3-Sep-19	600.41	948.78	920.21	991.69	279.22	266.32	296.77	45.8	43.3	49.4	
4	4-Sep-19	634.04	963.48	907.54	994.84	283.81	269.62	297.91	46.8	43.9	49.2	
5	5-Sep-19	635.37	965.18	904.67	996.76	284.57	266.64	298.94	47.0	43.3	48.8	
6	6-Sep-19	559.83	932.10	877.13	975.87	274.19	254.42	291.67	44.8	40.9	48.3	
7	7-Sep-19	435.21	888.05	844.91	915.93	261.16	244.31	274.67	42.3	38.9	44.8	
8	8-Sep-19	433.92	888.20	862.87	918.68	261.35	250.56	275.12	42.3	40.1	45.1	
9	9-Sep-19	402.26	870.65	852.66	902.17	254.86	245.93	270.48	40.9	39.1	44.1	
10	10-Sep-19	399.93	879.49	851.70	900.77	259.44	245.62	270.15	41.9	39.1	44.0	
11	11-Sep-19	411.29	878.88	854.56	907.19	258.21	247.03	269.31	41.7	39.4	43.9	
12	12-Sep-19	454.38	895.95	873.48	919.90	263.55	252.35	275.56	42.7	40.5	45.1	
13	13-Sep-19	453.91	898.09	873.71	920.94	264.67	252.50	276.05	42.9	40.5	45.2	
14	14-Sep-19	454.3	899.66	873.34	922.11	265.42	252.68	276.61	43.1	40.5	45.3	
15	15-Sep-19	454.23	891.59	874.11	915.51	261.38	252.72	273.39	42.3	40.4	44.7	
16	16-Sep-19	561.72	938.92	901.46	963.21	276.24	264.52	287.83	45.2	42.9	47.6	
17	17-Sep-19	574.99	946.11	918.52	974.90	279.28	265.70	291.66	45.9	43.1	48.3	
18	18-Sep-19	576.79	944.31	917.80	966.42	278.47	265.37	289.73	45.7	43.1	48.0	
19	19-Sep-19	504.73	919.03	876.85	966.62	271.70	254.14	289.42	44.4	40.8	47.9	
20	20-Sep-19	554.44	931.86	885.23	972.17	274.10	255.96	291.23	44.9	41.2	48.3	
21	21-Sep-19	565.64	937.24	909.31	960.66	275.78	262.96	287.82	45.2	42.6	47.6	
22	22-Sep-19	609.44	956.36	918.27	994.28	281.90	265.78	298.08	46.4	43.2	49.3	
23	23-Sep-19	573.35	942.23	917.96	966.01	277.68	265.55	289.49	45.5	43.1	47.9	
24	24-Sep-19	476.41	904.94	877.25	950.80	266.98	253.54	282.13	43.4	40.7	46.4	
25	25-Sep-19	458.09	906.91	874.27	926.26	268.79	252.96	277.83	43.7	40.6	45.6	
26	26-Sep-19	454.96	897.97	863.64	957.59	264.51	249.63	285.72	42.9	39.9	46.8	
27	27-Sep-19	440.64	889.78	863.22	961.11	261.47	249.32	286.80	42.3	39.9	47.4	
28	28-Sep-19	448.24	897.50	866.21	964.82	264.69	250.68	287.69	43.0	40.1	47.5	
29	29-Sep-19	441.18	897.53	865.41	963.11	265.19	250.46	287.05	43.0	40.1	47.4	
30	30-Sep-19	121.77	879.92	863.2	895.29	258.5	249.58	265.6	41.7	39.9	43.1	

CEMS DAYWISE VALUES FOR THE MONTH OF APR '2019											
S.NO.	S.NO.	UNIT# 3 LOAD(MW)	UNIT# 3 SOX(mg/nm3)			UNIT# 3 NOX(mg/nm3)			UNIT# 3 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Apr-19	653.67	977.25	945.7	997.5	289.1	273.81	298.67	38.51	36.48	40.42
2	2-Apr-19	651.33	971.01	945.31	992.1	286.16	273.62	297.1	38.46	36.24	40.18
3	3-Apr-19	649.15	970.57	945.64	994.62	286.1	273.91	298	38.16	36.14	40.19
4	4-Apr-19	646.06	965.52	944.92	992.41	283.84	273.97	296.45	38.07	36.1	40.05
5	5-Apr-19	622.32	959.95	929.9	986.83	282.98	269.4	295.53	37.57	35.32	39.4
6	6-Apr-19	631.7	961.73	921.86	989.52	282.89	266.71	295.75	37.74	34.68	40.14
7	7-Apr-19	652.86	971.68	949.44	996.16	286.39	275.23	298.5	38.58	36.85	40.28
8	8-Apr-19	648.15	973.57	947.04	996.32	287.67	274.15	298.2	37.99	S.NO.	40.29
9	9-Apr-19	643.86	965.88	944.7	992.03	284.18	273.98	297.45	37.72	36.35	40.18
10	10-Apr-19	652.87	965.07	946.66	989.49	283.11	274.14	295.11	38.19	36.33	40.29
11	11-Apr-19	646	976.6	947.3	995.82	289.37	275.77	298.43	S.NO.	S.NO.	39.81
12	12-Apr-19	648.9	969.8	947.3	995.34	285.62	274.24	298.26	38.52	36.81	40.26
13	13-Apr-19	651.88	971.43	946.63	995.02	286.32	274.64	298.05	38.24	36.51	40.19
14	14-Apr-19	651.07	974.78	948.28	995.94	288.03	275.12	298.64	38.08	36.29	40.07
15	15-Apr-19	653.66	970.6	949.48	997.47	285.76	275.25	299.17	38.08	36.45	40.24
16	16-Apr-19	651.09	971.83	947	994.72	286.61	274.67	297.83	38.16	36.35	40.23
17	17-Apr-19	651.66	978.26	947.95	996.07	289.76	274.68	298.46	38.65	36.46	40.31
18	18-Apr-19	653.83	972.1	952.92	994.65	286.51	276.84	297.82	38.33	36.47	40.37
19	19-Apr-19	655.11	974.44	943.62	997.24	287.57	273.52	298.38	38.38	S.NO.	40.29
20	20-Apr-19	656.25	973.8	951.66	995.7	287.16	275.68	298.5	38.81	36.67	40.37
21	21-Apr-19	653.11	973.46	948.34	998.39	287.27	274.8	299.47	38.21	36.6	40.15
22	22-Apr-19	653.39	973.28	951.35	994.77	287.14	276.09	297.9	38.37	36.69	40.12
23	23-Apr-19	652.88	970.46	947.79	994.9	285.78	274.41	298.06	37.98	36.4	40.03
24	24-Apr-19	653.21	974.88	949.72	996.45	287.95	275.36	298.7	38.64	36.44	40.28
25	25-Apr-19	635.31	962.01	934.63	996.54	282.95	270.75	298.84	37.75	35.48	40.33
26	26-Apr-19	651.57	976.94	949.91	996.16	289.04	275.68	298.43	38.51	36.29	40.3
27	27-Apr-19	651.44	971.7	946.24	997.22	286.5	273.95	299.11	38.64	36.49	40.12
28	28-Apr-19	653.71	972.15	949.7	998.49	286.54	275.2	299.54	37.9	36.35	39.79
29	29-Apr-19	650.06	974.78	948.34	995.03	288.15	275.11	298.32	37.94	36.14	39.92
30	30-Apr-19	647.69	970.34	946.28	993.68	286.11	274.29	297.66	38.2	36.34	39.94

CEMS DAYWISE VALUES FOR THE MONTH OF MAY '2019											
S.NO.	S.NO.	UNIT# 3 LOAD(MW)	UNIT# 3 SOX(mg/nm3)			UNIT# 3 NOX(mg/nm3)			UNIT# 3 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-May-19	549.63	930.96	877.91	986.76	273.87	254.68	294.07	35.75	31.66	40.08
2	2-May-19	624.59	964.33	882.28	995.43	284.68	256.75	298.34	38.17	31.74	40.21
3	3-May-19	583.16	942.68	888.18	988.69	277.6	258.68	295.75	36.13	S.NO.	39.26
4	4-May-19	514.68	925.22	905.42	965.1	273.76	263	288.51	34.75	32.72	37.32
5	5-May-19	586.86	955.47	904.96	984.5	282.66	264.36	294.19	36.79	33.13	39.84
6	6-May-19	601.04	953.12	923.64	985.75	280.95	267.34	293.93	37.32	35.1	39.87
7	7-May-19	617.51	961.33	929.18	992.82	284.1	270.37	297.02	37.48	34.78	39.9
8	8-May-19	590.85	945.2	907.99	980.41	278.24	263.1	290.56	36.88	34.57	39.85
9	9-May-19	618.94	959.32	929.62	991.64	282.55	270.29	296.21	37.39	34.77	40.17
10	10-May-19	616.01	958.13	923.08	996.68	282.65	267.17	298.58	37.29	34.73	39.59
11	11-May-19	638.12	964.81	943.02	992.66	284.14	274.35	296.8	37.77	35.49	39.88
12	12-May-19	606.81	955.79	927.56	988	282.21	269.2	294.78	37.18	34.99	39.39
13	13-May-19	626.72	964.99	927.55	994.91	284.75	269.29	298.01	37.79	35.47	39.88
14	14-May-19	648.1	975.8	952.42	996.6	288.83	277.44	298.98	38.23	36.53	40.19
15	15-May-19	644.99	972.25	949.89	989.6	S.NO.	276.33	296.38	38.31	35.95	40.11
16	16-May-19	651.27	974.67	951.36	995.02	287.99	276.24	298.33	38.1	36.3	40.29
17	17-May-19	651.1	972.34	948.34	995.05	286.85	274.81	298.18	38.24	S.NO.	40.27
18	18-May-19	651.58	969.78	947.4	998.22	285.52	274.24	299.43	38.35	36.58	40.08
19	19-May-19	650.84	968.57	947.92	991.5	284.97	274.63	296.14	38.32	36.36	40.19
20	20-May-19	642.07	966.62	939.5	993.62	284.7	275.25	297.69	37.89	35.8	40.04
21	21-May-19	650.4	967.43	947.68	993.57	284.45	274.63	297.6	38.26	36.46	40.07
22	22-May-19	647.17	968.89	944.46	990.35	285.39	273.42	296.4	38.16	36.69	40.12
23	23-May-19	651.14	977.03	951.98	995.99	289.17	276.51	298.46	38.25	36.58	40.33
24	24-May-19	642.18	968.86	942.61	994.67	285.86	273.85	297.7	37.96	35.77	40.31
25	25-May-19	650.73	976.62	952.26	994.8	289.04	277.01	298.03	38.1	36.74	39.99
26	26-May-19	650.45	976.36	953.18	995.27	288.91	277.17	297.95	38.42	36.1	40.15
27	27-May-19	644.77	965.41	945.1	989.18	283.88	274.38	295.43	38.09	36.25	40.23
28	28-May-19	645.72	964.82	947.13	993.89	283.55	275.07	297.85	38.21	36.46	40.35
29	29-May-19	641.62	971.79	943.29	995.33	287.14	273.99	298.46	38.09	35.77	40.3
30	30-May-19	648.81	972.9	948.8	998.39	287.33	275.03	299.48	38.4	36.32	40.21
31	31-May-19	652.52	972.43	949.69	996.24	286.79	275.36	298.69	38.26	36.58	40.22

CEMS DAYWISE VALUES FOR THE MONTH OF JUN '2019											
S.NO.	DATE	UNIT# 3 LOAD(MW)	UNIT# 3 SOX(mg/nm3)			UNIT# 3 NOX(mg/nm3)			UNIT# 3 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Jun-19	652.6	978.43	947.13	997.18	289.78	274.2	299.06	37.92	36.3	39.99
2	2-Jun-19	626.02	962.25	882.27	995.66	283.86	256.64	298.54	37.84	32.93	40.21
3	3-Jun-19	626.38	961.96	908.58	986.93	283.61	263.68	294.76	37.38	35.35	40.09
4	4-Jun-19	627.74	960.93	918.86	989.03	282.87	269.82	295.90	37.68	35.68	40.05
5	5-Jun-19	642.23	971.97	933.15	996.42	287.21	270.44	298.92	37.84	36.16	39.8
6	6-Jun-19	639.32	960.92	937.29	998.38	282.13	271.24	298.77	37.61	35.12	39.57
7	7-Jun-19	620.97	960.34	924.43	983.46	283.04	269.11	292.67	37.59	35.67	39.88
8	8-Jun-19	649.07	970.51	948.43	995.45	285.98	275.06	298.35	38.14	36.27	40.31
9	9-Jun-19	639.83	963.28	945.54	989.88	283.16	275.02	296.45	38.05	36.35	39.88
10	10-Jun-19	631.91	964.75	943.36	985.85	284.49	274.42	295.06	37.62	36.01	39.95
11	11-Jun-19	632	963.67	917.94	998.48	283.62	265.46	299.48	38.17	34.86	40.08
12	12-Jun-19	601.43	957.54	907.77	994.44	283.49	269.11	298.19	36.76	32.55	39.92
13	13-Jun-19	639.79	966.38	935.63	989.46	284.76	272.72	296.60	38.23	36.29	40.05
14	14-Jun-19	644.46	973.68	949.78	996.69	288.02	276	298.96	38.02	36.09	40.07
15	15-Jun-19	651.87	972.63	950.44	996.42	286.94	275.41	298.69	37.98	36.48	40.23
16	16-Jun-19	644.85	970.07	936.35	995.12	286.19	274.94	298.17	38.03	35.78	40.31
17	17-Jun-19	642.27	963.69	939.39	994.44	283.24	273.47	297.99	37.62	35.25	39.59
18	18-Jun-19	648.06	970.75	947.65	996.08	286.31	274.38	298.55	38.53	36.36	40.31
19	19-Jun-19	650.81	974.88	948.97	997.52	288.1	275.7	299.94	38.36	36.91	40.31
20	20-Jun-19	643.63	968.66	940.42	995.95	285.58	272.85	298.54	38.5	36.53	39.76
21	21-Jun-19	621.1	960.5	927.95	987.09	283.22	268.73	295.26	37.51	35.42	39.43
22	22-Jun-19	650.59	974.19	944.29	995.35	287.83	274.43	298.21	38.17	36.48	40.05
23	23-Jun-19	643.68	969.61	951.97	993.75	286.01	276.68	297.42	38.06	35.63	39.92
24	24-Jun-19	254.12	943.56	898.43	975.7	278.34	263.6	291.03	36.56	31.73	39.21
25	25-Jun-19	Unit in shutdown condition									
26	26-Jun-19	Unit in shutdown condition									
27	27-Jun-19	Unit in shutdown condition									
28	28-Jun-19	80.22	888.72	843.11	913.45	262.02	244.67	273.28	32.83	29.57	34.73
29	29-Jun-19	497.02	911.8	872.64	984.08	268	252.06	292.31	34.33	31.41	39.54
30	30-Jun-19	537.65	926.88	873.92	984.18	273.43	252.35	292.19	35.36	31.71	39.08

CEMS DAYWISE VALUES FOR THE MONTH OF JUL '2019											
S.NO.	DATE	[# 3 LOAD(	UNIT# 3 SOX(mg/nm3)			UNIT# 3 NOX(mg/nm3)			UNIT# 3 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Jul-19	552.64	934.85	883.25	984.84	275.54	257.23	292.79	35.87	32.25	39.3
2	2-Jul-19	632.5	963.48	938.65	995.73	283.9	273.65	298.22	37.77	36.33	40.18
3	3-Jul-19	613.8	951.73	890.34	990.76	279.63	260.61	296	36.89	32.95	39.8
4	4-Jul-19	584.89	939.23	880.55	983.22	275.74	255.99	294.88	36.07	32.26	39.39
5	5-Jul-19	580.63	941.95	876.44	992.39	277.29	253.48	296.77	36.34	32.14	39.93
6	6-Jul-19	565.42	935.5	876.31	987.2	275.46	253.34	294.44	35.92	31.67	39.52
7	7-Jul-19	517.95	915.41	873.02	983.38	269.18	252.04	292.48	34.54	31.43	39.23
8	8-Jul-19	547.36	930.79	876.62	993.12	274.55	254.51	297.83	35.57	31.76	40.04
9	9-Jul-19	593.52	951.33	886.17	981.28	281.01	258.49	292.45	37.02	32.47	39.1
10	10-Jul-19	635.1	967.48	939.26	988.72	285.58	S.NO.	294.01	38.06	36.31	39.57
11	11-Jul-19	587.01	947.48	873.8	996.34	279.55	252.19	298.71	36.73	31.47	40.24
12	12-Jul-19	637.86	974.15	943.32	995.11	288.78	273.84	298.26	38.53	36.12	40.15
13	13-Jul-19	617.5	954.34	885.61	993.75	280.48	258.67	297.5	37.05	32.46	40.04
14	14-Jul-19	602.26	954.35	887.55	998.78	281.89	259.21	299.48	37.17	32.58	40.41
15	15-Jul-19	618.58	956.42	887.2	990.41	281.57	259.06	295.48	37.28	32.84	S.NO.
16	16-Jul-19	651.23	969.15	942.36	995.43	285.22	273.18	298.22	38.07	35.84	S.NO.
17	17-Jul-19	649.97	970.62	942.6	996.13	286.07	272.99	298.43	38.16	36.03	40.22
18	18-Jul-19	654.43	976.88	952.06	996.59	288.89	276.45	298.82	38.69	36.69	40.26
19	19-Jul-19	649.23	972.71	948.44	996.66	287.21	275.03	298.77	38.44	36.47	40.41
20	20-Jul-19	642.73	970.4	946.33	997.38	286.49	274.1	299.11	38.21	36.49	40.32
21	21-Jul-19	641.03	963.34	908.32	986.82	283.16	264	295.53	37.64	33.85	39.59
22	22-Jul-19	637.57	961.69	942.34	990.11	282.48	273.57	296.48	37.51	35.81	39.81
23	23-Jul-19	629.07	960.97	939.47	983.2	282.86	274.06	292.88	37.55	35.96	39.17
24	24-Jul-19	586.16	944.42	873.24	982.49	277.92	252.13	294.3	36.49	S.NO.	39.31
25	25-Jul-19	530.7	922.19	871.11	976.36	271.66	251.37	290.23	35.04	31.3	39.21
26	26-Jul-19	496.66	908.99	872.99	978.52	267.22	251.93	293.04	34.1	31.42	39.05
27	27-Jul-19	474.23	904.58	871.39	958.65	266.25	251.54	281.46	33.81	31.32	S.NO.
28	28-Jul-19	507.59	919.38	877.9	993.3	270.96	254.71	297.79	34.82	31.83	40.04
29	29-Jul-19	561.4	927.62	878.36	991.2	271.81	254.73	295.99	35.29	S.NO.	39.82
30	30-Jul-19	518.96	921.16	872.62	982.98	271.83	251.94	294.88	35	31.7	39.38
31	31-Jul-19	560.56	940.52	879.4	983.99	277.75	255.19	293.76	36.29	31.94	39.34

CEMS DAYWISE VALUES FOR THE MONTH OF AUG '2019										
S.NO.	DATE	UNIT# 3 LOAD(MW)	UNIT# 3 SOX(mg/nm3)			UNIT# 3 NOX(mg/nm3)			UNIT# 3 DUST(mg/nm3)	
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Aug-19	609.95	953.18	895.02	991.76	280.39	263	297.19	36.99	33.19	39.46
2	2-Aug-19	552.09	929.19	874.58	978.09	273.17	252.82	293.02	35.42	31.55	38.8
3	3-Aug-19	597.75	948.39	889.99	987.88	278.97	260.49	294.26	36.69	S.NO.	39.55
4	4-Aug-19	558.84	938.42	874.56	984.5	277.44	252.93	292.41	36.19	31.56	39.27
5	5-Aug-19	406.89	935.29	859.8	978.08	275.22	251.91	290.28	35.85	30.83	38.83
6	6-Aug-19	573.68	944.75	897.23	978.29	279.38	264.17	292.46	36.58	33.37	38.91
7	7-Aug-19	547.74	939.14	885.69	993.67	278.35	257.19	S.NO.	36.29	32.36	40.04
8	8-Aug-19	540.74	926.28	872.61	966.27	272.87	251.79	288.6	35.3	31.39	38.04
9	9-Aug-19	547.29	934.89	877.85	999.51	276.35	254.55	299.6	35.91	31.72	40.45
10	10-Aug-19	567.93	934.23	883.15	985.49	274.68	257.07	295.13	35.77	32.5	39.51
11	11-Aug-19	605.46	955	905.8	996.01	281.79	268.58	298.62	37.25	34.06	40.1
12	12-Aug-19	647.3	971.89	949.05	994.76	286.86	275.99	297.88	38.31	36.58	40.12
13	13-Aug-19	621.33	957.08	930.79	977.26	281.65	270.65	289.92	37.25	35.01	S.NO.
14	14-Aug-19	631.13	960	939.56	991.59	282.16	272.12	296.18	37.4	35.85	39.85
15	15-Aug-19	490.33	915.42	873.03	959.01	271.26	252.14	284.95	34.66	S.NO.	S.NO.
16	16-Aug-19	524.35	922.15	872.94	970.08	270.94	251.91	287.86	34.99	31.42	38.3
17	17-Aug-19	640.23	967.28	909.81	993.62	285.07	263.94	297.96	37.96	33.92	40.24
18	18-Aug-19	646	967.87	943.65	990.85	285.04	S.NO.	296.57	38	36.1	39.82
19	19-Aug-19	615.25	956.48	925.64	991.29	281.86	268.33	297.23	37.27	34.97	39.91
20	20-Aug-19	651.08	974.2	945.45	995.23	287.7	273.67	298.08	38.48	36.2	40.33
21	21-Aug-19	639.18	968.43	934.14	993.06	285.88	270.49	297.11	38.08	35.47	39.98
22	22-Aug-19	608.15	956.65	900.34	998.37	282.43	263.07	299.43	37.31	33.31	40.39
23	23-Aug-19	599.34	949.66	857.62	991.73	279.78	247.98	296.7	36.86	30.56	39.9
24	24-Aug-19	607.09	954.39	903.04	988.29	281.37	265.44	296.22	37.11	33.91	39.71
25	25-Aug-19	625.62	964.65	933.74	990.97	284.78	270.98	296.02	37.83	35.49	39.81
26	26-Aug-19	622.5	956.45	929.53	995.65	281.02	269.93	298.48	37.19	35.22	40.2
27	27-Aug-19	613.05	954.96	929.98	982.56	280.87	269.15	294.33	37.11	35.19	39.32
28	28-Aug-19	532.99	923.5	899.78	948.8	271.9	260.06	284.55	35.13	33.19	37.11
29	29-Aug-19	509.09	914.36	887.16	943.32	268.75	256.41	281.75	34.48	32.37	36.41
30	30-Aug-19	478.78	904.5	881.31	928.16	266.02	256.68	276.69	33.85	32.13	35.8
31	31-Aug-19	489.78	908.22	873.39	933.78	266.91	252.14	278.38	34.08	31.45	35.9

CEMS DAYWISE VALUES FOR THE MONTH OF SEP '2019											
S.NO.	S.NO.	UNIT# 3 LOAD(MW)	UNIT# 3 SOX(mg/nm3)			UNIT# 3 NOX(mg/nm3)			UNIT# 3 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Sep-19	Unit in shutdown condition									
2	2-Sep-19	Unit in shutdown condition									
3	3-Sep-19	Unit in shutdown condition									
4	4-Sep-19	Unit in shutdown condition									
5	5-Sep-19	Unit in shutdown condition									
6	6-Sep-19	Unit in shutdown condition									
7	7-Sep-19	Unit in shutdown condition									
8	8-Sep-19	Unit in shutdown condition									
9	9-Sep-19	Unit in shutdown condition									
10	10-Sep-19	Unit in shutdown condition									
11	11-Sep-19	Unit in shutdown condition									
12	12-Sep-19	Unit in shutdown condition									
13	13-Sep-19	Unit in shutdown condition									
14	14-Sep-19	Unit in shutdown condition									
15	15-Sep-19	Unit in shutdown condition									
16	16-Sep-19	Unit in shutdown condition									
17	17-Sep-19	Unit in shutdown condition									
18	18-Sep-19	Unit in shutdown condition									
19	19-Sep-19	454.89	908.96	873.37	967.52	267.47	252.7	289.35	S.NO.	31.5	38.29
20	20-Sep-19	573.34	940.79	920.35	962.34	276.97	267.15	287.56	36.21	34.63	37.97
21	21-Sep-19	588.37	949.87	926.76	972.96	280.34	268.8	291.8	36.88	35.02	38.65
22	22-Sep-19	538.98	929.43	902.44	957.37	274.02	261.92	286.45	35.57	33.64	37.63
23	23-Sep-19	577.76	943.75	918.87	969.98	278.1	265.69	290.9	36.44	34.67	38.51
24	24-Sep-19	477.99	904.09	867.72	961.02	266.45	251.1	287.09	33.82	31.12	37.84
25	25-Sep-19	451.54	897.02	872.29	916.64	264.3	252.18	274.43	33.37	31.41	34.96
26	26-Sep-19	462.92	897.19	863.56	942.56	263.47	249.15	278.52	33.3	30.8	36.41
27	27-Sep-19	440.62	893.09	863.99	945.58	263.14	250.08	280.98	33.14	31.06	36.72
28	28-Sep-19	438.87	893.61	866.7	949.66	263.49	251.31	282.15	33.16	30.99	36.99
29	29-Sep-19	438.3	884.61	860.38	936.73	259.06	248.2	275.37	32.43	30.59	35.93
30	30-Sep-19	444.93	892.45	860.37	960.69	262.37	249	283.76	32.99	30.65	37.59

CEMS DAYWISE VALUES FOR THE MONTH OF APR '2019											
S.NO.	S.NO.	UNIT# 4 LOAD(MW)	UNIT# 4 SOX(mg/nm3)			UNIT# 4 NOX(mg/nm3)			UNIT# 4 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Apr-19	595.36	950.88	887.21	996.34	279.53	257.98	297.56	46.1	41.3	49.78
2	2-Apr-19	621.77	960.61	922.67	992.31	283.95	273.53	297.82	46.58	43.22	49.45
3	3-Apr-19	635.96	968.32	924.69	999.12	285.22	270.24	298.48	47.2	44.22	49.95
4	4-Apr-19	633.87	966.69	917.82	996.22	285.95	271.66	296.78	47.06	43.33	49.75
5	5-Apr-19	561.18	938.7	890.47	987.46	274.62	254.28	290.05	45.52	S.NO.	49.2
6	6-Apr-19	613.63	964.49	937.93	993.7	280.88	266.77	293.32	47.11	44.58	49.6
7	7-Apr-19	637.47	969.64	927.69	993.65	283.62	271.25	297.62	47.3	43.99	49.54
8	8-Apr-19	641.3	967.78	939.96	991.81	286.98	274.02	298.2	47.06	44.79	49.51
9	9-Apr-19	645.48	970.54	946.77	993.88	286.55	274.48	298.42	47.27	45.11	49.44
10	10-Apr-19	638.42	963.64	934.96	987.52	289.84	274.04	297.87	46.69	44.34	49.01
11	11-Apr-19	644.72	966.77	941.72	995.32	286.37	275.3	298.05	46.9	44.51	49.66
12	12-Apr-19	648.43	968.58	943.39	996.44	285.19	276.03	298.84	47.08	44.64	49.78
13	13-Apr-19	626.1	956.24	892.99	995.58	285.18	260.37	299.65	46.17	42.53	49.67
14	14-Apr-19	578.07	944.14	877.47	989.45	279.64	259.8	293.88	45.64	40.81	49.21
15	15-Apr-19	523.55	926.56	882.87	990.33	274.09	253.86	295.04	44.62	41.46	49.3
16	16-Apr-19	497.35	916.09	848.91	981.82	270.42	243.25	297.25	43.92	S.NO.	48.47
17	17-Apr-19	Unit in shutdown condition									
18	18-Apr-19	Unit in shutdown condition									
19	19-Apr-19	Unit in shutdown condition									
20	20-Apr-19	278.37	959.94	888.48	990.3	281.55	272.37	295.81	46.58	42.43	49.08
21	21-Apr-19	614.6	954.71	888.89	995.87	281.85	255.56	298.12	46.21	42.34	49.62
22	22-Apr-19	630.91	966.09	943.38	990.26	284.86	272.93	296.97	46.87	44.61	49.27
23	23-Apr-19	647.94	969.49	947.37	993.54	284.47	274.02	296.86	47.17	44.84	49.7
24	24-Apr-19	616.27	962.15	918.91	991.55	280.97	265.67	298.18	46.93	43.41	49.37
25	25-Apr-19	647.91	972.39	945.49	993.21	287.05	273.68	299.39	47.38	44.58	49.55
26	26-Apr-19	642.41	969.52	943.22	989.84	285.04	274.83	295.54	47.23	S.NO.	49.14
27	27-Apr-19	645.02	972.47	949.64	993.78	282.54	272.99	294.67	47.47	45.19	49.59
28	28-Apr-19	640.45	972.05	951.72	995.05	284.25	265.94	299.84	47.47	45.59	49.62
29	29-Apr-19	651.84	970.05	937.1	993.59	287.49	276.23	298.84	47.11	44.33	49.49
30	30-Apr-19	642.88	972.25	938.02	996.36	288.71	267.73	297.96	47.46	44.39	49.72

CEMS DAYWISE VALUES FOR THE MONTH OF MAY '2019											
S.NO.	DATE	UNIT# 4 LOAD(MW)	UNIT# 4 SOX(mg/nm3)			UNIT# 4 NOX(mg/nm3)			UNIT# 4 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-May-19	490.06	911.06	862.94	988.44	266.82	250.17	292.5	43.69	39.81	48.8
2	2-May-19	512.91	922.37	871.14	980.63	272.07	248.13	295.8	44.36	41.07	48.6
3	3-May-19	464.83	898.69	863.56	954.88	264.46	249.53	283.7	43.01	39.82	45.4
4	4-May-19	553.44	939.29	875.98	995.94	276.91	251.98	298.5	45.42	40.85	49.7
5	5-May-19	599.96	946.36	886.62	1000	280.97	262.75	296.4	45.58	S.NO.	49.5
6	6-May-19	601.07	951.74	903.7	995.24	281.07	265.74	296.1	46	43.06	49.7
7	7-May-19	607.93	957.15	894.7	984.13	282.18	263.94	298.9	46.57	42.33	49.0
8	8-May-19	607.76	955.6	908.69	987.79	278.59	258.33	293.0	46.4	42.57	49.0
9	9-May-19	636.1	960.44	937.1	992.33	284.59	270.28	298.6	46.39	44.38	49.5
10	10-May-19	626.74	958.36	925.54	982.93	284.46	267.78	297.2	46.39	44.03	48.9
11	11-May-19	640.59	966.3	935.72	991.03	285.08	273.17	296.9	46.94	44.23	49.4
12	12-May-19	621.97	961.59	883.75	989.59	285.04	261.41	298.5	46.81	41.72	49.1
13	13-May-19	628.98	966.52	919.56	995.53	283.87	273.72	296.3	47.09	43.89	49.7
14	14-May-19	647.07	966.95	943.5	990.15	285.99	274.73	298.2	46.92	44.74	49.5
15	15-May-19	645.23	971.39	947.35	988.94	286.64	274	298.1	47.34	44.92	49.2
16	16-May-19	650.68	970.93	947.67	994.15	286.94	275.06	298.9	47.2	44.92	49.5
17	17-May-19	629.28	963.37	898.01	996.19	282.55	253.7	295.9	46.81	42.91	49.7
18	18-May-19	624.8	957.95	880.69	995.1	282.42	254.24	294.8	46.35	41.17	49.6
19	19-May-19	631.86	963.93	911.04	996.59	283.46	260.56	299.1	46.83	42.84	49.7
20	20-May-19	644.12	961.47	937.09	997.1	284.6	271.96	294.7	46.42	44.7	49.8
21	21-May-19	637.26	964.08	926.17	993.53	287.21	275.57	297.7	46.77	43.59	49.6
22	22-May-19	605.29	953	874.02	991.42	282.85	260.85	296.6	46.12	40.53	49.3
23	23-May-19	632.88	969.62	941.3	990.58	284.34	272.44	295.9	47.35	44.57	49.3
24	24-May-19	591.7	952.57	910.31	983.63	278.9	260.81	294.9	46.33	42.95	48.9
25	25-May-19	641.45	977.9	931.19	999.3	284.08	259.93	296.7	48.09	45.13	49.9
26	26-May-19	635.07	963.88	904.73	993.5	285.34	265.65	297.5	46.79	43.03	49.4
27	27-May-19	653.43	968.86	946.89	997.81	287.77	275.15	299.0	47.01	44.85	49.8
28	28-May-19	644.78	969.83	943.02	992.31	285.1	273.41	298.0	47.24	44.69	49.5
29	29-May-19	639.46	968.69	940.29	994.15	284.37	270.74	298.9	47.21	44.55	49.6
30	30-May-19	638.05	969.79	917.06	997.66	288.32	262.45	298.6	47.33	44.5	49.8
31	31-May-19	631.25	965.15	904.17	995.82	283.26	265.89	296.1	46.99	43.04	49.7

CEMS DAYWISE VALUES FOR THE MONTH OF JUN '2019											
S.NO.	DATE	UNIT# 4 LOAD(MW)	UNIT# 4 SOX(mg/nm3)			UNIT# 4 NOX(mg/nm3)			UNIT# 4 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Jun-19	618.5	958.77	921.99	985.23	283.1	258	295.46	46.49	43.54	48.7
2	2-Jun-19	580.63	945.08	872.2	988.28	278.75	252.93	296.23	45.76	40.35	49.2
3	3-Jun-19	490.37	918.03	880.5	990.20	268.92	252.1	288.90	44.33	41.14	49.4
4	4-Jun-19	513.38	914.48	868.79	970.25	270.95	251.46	292.58	43.7	40.16	47.4
5	5-Jun-19	609.32	960.46	887.77	998.27	284.03	257.04	297.05	46.79	41.52	48.6
6	6-Jun-19	601.72	951.51	887.62	988.11	281.09	256.36	297.95	46.04	42.15	49.2
7	7-Jun-19	635.88	965.17	935.18	997.16	281.4	272.34	297.98	46.86	44.67	47.7
8	8-Jun-19	604.87	953.21	874.71	993.45	278.9	252.68	297.70	46.24	40.58	49.4
9	9-Jun-19	569.2	931.67	881.35	978.04	280.34	254.34	298.73	44.72	41.23	47.8
10	10-Jun-19	538.75	928.45	873.06	998.57	274.07	255.89	297.50	44.77	40.41	48.8
11	11-Jun-19	534.64	929.68	878.6	990.40	273.11	251.86	294.03	44.77	40.74	48.9
12	12-Jun-19	534.61	924.61	883.16	995.47	271.87	254.99	298.83	44.51	41.19	46.6
13	13-Jun-19	527.81	917.83	873.67	994.17	270.15	251.44	297.28	43.91	40.55	47.5
14	14-Jun-19	574.75	943.9	871.94	996.52	277.04	259.25	296.58	45.79	40.37	46.7
15	15-Jun-19	602.62	948.39	871.81	994.49	282.45	253.85	299.29	45.82	40.37	48.5
16	16-Jun-19	577.48	943.28	899.34	990.95	276.61	256.81	297.67	45.65	42.43	49.4
17	17-Jun-19	561.78	934.53	881.01	996.52	274.76	251.82	298.21	45.03	41.04	48.7
18	18-Jun-19	587.32	948.19	892.65	995.31	278.08	255.06	296.85	45.98	42.07	48.6
19	19-Jun-19	455.23	966.51	893.1	998.98	282.34	262.09	295.74	47.2	42.41	47.9
20	20-Jun-19	Unit in shutdown condition									
21	21-Jun-19	Unit in shutdown condition									
22	22-Jun-19	Unit in shutdown condition									
23	23-Jun-19	Unit in shutdown condition									
24	24-Jun-19	Unit in shutdown condition									
25	25-Jun-19	Unit in shutdown condition									
26	26-Jun-19	Unit in shutdown condition									
27	27-Jun-19	Unit in shutdown condition									
28	28-Jun-19	Unit in shutdown condition									
29	29-Jun-19	Unit in shutdown condition									
30	30-Jun-19	Unit in shutdown condition									

CEMS DAYWISE VALUES FOR THE MONTH OF JUL '2019											
S.NO.	DATE	UNIT# 4 LOAD(MW)	UNIT# 4 SOX(mg/nm3)			UNIT# 4 NOX(mg/nm3)			UNIT# 4 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Jul-19	Unit in shutdown condition									
2	2-Jul-19	Unit in shutdown condition									
3	3-Jul-19	Unit in shutdown condition									
4	4-Jul-19	Unit in shutdown condition									
5	5-Jul-19	Unit in shutdown condition									
6	6-Jul-19	Unit in shutdown condition									
7	7-Jul-19	Unit in shutdown condition									
8	8-Jul-19	Unit in shutdown condition									
9	9-Jul-19	Unit in shutdown condition									
10	10-Jul-19	Unit in shutdown condition									
11	11-Jul-19	278.76	905.74	831.78	966.8	265.25	242.07	285.43	43.07	38.41	47.09
12	12-Jul-19	595.75	950.04	881.08	989.04	279.96	254.92	296.53	46	40.98	49.31
13	13-Jul-19	580.93	940.86	872.68	985.11	276.77	252.39	294.1	45.39	40.48	48.82
14	14-Jul-19	490.34	904.39	877.17	971.35	265.86	253.71	288.94	43.18	40.74	47.79
15	15-Jul-19	503.64	920.06	878.76	987.59	271.63	253.88	296.02	44.33	40.78	49.2
16	16-Jul-19	599.86	954.81	912	983.57	282.13	269.59	294.28	46.4	43.62	48.81
17	17-Jul-19	612.68	949.71	894.43	979.82	278.66	260.2	292.1	45.77	42.04	48.42
18	18-Jul-19	651.76	966.3	947.65	998.76	283.75	274.6	299.13	46.75	44.92	49.83
19	19-Jul-19	647.42	977.09	956.2	993.03	289.49	280.42	297.08	47.91	46.08	49.42
20	20-Jul-19	643.55	966.45	941.24	991.85	284.5	272.43	296.7	46.9	44.49	49.34
21	21-Jul-19	625.64	959.85	930.03	988.95	282.63	271.83	294.87	46.47	44.37	48.97
22	22-Jul-19	638.77	967.59	934.57	996.3	285.25	270.58	298.2	47.06	44.12	49.64
23	23-Jul-19	639.75	970.51	936.05	996.07	286.85	270.9	298.65	47.36	44.18	49.78
24	24-Jul-19	531.22	921.23	879.38	987.02	271.04	255.25	295.6	44.19	41.05	49.12
25	25-Jul-19	468.8	898.91	878.46	931.73	263.86	254.65	279.36	42.79	40.93	45.87
26	26-Jul-19	474.23	901.5	881.13	917.46	264.91	255.19	272.73	42.96	41.04	44.54
27	27-Jul-19	470.79	904.9	877.76	**S.NO.**	266.75	254.18	277.03	**S.NO.**	40.84	45.41
28	28-Jul-19	477.43	909.94	890.29	939.85	268.77	259.4	281.55	43.74	41.54	46.31
29	29-Jul-19	487.6	909.56	877.17	963.22	268.04	253.15	288.78	43.61	40.63	47.76
30	30-Jul-19	486.01	905.71	877.52	955.53	265.95	253.48	285.72	43.23	40.72	47.4
31	31-Jul-19	519.04	922.67	872.34	985.2	271.8	253.17	294.05	44.32	40.55	49.23

CEMS DAYWISE VALUES FOR THE MONTH OF AUG '2019											
S.NO.	DATE	UNIT# 4 LOAD(MW)	UNIT# 4 SOX(mg/nm3)			UNIT# 4 NOX(mg/nm3)			UNIT# 4 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Aug-19	542.75	929.19	873.42	983.07	273.49	252.46	292	44.72	40.49	48.4
2	2-Aug-19	483.35	901.55	866.34	948.59	264.9	250.06	282.27	42.97	40.01	46.45
3	3-Aug-19	526.21	930.12	878.86	989.17	274.66	254.63	296.42	S.NO.	40.93	49.28
4	4-Aug-19	499.85	904.76	876.27	952.07	265.33	253.74	284.01	43.09	40.72	46.8
5	5-Aug-19	524.44	933.1	890.52	976.13	276.37	259.45	292.65	45.27	41.89	48.53
6	6-Aug-19	537.01	927.44	882.96	973.36	273.39	256.34	290.6	44.69	41.27	48.12
7	7-Aug-19	505.75	916.1	885.9	959.79	270	257.44	284.88	44.02	41.49	46.98
8	8-Aug-19	508.11	916.89	880.25	963.01	269.68	254.43	284.78	43.93	40.89	47.37
9	9-Aug-19	485.44	907.97	876.72	968.27	267.21	S.NO.	289.92	43.49	40.65	47.98
10	10-Aug-19	503.91	915.51	874.38	984.7	269.33	252.68	295.23	43.87	40.65	49.05
11	11-Aug-19	556.94	934.32	878.52	986.95	275.37	254.73	293.67	45.12	40.95	48.73
12	12-Aug-19	623.4	957.17	877.47	1000	281.59	254.29	299.96	46.31	40.86	49.99
13	13-Aug-19	639.31	963.53	891.8	994.1	283.43	258.55	298.03	46.71	41.71	49.61
14	14-Aug-19	603.2	952.16	876.88	997.44	280.69	254.14	298.41	46.14	40.41	49.97
15	15-Aug-19	462.43	902.5	873.35	954.1	266.15	252.49	283.19	43.24	40.5	46.64
16	16-Aug-19	491.84	915.1	881.46	964.75	270.03	255.17	286.87	44.04	S.NO.	47.37
17	17-Aug-19	611.76	954.76	873.4	994.69	280.9	252.4	297.75	46.2	40.48	49.71
18	18-Aug-19	624.86	955.79	896.13	993.86	280.76	258.96	297.84	46.13	41.79	49.57
19	19-Aug-19	658.44	973.13	951.78	995.72	286.69	275.74	297.91	S.NO.	45.15	49.58
20	20-Aug-19	643.04	965.53	939.35	999.93	284.14	272	299.96	46.86	44.4	49.82
21	21-Aug-19	442.19	933.33	826.32	985.42	274.12	240.14	295.31	44.88	38.03	49.06
22	22-Aug-19	574.32	942.71	872.29	996.2	278.15	251.89	298.63	45.63	40.38	49.73
23	23-Aug-19	608.08	958.34	890.87	998.55	282.4	261.33	299	46.47	42.27	49.6
24	24-Aug-19	530.26	921.02	872.99	974.98	270.93	252.3	290.52	44.2	40.46	48.53
25	25-Aug-19	532.7	933.4	881.54	975.58	275.86	255.37	291.88	45.17	S.NO.	48.54
26	26-Aug-19	534.63	932.79	880.63	973.95	S.NO.	254.59	292.09	45.07	40.92	48.42
27	27-Aug-19	490.14	908.48	874.05	935.85	267	252.53	276.03	43.4	40.51	45.21
28	28-Aug-19	555.71	939.56	910.91	969.06	277.65	263.97	289.43	45.57	42.79	47.89
29	29-Aug-19	539.29	930.04	904.54	958.35	274.34	262.36	287.09	44.85	42.47	47.42
30	30-Aug-19	520.08	921.24	872.15	958.43	271.41	252.01	287.19	44.3	40.7	47.44
31	31-Aug-19	463.92	901.48	866.6	933.12	265.56	249.99	276.92	43.11	40	45.38

CEMS DAYWISE VALUES FOR THE MONTH OF SEP '2019											
S.NO.	DATE	UNIT# 4 LOAD(MW)	UNIT# 4 SOX(mg/nm3)			UNIT# 4 NOX(mg/nm3)			UNIT# 4 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Sep-19	531.82	926.76	884.61	972.25	273.07	256.3	291.56	44.59	41.26	48.31
2	2-Sep-19	515.6	917.57	867.26	972.76	270.08	250.64	291.66	44.01	40.13	48.14
3	3-Sep-19	551.65	937.86	883.96	974.88	277.42	256.03	292.45	45.48	41.21	48.49
4	4-Sep-19	553.64	932.48	891.14	976.07	274.28	260.63	292.73	44.83	41.74	48.55
5	5-Sep-19	550.5	932.7	874.61	977.68	274.72	253.77	293.14	44.96	40.75	48.63
6	6-Sep-19	512.98	910.97	870.65	980.87	266.8	251.24	291.82	43.38	40.25	48.36
7	7-Sep-19	464.8	898.88	877.25	923.18	264.37	253.24	276.94	42.87	40.65	45.39
8	8-Sep-19	455.43	899.19	859.68	933.39	265.3	249.82	279.46	43.06	39.96	45.65
9	9-Sep-19	436.44	888.21	859.29	928.67	260.84	249.13	276.78	42.19	39.83	45.36
10	10-Sep-19	479.61	903.86	871.3	929.18	265.49	251.78	278.26	43.09	40.36	45.65
11	11-Sep-19	475.58	900.01	877.57	935.13	264.06	254.34	279.52	42.88	40.97	45.9
12	12-Sep-19	456.47	897.75	874.28	921.39	264.3	253.04	276.21	42.87	40.61	45.24
13	13-Sep-19	457.17	897.4	866.51	930.29	264.04	250.03	278.98	42.8	40.01	45.8
14	14-Sep-19	452.28	897.56	872.8	920.86	264.52	253.57	276.03	42.94	40.71	45.21
15	15-Sep-19	466.36	899.15	870.05	926.42	264.15	251.58	277.41	42.82	40.32	45.48
16	16-Sep-19	578.32	948.51	895.99	983.2	279.79	261.29	294.34	45.94	42.26	48.87
17	17-Sep-19	544.83	927.15	894.42	965.82	272.5	260.36	289.35	44.51	42.07	47.87
18	18-Sep-19	479.06	909.26	878.66	929.65	268.38	255.46	278.03	43.67	41.09	45.76
19	19-Sep-19	507.64	918.19	874.04	977.94	270.26	252.93	292.78	44.04	S.NO.	48.56
20	20-Sep-19	530.78	927.08	878.53	968.26	273.37	254.42	289.26	44.66	40.88	47.85
21	21-Sep-19	552.42	936.04	880.44	973.61	276.41	256.7	291.33	45.32	41.34	48.27
22	22-Sep-19	580.13	948.02	899.13	984.69	280.19	262.99	294.46	46.03	42.6	48.89
23	23-Sep-19	607.38	955.19	923.1	986.54	281.67	268.21	294.55	46.35	43.64	48.91
24	24-Sep-19	500.98	910.88	884.36	975.81	268.02	256.01	290.93	43.6	41.2	48.19
25	25-Sep-19	471.99	904.6	877.13	926.08	266.54	253.19	277.08	43.25	40.64	45.31
26	26-Sep-19	459.06	904.72	873.83	937.41	267.61	254.75	275.21	43.53	40.95	45.04
27	27-Sep-19	450.23	897.45	867.1	970.82	264.51	250.94	290.5	42.92	40.19	48.1
28	28-Sep-19	450.1	897.36	863.49	963.37	264.44	249.35	287.71	42.91	39.87	47.54
29	29-Sep-19	446.14	895.26	867.22	953.41	263.75	250.66	285.5	42.74	40.13	47.1
30	30-Sep-19	453.3	894.18	865.05	973.64	262.61	249.99	290.36	42.56	40	48.07

CEMS DAYWISE VALUES FOR THE MONTH OF APR '2019											
S.NO.	S.NO.	UNIT# 5 LOAD(MW)	UNIT# 5 SOX(mg/nm3)			UNIT# 5 NOX(mg/nm3)			UNIT# 5 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Apr-19	613	901.56	857.88	942.21	279.32	265.57	296.33	42.88	40.36	46.27
2	2-Apr-19	631.2	909.67	871.58	945.07	281.98	267.35	298.1	43.45	40.47	46.62
3	3-Apr-19	645.41	920.18	893.61	948.87	285.98	S.NO.	299.43	44.23	42.08	46.89
4	4-Apr-19	650.06	925.73	899.9	945.91	288.65	276.61	298.37	44.73	42.51	46.47
5	5-Apr-19	571.18	891.05	844.64	938.17	277.71	260.57	295.52	42.52	38.95	46.1
6	6-Apr-19	637.45	913.57	887.02	941.93	283.47	273.59	297.44	43.67	41.72	46.49
7	7-Apr-19	646.72	923.34	879.66	944.76	287.74	272.9	297.55	44.56	S.NO.	46.77
8	8-Apr-19	647.66	919.13	895.7	941.01	285.5	273.78	296.32	44.08	41.76	46.26
9	9-Apr-19	637.58	920.26	892.98	940.24	286.85	273.26	296.83	44.31	41.52	46.37
10	10-Apr-19	649.97	923.51	895.04	945.78	287.44	274.46	298.2	44.48	41.46	46.58
11	11-Apr-19	655.42	916.1	898.86	937.94	283.41	275.26	294.15	43.68	42.05	45.83
12	12-Apr-19	655.43	927.19	900.53	950	288.84	275.54	298.9	44.77	42.11	47.08
13	13-Apr-19	632.19	910.35	841.01	946.8	282.45	258.79	298.42	43.44	38.76	46.68
14	14-Apr-19	596.92	897.24	831.69	942	278.27	255.27	296.29	42.62	38.05	46.26
15	15-Apr-19	536.14	885.23	822.31	948.36	276.58	252.19	299.5	42.3	37.44	46.9
16	16-Apr-19	518.78	874.58	804.54	948.07	272.96	249.78	299.27	S.NO.	36.96	46.85
17	17-Apr-19	597.69	904.43	833.41	948.67	281.42	255.2	299.43	43.3	38.04	46.89
18	18-Apr-19	Unit in shutdown condition									
19	19-Apr-19	Unit in shutdown condition									
20	20-Apr-19	Unit in shutdown condition									
21	21-Apr-19	212.87	875.11	830.13	926.87	270.37	255.91	289.68	41.13	38.18	44.94
22	22-Apr-19	641.47	922.32	892.58	943.97	286.58	274.14	297.44	44.33	41.83	46.49
23	23-Apr-19	655.95	919.97	895.57	947.25	285.29	273.68	299	44.06	41.74	46.8
24	24-Apr-19	658.92	926.49	900.28	949.59	288.33	275.44	299.84	44.64	42.09	46.97
25	25-Apr-19	660.15	925.09	900.95	948.93	287.53	275.5	299.19	44.51	42.1	46.84
26	26-Apr-19	659.23	923.67	900.69	942.24	286.91	275.92	296.49	44.36	S.NO.	46.3
27	27-Apr-19	656.35	923.21	900.93	945.59	286.93	275.71	298.62	44.41	42.01	46.72
28	28-Apr-19	657.62	924.24	889.23	947.02	287.32	273.97	298.73	44.44	41.79	46.75
29	29-Apr-19	653.51	921.99	881.07	945.2	286.44	269.33	297.58	44.26	40.87	46.52
30	30-Apr-19	651.27	917.61	888	944.53	284.51	271.53	297.53	43.89	41.31	46.51

CEMS DAYWISE VALUES FOR THE MONTH OF MAY '2019											
S.NO.	S.NO.	UNIT# 5 LOAD(MW)	UNIT# 5 SOX(mg/nm3)			UNIT# 5 NOX(mg/nm3)			UNIT# 5 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-May-19	487.2	853.97	812.69	932.78	265.06	249.54	291.8	40.02	36.91	45.36
2	2-May-19	526.54	875.24	824.51	923.19	272.17	254.28	287.5	41.49	37.85	44.49
3	3-May-19	470.19	848.1	818.57	920.39	264.53	250.97	286.6	39.89	37.19	44.32
4	4-May-19	557.23	887.54	817.43	946.48	275.81	250.69	298.6	42.19	37.14	46.71
5	5-May-19	613.19	907.19	822.26	941.14	282.39	254.12	295.9	43.48	S.NO.	46.19
6	6-May-19	618.06	909.54	860.66	939.72	282.61	263.61	296.5	43.54	39.72	46.31
7	7-May-19	617.79	906.62	836.93	938.17	281.74	260.67	295.6	43.36	39.13	46.12
8	8-May-19	618.42	910.58	848.01	936.84	283.48	264.03	295.6	43.69	39.81	46.13
9	9-May-19	648.35	917.68	895.45	943.89	284.68	273.9	297.3	43.96	41.99	46.46
10	10-May-19	638.93	917.17	870.58	941.44	285.31	267.36	297.1	44.09	40.09	46.42
11	11-May-19	652.82	924.15	897.18	949.79	287.64	274.98	298.8	44.54	42	46.96
12	12-May-19	617.39	908.12	848.02	942.3	282.5	260.33	296.8	43.48	39.07	46.36
13	13-May-19	644.06	919.83	879.56	946.55	286.12	269.98	298.2	44.25	41	46.64
14	14-May-19	654.46	922.09	900.94	948.68	286.5	276.31	298.6	44.29	42.26	46.92
15	15-May-19	645.56	926.14	896.95	944.95	289.15	274.61	298.2	44.81	S.NO.	46.64
16	16-May-19	647.29	920.16	894.54	947.59	286.04	273.79	298.8	44.2	41.76	46.77
17	17-May-19	641.4	915.75	851.77	946.1	284.41	262.4	298.6	43.85	39.48	46.72
18	18-May-19	629.54	909.24	850.19	940.96	282.1	264.17	295.6	43.44	39.83	46.57
19	19-May-19	630.24	911.98	858.47	948.77	283.35	266.18	S.NO.	43.68	40.24	46.9
20	20-May-19	646.77	921.09	897.99	944.85	286.56	274.85	297.8	44.31	41.97	46.56
21	21-May-19	641.96	921.29	874.39	946.93	287.06	267.32	298.6	44.41	40.46	46.72
22	22-May-19	596.64	896.91	839.76	934.76	278.23	258.34	295.2	42.66	38.67	46.04
23	23-May-19	625.47	910.92	879.78	939.39	283.15	269.3	296.6	43.64	40.86	46.32
24	24-May-19	625.77	919.2	849.36	950	287.43	263.05	296.9	44.49	39.61	47.18
25	25-May-19	648.39	922.39	871.33	949.36	287.16	271.73	298.7	44.42	S.NO.	46.71
26	26-May-19	629.57	910.79	870.44	933.91	282.9	269.49	294.2	43.58	40.9	45.46
27	27-May-19	655.49	918.9	900.93	942.99	284.83	275.81	297.0	43.96	41.92	46.4
28	28-May-19	647.52	917.9	896.85	940.76	284.93	274.32	297.0	43.96	41.86	46.4
29	29-May-19	642.55	918.9	880.28	942.63	285.74	270.75	296.2	44.16	41.15	46.24
30	30-May-19	642.26	916.68	839.09	944.56	284.79	259.58	297.3	43.95	38.92	46.91
31	31-May-19	635.29	916.56	850.13	944.29	285.28	261.2	297.9	44.06	39.24	46.58

CEMS DAYWISE VALUES FOR THE MONTH OF JUN '2019											
S.NO.	DATE	UNIT# 5 LOAD(MW)	UNIT# 5 SOX(mg/nm3)			UNIT# 5 NOX(mg/nm3)			UNIT# 5 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Jun-19	621.46	911.07	857.17	946.34	283.45	262.38	298.47	43.7	39.48	46.69
2	2-Jun-19	589.17	898.06	838.36	938.99	279.84	258.68	295.95	42.98	38.74	S.NO.
3	3-Jun-19	503.34	860.93	828.91	917.38	267.29	253.85	284.18	40.47	37.77	43.84
4	4-Jun-19	530.66	878.59	832.22	943.83	274.15	255.88	297.26	41.84	S.NO.	46.45
5	5-Jun-19	610.59	907.94	845.59	936.45	282.81	262.23	294.43	43.54	39.45	45.89
6	6-Jun-19	608.88	904.87	848.09	943.19	281.45	261.77	297.91	43.32	39.35	46.58
7	7-Jun-19	638.35	916.93	862.18	948.00	285.18	264.27	299.38	44.1	40.35	46.88
8	8-Jun-19	612.99	908.2	837.08	944.89	282.93	257.76	297.64	43.58	38.55	46.53
9	9-Jun-19	566.01	888.3	829.98	940.68	276.82	254.5	295.97	42.38	37.9	46.19
10	10-Jun-19	528.87	873.71	827.14	927.47	271.98	254.02	291.12	41.41	37.8	45.26
11	11-Jun-19	528.09	879.17	834.4	943.03	274.1	257.87	296.86	41.8	38.57	45.98
12	12-Jun-19	547.4	880.43	829.18	938.32	274.39	254	295.47	41.87	37.69	46.09
13	13-Jun-19	536.95	878.74	827.01	940.25	274.35	253.24	295.39	41.93	37.75	46.08
14	14-Jun-19	574.04	893.5	834.28	946.37	278.56	256.64	298.49	42.71	38.33	46.69
15	15-Jun-19	587.43	897.23	833.4	948.99	279.2	259.21	298.68	42.92	38.84	46.94
16	16-Jun-19	573.72	890.57	830.74	941.16	277.31	256.09	296.08	42.48	38.22	46.22
17	17-Jun-19	569.18	888.38	831.99	946.74	276.52	255.15	298.66	42.29	38.03	46.73
18	18-Jun-19	588.35	897.7	835.4	937.78	279.72	258.69	294.77	42.95	38.74	45.95
19	19-Jun-19	637.98	918.63	885.31	945.30	286.06	270.81	298.42	44.21	41.16	46.68
20	20-Jun-19	645.34	918.92	890.39	944.68	285.55	272.16	297.47	44.11	41.43	46.49
21	21-Jun-19	641.38	921.75	891.1	941.61	287.25	272.44	296.04	44.42	41.49	46.21
22	22-Jun-19	634.32	911.75	890.61	943.35	282.96	274	297.05	43.58	41.66	46.65
23	23-Jun-19	542.11	876.77	835.76	917.97	272.81	257.03	290.07	41.55	38.41	45.01
24	24-Jun-19	554.82	886.52	819.73	929.72	276.33	251.08	293.57	42.28	37.22	45.71
25	25-Jun-19	639.54	917.67	896.06	942.57	285.26	274.52	297.32	44.02	41.9	46.46
26	26-Jun-19	618.14	910.42	838.72	949.06	283.59	257.51	299.45	43.72	38.5	46.89
27	27-Jun-19	549.03	880.8	837.35	919.46	273.81	257.83	289.32	41.73	38.4	44.86
28	28-Jun-19	483.06	853.66	832.3	883.96	265.46	255.1	278.33	40.13	38.02	42.67
29	29-Jun-19	495.23	866.17	827.24	924.36	270.41	253.24	287.20	41.1	37.65	44.44
30	30-Jun-19	515.25	860.81	830.8	928.90	267.27	255.01	290.22	40.49	38	45.04

CEMS DAYWISE VALUES FOR THE MONTH OF JUL '2019											
S.NO.	DATE	'# 5 LOAD(	UNIT# 5 SOX(mg/nm3)			UNIT# 5 NOX(mg/nm3)			UNIT# 5 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Jul-19	521.14	874.57	830.84	942.09	272.82	254.92	296.96	41.52	37.98	46.39
2	2-Jul-19	528.91	874.88	828	931.86	273.19	253.86	293.69	41.66	37.77	45.74
3	3-Jul-19	547.93	882.14	829.06	936.51	275.19	253.9	295.24	42.1	37.78	46.05
4	4-Jul-19	555.3	881.47	831.88	942.82	274.12	255.42	297.49	41.81	37.93	46.5
5	5-Jul-19	520.26	862.1	825.54	916.08	267.44	253.59	288.18	40.46	37.72	44.34
6	6-Jul-19	464.03	845	816.82	892.72	262.29	250.07	279.61	39.47	37.01	43.04
7	7-Jul-19	462.53	850.52	826.75	876.5	265.27	253.34	277.5	40.03	37.67	42.5
8	8-Jul-19	513.84	872.58	833.07	931.33	272.09	255.53	292.59	41.42	38.11	45.52
9	9-Jul-19	533.61	873.72	831.77	926.07	272.07	256	292.8	41.38	38.2	45.56
10	10-Jul-19	549.17	883.94	835.48	919.76	275.43	256.59	287.74	42.09	38.32	44.55
11	11-Jul-19	542.42	882.92	832.78	922.16	275.84	256.09	289.94	42.16	38.22	44.99
12	12-Jul-19	577.57	890.32	835.69	933.26	276.56	258.42	294.94	S.NO.	38.68	45.99
13	13-Jul-19	576.86	889.93	837.58	933.34	276.54	258.06	293.5	42.26	38.61	45.7
14	14-Jul-19	508.12	863.76	833.47	913.8	269.14	256.2	286.76	40.82	38.24	44.35
15	15-Jul-19	517.59	872.08	827.94	937.92	271.58	253.52	295.71	41.3	37.63	46.14
16	16-Jul-19	623.51	907.54	862.77	944.98	281.72	267.71	297.6	43.36	40.54	46.52
17	17-Jul-19	607.52	903.16	838.08	928.72	280.7	256.98	293.15	43.13	38.4	45.63
18	18-Jul-19	638.26	915.05	896.23	935.99	284.19	274.39	294.93	43.86	41.88	45.99
19	19-Jul-19	643.78	920.25	890.37	944.61	286.39	273.36	297.95	44.28	41.67	46.59
20	20-Jul-19	641.42	916.97	897.26	939.98	284.93	275.53	295.83	43.98	42.11	46.11
21	21-Jul-19	597.01	901.73	859.7	921.08	280.94	266.63	289.87	43.21	40.33	44.97
22	22-Jul-19	616.47	909.53	877.61	932.4	282.79	269.51	293.34	43.6	40.9	45.67
23	23-Jul-19	624.68	908.69	877.24	943.51	281.93	268.92	297.34	43.41	40.78	46.47
24	24-Jul-19	529.61	867.84	828.04	933.78	269.35	254.58	293.46	40.87	37.92	45.69
25	25-Jul-19	466.07	847.75	821.39	896.8	263.63	251.49	279.95	39.73	37.3	42.99
26	26-Jul-19	451.92	850.3	820.88	872.6	265.9	251.34	276.74	40.17	37.27	42.21
27	27-Jul-19	454.14	844.02	823.72	869.66	262.58	252.84	S.NO.	39.61	37.57	42.16
28	28-Jul-19	460.84	854.93	834.61	884.52	267.49	257.84	279.26	40.5	38.57	42.85
29	29-Jul-19	471.4	850.62	824.26	889.58	264.7	252.84	279.01	39.93	37.57	42.8
30	30-Jul-19	462.86	847.64	825.95	876.64	263.69	253.88	275.43	39.74	37.68	42.09

CEMS DAYWISE VALUES FOR THE MONTH OF AUG '2019											
S.NO.	DATE	UNIT# 5 LOAD(MW)	UNIT# 5 SOX(mg/nm3)			UNIT# 5 NOX(mg/nm3)			UNIT# 5 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Aug-19	536.97	882.47	821.45	937.98	275.55	251.74	295.27	42.1	37.35	46.05
2	2-Aug-19	514.14	868.73	829.52	911.48	270.87	253.99	286.33	41.16	37.8	44.27
3	3-Aug-19	533.05	881.01	825.96	928.95	274.74	253	293.57	41.95	37.6	45.71
4	4-Aug-19	486.59	857.48	822.78	910.66	267.6	252.27	285.28	40.5	37.45	44.06
5	5-Aug-19	523.65	876.91	827.41	924.34	273.45	254.39	291.34	41.67	37.88	45.27
6	6-Aug-19	538.55	875.07	825.14	921.11	271.96	252.79	289.07	S.NO.	S.NO.	S.NO.
7	7-Aug-19	515.29	867.3	826.49	938.3	269.83	254.17	295.49	40.97	S.NO.	46.1
8	8-Aug-19	496.73	866.6	829.6	930.21	270.4	255.32	293.38	41.01	38.06	45.46
9	9-Aug-19	S.NO.	862.25	837.24	926.78	268.58	258.86	292.89	40.7	S.NO.	45.58
10	10-Aug-19	507.5	866.09	826.89	929.24	269.74	254.16	293.68	40.96	37.83	45.74
11	11-Aug-19	550.1	882.35	833.39	933.3	274.85	256.03	294.84	41.94	38.21	45.97
12	12-Aug-19	618.62	910.65	849.96	940.88	283.4	264.15	297.21	43.7	39.83	46.44
13	13-Aug-19	614.7	900.43	828.93	932.92	278.85	254.79	293.29	42.79	37.96	45.66
14	14-Aug-19	580.51	892.06	822.04	936.86	277.25	252.17	295.17	42.44	S.NO.	46.03
15	15-Aug-19	479.72	857.44	823.87	911.03	267.23	252.25	287.62	40.46	37.45	44.52
16	16-Aug-19	484.02	862.34	821.18	915.36	269.4	251.46	289.4	40.88	S.NO.	45
17	17-Aug-19	586.06	898.16	832.15	942.81	279.59	255.79	297.69	42.88	38.16	46.38
18	18-Aug-19	626.38	916.94	864.99	945.5	286.11	271.47	298.07	44.22	41.29	46.61
19	19-Aug-19	643.35	922.88	888.89	946.68	287.74	271.77	298.64	44.57	41.36	46.73
20	20-Aug-19	655.51	923.44	897.84	947.32	287.05	274.99	298.87	44.39	42	46.77
21	21-Aug-19	623.3	911.67	873.65	948.16	283.82	269	299.3	43.72	40.42	46.86
22	22-Aug-19	564.06	889.24	836.28	935.72	276.95	257.15	293.66	42.36	38.43	45.73
23	23-Aug-19	589.13	896.4	834.89	942.47	277.99	258.22	297.41	42.6	38.64	46.62
24	24-Aug-19	533.76	873.68	827.61	934.8	271.95	254.57	293.64	41.39	37.91	45.73
25	25-Aug-19	553.37	888.96	831.07	945.1	277.06	254.39	297.9	42.41	37.88	46.58
26	26-Aug-19	590.8	908.82	851.36	940.87	283.94	260.67	296.85	43.81	39.13	46.37
27	27-Aug-19	582.37	890.52	825.1	945.45	276.59	252.56	297.96	42.35	37.51	46.59
28	28-Aug-19	549.05	882.74	851.25	911.78	275.01	260.6	287.21	42	39.12	44.44
29	29-Aug-19	524.35	867.12	838.79	896.54	268.82	256.96	280.88	40.79	38.39	43.18
30	30-Aug-19	533.49	878.74	831.61	913.59	274.24	255.21	288	41.84	38.04	44.73
31	31-Aug-19	464.51	901.48	866.6	933.12	265.56	249.99	276.92	43.11	40	45.38

CEMS DAYWISE VALUES FOR THE MONTH OF SEP '2019											
S.NO.	S.NO.	UNIT# 5 LOAD(MW)	UNIT# 5 SOX(mg/nm3)			UNIT# 5 NOX(mg/nm3)			UNIT# 5 DUST(mg/nm3)		
		AVG	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX
1	1-Sep-19	501.95	866.68	824.79	912.53	270.33	253.14	288.45	41.09	37.63	44.69
2	2-Sep-19	509.64	863.47	831.76	915.97	268.31	256	289.55	40.69	38.2	44.91
3	3-Sep-19	531.85	872.94	823.24	912.19	271.38	251.98	287.96	41.29	37.4	44.59
4	4-Sep-19	547.99	885.33	839.22	936.11	276.04	259.05	295.71	42.19	38.81	46.14
5	5-Sep-19	534.94	875.68	827.58	914.59	272.48	253.77	289.14	41.46	37.75	44.83
6	6-Sep-19	520.65	868.84	833	932.96	270.29	255.76	294.35	41.1	38.15	45.87
7	7-Sep-19	491.61	856.47	829.96	897.77	265.97	254.38	284.04	40.16	37.88	43.81
8	8-Sep-19	453.92	847.48	808.86	881.09	264.56	249.3	278.6	39.9	36.86	42.72
9	9-Sep-19	431.25	839.08	808.55	865.94	261.67	249.16	273.76	39.31	36.83	41.75
10	10-Sep-19	476.25	858.16	819.16	891.05	267.93	251.63	280.46	40.56	37.33	43.09
11	11-Sep-19	499.36	867.35	832.87	894.4	271.01	255.95	282.29	41.18	38.19	43.46
12	12-Sep-19	454.16	848.57	818.66	868.63	265	251.22	273.91	39.99	37.24	42.27
13	13-Sep-19	463.99	852.74	822.67	879.05	266.11	251.9	278.62	40.22	37.38	42.72
14	14-Sep-19	469.79	856.28	830.65	877.19	267.53	254.87	278.1	40.47	37.97	42.62
15	15-Sep-19	455.98	847.73	821.81	867.88	264.42	251.96	275.07	39.89	37.23	42.01
16	16-Sep-19	580.08	896.69	859.69	928.33	278.58	265.87	292.45	42.7	40.11	45.49
17	17-Sep-19	560.24	887.54	840.38	917.59	276.51	258.33	289.58	42.3	38.67	44.92
18	18-Sep-19	499.76	862.14	836.06	903.53	268.14	256.28	283.53	40.61	38.26	43.88
19	19-Sep-19	543.91	879.27	838.04	931.16	273.59	S.NO.	293.86	41.75	38.56	45.77
20	20-Sep-19	574.93	888.41	833.64	932.83	276.06	257.72	292.8	42.22	38.54	45.56
21	21-Sep-19	549.99	882.52	850.37	918.47	274.82	264.45	289.57	41.94	39.89	44.91
22	22-Sep-19	516.91	872.11	819.83	911.96	272.2	251.06	288.48	41.41	37.21	44.7
23	23-Sep-19	566.43	890.32	855.66	919.71	277.17	262.9	290	42.43	39.58	45
24	24-Sep-19	474.52	849.85	820.69	897.34	264.68	251.47	282.85	39.9	37.29	43.24
25	25-Sep-19	450.26	843.86	824.2	869.04	262.85	252.9	275.57	39.56	37.58	42.11
26	26-Sep-19	456.12	851.25	816.42	883.57	266.02	251.22	274.16	40.19	37.24	41.83
27	27-Sep-19	449.6	845.03	811.64	867.88	263.42	249.69	273.7	39.7	36.82	41.74
28	28-Sep-19	444.87	841.99	815.76	898.33	262.29	250.78	282.66	39.46	37.16	43.13
29	29-Sep-19	440.93	844.46	815.73	922.59	263.7	251.35	289.79	39.76	37.27	44.96
30	30-Sep-19	444.11	840.13	808.79	927.53	261.24	247.75	291.76	39.26	36.55	45.35

Annexure - IV

ADANI POWER MAHARASHTRA LIMITED
ASH GENERATION AND UTILIZATION DETAILS
(April 2019 - September 2019)

Month	Ash Generation MMT/Month	Ash Utilization (%)	For Cement Manufacturing MMT/Month	For Brick/Construction MMT/Month	Ash dyke Raising MMT/Month	Reclamation of Low lying Area MMT/Month	Mount Formation + Export of Fine Ash	Mine Filling and Agriculture	Ash Dyke MMT/Month
Apr-19	0.421	65.0	0.003	0.010	0.001	0.045	0.213	0.001	**0.147**
May-19	0.418	80.7	0.000	0.008	0.006	0.144	0.177	0.002	**0.081**
Jun-19	0.397	84.4	0.008	0.008	0.034	0.149	0.136	0.001	**0.062**
Jul-19	0.404	58.8	0.000	0.008	0.000	0.021	0.209	0.000	**0.166**
Aug-19	0.386	72.0	0.000	0.003	0.000	0.023	0.252	0.000	**0.108**
Sep-19	0.313	66.8	0.002	0.005	0.000	0.024	0.178	0.001	**0.104**
Total	**2.34**	**71.4**	**0.012**	**0.041**	**0.040**	**0.407**	**1.166**	**0.005**	0.668

Fig in MMT

adani
Power

Ref: APML/ENV/MoEFCC/EC/976/19 Date: 09.10.2019

To,

The Director
Ministry of Environment, Forest and Climate Change
Regional Office (WCR)
Ground Floor, East Wing
New Secretariat Building
Civil Lines, Nagpur – 440001

Sub: Advisory regarding implementation of Notification No. G.S.R. 02 (E) dated 2nd January 2014 for supply and use of coal with ash content – regarding.

Dear Sir,

With above subject, we are submitting herewith the compliance of said notification.

The half yearly compliance report for Fly Ash Management for environmental safeguards stipulated in the EC and consent are being submitted to Regional office of MoEF – Nagpur as well as Maharashtra Pollution Control Board (MPCB). We are also submitting half yearly & annual fly ash utilization and ash content in coal to Central Electricity Authority (CEA), New Delhi.

We are enclosing herewith monthly as well as quarterly average ash content in the coal used by our power plant during the period of **July'2019 – September'2019** as Annexure – 1.

This is for your kind information & records please.

Thanking you.

Yours faithfully
For Adani Power Maharashtra Limited

(Kanti Biswas)
Station Head

Sub-Regional Office
M. P. C. Board, Bhandara.
Rec.
Date 11/10/2019

Encl: As above

CC: MPCB, Mumbai

Adani Power Maharashtra Ltd
Plot A-1, Tirora Growth Centre
MIDC Area, Tirora
Gondia 441 911
Maharashtra, India
CIN: U40101GJ2007PLC050506

Tel +91 7198255100
Fax +91 7198255111/800
info@adani.com
www.adanipower.com

Registered Office: Adani House, Shantigram, S G Highway, Ahmedabad 382 421, Gujarat, India

ADANI POWER MAHARASHTRA LIMITED

ASH PERCENTAGE IN COAL

(FROM July'2019 – September '2019)

Month	Coal Consumption (MMT)	Ash % in Coal
July- 2019	1.25	32.31
August- 2019	1.20	31.96
September-2019	0.96	32.44
Quarterly Average	-	**32.24**

MMT: Million Metric Tons

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H. O. : B-1003, Enviro House, 10th Floor, Western Edge II, Western Express Highway, Borivali (E), Mumbai - 400 066.
• Tel. : +91 22 2854 1647 / 48 / 49 / 67 / 68 • E-mail : info@eaepl.com • Website : www.eaepl.com

ENV/SWT/2019-20/081 **Date: 16.09.2019**

ISSUED TO:
M/s ADANI POWER MAHARASHTRA LIMITED
Plot no. - A1, Tirora Growth Center, MIDC, Tirora,
Dist.: Gondia, Maharashtra – 441 911. India

Sample Particulars : Fly Ash Sample

Sample Registration Date	: **28.08.2019**	Analysis Starting Date :	01.09.2019
Quantity received	: **2 kg**	Analysis Completion Date :	14.09.2019
Sample Type:	: **Solid Waste**	Sampled by :	EAEPL Representative

TEST RESULTS

Sr. No.	Test Parameters	Measurement Unit	Results
1	Alumina (as Al_2O_3)	% by mass	24.88
2	Iron Oxide (as Fe_2O_3)	% by mass	4.87
3	Silica (as SiO_2)	% by mass	60.2
4	Reactive Silica	% by mass	0.038
5	Magnesium Oxide (as MgO)	% by mass	1.48
6	Sulphur Trioxide (as SO_3)	% by mass	0.12
7	Alkalies (as Na_2O)	% by mass	3.61
8	Chloride (as Cl)	% by mass	0.047
9	Loss on ignition (as LOI)	% by mass	0.064
10	Cadmium	mg/kg	0.47
11	Chromium	mg/kg	24.8
12	Arsenic	mg/kg	1.13
13	Mercury	mg/kg	0.117
14	Selenium	mg/kg	Nil
15	Cyanide	mg/kg	Nil
16	Cobalt	mg/kg	15.7
17	Copper	mg/kg	30.8
18	Lead	mg/kg	39.6
19	Molybdenum	mg/kg	Nil
20	Nickel	mg/kg	28.3
21	Tin	mg/kg	Nil

For Enviro Analysts & Engineers Pvt. Ltd.

Authorized Signatory

Nagpur Branch : Shiv Kunj, Bunglow No. 65, Old Verma Layout, Ambazari, Nagpur - 440 010. Tel. : 0712 - 2241 835, Telefax : 0712 - 2241 836

Pune Branch: Flat No. 11, Tarankit Co. Op. Hsg. Soc. Ltd., City S. No. 209, B/1, Sadashiv Peth, L. B. S. Road, Nr. Dnyanal Mangal Hall, Pune - 411 030. Tel. : 020-2432 4444

Lab : Row House No. 2, Shalom Garden, Opp. Kanakia College, 100 Feet Kanakia Road, Mira Road (East), Thane - 401 107. Tel. : 022-2811 6442

Workshop : Plot No. E - 122, MIDC Tarapur, Boisar, Dist. - Thane - 401 506.

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ENV/SWT/2019-20/081 **Date: 16.09.2019**

ISSUED TO:
M/s ADANI POWER MAHARASHTRA LIMITED
Plot no. - A1, Tirora Growth Center, MIDC, Tirora,
Dist.: Gondia, Maharashtra – 441 911. India

Sample Particulars : Fly Ash Sample

Sample Registration Date	: **28.08.2019**	Analysis Starting Date :	01.09.2019
Quantity received	: **2 kg**	Analysis Completion Date :	14.09.2019
Sample Type:	: **Solid Waste**	Sampled by :	EAEPL Representative

TEST RESULTS

Sr. No.	Test Parameters	Measurement Unit	Results
22	Barium	mg/kg	383
23	Calcium	mg/kg	12380
24	Iron	mg/kg	34041
25	Zinc	mg/kg	72.4
26	Aluminium	mg/kg	131615
27	Manganese	mg/kg	128.7
28	Antimony	mg/kg	Nil
29	Beryllium	mg/kg	Nil

Note: 1. Results relate to tested sample only.
2. Test report should not be reproduced partially.

REMARKS: Based upon request of party, sample was tested for above mentioned parameters only.

For Enviro Analysts & Engineers Pvt. Ltd.

Authorized Signatory

Nagpur Branch : Shiv Kunj, Bunglow No. 65, Old Verma Layout, Ambazari, Nagpur - 440 010. Tel. : 0712 - 2241 835, Telefax : 0712 - 2241 836

Pune Branch: Flat No. 11, Tarankit Co. Op. Hsg. Soc. Ltd., City S. No. 209, B/1, Sadashiv Peth, L. B. S. Road, Nr. Dnyanal Mangal Hall, Pune - 411 030. Tel. : 020-2432 4444

Lab : Row House No. 2, Shalom Garden, Opp. Kanakia College, 100 Feet Kanakia Road, Mira Road (East), Thane - 401 107. Tel. : 022-2811 6442

Workshop : Plot No. E - 122, MIDC Tarapur, Boisar, Dist. - Thane - 401 506.

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• Tel. : +91 22 2854 1647 / 48 / 49 / 67 / 68 • E-mail : info@eaepl.com • Website : www.eaepl.com

ENV/SWT/2019-20/081 /1 Date: 16.09.2019

ISSUED TO:
M/s ADANI POWER MAHARASHTRA LIMITED
Plot no. - A1, Tirora Growth Center, MIDC, Tirora,
Dist.: Gondia, Maharashtra – 441 911. India

Sample Particulars : Pond Ash Sample

Sample Registration Date	: **28.08.2019**	Analysis Starting Date :	01.09.2019
Quantity received	: **2 kg**	Analysis Completion Date :	14.09.2019
Sample Type:	: **Solid Waste**	Sampled by :	EAEPL Representative

TEST RESULTS

Sr. No.	Test Parameters	Measurement Unit	Results
1	Alumina (as Al_2O_3)	% by mass	22.67
2	Iron Oxide (as Fe_2O_3)	% by mass	4.39
3	Silica (as SiO_2)	% by mass	58.72
4	Reactive Silica	% by mass	0.028
5	Magnesium Oxide (as MgO)	% by mass	1.33
6	Sulphur Trioxide (as SO_3)	% by mass	0.11
7	Alkalies (as Na_2O)	% by mass	3.12
8	Chloride (as Cl)	% by mass	0.033
9	Loss on ignition (as LOI)	% by mass	0.06
10	Cadmium	mg/kg	0.43
11	Chromium	mg/kg	29.1
12	Arsenic	mg/kg	1.14
13	Mercury	mg/kg	0.107
14	Selenium	mg/kg	Nil
15	Cyanide	mg/kg	Nil
16	Cobalt	mg/kg	15.9
17	Copper	mg/kg	31.6
18	Lead	mg/kg	39.7
19	Molybdenum	mg/kg	Nil
20	Nickel	mg/kg	28.8
21	Tin	mg/kg	Nil

For Enviro Analysts & Engineers Pvt. Ltd.

Authorized Signatory

ENV/SWT/2019-20/081 /1 **Date: 16.09.2019**

ISSUED TO:
M/s ADANI POWER MAHARASHTRA LIMITED
Plot no. - A1, Tirora Growth Center, MIDC, Tirora,
Dist.: Gondia, Maharashtra – 441 911. India

Sample Particulars : Pond Ash Sample

Sample Registration Date	: **28.08.2019**	Analysis Starting Date :	01.09.2019
Quantity received	: **2 kg**	Analysis Completion Date :	14.09.2019
Sample Type:	: **Solid Waste**	Sampled by :	EAEPL Representative

TEST RESULTS

Sr. No.	Test Parameters	Measurement Unit	Results
22	Barium	mg/kg	332
23	Calcium	mg/kg	11070
24	Iron	mg/kg	30686
25	Zinc	mg/kg	69.9
26	Aluminium	mg/kg	119924
27	Manganese	mg/kg	126.4
28	Antimony	mg/kg	Nil
29	Beryllium	mg/kg	Nil

Note: 1. Results relate to tested sample only.
2. Test report should not be reproduced partially.

REMARKS: Based upon request of party sample was tested for above mentioned parameters only.

For Enviro Analysts & Engineers Pvt. Ltd.

Authorized Signatory

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ENV/SWT/2019-20/081/2 **Date: 16.09.2019**

ISSUED TO:
M/s ADANI POWER MAHARASHTRA LIMITED
Plot no. - A1, Tirora Growth Center, MIDC, Tirora,
Dist.: Gondia, Maharashtra – 441 911. India

Sample Particulars : Bottom Ash Sample

Sample Registration Date	: **28.08.2019**	Analysis Starting Date :	01.09.2019
Quantity received	: **2 kg**	Analysis Completion Date :	14.09.2019
Sample Type:	: **Solid Waste**	Sampled by :	EAEPL Representative

TEST RESULTS

Sr. No.	Test Parameters	Measurement Unit	Results
1	Alumina (as Al_2O_3)	% by mass	19.62
2	Iron Oxide (as Fe_2O_3)	% by mass	5.96
3	Silica (as SiO_2)	% by mass	49.2
4	Reactive Silica	% by mass	0.010
5	Magnesium Oxide (as MgO)	% by mass	1.95
6	Sulphur Trioxide (as SO_3)	% by mass	0.093
7	Alkalies (as Na_2O)	% by mass	2.42
8	Chloride (as Cl)	% by mass	0.027
9	Loss on ignition (as LOI)	% by mass	0.008
10	Cadmium	mg/kg	0.19
11	Chromium	mg/kg	18.5
12	Arsenic	mg/kg	0.62
13	Mercury	mg/kg	0.091
14	Selenium	mg/kg	Nil
15	Cyanide	mg/kg	Nil
16	Cobalt	mg/kg	11.9
17	Copper	mg/kg	33.5
18	Lead	mg/kg	26.7
19	Molybdenum	mg/kg	Nil
20	Nickel	mg/kg	31.6
21	Tin	mg/kg	Nil

For Enviro Analysts & Engineers Pvt. Ltd.

Authorized Signatory

ENV/SWT/2019-20/081/2 **Date: 16.09.2019**

ISSUED TO:
M/s ADANI POWER MAHARASHTRA LIMITED
Plot no. - A1, Tirora Growth Center, MIDC, Tirora,
Dist.: Gondia, Maharashtra – 441 911. India

Sample Particulars : Bottom Ash Sample

Sample Registration Date	: **28.08.2019**	Analysis Starting Date :	01.09.2019
Quantity received	: **2 kg**	Analysis Completion Date :	14.09.2019
Sample Type:	: **Solid Waste**	Sampled by :	EAEPL Representative

TEST RESULTS

Sr. No.	Test Parameters	Measurement Unit	Results
22	Barium	mg/kg	338
23	Calcium	mg/kg	13590
24	Iron	mg/kg	41660
25	Zinc	mg/kg	71.3
26	Aluminium	mg/kg	103790
27	Manganese	mg/kg	129.4
28	Antimony	mg/kg	Nil
29	Beryllium	mg/kg	Nil

Note: 1. Results relate to tested sample only.
2. Test report should not be reproduced partially.

REMARKS: Based upon request of party sample was tested for above mentioned parameters only.

For Enviro Analysts & Engineers Pvt. Ltd.

Authorized Signatory

ADANI POWER MAHARSHTRA LIMITED, TIRORA

GREEN BELT & PLANTATION DETAILS

Total Area Covered: 258 HA

Tree Planted: 517478 Nos.

Shrubs Planted: 59885 Sq. Meter

Green Carpet: 322195 Sq. Meter

Plant & Shrubs Species used for Green Belt Development

Shrubs	Tree Species
Bogunvellia	Psidium guavajava (Amarud)
Rose	Punica granatum (Anar)
Furcaria	Manilkara zapota (Chikoo)
Cassia biflora	Phyllanthus emblica (Aonla)
Lagerstromia indica	Tamarindus indica (Imali)
Shrubs	Mangifera indica (Mango)
Flower Beds.	Lemon
Lawn	Carissa carandas
Exora Tall	Bottle Brush
Golden Ficus	Casuarina
Ficus panda	Samania saman
Group plants	Ficus religeosa
Nerium Bell (Yellow Ghanti Kanher)	Casia siamia
Hibiscus	Bauhinia purpuria
Musanda	Ficus bengalensis
Nolino	Delonix regia
Furcaria	Azadiracta Indica
Junifer	Spathodia
Ficus Golden	Peltaphorum
Ficus blackiana	Delonix regia
Headge	Acacia auriculiformis
	Jackranda
	Peltaphorum
	Neolamarckia cadamba
	Palms (Coconut, Fistal palm, Royal Palm, etc)
	Ficus Golden
	Rain Tree
	Mimusops elengii
	Cassia fistula
	Tectona grandis (Teak)

ADANI POWER MAHARSHTRA LIMITED, TIRORA

ADANI POWER MAHARSHTRA LIMITED, TIRORA

ADANI POWER MAHARSHTRA LIMITED, TIRORA

ADANI POWER MAHARSHTRA LIMITED, TIRORA

Plantation in Nearby Villages

ADANI POWER MAHARSHTRA LIMITED, TIRORA

ADANI POWER MAHARSHTRA LIMITED, TIRORA

ADANI POWER MAHARSHTRA LIMITED, TIRORA

ADANI POWER MAHARSHTRA LIMITED, TIRORA

Annex - VII

adani Foundation

TIRODA

CSR REPORT

APRIL- 2019 to SEPTEMBER- 2019

Overview: Foundation's Presence in Tirora since 2010

adani Foundation

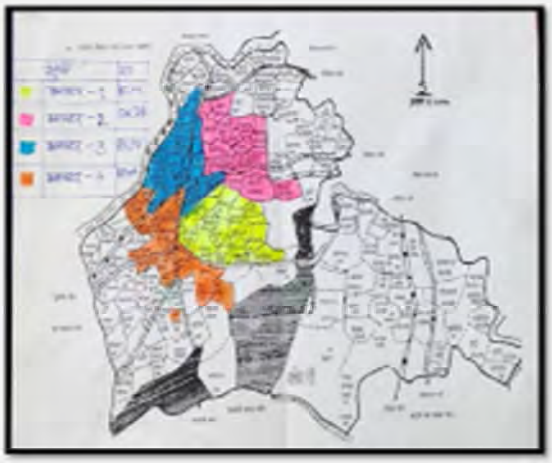
Total Coverage

64 Villages

58 Grampanchayat	27 Tolas

130973 Total Population Benefitted

- **65623** Female
- **65349** Male



Our Focus Area for Community Development

adani Foundation

- Education
- Community Health
- Sustainable Livelihood
- Rural Infrastructure

Special Activity- Disaster Relief Work

1. Disaster Relief Work for Sangali flood- This monsoon season unexpected heavy rains in August have severally affected the Sangali district. Therefore AF and APML have taken an initiative for relief work in Sangali. Total 36 APML disaster Relief team and MHCU helpage India team have appointed in Sangali for 10 days. The Disaster relief team worked on retaining electric supply of households, provided medical services in 25 villages, supported for restoration of electricity in 16 villages and donated 10,000 units of LED bulbs in Sangli Dist.


2. Swachhagrahi Film Shooting - The News-18-Lokamat team visited AF for Swachhagrahi Film Shooting which covered different activities of the Swachhagrahi in School program and Swachhagrahi House Competition program. The school activities covered at Z.P. Upper Primary School, Kodelohara, activities are- Swachhagraha Pledge, Swachhagrahi Dal meeting Activity, Snake and Ladder Game, Swachhagrahi Wall, Street Play and Awareness on Swachhagraha. However Swachhagrahi Households Competition activities shots at Chikhali village, which covered Women's meeting for Swachhagrahi house competition, House visit for preparation, House evaluation activity and bytes, APML Station head, Unit CSR head, Block Education Officer, CEO bytes and Prize Distribution Programme.



Special Events-

1. Adani Foundation Cricket Cup - 2019-2020

Adani foundation, Tiroda organized Adani Foundation Cricket Cup Season-2 dated from 23 April to 30 April 2019 for rural youths from our vicinity. The matches played at Shantigram Cricket Ground with 2 matches every day in a knockout format. The program inaugurated in presence of District Education Officer, Tiroda Sub Divisional Police Officer, Tahasildar, Deputy Education Officer, APML station head and Adani Foundation Unit CSR head. Also school girl's students played the Lezim and made this even pleasurable. In this 8 day event Village Berdipar and Thanegaon made it to the finals. In an electrifying atmosphere and nail biting match Thanegaon emerged victorious.



2. Observance of Fire Service Day /Week

AF organized Fire Service day/week from 8th April to 14th April 2019 in two schools about 150 students took part. The week was celebrated on the theme '*Fire Prevention is better than Fire Fighting'.* The drawing competition was conducted in schools on according to the theme.

3. Road Safety and Transport awareness Programme

Adani Foundation has trained the 30 youths of Gumadhawada village about the rules of Road Safety. And with the help of these 30 youths AF had run one week road safety awareness programme at Gumadhawada bus stop. For spreading awareness about road safety rules pamphlets also distributed to commuters.


4. World Menstrual Hygiene Day

Kishori Melava' was organized on the occasion of the World Menstrual Hygiene day on 28th May 2019 on this occasion Dr. Gargi Bahekar, Gynecologist and Dr. Richa Khare, Nutritionist were the leading guest. The program was focused on the Physical and Psychological changes of Adolescence girls during the menstrual days. Dr. Gargi Bahekar has explained about the scientific reasons of Menstrual Cycle and hygiene and precautions to be taken by ladies during those days. Furthermore the Nutritionist Dr. Richa Khare gave presentation on deficiency of nutrients in women caused during the menstrual days. On these occasions about 200 women and adolescence girls were present.


5. Blood Donation Drive:

At APML every year the blood donation drive has been organizing on 24th June, aiming to save human lives and eliminate health problems emerging due to blood shortage. This year total 1084 units of blood donated by the APML employees and supporting staff. APML all department's employees participated enthusiastically. The drive was organized by the all departments under the guidance of APML station head C.P. Sahoo sir. Adani Medical Team, HR Dept. and all other Departments of APML, associate agencies and their employees actively involved for coordinating this drive. In this mega drive the big charitable blood banks teams from Nagpur, Gondia came to coordinate and collect the blood.


6. Yoga Day celebration

APML has celebrated the 5th International Yoga Day 2019 on June 21, 2019. The theme of 2019 yoga day is 'Climate Action'. Climate Action theme focuses on the way how yoga can help us to solve the problem of climate change and also it bring it lots more benefits into the lives of people. Total 1600-1700 employees, supporting staff and youths from nearby villages were performed Yoga.

A. Chairperson Dr. Priti G. Adani Mam birthday Celebration

At Adani Foundation- We celebrated birthday of our beloved Honorable Chairperson Dr. Priti G Adani Madam with Ashram school children, Gondia belonging to North East states. The children belong to financially deprived families. We provided them with school kit (School bag, compass box and notebooks) and refreshments.

At Adani Skill Development Centre- We organized a program for inauguration of 3rd batch at ASDC Tiroda for 3 trades and 100 students. Distribution of training material was also undertaken on this auspicious occasion. The students made birthday videos for Hon Chairperson Priti G Adani madam and everyone wished for good health & prosperity. The occasion was graced by Station head Sh C.P Sahoo, Sh. Mr. M Ramanujam Sir (Conservator of Forest) and CSR unit head Sh Nitin Shiralkar Sir.

B. Adani Foundation Day- The 'Adani Foundation day- 12th August- 2019' was celebrated at Balapur Village with the farmers, importance of organic farming and community participation were delivered during an event. Total 70 villagers were present during an occasion.


Education

A. Aamchi Shala Adarsh Shala Competition- The competition is conducted to enhance the quality education of government Zilla Parishad School's by improving school environment (advancing infrastructure and quality education) with community participation, teachers' performance and student learning.

- Prize distribution program of 'Aamchi Shala Adarsh Shala competition-2018-19' was organized for participated Schools. From 33 participated schools, Zilla Parishad Upper Primary school, Atri won the 1st prize.
- This FY-2019-20 total 60 schools from Tiroda block and 255 schools from districts are participated in the competition. For participated schools organized 1st workshop of phase 3 on Aamchi Shala Aadarsh Shala Competition, focused on total 51 competition implementing parameters. Total 120 participants- includes School SMC, Principals, and teachers from 63 schools were present in the workshop.

B. Udaan- Objective of Udaan programme is to motivate the students and encourage them for dreaming big and developed an entrepreneurial spirit in student lives. The Udaan is a one day Exposure visit to APML-Tiroda, provides basic information related to power plant, various sources of power production and Conducts Goal setting session for students. Till now total 42 programmes have been conducted and total 2520 students participated.

C. E-Learning- Initiated for- Exposure of rural students to new multimedia technologies aimed at improving the quality of learning in an innovative & interactive way and to develop child friendly classrooms. Completed Up-gradation of Std. 2nd new E-learning syllabus in total 126 schools.

D. Navodaya Coaching Centre (NCC) - To nurture talent from rural area and support talented students from deprived families to get into Navodaya School. AF has conducted special coaching classes for these students in Government school.

- FY-2018-19 NCC batch Exam held on 6th April 2019, total 75 aspirant students from 3 centers were given the exam. 2 students- Krish Baghele, Bhajepar & Aakruti Ramteke, Gumadhawada were selected for Javahar Navoday Vidyalaya, Gondia.
- With the support of education department for NCCs started in total 4 centers i.e. ZP Upper primary school Birshi, ZP Upper primary school Gumadhawada, Z.P. School Kawalewada and ZP High School Berdipar.
- The 2019-20 NCC batch classes are ongoing on regular basis in the morning from 8.00 am- 10.00am. Total 80 students enrolled from 15 schools for the Navodaya Classes.



E. Pre- Training of Youths for Army and Police services- To transform young candidates into academically proficient, physically fit, mentally strong individuals bursting with energy and confidence and ready to face any challenge in life. The 3 months trainings conducted by Adani foundation in association with police department and gram panchayat of Khairbodi.

- Completed 2nd batch of 253 students.
- Pre-police training 3rd batch of 148 students is ongoing with the support of police department and security department of APML. Ongoing regular 2 hours of Physical Training, weekly 2 days theory classes and weekly one exams as per the parameters of military and police.



F. A & TDD Archery Coaching Academy- To nurture the natural athletic talent of tribal students, AF Started Archery Coaching Academy, it named as 'Adani and Tribal Development Department (A&TDD)'. Total 36 Tribal Students selected from Tribal Ashram Schools under Integrated Tribal Development project, Deori. The coaching academy inauguration program has been organized in collaboration with Integrated Tribal Development Project at Upper Primary Ashram School, Masjitpur. The ACC was inaugurated by Guardian Minister- Dr. Parinay Fuke and MLA. Total 436 people were present in the program includes Sarpanch, teachers, students and villagers. Archery coaching classes runs daily for 2 hours each in the morning and evening.



Community Health

A. Mobile Healthcare Unit (MHCU) –

In partnership with Helpage India Organization two MHCU started for providing quality healthcare service at the doorstep of village's two MHCU covering 25 villages each on weekly basis, both MHCU treated and provided medicines to total 47432 patients (Male- 12079, Female- 15353).



B. General Medical Health Camp- Complete total 13 General Medical Health camps in villages total 854 patients benefitted by this camps (244-male and 610-female).


C. Awareness programme on Hypertension and BP- An awareness programme on Hypertension and BP were conducted at Berdipar village in which 79 participants participate and get information by this camp. (Male 39 and Female- 40).

D. Poor Patient assistant programme- Assisted 3 Poor Patients by providing financial aid, patients' are- Vasantrao Tembhare, Rashmi Bangare and Durga Dilip Shribanshri. We have conducted each household visits to understand the actual condition of patients and their family. Given information to applicant about our schemes and informed them our process and documentation.

E. Adolescent girls Anaemia testing and treatment awareness camp

To spread awareness about health, sanitation and anaemia, in adolescent girls we have conducted awareness camp on Anaemia and nutrition in our programme villages. Total 81 women and adolescent girls visited and get free treatment as well as free Iron Folic acid tablets. 75 adolescent girls have done HB testing.

F. SuPoshan

A unique community based intervention to – Reduce the occurrence of malnutrition in children (0-5years), to reduce occurrence of malnutrition & anemia in adolescent girls & women in reproductive age group, create a pool of resource at community level, especially SuPoshan Sangini.

- Total no. of Anganwadis covered: **112**
- Total Population Covered: **25,993**
- Total no. of villages Covered: **48**
- Total no. of SuPoshan Sanginis: **36**

Sr. No.	Community Engagement and other Activities	Cumulative Data
1	Focus Group Discussion	2173
2	Family Counselling	951
3	Village level Events	110
4	No of SAM children referred to CMTC	20
5	No of SAM children provided with Energy Dense Food (Only New children)	329
6	No of total Hb & BMI screening - Women in reproductive age	2256
7	No of total Hb & BMI screening - Adolescent girls	789
8	No of women in reproductive age provided with IFA Tablets	30
9	No of adolescent girls provided with IFA Tablets	97

Sr. No.	Project Achievements-Indicator	Numbers
1	Stunting Category	61
2	Wasting Category	185
3	Underweight Category	386
4	No of Adolescent Girls with Anaemia (10-19 yr.)	112
5	No of Women with Anaemia in reproductive age (14-50 yr.)	249
6	Stunting Catagory first Shifting (Severe-Moderate)	20
7	Wasting Catagory first Shifting (Severe-Moderate)	27
8	Underweight Catagory first Shifting (Severe-Moderate)	83

A. i. Breastfeeding Week- Breastfeeding week 1^{st} Aug-7^{th} Aug 2019 were celebrated with 27 communities in total 25 villages of SuPoshan programme. Through this events we spread awareness amongst 1198 women about the good practices of breastfeeding- dos & don'ts, child nutritional food and hand-wash practices in programme villages.



A ii. National Nutrition Week - The National Nutrition Week- 1^{st}Sep- 7^{Th} Sep 2019 were celebrated in the villages and schools based on the theme 'Complementary Feeding'. The whole month of September celebrated as 'Poshan Mah'. The covered activities were Rally, Food Competition, Food Exhibition, Anand Melava, Awareness on Poshan and Supplements, Nutrition and supplements for growth and development, Chart presentation on vitamin and minerals, and Etc. On this occasion total 27 events were organized in 26 villages and total 5165 villagers and school children participated in events.



G. Swachhagraha Programme- 'Go Clean Go Green…'

Conducted Swachhagrah clean-ship drive along with tree plantation on June 23, 2019 in four villages' of the Tiroda Taluka Churdi, Garada, Chikhali, and Bhivapur. About 1000-12000 villagers and Adani employees were participated. The program started by taking Swachhata Oath. School students participated in the Swachhata rally by wearing different costumes of Indian leaders, & through street play & songs students had spread the awareness about cleanliness**.** The program was also conducted at Mokshdham in Gondia on 30th June

2019. Total 26 APML EVP's and supporting staff participated to clean the Mokshdham and trees also planted.

Sustainable Livelihood Development (SLD)

A. Organic System Rice Intensification (SRI) - SRI farming initiated to encourage farmers to adopt SRI technique for rice cultivation and produce their own organic fertilizer and pesticide.

- Started chariots (SRI Rath) to spread awareness about organic farming with (SRI) method the chariots moved in total 65 villages & spread awareness about benefits and importance of adopting organic way of farming.

- Selected village Volunteers for SRI and imparted training to them.
- Seeds Distributed to paddy seed to 10,000 farmers in 50 villages (4kg each farmer).

- SRI Training- Conducted SRI training programme in 32 villages. Total 2623 farmers participated in this training programme. Accordingly demonstration conducted on making of SRI Rice bed in farm at 10 villages with 324 farmers.

- **Krishi Melawa -** Krishi Melawa was organized on 30th April 2019. The workshop was focused on identification of pest and diseases on crops and related consultation. It covered the importance of SRI farming; precautionary measures to be taken care of during uses of chemical fertilizers and pest control. The workshop was conducted in guidance of Agriculture officer, Agriculture assistant, Agriculture supervisor along with Adani Foundation team. About 97 participants were attended the workshop.

- In 2019 monsoon, SRI Transplantation completed in 50 villages, total 10000 farmers replicated SRI transplantation on total 20191 acres land.
- Also, to promote organic farming conducted 22 Training Programmes for farmers on the making of organic pesticide & organic vermi compost, for training total 664 farmers were participated from 22 villages.

B. Farmers Producer Company (FPC)
Milk Collection, Processing and Marketing

To Establish a Farmer's Centric and Functional Farmers Producer Organization on Milk processing Unit and to give marketing platform to the small scale farmers. AF has registered two Farmers Producer Company (FPC) for male and female, named as Tiroda Farmers Producer Company- Male and Pragatishil Mahila Farmers Producer Company- Female.

Rs. 2, 20,000/- shares have been collected from 440 farmers of Tiroda Male and female Farmer Producer Company and remaining shares collection is ongoing.15 Joint Liability Groups are formed out of 20 JLG's. Organized cow based livelihood workshop for Joint Liability Group (JLG) women, total 30 women's are participated in this programme.

C. Animal Husbandry and Related Initiative (Dhanalakshami Programme)

To develop dairy farming as an additional source of livelihood for the farmers by improving productivity of local cows and buffaloes. Under two livestock development centers (LDC) completed-

- Artificial Insemination (AI)- 779
- Pregnancy Diagnose (PD)- 694
- Total calving- 228

➢ 45 Farmers are also cultivating hybrid nepier grass as fodder for livestock development in 19 villages.

➢ Total 9 farmers from 5 villages brought 18 cows and bullocks in free of cost from Go-Vigyan Anushandhan Kendra Devlapar.

D. **Lac Cultivation-** Conducted Workshop on Lac Cultivation with the farmers, the training was given on process of lac cultivation, lac harvesting and precautionary measures during cultivation as well as Pruning cutter and Knife distributed to total 130 farmers present in the workshop.

Capacity building & Support for income generation activity (IG)

A. Lac Bangle Making-

- On 28th June 2019 Conducted One day exposure visit and hands-on training on lac bangle at Mangezari, training given by Duhlandevi Sansthan in Bhalaghat. Total 7-Lac bangle making SHG women attended the training and learned the new skill. Women started making new designs of bangle like- kada and multicolor bangles.

- **'Adhirakshi' Brand-** Completed registration process of "Aadhirakshi" brand of women Farmer Producer Company on amazon. GST number received, applied for trademark. Completed the Lac Bangles marketing process on amazon.

B. Mushroom Spawn Unit- Oyster Mushroom spawn making process is started. Daily 20kg of mushroom spawns supplying to nearby villages SHG's and other beneficiary from Mushroom Spawn Unit.

C. Mushroom Cultivation- Oyster mushroom cultivation training programme organized in Chikhali Village. The training given on Oyster Mushroom Bed making process through theory & Practical sessions. Till now total 277 Mushroom beds have been cultivated and simultaneously new beds are being added on daily basis by the women in nearby Village.

D. Agarbatti Making- Agarbatti Making programme is ongoing through buy back policy and new machines installations are in process at Ramatola, Tikaramtola and Mendipur villages. To catch local market we have provided Perfume and Packaging material to the Beneficiaries. Beneficiaries have started making and selling of perfumed Agarbatti. Perfumed Agarbatti Produced 120 Kg, and selling at Rs. 200/Kg, Earlier they were getting profit of Rs. 8 to 10 / Kg, Now they are getting profit of Rs. 50 to 80 / kg.

F. Special activity- Bamboo Making Workshop & Exhibition

Bamboo Product Making Workshop was organized at China Colony under the 'World Environment Week Celebration' Programme. The Centre for Indian Bamboo Resources and Technology (CIBART) from Delhi has given the Training. The women learned to make the Bamboo products like Pen box, Mat, ring designs and other decorates. 90 SHG's Women members from 10 villages participated in this workshop

Rural Infrastructure Development (RID)

A. Water Conservation Work- at 6 village's total 49850 CUM of water conservation work completed of Ponds (4no) and Streams (4no.). After the monsoon the ponds and streams are fulfilled with the ample rainwater.

Water Conservation- Stream Deepening
Steam 1- Ekodi

Water Conservation- Pond Deepening
Ramatola Pond

B. Construction and Repairing of toilet facilities of Schools and Anganwadis-

Toilet construction work is completed at villages- Dhamnewada Paldongari, and Sukadi.

Toilet Construction completed- Dhamnewada Village

Media Coverage

किसानों में किया जा रहा जागरण

जैविक खेती के गुर सिखाने निकला पद्म प्रचार रथ

TheHitavada

Vidarbha Line | 2019-04-18 | Page- 8

Youths must grab opportunities that come their way: Sahu

Adani Cup Cricket Tournament begins

अदानी की ओर से क्रिकेट स्पर्धा आयोजित

अदानी प्रकल्पातर्फे आरोग्य तपासणी

एकोडी. अदानी विद्युत प्रकल्प तिरोडाच्या अदानी फाउंडेशन आणि हेल्पलाईन इंडियाच्या वतीने ग्राम पंचायत खेरडीपार येथे आज (ता.15) विविध आजारांची तपासणी करण्यात आली. दरम्यान आजारांची माहिती देऊन औषधोपचार देखील करण्यात आला. परिसरातील नागरिक मोठ्या संख्येने या शिबिराला उपस्थित होते. यावेळी नागरिकांना निःशुल्क औषध देण्यात आले. या उपक्रमाचे नागरिकांनी कौतुक केले.

Over 1,700 APML employees participate in Yoga Day

One of the guests addressing the gathering.

■ District Correspondent
GONDIA, June 27

THE 5th International Yoga Day - 2019 was celebrated at Adani Power Maharashtra Ltd (APML) Tiroda. More than 1,700 employees and workers took part in the mega exercise.

The theme on the occasion was 'Climate Action' to focus on the way how yoga can help in mitigating the problem of changing climate and importance of yoga in life to lead stressfree, healthy life.

APML Project Head Chaitanya Sahoo guided the programme and urged the gathering to make yoga an integral part of their life.

The day was celebrated at total 12 different locations of APML, all APML departments that includes Adani Foundation, Adani Skill Development Center, Shantigram Township and others.

Yoga teacher from Bihar School of Yoga were present to guide the gathering. APML employees worked towards the success of the programme.

चुरड़ी, गराडा, चिखली और भिवापुर में चला स्वच्छता अभियान

निरंतर चलाए जाते हैं उपक्रम

'Aamchi Shala, Adarsh Shala' to be implemented in Gondia distt

Maharashtra Pollution Control Board
महाराष्ट्र प्रदूषण नियंत्रण मंडळ

FORM V
Environmental Audit Report for the financial Year ending the 31st March 2019

Unique Application Number
MPCB-ENVIRONMENT_STATEMENT-0000019558

Submitted Date
25-09-2019

Company Information

Company Name	***Application UAN number***	
ADANI POWER MAHARASHTRA LIMITED	CR1507000296	
Address		
PLOT NO A1, TIRODA GROWTH CENTER, MIDC TIRODA, DIST. GONDIA		
Plot no	***Taluka***	***Village***
A1	TIRODA	TIRODA
Capital Investment (In lakhs)	***Scale***	***City***
1875342	LARGE	TIRODA
Pincode	***Person Name***	***Designation***
441911	Kanti Biswas	STATION HEAD
Telephone Number	***Fax Number***	***Email***
07198253961	07198253971	Kanti.Biswas@adani.com
Region	***Industry Category***	***Industry Type***
SRO-Bhandara	Red	R48 Thermal Power Plants
Last Environmental statement submitted online	***Consent Number***	***Consent Issue Date***
yes	Format 1.0/.BO/CAC-Cell/EIC No. NG-13350-15/CAC/CAC-14033	04.11.2015
Consent Valid Upto		
31.08.2020		

Product Information

Product Name	***Consent Quantity***	***Actual Quantity***	***UOM***
Electricity Generation	3300 MW	21665480	Mwh
Fly Ash Brick	10000 Nos./day	135210	Nos./Y

By-product Information

By Product Name	***Consent Quantity***	***Actual Quantity***	***UOM***
N.A	N.A	N.A	

1) Water Consumption in m3/day

Water Consumption for	***Consent Quantity in m3/day***	***Actual Quantity in m3/day***
Process	29712	2790
Cooling	163728	136054
Domestic	1440	1200
All others	-	-
Total	194880	140044

1) Effluent Generation in CMD / MLD

Particulars	***Consent Quantity***	***Actual Quantity***	***UOM***
Trade Effluent	35405	26495	CMD
Domestic Effluent	192	130.7	[illegible]

2) Product Wise Process Water Consumption (cubic meter of process water per unit of product)

Name of Products (Production)	***During the Previous financial Year***	***During the current Financial year***	***UOM***
Electricity Generation	2.39	2.35	
Fly Ash Bricks	0.0003	[illegible]	

3) Raw Material Consumption (Consumption of raw material per unit of product)

Name of Raw Materials	***During the Previous financial Year***	***During the current Financial year***	***UOM***
Coal	0.62	[illegible]	

4) Fuel Consumption

Fuel Name	***Consent quantity***	***Actual Quantity***	***UOM***
Furnace Oil	90KLD	459.9	KL/A
LDO	95.52 KLD	419.2	[illegible]

Pollution discharged to environment/unit of output (Parameter as specified in the consent issued)

[A] Water

Pollutants Detail	***Quantity of Pollutants discharged (kL/day)***	***Concentration of Pollutants discharged(Mg/Lit) Except PH,Temp,Colour***	***Percentage of variation from prescribed standards with reasons***		
	Quantity	***Concentration***	***%variation***	***Standard***	***Reason***
N.A (ZLD Maintained)	N.A	N.A	N.A	N.A	[illegible]

[B] Air (Stack)

Pollutants Detail	***Quantity of Pollutants discharged (kL/day)***	***Concentration of Pollutants discharged(Mg/NM3)***	***Percentage of variation from prescribed standards with reasons***		
	Quantity	***Concentration***	***%variation***	***Standard***	***Reason***
PM	2778	43.2	N.A	N.A	N.A
SO2	58899	914.8	N.A	N.A	N.A
NOx	17291	268.6	N.A	N.A	[illegible]

HAZARDOUS WASTES

1) From Process

Hazardous Waste Type	***Total During Previous Financial year***	***Total During Current Financial year***	***UOM***
5.1 Used or spent oil	60.52	32.838	KL/A
33.1 Empty barrels/containers/liners contaminated with hazardous chemicals /wastes	300	301	Nos./Y
35.2 Spent ion exchange resin containing toxic metals	0.05	0.5	KL/A
35.3 Chemical sludge from waste water treatment	0.48	0.47	[illegible]

2) From Pollution Control Facilities

Hazardous Waste Type	Total During Previous Financial year	Total During Current Financial year	UOM
0	NA	[illegible]	

SOLID WASTES

1) From Process

Non Hazardous Waste Type	Total During Previous Financial year	Total During Current Financial year	UOM
Bottom Ash	706381	872762	[illegible]

2) From Pollution Control Facilities

Non Hazardous Waste Type	Total During Previous Financial year	Total During Current Financial year	UOM
ESP Ash (Fly Ash)	2825523	3491050	[illegible]

3) Quantity Recycled or Re-utilized within the unit

Waste Type	Total During Previous Financial year	Total During Current Financial year	UOM
0	N.A	N.A	[illegible]

Please specify the characteristics(in terms of concentration and quantum) of hazardous as well as solid wastes and indicate disposal practice adopted for both these categories of wastes.

1) Hazardous Waste

Type of Hazardous Waste Generated	Qty of Hazardous Waste	UOM	Concentration of Hazardous Waste
5.1 Used or spent oil	32.838	KL/A	Report Attached
33.1 Empty barrels/containers/liners contaminated with hazardous chemicals /wastes	301	Nos./Y	-
35.2 Spent ion exchange resin containing toxic metals	0.5	KL/A	-
35.3 Chemical sludge from waste water treatment	0.47	MT/A	

2) Solid Waste

Type of Solid Waste Generated	Qty of Solid Waste	UOM	Concentration of Solid Waste
PVC,Plastic, Rubber	79311	Kg/Annum	-
Wooden Scrap	40880	Kg/Annum	-
MS Scrap	2008480	Kg/Annum	-
Misc. Scrap	617682	Kg/Annum	

Impact of the pollution Control measures taken on conservation of natural resources and consequently on the cost of production.

Description	Reduction in Water Consumption (M3/day)	Reduction in Fuel & Solvent Consumption (KL/day)	Reduction in Raw Material (Kg)	Reduction in Power Consumption (KWH)	Capital Investment(in Lacs)	Reduction in Maintenance(in Lacs)
Energy Savings by reducing throttling loss in CEP in unit 1,3 & 5	-	-	-	7000000	-	-
Changing of Units valve mode operation from single valve mode to sequential valve mode to improve HPT cylinder efficiency	-	-	54579 MT	-	-	-
Energy savings by reducing primary air heater pressure from 9.2 kpa to 8.4 kpa in all units	-	-	-	16918215	-	-

NABI Accreditation					1.97	
CW pump impeller anti-friction (corrocoating) coating to reduce energy consumption at Unit 1, 2 & 3	-	-	-	1949268	-	-
Green Belt Development	-	-	-	-	273.61	-
Unit # 4, CM # C, Coal Mill bowl extension ring modification to reduce energy consumption in coal Mills	-	-	-	1974353	-	-
Green Belt Development	-	-	-	-	227.72	-
Installation of Micro oil gun in all 5 units to reduce fuel oil consumption during start up (savings 4 nos. of Startup/year)	-	1505 Ton	-	-	-	

Additional measures/investment proposal for environmental protection abatement of pollution, prevention of pollution.

[A] Investment made during the period of Environmental Statement

Detail of measures for Environmental Protection	*Environmental Protection Measures*	*Capital Investment (Lacks)*
Pollution Control Equipment O & M	ESP, Bag Filters Etc.	2453.09
Pollution Monitoring, Study and Analysis	Pollution Monitoring, Study and Analysis	54.85
Green Belt Development	Green Belt Development	273.61
CSR	Rural Development	537.34
Legal & Consent Fee	Legal & Consent Fee	375.07
Training & Awareness	Training & Awareness	1.53
Waste Management	Waste Management	[illegible]

[B] Investment Proposed for next Year

Detail of measures for Environmental Protection	*Environmental Protection Measures*	*Capital Investment (Lacks)*
As per part H (A) above	As per part H (A) above	[illegible]

Any other particulars in respect of environmental protection and abatement of pollution.

Particulars

1. Environmental laboratory (NABL Accredited) has been established to monitor environmental parameters 2. Pollution monitoring and control equipment's established 3. We are scientifically disposing domestic waste originated from canteen and guest houses from our plant through "Organic Waste Convertor" Machine which decomposes domestic waste into organic manure. Waste papers are being [illegible]

Name & Designation

Kanti Biswas, Station Head

ASDC Tiroda Training and Placement Details												
S. N.	FY Year	Trade	Candidates Training						Drop Out Candidates	Total Trained	Total Placement
			ST	SC	Minority	OBC	Gen	Total			
1	2017-18	Welding Technician	125	0	0	0	0	125	2	123	117
2	2017-18	Assistant Electrician	116	0	0	0	0	116	5	111	95
3	2018-19	Welding Technician	30	18	2	0	0	50	5	45	45
4	2018-19	Assistant Electrician	11	14	5	0	0	30	2	28	26
5	2018-19	General Duty Assistant	11	12	7	0	5	35	1	34	29
6	2019-20	Welding Technician	22	19	0	16	4	61	3	58	50
7	2019-20	Assistant Electrician	17	19	0	22	7	65	5	60	55
8	2019-20	General Duty Assistant	24	18	0	13	15	70	2	68	57
Total			356	100	14	51	31	552	25	527	474

Digital literacy training programme total 256 trained in FY 2018-19

Digital literacy training programme total 259 trained in FY 2019-20

Maharashtra Pollution Control Board
महाराष्ट्र प्रदूषण नियंत्रण मंडळ

Information Disclosure Program for Air Pollution Abatement

Air Pollution Card

Adani Power Maharashtra Limited

★★★★★

Very Good

Industry Description

MPCB Regional Office (RO)	:	NAGPUR
Sub-Regional Office (SRO)	:	BHANDARA
Type	:	Red
Scale	:	Large
Sector	:	Power
Release Date	:	9 September 2019

Address

Plot No-A-1, Tiroda Growth Centre MIDC, Tiroda, Dist.- Gondia

What does the rating mean?

Better Performing plants (i.e. plants with lower particulate matter (PM) concentration in stack emissions) get more stars. A 4-star or 5-star rating implies that most of the recent stack samples of the plant report PM emissions below a standard of 150mg/Nm3. A plant's star rating also benchmarks its relative performance: as of ratings date, 38 percent of rated plants have done better (received 4 or 5 stars) and 43 percent of rated plants have done worse (received 1 or 2 stars).

Star Rating Key

Very Poor	Poor	Moderate	Good	Very Good
★☆☆☆☆	★★☆☆☆	★★★☆☆	★★★★☆	★★★★★

Stack Samples used to calculate Star-Rating

Collection Date	Dust Concentration (mg/Nm^3)	Median Dust Concentration (mg/Nm^3)
15 March 2019	21	23
15 March 2019	34	
15 March 2019	24	
15 March 2019	20	

Rating Scale

Rating	Range of PM Concentration (mg/Nm^3)		Rating Key	Representation
	Minimum	Maximum		
1 star	250	-	Very Poor	★☆☆☆☆
2 star	150	250	Poor	★★☆☆☆
3 star	100	150	Moderate	★★★☆☆
4 star	50	100	Good	★★★★☆
5 star	0	50	Very Good	★★★★★

About the Star Rating Program

Maharashtra Pollution Control Board (MPCB) has initiated an air pollution information disclosure program to give industries star ratings on the basis of their particulate matter (PM) emissions. These ratings are shared through **Air Pollution Report Cards**. Ratings represent the **air pollution performance** of industries, as measured by their **PM emission concentrations.**

Ratings are based on data obtained from routine stack sampling for PM as supervised by MPCB. Industries are rated according to the median PM emissions concentration of their latest 4 sample.

National Accreditation Board for Testing and Calibration Laboratories
(A Constituent Board of Quality Council of India)

CERTIFICATE OF ACCREDITATION

ENVIRONMENTAL LABORAEORY, ADANI POWER MAHARASHTRA LIMIEED

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2017

"General Requirements for the Competence of Eesting & Calibration Laboratories"

for its facilities at

PLOT NO. A-1, TIRODA GROWTH CENTRE, MIDC AREA, GONDIA, MAHARASHTRA, INDIA

in the field of

TESTING

Certificate Number: TC-5193

Issue Date: 28/06/2019 Valid Until: 27/06/2021

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the relevant requirements of NABL.
(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Signed for and on behalf of NABL

N. Venkateswaran
Chief Executive Officer

Power

Ref: APML/ENV/MPCB/WED/925/19

Date: 10.06.2019

To,

The Regional Officer

Maharashtra Pollution Control Board

Udyog Bhawan

Civil Lines, Nagpur

Sub: **Celebration of World Environment Day 2019 – Reg.**

Dear Sir,

With reference to above subject, we would like to inform that, On the eve of World Environment Day 5th June'2019, Adani Power Maharashtra Ltd. celebrated world Environment week from 30th May to 5th June' 2019 to create awareness among nearby villagers, workers, our employees, Students, ladies and children on Environmental Protection and conservation of Natural Resources. Various awareness programmes, competitions, Workshops and Environmental Rally followed by Plantation Program were organized during the Week.

Detailed report has been enclosed herewith for your kind perusal.

Thanking You

Yours truly,

For Adani Power Maharashtra Ltd.

(C P Sahoo)

Station Head

Encl: *as above*

CC: Sub Regional Officer, M.P.C Board, Nagpur

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WORLD ENVIRONMENT DAY' 2019

(Celebration from 30th May to 5th June'2019

We, at Adani Power Maharashtra Limited celebrated World Environment Day with great enthusiasm from 30th May to 5th June'19 to create awareness among the Employees, Family Members, Contract Man powers, Villagers and children on Environmental Protection and conservation of Natural Resources. This year China is hosting World Environment Day 2019. We have taken oath with Participants to protect our Natural Resources and act wisely to reduce air pollution in our daily activities. Theme for WED 2019 as decided by UNEP was:

"Beat Air Pollution"

Details of various programs are as under:

Awareness Session on Environment & Waste management at APML:

On 30th May, 2019, awareness/induction program on the occasion of Environment week was conducted for the students of all trades i.e. Welding Technician, Assistant Electrician, and General Duty Assistant (GDA) of Saksham-Adani Skill Development Centre, Tiroda.

This awareness/induction program was lead by Mr. Vijendra Khandekar, Assistant Manager - Environment dept. He shared on waste Management, Environmental best Practices, standard and norms. Also explained how waste paper was collected from all over the plant and how it is being recycled by paper recycling unit. Various products like envelope, big bags, paper plates, disposals, dustbins for papers and many more are made in this recycling unit. He also shared about steps taken at Tirora for reduction towards paper consumption. He also explained to all the students, how waste organic products were collected from the township and Plant and converted in to manure for reuse.

Awareness session by Vijendra Khandekar

Bamboo Plantation Program - Making Bamboo Products & Exhibition :

For development of skill and income generation of Self Help Group (SHGs) of villagers, a program on making bamboo products conducted at APML on 31st May 2019. Various Bamboo products are displayed and making skill was demonstrated to SHGs by team CIBART- New Delhi.

APML Station Head – Shri C P Sahoo was present in the occasion

Speech by Expert from CIBART – New Delhi

Display of Bamboo Products

Mr. Hari Singh Rawat, Dr. Deshraj Verma, Dr.. Nisha Tripathi and Mrs. K Rathana from CIBART – New Delhi demonstrated how to make various attractive Bamboo products as the source of income generation. Approx. 90 villagers (SHGs) were benefited by the skill development program organised by APML.

Demonstration on Making of Bamboo Products

Gathering on the occasion

Seminar on Fly Ash Utilization:

To maximize use of Fly ash, a Workshop on Fly Ash Utilization conducted on 01.06.2019 to create awareness on beneficial use of Fly Ash.

Station Head- Shri C P Sahoo & Sr. Officers were present on the occasion. Program started with lighting of lamp and worshiping Goddess "Saraswati".

Address by HOD - Environment

Mr. Pravin R Jani from Fly Ash Cluster, Chandrapur and Dr. Avinash Jain, Scientist from TFRI – Jabalpur (GoI) was the eminent speaker on the occasion. Various beneficial use of Fly Ash in Forestry research were explained by Dr. Jain. Mr. Jani explained about variety of Ash Based beneficial product like window frame, Low cost home, fertilizers application etc. Approx. 90 beneficiaries were present during the program.

Lamp Lighting

Gathering on the occasion

Station Head Presenting mementoes to Mr. Pravin Jani

Station Head Presenting mementoes to Dr. Avinash Jain

Slogan & Poster Competition:

Spot Quiz Competition:

On 03.06.2019 APML Inter departmental spot Quiz Competition was conducted with 9 teams consisting of 4 participants of same department in each team. Total participants were 36 and approx. 55 audiences were present. HR- Admin team was winner and MTP department was runner of this competition.

Address by HOD - Environment

Apart from quiz participants of departments, separate spot prizes were kept for audiences and awarded on spot for replying correct answers. This was an entertainment cum awareness programs and every body enjoyed a lot.

Environment Quiz in Progress

On 04.06.2019 spot Quiz Competition also was conducted for Township housewives. 4 teams consisting of 4 participants in each team were present along with many spectators.

Environment Quiz for Township Housewives in progress

Environment Quiz for Township Housewives in progress

Environment Model Competition:

Contract agencies as well as Township Housewives participated in Environmental Model making competitions with great creativity. Evaluation does on 04.06.2018 and Winners (1st , 2nd & 3rd with consolation prizes with certificates) awarded on closing ceremony of World Environment Day Programs on 5th June, 2019.

Environment Model displayed by Township Housewives

Environment Model displayed by Business Partners

Green Rally and Plantation:

On Environment Day, 5th June 2019, day started with Environment Rally followed by plantation. Residents from Shanti Niketan and Shantigram Township including small kids participated with great enthusiasm.

Various slogans chanted during Rally on Environment Protection, Plantation, Water conservation & Conservation of Natural Resources.

All participants took oath to conserve natural Resources for sustenance of better future.

Environment Rally

Shri C P Sahoo (Station Head) lead Green Rally and Plantation program.   Even small kids planted trees with great enthusiasm.

Plantation by Township residents

Plantation by Station Head

Plantation by Township residents

Closing Ceremony:

World Environment Day (WED) Program was concluded on 05.06.2019 with prize distribution along with appreciation certificates to winners of various competitions during Environment Week.

Approx. 225 participants from villages, Contract man powers, Employees & family members were present during the closing ceremony. Winners of various competitions were awarded during the ceremony

Welcome Address by HOD - Environment

Lamp Lighting by Station Head

Address by Head – O&M

Address by Station Head

Environmental Oath:

Gathering during Closing Ceremony:

Prize Distribution:

Prize Distribution to winners by Station Head & Head O&M

Prize Distribution to village winners by Station Head & Head O&M

Prize Distribution to winners by Seniors & Station Head

Adani power is committed for prevention of pollution and maintaining greenery for future sustenance.

THANK YOU

Annexure - XIII

ADANI POWER MAHARASHTRA LIMITED

SOURCE SUSTAINABILITY STUDY FOR DRAWL OF WATER FROM RIVER WAINGANGA

FOR TIRODA THERMAL POWER PLANT (5 x 660 MW), GONDIA, MAHARASHTRA

Final Report

Academy of Water Technology and Environ Management
AWTEM

कर्मण्येव हि संसिद्धिम्
CGCRI
CECRI

I. I. S. W. B. M.

March 2019

Final Report

SOURCE SUSTAINABILITY STUDY FOR DRAWL OF WATER FROM RIVER WAINGANGA FOR TIRODA THERMAL POWER PLANT (5 x 660 MW)

ADANI POWER MAHARASHTRA LIMITED
TIRODA THERMAL POWER PLANT
PLOT NO. A-1, TIRODA GROWTH CENTRE, MIDC
TIRODA, DISTRICT - GONDIA
PIN- 441911 (MAHARASHTRA)

Executed by

Academy of Water Technology and Environ Management, Kolkata – 700 008

In Technical Collobration with

Indian Institute of Social Welfare & Business Management, Kolkata – 700 073
and
CSIR-CGCRI, Kolkata – 700 032

March, 2019

FOREWORD

The Adani Group (1988) has grown from being a trading house to a diversified business group with interests from infrastructural development to FMCGs. The Adani Group has made foray into high growth sector like Power, Infrastructure, Global Trading, Logistics and Energy. Adani Power Limited (APL), a member of the Adani Group, has taken up implementation of large Thermal Power Projects at various locations in India in view of the growing needs of power requirements in the country. APL is also actively planning to implement Thermal Power Stations at various locations in India, totaling to about 20,000 MW in the coming years. Adani Power Maharashtra Ltd (APML), a wholly owned company of APL, has set up Tiroda Thermal Power Plant of 3300 MW (5x660) atTiroda, District Gondia in Maharashtra.

The Water Resources Department, Nagpur Government of Maharashtra has given permission for withdrawal of 70 MCM/annum of raw water from the Dhapewada Barrage on the Wainganga river located at Kawelewada about 8 km away from the Tiroda TPP. The impact of the water drawl including in lean season on downstream competing users is to be assessed as per requirement of MoEF&CC. Accordingly, APML has approached AWTEM in technical collaboration with IISWBM and CSIR-CGCRI to undertake source sustainability study for drawl of water from Dhapewada Barrage on the Wainganga river for proposed Tiroda TPP.

The study presents results of the comprehensive analysis of different components associated with the hydrology, hydrogeology, geo-morphology, LULC of the area and about water source sustainability. The report provides an in-depth analysis on different components associated with water balance study with some recommendations on precautionary conservation measures to counterbalance any unforeseen negative impact on the natural ecosystem of the area.

This study would have not been possible without the constant support and guidance of *Shri C. P. Sahoo, Plant Head; Shri A. P. Singh, AGM(Environment); Shri Dinesh Gupta, Shri Neelkanth Prajapati, Shri Vijendra Kumar, Shri Girish Kulkarni, Environment Management Cell, APML; and* other executives & officers of APML, we are indebted to acknowledge their guidance and support.

We are thankful to Shri Santosh Singh, Sr VP & Head-Environment and Shri R. N. Shukla, AGM, Corporate Environment Group, and other Executives of APL, for their constant guidance and support provided from time to time in completion of this study.

We are also thankful to Shri P. M. Phalke, Executive Engineer, Dhapewada Irrigation Project, VIDC, Tiroda and other Executives & Officers of VDIC, for their guidance and support provided in execution of present study.
.
The study has been carried out under the technical collaboration with IISWBM and CSIR-CGCRI, we put on record my deep appreciation to the faculty members & research scholars of IISWBM and scientists and other staff members of CSIR-CGCRI associated with this project for bringing out such a comprehensive report.

We are indebted to acknowledge the guidance and proactive support extended by the faculty members and research scholars of Department of Geography of Presidency University, University of Calcutta & Department of Environmental Science, University of Kalyani and Director of Good Earth Enviro Care in execution of the present study.

A.K.Bhattacharya

Kolkata
March 28, 2019

Dr.Ashim Kr Bhattacharyay
Executive Director, AWTEM

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LIST OF ABBREVIATION

ABBREVIATION		DESCRIPTION
ADCP	:	Acoustic Doppler Current Meter
APML	:	Adani Power Maharashtra Limited
APL	:	Adani Power Limited
AWTEM	:	Academy of Water Technology & Environment Management
BCM	:	Billon Cubic Meter
CSIR- CGCRI	:	Council of Scientific & Industrial Research-Central Glass & Ceramic Reseach Institute
CWC	:	Central Water commission
DEM	:	Digital Elevation Model
EC	:	Environmental Clearance
FDC	:	Flow Duration Curve
G&D	:	Gauge & Discharge
IISWBM	:	Indian Institute of Social Welfare & Business Management
IMD	:	Indian Meterogical Department
IWAI	:	Inland Water Authourity of India
LULC	:	Land Use and Land Cover
MoEF&CC	:	Ministry of Environment , Forest &Cliamate Change
MoWR	:	Ministry of Water Resource
NRCD	:	National River Consevation Directorate
SOI	:	Survey of India
SRTM	:	Shuttle Rader Topographic Mission
TTPP	:	Tiroda Thermal Power Plant
VIDC	:	Vidarbha irrigation Development Corporation
WRD	:	Water Resource Department
WRIS	:	Water Resources Information System

EXECUTIVE SUMMARY

The Adani Group (1988) has grown from being a trading house to a diversified business group with interests from infrastructural development to FMCGs. The Adani Group has made foray into high growth sector like Power, Infrastructure, Global Trading, Logistics and Energy. Adani Power Limited (APL), a member of the Adani Group, has taken up implementation of large Thermal Power Projects at various locations in India in view of the growing needs of power requirements in the country. APL is also actively planning to implement Thermal Power Stations at various locations in India, totaling to about 20,000 MW in the coming years.

Adani Power Maharashtra Ltd (APML), a wholly owned company of Adani Power Limited, a wholly owned company of Adani Power Limited, has set up Tiroda Thermal Power Plant (TTPP) of 3300 MW (5x660) capacity near Tiroda Village, District Gondia in Maharashtra. Tiroda TPP requires total of 70 MCM/annum @ 1,91,760 m^3/day of raw water for DM plant feed, Cooling tower, Ash Disposal, Domestic & Other Utilities Services, etc. The Water Resources Department, Nagpur Government of Maharashtra has given permission for withdrawal of 70 MCM/annum of raw water from the Dhapewada Barrage on the Wainganga river located about 8 km away from the Tiroda TPP.

For the compliance one of the conditions of Ministry of Environment, Forest and Climate Change (MoEF&CC) Environment Clearance, Source of water and its sustainability even in lean season shall be provided along with details of ecological impacts arising out of withdrawal of water and taking into account inter-state shares (if any). Information on other competing sources downstream of the proposed project and commitment regarding availability of requisite quantity of water from the Competent Authority shall be provided along with letter / document stating firm allocation of water. Accordingly, APML planned to undertake source sustainability study for drawal of water from river Wainganga Tiroda Thermal Power Plant (5x660 MW).

Accordingly, APML has approached AWTEM in technical collaboration with IISWBM and CSIR-CGCRI to undertake source sustainability study for drawl of water from Dhapewada barrage on river Wainganga for TTPP. The prime objectives of the present study were as follows:

- To study water availability in Dhapewada barrage on River Wainganga for all seasons as well as during scanty rain and heavy rain;
- To study the river behavior for leanest period and flooding period;
- To study impact on hydrology and downstream flow and ecology due to water withdrawal for TTPP;

- To identify downstream competing users and impact on them due to proposed withdrawal of water;
- To formulate plan for maintaining minimum ecological/enviornmental flow in the river Wainganga;
- To delineate Water Management Plan.

The scope of the study includes the undertaking of a reconnaissance hydrological survey. On the basis of the reconnaissance hydrological survey a framework were evolved for undertaking time bound detailed field survey for characterizing the flow in river Wainganga besides collecting other primary as well as secondary data required for assessing the hydrology and behavior of river Wainganga. Preparation of inventory of downstream competing users along with medium/minor lift irrigation scheme constructed at downstream and the quantum of water being withdrawn by these users.

The location of intake water system for the TTPP is: 21°21'27"N, 79°48'07"E which consists of Pumping (drawl) water from Dhapewada barrage on River Wainganga (Intake location) and conveying it in pipeline upto plant reservoir through intake well. The locations have been selected based on position of main flow close to the left bank as well as morphological stability of the river bank line analyzed using historical imageries. Pipe line corridor length from water intake system point at River Wainganga to TTPP is approx. 5 km.

The present study has been exploratory in nature based on primary as well as secondary data of water intake location. Seasonal river flow rate is calculated near the intake well point using the long term time series secondary data on monthly water level and discharge from nearest G&D station of CWC. Primary data of velocity and depth of channel also collected during Jan-Feb 2019 at upstream as well as downstream of intake well for inflow/discharge computation and to ground check the authenticity and variation with the available secondary data. Subsequently, the sediment load also taken into consideration during river flow study. Based on the available monthly water flow in the river month - wise water demand are matched. The study also analyses the impact of intake water from intake well on local subsurface water and downstream in the different season.

To study the river behaviour around 10 km upstream and 10 Km downstream from the intake well for the leanest period and flooding period, two sets of high-resolution satellite images of pre-monsoon and post-monsoon period are procured, the digital elevation model of the area created for geomorphology of the terrain and detailed analysis. This is to understand the lateral and vertical accretion, channel migration of the river in the area. The morphological changes are matched with the river flow data for understanding the river behaviour along the Intake well point. To study the impact on hydrology and downstream flow due to water withdrawal for TTPP monthly water availability is calculated and its impact on downstream water availability and impact on the behaviour of the river is assessed using digital model.

Thus, the problem of source water sustainability is envisaged as the water balance study emphasizing components of supply-side, demand-side and system-side assessment focusing mainly to examine whether the quantity of water available as inputs at a given time at the Dhapewada barrage can meet all desired demands at that site and downstream including the demands of APML. In other words, the inflows to the Dhapewada barrage including its storage at a given time should not be less than the demands of various designated uses at the barrage and downstream.

The reconnaissance survey was undertaken by a team of AWTEM Consortium along with APML Team from 11th to 13th January 2019. The team had a kick-off meeting at the TTPP to finalise the modalities for commencing the field study as well as collection of secondary data. During the reconnaissance survey, AWTEM team member along with APML Team visited the intake well site as well as upstream and downstream. During the field visit team members had interactions with local people to understand their water requirement along with usage and dependence on river Wainganga for domestic as well as agricultural activities. The irrigation water requirement being met from river Wainganga in both upstream and downstream of water intake well were also explored through interaction with the local community. The existing weirs/barrage/dams in the river reach were also explored. The detailed public consultation was undertaken in the vicinity of water intake system.

Wainganga is a tributary of the Godavari River and it originates near village Partabpur or Mundara (21^{0}57'N & 79^{0}34'E) about 20 Km from the town of Satapura plateau and flows in a wide half circle, bending and winding among the spurs of the hills from the west to the east of the Seoni District. The principal tributaries of the river are Bagh in Balaghat, Bawanthari, Kanhan, Chulband in Bhandara & Garvhi in Chandrapur. It then flows through Chandrapur & Gadchiroli Districts and after a course of about 570 Km joins the Wardha at Seoni in Chandrapur district. The total catchment area of the river upto It's confluence with river Wardha is about 51000 Sq. Km. The Wainganga sub-basin has varied rock formation and includes Precambrain rocks (granite gneisses) and Deccan traps which cover the major portion of the basin. Alluvial soils, laterite, granite, sandstone, shale, dolomite, mica, schist etc are also seen in fragments. The soil conditions along the valleys are rich with black regur loams while clay loams are also found along the river bed. These soils, known locally as kali soils, are very productive and suitable for rabi crops due to high moisture retention capacity. The important uses of the river include agriculture, industries, fisheries, navigation and tourism.

The area within 10 km from the Water Intake Well is dominated by the valley of the Wainganga System and outliers of the residual hills in the fringes. Elevation of the riverbank at the location of the Water Intake Well is 267 m. For studying the river bank behaviour at intake point, comparison of winter satellite images of 19-Jan-1988 and 29-Jan-2019 was undertaken. The analysis indicates that there is negligible change in riverbank positions of the Wainganga at the vicinity of the Water Intake Well during the last 30 years, attesting its position at a stable location. The underlying structure and disposition of the Waingana has rendered its channel a stable position that has remained largely unaltered for decades. This implies a safe location for the Water Intake Well at 21º26'35" N, 79º53'06" E, which has negligible risk of bank erosion. To bring out the land use land cover characteristics of the area within 10 km from the Water Intake Well, Sentinel-2BMultispectral Instrument (MSI) dataset of 29-Jan-2019 was classified using maximum likelihood algorithm, after extensive ground truth verification. Major part of the region is occupied by farmlands (69%), followed by planation and orchards (18%), grasses and shrubs (3%) and built-up areas (2%). Sands and water, mostly associated with the river channels are also extensive.

The analysis of hydrogeology and groundwater contour and flow direction reveals that the study area constitutes hydrogeological formation belonging to rocks of ancient formation. The groundwater occurrence in areas is in phreatic to semi confined condition. Two types of aquifer are found in the study area i.e., shallow and deeper aquifer. The shallow aquifer occurs in soft rock and porous material while the deep aquifer is associated with fractured rocks.

AWTEM has obtained the data of the Rain Gauge stations situated in the project vicinity of Wainganga sub-basin to assess the water availability including monthly inflow data. The long term rainfall data for Vidarbha from 1917 to 2016 have been collected from National Data Centre, IMD, Pune to analyze the dependable rainfall and average duration curve for rainfall. Vidarbha Region has an yearly rainfall of 1087.3 mm with an Standard Deviation of ±206.7. As the 75% and 90% dependability are of great importance in the field of hydrology the same were estimated and found to be 1194 mm and 1023 mm. The rainfall data for four rain gauge stations namely Balaghat, Gondia, Bhandara and Nagpur have also been collected through Customized Rainfall Information System (CRIS), Indian Meteorological Department, Government of India to assess the inflow of water and water availability in the intake site at River Wainganga (2013 to 2017). The analysis reveals that the annual rainfall at Balaghat region varies from 915.4 to 1028.8 mm, however, in Gondia region the annual rainfall varies from 856.2 to 1955.6 mm. APML has setup weather station at TTPP since its inception to record and assess micro-meteorological status in and around power plant. The analysis of recorded from 2012 to 2018 (7yrs) reveals that rainfall in the study region varies from 987 to 1787 mm with an average of 1298.0 mm.

Monthly hydrograph of discharge in River Wainganga has been developed on the basis of long term monthly discharge date collected from CWC for G&D Station at Pauni for years 1975 to 2010. The analysis reveals that the monthly average inflow flow varies 14.9919 to 2579.317 mcum/month. Accordingly monthly FDC has been also developed on the basis of monthly discharge data collected. From the analysis of probable flows, it is evident that river is perennial and the maximum flow occurred in the month of July-August, while minimum in the month of April-June in all the analyzed probability levels.

To assess the actual water availability at Dhapewada barrage for TTPP the water level and discharge data for the period of Jan 2016 to December, 2018 were collected form Dhapewada Irrigation Project-II, VIDC, Tiroda. The analysis reveals that the minimum discharge rate during the lean months varies between 0.0108 to 0.4781 mcumd, whereas the maximum discharge rate during the monsoon months varies between 29.6872 to 202.8574 mcumd. The present daily as well as monthly status of water consumption for irrigation, domestic as well as for industrial purpose from Dhapewada Barrage was analysed to undertake water balance study.

Real time water inflow and discharge was measured at upstream as well as down stream of intake site on 1st to 3rd February, 2019. Stream velocity measurements were conducted with a Current Meter (Valeport Model 106 Current Meter). The measurement of depth in terms of bathymetry survey has been done by using Eco- sounder (Velport Medas surveyor Sl. No. 45663) with single transducer along the cross sections. The estimated inflow at cross section 1 of River Wainganga i.e U/S of intake site at Bapera-Chandori (Approx 10 km u/s of APML intake well) work out to be 1054.9545 cumecs. However estimated inflow at cross section 2 of River Wainganga i.e Kumli-Sawra (Approx 15 km u/s of intake well) work out to be 370.9403 cumecs. The estimated discharge at cross section 3 of River Wainganga i.e D/S of intake site at Mandvi (Approx 3 km d/s of intake well) work out to be 23.9533 cumecs.

From the analysis of the water balance components at different probability levels it is evident that at 75% dependence level, all demands including the environmental flows requirement has been found satisfied except lean period. However at 90% & 95% dependence level, deficit in environmental flows in the month of Apr-Jun as per WG recommendations has been observed but the demands of all other competitive uses have been found satisfied.

The physio-chemical and bacteriological quality of water need to be assessed not only to estimate various treatment required for it ultimate use in TPP but it is also important to have details on presence of salts and nature of water (acidic or alkaline) which may have effect on intake well structure and equipments. The prime parameter includes pH, electrical conductivity, dissolve solids, suspended solids. Total hardness, sulphates, carbonates, bi-carbonates, chlorides, iron, calcium, magnesium, etc. Accordingly, water quality of River Wainganga at intake site along with upstream as well as the downstream was assessed as per BIS 10500 guidelines.

Silt laden water to be withdrawn during monsoon period may cause damage to under water components of intake well system resulting in costly repair and maintenance of equipment. The problem is significant in River Wainganga which carries lots of sediment containing quartz during monsoon.

The river Wainganga and its tributaries are home to a wide variety of aquatic biota (microscopic flora and fauna to higher invertebrates, vertebrates and plants). The field survey was undertaken in winter period (Jan-Feb, 2019). During field survey for plankton study, five locations were selected which includes the water intake site along with 3 u/s and 1 d/s of intake site. With the help of mechanised vessel, water sample of mid river streams was collected (at a depth of 0.5 – 1.0 meter) and filtered through plankton net (mesh 40 nm). At each sampling location 100 liter river water was filtered and samples were collected and preserved. The samples were brought to laboratory for microscopic study to ascertain the taxa. Periphytons were collected at random at river banks. Zoobenthios and other macro flora/fauna were examined along the study stretch and also at fish landing zones. The aquatic macrophytes and riparian vegetation composition were also recorded during field survey.

Species Diversity, which measures the bio-diversity and heterogeneity of aquatic ecosystem, was calculated based on the Shanon Weiner's function. The analysis reveals that the phytoplankton diversity ranges from 3.239-3.665 whereas the equitability index ranges from 0.875 to 0.991. The analysis further reveals that the zooplankton diversity ranges from 1.922 to 2.556 whereas the equitability index ranges from 0.744 to 0.989.

There are many factors which may affect the ecological integrity of river Wainganga of which anthropogenic activities along the river Wainganga is of the prime concern. These causatives are of major concern today with respect to threat of aquatic biodiversity of river Wainganga. The some of the major causes includes habitat fragmentation, shrinkage, alteration, Invasion by Alien Species, encroachment, disturbances and malnutrition, etc.

As the water availability at intake site is very high, the water abstraction of only 70 MCM annually from Dhapewada barrage on river Wainganga for TTPP is not likely to have any significant ecological impact. However, it may have some ecological impact in the form of habitat shrinkage and alteration. To combat/compensate the habitat shrinkage sand bars which were formed on the river bed need to be dredged in a periodic interval. As a long term management options for reduction of river water abstraction, rain water harvesting need to be explored. Appropriate Dry ash disposal system can also be explored along with regular water audit in power plant.

To assess the socio economic profile the villages falling within 2 km distance along with both the bank of the river Wainganga in downstream up to Gose Dam have been identified using 2011 census atlas. The demographic profile of these villages as well as the land use pattern and irrigation facilities have been extracted using the latest census data other documents of Department of Water Resource and Irrigation, Government of Maharashtra and have been analysed to assess the existing water usage pattern and livelihood dependency on river Wainganga at down stream upto the nearest next barrage from intake location i.e Gose Dam. For public consultation to identify and asses the dependency of the local people on river Wainganga and likely impact caused due to drawl of water for TTPP the questionnaire has been developed and were used for the purpose.

The villages at the downstream reach of river Wainganga lies in Tirora block of Gondia district and Tumsar, Mohadi, Bhandara & Pauni blocks of Bhandara district as well as Kuhi block of Nagpur in Maharashtra. In total 116 villages lies in this zone, of which 105 villages are inhabited. As per Census of India, 2011 data, total populations in the downstream villages at river reach upto next barrage i.e. Gose is 1,27,529 covering a total of 29,203 households on both the right and left side bank of the Wainganga river. The analysis of distribution of scheduled caste and scheduled tribe population in downstream villages of Wainganga River reveals that 14.49% are scheduled caste and 3.33% are scheduled tribe of total population in downstream villages of Wainganga River. Status of literacy in downstream villages of Wainganga River is 82.07% of the population are literates. Gender wise status of literacy in downstream villages of Wainganga River reveals that 88.63% are male literates of the total male population against 75.38% female literates of the total female population. Analysis of occupational pattern in downstream villages shows that out of total working population, 75% are main workers and remaining 25% are marginal workers. Out of total main workers, majority (48.58%) are agricultural labour followed by cultivators (28.36%). Out of total marginal workers, majority (65.67%) are agricultural labour followed by cultivators (13.71%). The analysis of landuse pattern of downstream villages under river reach of Wainganga shows that out of the total geographical area of the study region, 35,969.56 ha is the net sown area, barren & un-cultivable land area is 6,780.55 ha. Out of net sown area in the downstream village approx 18,408.98 ha (51.18%) is unirrigated followed by irrigated area of 17,560.58 ha (48.82%).

As a part of the study, probable downstream users impacts associated with the withdrawal of water from Dhapewada barrage on River Wainganga have been identified. Mainly the water is used for irrigation, drinking as wel as industrial purposes by downstream users. Due to withdrawal of water from Wainganga River, water availability during the monsoon and winter season will not be affected for downstream users as per the water availability study as sufficient water is available in the river. But it may affect up to certain extent during the summer/lean season.

The entire catchment area of Dhapewada Irrigation Scheme –II Barrage at Kawalewada was visited during field survey to assess the domestic and irrigation water drawal from river Wainganga within barrage catchment area i.e. upto 12 km upstream from barrage near Sawara village under Tiroda thesil of Gondia district. During the field survey it was observed that various gram panchyat under National Rural Drinking Water Scheme have setup/developed intake well for drawal of water to meet domestic water requirement in right as well as left banks of Wainganga river.

During the survey it was also observed that farmer has developed minor river lift irrigation system by installing 3-10 Hp pumping system and farmer whose land is within approx 2 km stretch in right bank are significantly benefitted by the construction of the barrage at Kawalewada. For the purpose farmers have taken demand certificate from their respective thesil office and got separate electrical connection from Maharashtra State Electricity Distribution Company Limited (MSEDCL). As their irrigation facilities has increased many fold and they are able to have 3-4 crops in a year mostly paddy and vegetables. The crop yield also have improved significantly leading to improving their quality of life and economic progress.

Impact due to water drawl for TTPP on water availability, water quality, ecology as well as socio-economy of local people at downstream of the intake point has been assessed on the basis of data collected from CWC for nearest GD&Q site Pauni & Rajegaon and Dhapewada barrage water level and discharge from VIDC, Tiroda.

The analysis of impact on water availability at downstream due to withdrawl of water for TTPP presents that the water availability at intake site stretch of river Wainganga varies from 0.055627 to 13.39184 mcumd at 90% dependability. However, the average inflow required to pumped is only 0.191780 mcumd (including sediment flushing which come back in the river) for TTPP. The analysis of change in the water flow at downstream of intake point after the withdrawl of water for Tiroda TPP from Dhapewada Barrage at river Wainganga varies from 0.74 to 20.30% at 75% dependability, whereas 1.43 – 23.45% at 90% dependability of flow except pre-monsoon season. As the overall change in the water flow at downstream of the intake point is likely to be not significant at 75% as well as 90% dependability. Therefore APML can withdraw the 70 MCM water from the intake site at Dhapewada Barrage without affecting the downstream users.

Wainganga sub basin contributes to third highest storage of water with total 149 dams which are constructed over Wainganga and its different tributaries. There are two barrages, three weires and fifteen numbers of medium & large lift irrigation schemes constructed in Wainganga sub-basin. The storage capacity of dams/barrages/weirs are mostly filled in June & mid of July month. The store water is used for agricultural and ground water recharge in these regions. Thus substantial quantity of water shall be discharge/overflow these water resource structure during monsoon and flows towards the downstream of intake structure and finally disposal in the Gose Dam.

The water management & conservation plan for the TTPP of APML has been prepared with a view to help in conserving water during lean season/drought situations and ultimately reduce the demand of fresh water consumption from the Dhapewada Barrage at River Wainganga. The following water conservation steps are being implemented throughout the whole year with special emphasis during lean months/season for water conservation and reducing the ultimate water demand:

- APML have constructed four number of raw water reservoirs of total 7.340 MCM storage of water, so that sufficient water can be stored for utilizing during summer season, when enough water is not available.

- APML is also strengthening Rain Water harvesting measures, which may play an important role in conservation of water.

- Closed circuit cooling system have been adopted with minimum 5.5 COC for the thermal power plant to optimize fresh water requirement.

- In the Conventional Thermal Power Plants apart from cooling towers, water is also consumed in ash handling process. Bottom Ash from the boilers is being converted to slurry using the partially treated wastewater in water impounded bottom ash hopper and transported to co processing units for disposal. HCSD have been also adopted to optimize water requirement for disposal of unutilized ash.

- Moreover, in order to reduce the water demand in fly ash handling and disposal, a dry phase pneumatic conveying system is also adopted.

- The major waste-water generated from the plant like DM Plant discharge is being treated in a Effluent Treatment Plant and recycled for its reuse in the Plant. No discharge of liquid waste is foreseen from the TTPP. The coal pile area runoff water during monsoon season is being led to a well-designed Coal Setting pond. Coal particles settle down in the Pond and clear water allowed to overflow to the Central Monitoring Basin for treatment in the Effluent Treatment Plant (ETP).

- Automation of control systems has been done to the extent possible to reduc 170 r losses.

- The rain water may be collected separately in the Storm Water Drain running all around the project. Rain Water Harvesting Pit may be connected to the Storm Water Drain. Excess rain water shall flow to common collection pit from where water can be pumped for use in the ash handling system.

- Regular maintenance of pumps and valves shall be carried out.

- Water audits shall be carried out regularly and records of water consumption and wastewater generation shall be maintained.

The study has been carried out in order to identify the likely impacts on water availability and downstream users due to withdrawal of water from the Dhapewada barrage on river Wainganga. All the impacts associated with the withdrawal of water from the Dhapewada barrage on river Wainganga which were likely to have an effect on the availability of water and downstream competing users have been identified and studied in detail. The foremost positive impact of the project is increase in agricultural production as the water from the Dhapewada barrage on river Wainganga is being lifted besides increase in ground water table in the region as a result of rain water harvesting and other water resource management structures.

Considering the scenario of likely impacts, there are some impacts on the ecological environment of the River Wainganga which shall be mitigated naturally with due course of time as ecological cycle has a self-sustaining capacity. Moreover, there are insignificant impacts on the downstream users due to the water withdrawal for the TTPP. Further, the APML also undertaking CSR activities which have beneficial impacts on the socio-economic environment.

Looking to the overall project scenario, it has been noticed that the project in totality may be considered environmentally safe.

1.0 INTRODUCTION

1.1 BACKGROUND

The Adani Group (1988) has grown from being a trading house to a diversified business group with interests from infrastructural development to FMCGs. The Adani Group has made foray into high growth sector like Power, Infrastructure, Global Trading, Logistics and Energy.

Adani Power Limited (APL), a member of the Adani Group, has taken up implementation of large Thermal Power Projects at various locations in India in view of the growing needs of power requirements in the country. APL is also actively planning to implement Thermal Power Stations at various locations in India, totaling to about 20,000 MW in the coming years.

Adani Power Maharashtra Ltd (APML), a wholly owned company of Adani Power Limited, has set up Tiroda Thermal Power Plant of 3300 MW (5x660) capacity near Tiroda Village, District Gondia in Maharashtra.

With reference to the Ministry of Environment & Forest (MoEF), Government of India (GoI), Environmental Clearance (EC) for Tiroda TPP conditions Water Source Sustainability Study for drawal of water from river Wainganga for Tiroda TPP shall be carried out periodically and details to be submitted to MoEF&CC.

For the compliance one of the conditions of Ministry of Environment, Forest and Climate Change (MoEF&CC) Environment Clearance, Source of water and its sustainability even in lean season shall be provided along with details of ecological impacts arising out of withdrawal of water and taking into account inter-state shares (if any). Information on other competing sources downstream of the proposed project and commitment regarding availability of requisite quantity of water from the Competent Authority shall be provided along with letter / document stating firm allocation of water. Accordingly, APML planned to undertake source sustainability study for drawal of water from river Wainganga Tiroda Thermal Power Plant (5x660 MW).

The proposed study would enable Adani Power Maharashtra Limited to meet the requirement of MoEF's EC compliance besides meeting its mission of being socially responsible corporate entity.

1.2 PROJECT DETAIL

A 3300 MW (5 × 660 MW) coal based super critical thermal power plant has been set up. The location of Tiroda TPP is presented in Figure 1.1. The brief description of the plant is presented in Table 1.1. In addition to coal, LDO and HFO are used as an auxiliary liquid fuel. Light Diesel Oil

(LDO) is used for cold start up and HFO is used for flame stabilization at lower load. The main plant is arranged within the three interconnected structures, the boiler, turbine building & integrated control and electrical building.

TABLE 1.1: SALIENT FEATURES OF TTPP

Item	Particulars
Location of the Plant	Town: Tiroda, District: Gondia, State: Maharashtra
Net capacity	3300 MW
No. of Units and configuration	Phase I – 2 x 660 MW Phase II – 3 x 660 MW
Date of Commercial Operation (COD)	Phase I – Unit 1: September 23, 2012 Unit 2: March 30, 2013 Phase II – Unit 3: June 14, 2013 Unit 4: March 31, 2014 Unit 5: October 11, 2014
Technology	
Steam Generator	Super critical Pressure 255 kg /cm^2 Temperature 571°C
Turbo Generator	Turbine -246 kg/cm^2 (a), 563°C, 3000 rpm Generator - 660 MW (Each unit) Generator Transformer - 776 MVA
Major Auxiliary System	• Boiler & Turbine Auxiliaries • Pretreatment Plant • Compressed Air System • Coal and Ash Handling System • CW System and Raw Water System • Fire fighting System • Air conditioning System • Ventilation System
Stack Details	
No. of Stack	2
Stack Height (meter)	275 each
No. of flue	Five
Additional equipment	Electrostatic Precipitator
Coal	Indigenous Coal – 15.0 MTPA (6.3 MTPA for Phase I & 8.7 MTPA for Phase II) Transportation: Railways

Land	
MIDC Land Forest land	402.00 ha [210 ha for Phase I & 192 ha for Phase II] 163.84 ha
Water	
Cooling Technology	Induced draft cooling system is proposed
Total Water Requirement	70 MCM (191760 m^3/day)
Total Discharge	'Zero Discharge Norm' is being followed
General Information	
Manpower Requirement (Total)	Approx 500 Employee and 2500 Contractual
Project Cost	Rs 18,753 crores

Advantages of Supercritical Thermal Cycle:

- The 660 MW units have super critical steam parameters to achieve higher efficiency and hence, lower cost of generation. The prime advantages of the Super-critical technology are:
    - Improvement in power plant efficiency is more than 2%.
    - Reduction in coal consumption.
    - Reduction in emission of Green house gases.
    - Overall reduction in auxiliary Power Consumption,
    - Reduction in requirement of ash dyke land and consumptive water.
    - Sliding pressure operation due to once through system.
    - Uniform distribution of heat due to spiral wall arrangement leading to less Boiler tube failure, thereby improving system continuity and availability of the station.
    - Low thermal stress in turbine.
    - Less start up time of the boiler.
    - Reduction in water requirement.
- The thermodynamic cycle for 660 MW units considers super-critical steam parameters. The unit comprises of boiler, steam turbine generator, condenser, condensate extraction and boiler feed system along with all other necessary equipment for single/double reheat-

regenerative cycle. For purpose of the study, the MP/IP cylinders may be of single/double casing design as per manufacturers' standard. The exhaust from HP-IP turbine will further expand in the double flow LP Turbine.

Steam Generator:	Super critical Pressure 255 kg /cm^2 Temperature 571°C
Turbo Generator:	Turbine - 246 kg/cm^2 (a), 563°C, 3000 rpm Generator - 660 MW (Each unit) Generator Transformer - 776 MVA

- A tri-flue chimney with common windshield for the unit 1, 2 & 3 has been installed. The total height of reinforced concrete chimney is 275 m having 7.4 m exit diameter.

- A bi-flue chimney with common windshield for the unit 4 & 5 has been installed. The total height of reinforced concrete chimney is 275 m having 7.4 m exit diameter.

- For air pollution control system, each steam-generating unit has been provided with electrostatic precipitators. Each precipitator has two parallel gas paths, any of which can be isolated for maintenance when required, keeping the other path in operation.

These units utilize main and hot reheat steam at a temperature of 566^{0}C at the turbine inlet. The main steam inlet pressure is about 254 Ata and the reheat steam pressures are in the order of 40 bar.

The energy flow in the process of thermal power generation is in four stages - firstly, the chemical energy of the coal is transformed into heat energy, which is then converted into mechanical energy and finally into electric energy through generator. The main raw materials required for thermal power generation are coal, water and air.

In the first stage, the coal moves from the coal handling plant to the coal bunker, from where it is fed into the pulverizing mills. This mill stacks, reclaims and crushes the coal into fine powder, which is then mixed with air and blow down into the boiler by a fan. In the boiler, the mixture of coal dust and air burns like a gas and produces high temperature. The boiler walls are lined with tubes containing high quality de-mineralized water, better known as boiler water. The heat released by the burning coal is absorbed by the boiler which in turn transfers the water into steam. The steam is then channelized through nozzles onto the turbines blades, where it makes the turbine rotate. A generator is attached to the turbine, which produce electricity once the turbine starts to move. The electricity is then passed through a step-up transfer which increase the voltage so that it can be transmitted efficiently over the power line of the grid.

The ash is generated due to combustion of coal as residue. Ash is collected at the bottom of the furnace as bottom ash, Economizer hoppers as Eco ash, Air-preheater hoppers as APH ash, electrostatic precipitator (ESP) hoppers as Fly ash and stack hoppers as Stack ash. The quantum of ash generation would depend on the plant load factor and the quality of coal being fed.

This ash, known as bottom ash is water quenched, and then conveyed for disposal. The rest is fly-ash, which is in form of fine powders and is taken out of the furnace to the Electrostatic Precipitators. The fly-ash trapped by the ESP is collected pneumatically operated dry ash storage silos for cement manufacturing.

As already mentioned earlier, the plant is using super-critical technology. The thermal efficiency of the power plant can be improved by using the steam at super critical condition. The improvement in overall efficiency of the plant compared to sub critical parameters is usually at least 2% if the super critical parameters are implemented. The importance of thermal efficiency of the thermodynamic cycle and the methods to improve the thermal efficiency of the cycle are also analyzed. The indirect costs such as reduction in maintenance cost, auxiliary power consumption, ash dyke land and environmental benefits such as reduction in green house gases; water requirements, etc. are additional to the above increase in efficiency.

Importance of Efficiency:

Since the time thermal power stations have been engineered, there is a quest for efficiency improvement. One such effort in that direction is supercritical parameters (i.e.) the pressure above 225 kg/cm^2 and temperature above 374.15ºC. The supercritical parameters for Tiroda 660 MW boiler are: 259 kg/cm^2 of pressure and 571ºC of temperature.

Methods of Increasing Ranking Cycle Efficiency:

The steam power cycle efficiency can be improved by the following methods:

<u>Raising supply temperature by super heating</u>: Increasing the turbine inlet temperature of steam will raise the heat supply to the boiler more than the heat rejection.

- <u>Raising inlet pressure of steam:</u> Increasing the pressure will mean increase in saturation temperature at which steam evaporates thus increasing the average inlet temperature (T_1).
- Efficiency can be improved by dropping the final pressure (or temperature) at which heat is rejected.
- <u>Regenerative heating</u>: Heating the feed water pumped to the boiler by bleeding steam from turbine.
- <u>Reheat cycle</u>: Reheating of steam in boiler after it has already expanded in high pressure (HP) turbine will avoid moisture formation in low pressure (LP) Turbine. Also more heat content of steam before LP turbine will improve efficiency.

At most elevated condition the steam is supercritical. Thus, if water is at a supercritical pressure and is heated the temperature will increase continuously. At a particular value the water will flash instantaneously into steam and super heating will commence. There is no change of specific volume from the liquid to the dry steam state.

Supercritical Boiler:

A Boiler operating at a pressure above critical point is called Supercritical Boiler. Supercritical Boiler has no drum and heat-absorbing surface being, in effect, one continuous tube hence called 'Once Through Supercritical Pressure Boilers'. Boiler Feed Pump pressurizes the water in boiler, sensible heat is added in feed heaters, economizer and furnace tubes, until water attains saturation temperature and flashes instantaneously to dry saturated steam and super heating commences.

Steam Generator Set:

The steam generator for super-critical unit consists of a number of parallel circuits connected by inlet & outlet headers. Pressurized water enters the circuit at one end and leaves as supercritical steam at other end. Thus boiler is of "Once-through type". Once-through boiler may be designed in both two-pass & tower type design. Since flow is once-through furnace wall tube. Temperature tends to increase at low load. Assisted circulation mode is super imposed to overcome this problem. The volume of the evaporator system is much smaller compared to a Natural circulation boiler. Due to smaller inventory of stored water & steam, theoretical rate of response is much faster than drum unit at base load. Super heater section has been divided in convection and radiant zones and designed so as to maintain rated steam temperature of 571^{0}C at the outlet. The units have been completed with coal preparations and firing system, fuel oil firing system, draft plants comprising FD, ID and PA fans, electrostatic precipitators with required number of fields in series and a multi-flue 275 m high chimney.

Light Diesel Oil (Calorific value around 10,300 K Cal/Kg) is being used as start-up and stabilization fuel. As per GOI norms, space provision for FGD unit has been incorporated in the plant layout.

Due to elevated pressure and temperature, cycle efficiency improves which results in reduction of fuel consumption per unit of electricity generated, which in turn reduces CO_2, NO_X & SO_2 emission. To limit the dust load at the inlet to the chimney to a value of 50 mg/Nm^3, as per the norms prescribed by the Ministry of Environment and Forest, Govt. of India, adequately sized electrostatic-precipitators have been provided.

Turbine Generator Set:

The steam turbine set is with standard multi-stage, 3000 rpm, tandem compound, single/double reheat, regenerative, condensing, multi-cylinder unit with eight (8)/nine (9) uncontrolled extractions for regenerative feed water heating. The turbine has one single flow HP cylinder, one double flow IP turbine and two double flow LP casings. The LP turbine exhausts against a condenser pressure of 76 mm Hg (abs) and maximum cooling water temperature of 33^{o}C. The unit has horizontally split double flow LP cylinder with the LP turbine exhausting steam directly into spring mounted surface type, two-pass condenser having divided water box. The turbo-generator sets are designed for a maximum throttle steam flow at turbine valve wide open (VWO) condition of 105% of turbine MCR flow. A quick acting "HP and LP Turbine Bypass Station" has been provided as a part of turbine package. The unit is equipped with all auxiliaries as per good engineering practice. The steam turbine is directly coupled to the horizontally mounted, three phases, two-pole, cylindrical rotor type electric generator terminal after meeting power requirement for excitation system. The generator is of 0.85 – plant load factor and thus the MVA rating works out to be about 776 MVA. The generators deliver power at the standard voltage of the manufacturer between 20-24 KV, 3 Phase, 50 Hz. The steam turbine is equipped with hydraulic/motorized turning gear for uniform heating/ cooling of the rotor during start up/shut down. Highly sensitive electronic-hydraulic governing system is provided with suitable hardware to ensure fast speed to operation & safety. The units are complete with twin flow, double-pass, horizontal, surface type, water cooled condensers, 2 x 100% vacuum pumps (1W + 1S), vertical/ horizontal shell and tube type high pressure feed water heaters with group bypass arrangement, 4-stage horizontal U-tube low pressure heaters, drain cooler, gland steam condenser, horizontal spray or spray-cum-tray type deaerator with integral vent condenser etc. The units are equipped with two (2) nos. 50% capacity turbine driven and one (1) 30% capacity motor driven centrifugal, horizontal, boiler feed pumps of barrel casing construction.

1.3 NEED OF THE STUDY

Adani Power Maharashtra Ltd (APML), has set up Tiroda Thermal Power Plant of 3300 MW (5x660) capacity near Tiroda Village, District Gondia in Maharashtra. Tiroda TPP requires total of 70 MCM/annum @ 1,91,760 m^3/day of raw water for DM plant feed, Cooling tower, Ash Disposal, Domestic & Other Utilities Services, etc. The Water Resources Department, Nagpur Government of Maharashtra has given permission for withdrawal of 70 MCM/annum of raw water from the Dhapewada Barrage on the Wainganga river located about 8 km away from the Tiroda TPP. The required water is being lifted by pumps installed at Intake Well, Kawalewada. The pumped water is stored in a four reservoirs having capacity equal to 40 days requirements of the plant. The Tiroda TPP has been designed and implemented to recycle and reuse its liquid effluents after suitable treatment for landscaping and greenbelt and hence, regarded as the zero effluent discharge scheme.

In addition to the demands of raw water by the APML, the other competitive users water demands from the Dhapewada barrage include irrigation water requirements (about 60 Mm^3/annum), domestic water requirements (about 5 Mm^3/annum) for various towns i.e Tiroda, Bhandara, Karthi, Indora, Chandori, Arjuni, etc in the region, losses of due to evaporation and groundwater seepage (about 10 Mm^3/annum) and Environmental Flows Requirements (EFR) at the downstream of the river.

APML has constructed the water intake system and pipeline infrastructure on river Wainganga at Dhapewada Barrage, Kawalewada. Water received from the source (Intake Well)is being treated in water treatment plant and then being used further for power plant purpose. The fresh water to cater the plant needs such as power cycle make up, auxiliary cooling water, services, potable water, etc. is being fed from water treatment plant.

In view of this, it is necessary to ascertain the availability of the allotted and water quantity with 100% reliability as it is necessary for power plant functioning during the year, without affecting the requirement of the downstream areas during whole year.

Also, the impact of the water drawl from Wainganga River even in lean season along with impacts on downstream competing users arising out of the withdrawal of water is to be assessed as per detailed scope of the work described in subsequent paragraphs.

For the compliance of the conditions of Ministry of Environment, Forest and Climate Change (MoEF&CC) Environment Clearance, Source of water and its sustainability even in lean season shall be provided along with details of ecological impacts arising out of withdrawal of water and taking into account inter-state shares (if any). Information on other competing sources downstream of the proposed project and commitment regarding availability of requisite quantity of water from the Competent Authority shall be provided along with letter / document stating firm allocation of water.

Accordingly, APML has approached AWTEM in technical collaboration with IISWBM and CSIR-CGCRI to undertake source sustainability study for drawl of water from river Wainganga for Tiroda Thermal Power Plant (5x660 MW).

1.4 OBJECTIVES OF THE STUDY

The prime objectives of the present study are as follows:

- To study water availability in Dhapewada Barrage at River Wainganga for all seasons as well as during scanty rain and heavy rain;
- To study the river behaviour for leanest period and flooding period;
- To study the hydrology of river Wainganga;

- To study impact on hydrology and downstream flow and ecology due to water withdrawal for Tiroda TPP;
- To identify downstream competing users and impact on them due to withdrawal of water;
- To prepare inventory of existing medium/minor/lift irrigation schemes constructed at downstream.
- To formulate plan for maintaining minimum ecological/enviornmental flow in the river Wainganga;
- To delineate Water Management Plan.

1.5 SCOPE OF STUDY

The scope of the study includes the undertaking of a reconnaissance hydrological survey. On the basis of the reconnaissance hydrological survey a framework would be evolved for undertaking time bound detailed field survey for characterizing the flow in river Wainganga besides collecting other primary as well as secondary data required for assessing the hydrology and behaviour of river Wainganga. Preparation of inventory of downstream competing users along with medium/minor lift irrigation scheme constructed at downstream and the quantum of water being withdrawn by these users. The detail scope of study shall cover following:

1. To obtain necessary data for hydrological aspects of the project.
2. To obtain and study the DPR of the Project.
3. To obtain the secondary data of the existing medium/minor/lift schemes constructed downstream if any.
4. To obtain Topo-sheets and Satellite images of the related area, if required.
5. Collection of Rainfall and Runoff data of river flow for vetting of DPR and/or EIA report.
6. To study the water availability in river for all situations, i.e. during scanty Rainfall and heaviest rainfall.
7. Review and analysis of the collected secondary data.
8. Preparation of water availability data and suggest measure for improvement if necessary.

9. To study river behaviour up to the next dam/barrage on the Wainganga River for all the River flow conditions, i.e. leanest period and flooding period.

10. Formulation of master plan and prioritization of water allocation across different season and for all likely possible situations.

11. Hydrology prepared by department shall be studied and vetted.

12. Review of the water management plans, flow regulation plan, plans for maintaining ecological flow and lean season flow and plan for downstream user.

13. Impact on hydrology of Wainganga River and downstream flow due to the proposed water allocation for Thermal Power Plant.

14. Study of downstream ecology and impact assessment due to proposed withdrawal of water.

15. Identification of downstream competing users and impact on them due to proposed withdrawal of water.

16. Delineation of Management Plan, if any.

The Scope of Work would also include presentation of the study report before the Expert Appraisal Committee of MoEF&CC and subsequent preparation of replies to the clarifications asked, if any. The final deliverable would be recommendation of the Expert Appraisal Committee.

2.0 WATER INTAKE SYSTEM & SOURCE SUSTAINABILITY

The brief detail of water intake system and approach adopted for source sustainability study for Tiroda TPP is presented in subsequent sections:

2.1 WATER INTAKE SYSTEM

2.1.1 Location of Intake Water System

Water requirement of the Tiroda Thermal Power Plant (TTPP) of Adani Power Maharashtra Limited (APML) is being met from River Wainganga, which is about 5 km from the plant site. Figure 2.1 presents the location of Water Intake Well of APML (21º26'35" N, 79º53'06" E) along with its 10 km buffer zone. The Water Resource Department of Government of Maharashtra has allocated 70 MCM per Annum for the Tiroda TPP (Annexure 2.1).

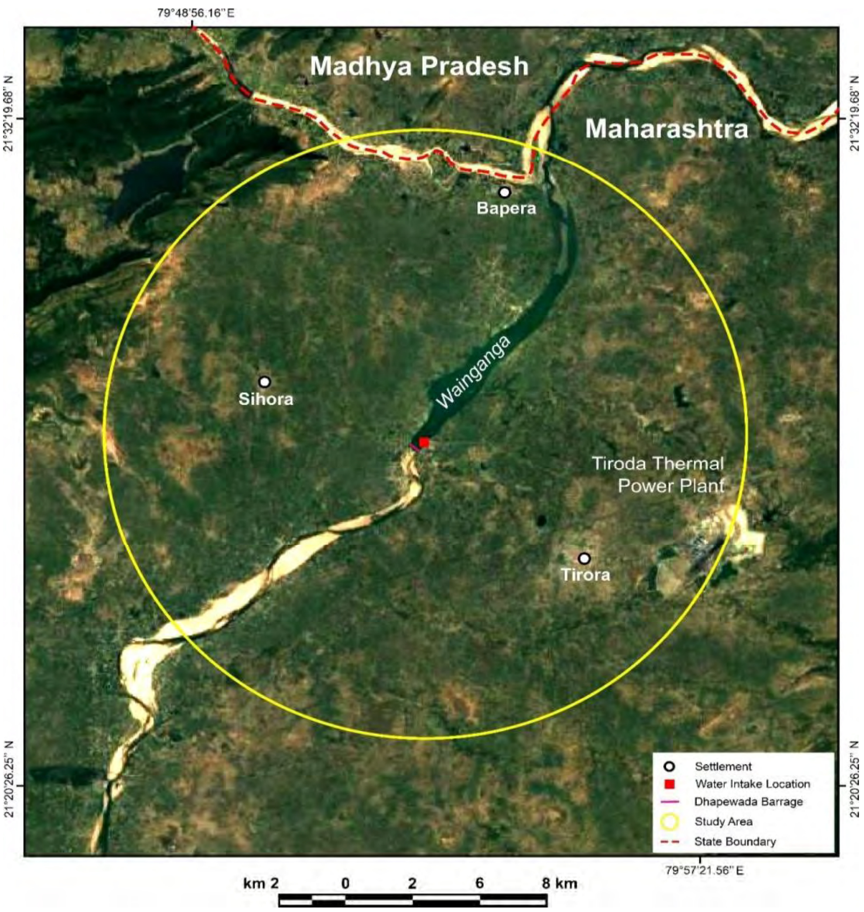


FIGURE 2.1: LOCATION OF THE STUDY AREA - 10-KM BUFFER AROUND THE WATER INTAKE POINT

Source: Image from Google Earth.

A barrage has been constructed across the River Wainganga at Kawalewada near the existing River Lift Irrigation Pump House in 2012-13 (Table 2.1).

TABLE 2.1: DETAIL OF BARRAGE CONSTRUCTED FOR TIRODA TPP

Particular	Detail
Name of Project	Barrage on Wainganga River for Supplying Water to Tiroda Thermal Power Plant of Adani Power Maharastra Limited (Dhapewada-II Irrigation Project)
Location	Village- Devara(kd)
	Taluqa- Tiroda
	District-Gondia
	State- Maharashtra
	Latitude- 21°21’27”
	Longitude- 79°48’07”
Basin	Godavari
Sub-basin	Wainganga
River/Nalla	Wainganga River
Catchment Area	Gross- 18253 Sqkm
	Free- 745 Sqkm
Topo Sheets No	55 O/14; **55 O/15**; 55 O/16 64 C/2; 64 C/4, 64 D/1
Quantity of Water Allocation to Adani Power Maharastra Limited for Tiroda TPP	70 MCM/Year or 1,91,760 m^3/day

Source: Water Resource Department, Government of Maharastra

The water requirement for the plant for 5x660 MW units are approximately 70 MCM per annum. The water is being drawn through a pipeline, (water pipe corridor – Right Of Way from GoM) which is about 8 km long.

The plant also has its own 4 water reservoirs for aprox 45 days requirement inside the plant boundary.

As already mentioned the total plant water requirement for the power station is 7990 m^3/hour. It is pertinent to mention here that requirement of water for ash handling and coal-handling system Is being met from condenser cooling water system blow down.

2.1.2 Climate and Meteorological Data

Nearest meteorological station (of Indian Meteorological Department) to the water intake site is at Gondia. Meteorological data as recorded at Gondia are presented in Table 2.2. The climate of the area is dry with large variation in temperature. In winter tenperature drops 5^0C, whereas in summer the same shoots up high as 47^0C. The precipitation in the catchments area is due to south west monsoon, from June to October with some occassional post monsoon shower in November to December. A few dry spells of week and fortnight generally experienced in August and September. The average annual rainfall is of about 1250 mm, of which 1196 mm experienced from June to October. Most of the area is classified under the agro climatic zone no. 9 of high rainfall.

TABLE 2.2: METEOROLOGICAL CONDITIONS AT GONDIA

Dry Bulb Temperature	Max: 47° C, Mean: 26° C, Min: 5° C
Relative Humidity	Max: 85%, Mean: 60%, Min: 35%
Rainfall Annual Average	1250 mm
Maximum 24 hour rainfall	307.3 mm

2.1.3 Salient Features of Water Intake System

The Intake water system of TTPP consists of Pumping (drawl) water from Dhapewada Barrage at River Wainganga (Intake location- Kawalewada) and conveying it in pipeline upto plant reservoirs through Desilting basin. The monthly water drawl schedule from River Wainganaga for Tiroda TPP:

- Daily water withdrawal: 1,91,760 m^3/d
- Average pumping capacity: 2.0 – 2.5 m^3/s (including silt flushing)
- Average pumping hours: 18-20 per day
- Average pumping days: 30 per month

A circular radial Intake well pump house has been constructed along with anicut at Kwalewada Barrage in the Wainganga River. A pump house has vertical pumps. The Raw Water Pumps at intake well lift the water and deliver it to the Desilting basin through a Rising main MS pipeline.

There is desilting basin (on land near to intake) with associated pump house. Water is lifted by the pump from the sump near desilting basin is pumped to Raw Water Reservoirs in plant through MS pipeline. Suitable cathodic protection & coating system have been adopted for corrosion protection of pipeline.

Raw water for the entire plant drawn from the river Wainganga is being stored in 4 reservoirs spread on aprox 70.47 ha (Figure 2.2). The capacity of raw water storage reservoir is 7.34 MCM with approx 40 days storage for both the phases (Table 2.3).

TABLE 2.3: DETAIL OF RAW WATER RESERVOIRS OF TTPP

S No	Particular	Area of Reservoir		Capacity of Reservoir (in Lacs M^3)
		In Acre	In Hectare	
1	Raw Water Reservoir - I	39.01	15.79	9.80
2	Raw Water Reservoir - II	97.73	39.55	20.80
3	Raw Water Reservoir - III	81.54	33.00	23.80
4	Raw Water Reservoir - IV	74.23	30.04	19.00
Total		174.14	70.47	73.40

FIGURE 2.2: LOCATION OF RAW WATER RESERVOIRS OF TTPP

The month wise detail of water intake and power generation for the last three year i.e. 2016-17 to 2018-19 is presented in Table 2.4 to 2.6. The analysis reveals that the actual annual water intake for Tiroda TPP is less than 50 MCM against allocated water drawal of 70 MCM.

TABLE 2.4: MONTH WISE DETAIL OF RAW WATER INTAKE OF APML (2016-17)

Month	Generation MU	MWh	PLF	Water Intake M^3
April'16	1792.849	1792849	75.46	3897543
May'16	826.760	826760	33.67	55553
June'16	383.191	383191	16.13	250845
July'16	1499.820	1499820	61.09	4910226
August'16	1242.000	1242000	65.07	3343509
September'16	1784.110	1784110	75.09	4742671
October'16	1967.300	1967300	80.13	5204490
November'16	1611.414	1611414	67.82	4332524
December'16	1475.004	1475004	60.08	4141502
January'17	1470.206	1470206	59.88	2827731
February'17	1419.669	1419669.4	64.02	4558615
March'17	2170.205	2170204.9	88.39	5672458
YTD	**17642.528**	**17642527.900**	**62.24**	**43937667**

TABLE 2.5: MONTH WISE DETAIL OF RAW WATER INTAKE OF APML (2017-18)

Month	Generation MU	MWh	PLF	Water Intake M^3
April'17*	1417.150	1417150	59.64	6062706
May'17	1576.126	1576126	64.2	3525420
June'17	1561.250	1561250	65.71	1677407
July'17	1743.650	1743650	71.02	3078090
August'17	1384.240	1384240	56.38	3679280
September'17	1459.770	1459770	61.44	2916139
October'17	1479.220	1479220	60.25	4121435
November'17	1422.530	1422530	59.87	2722781
December'17	1526.340	1526340	62.17	3563359
January'18	1415.230	1415230	57.64	2256874
February'18	1283.520	1283520	57.88	4810284
March'18	1327.220	1327220	54.05	3493562
YTD	**17596.246**	**17596246.000**	**60.85**	**41907337**

*Remark - Approx. 23,00,000m3 raw water stored in newly constructed Reservoir

TABLE 2.6: MONTH WISE DETAIL OF RAW WATER INTAKE OF APML (2018-19)

Month	Generation MU	MWh	PLF	Water Intake M^3
April'18	1353.990	1353990	57.0	4092039
May'18	1503.270	1503270	61.2	2306725
June'18	1284.180	1284180	54.1	2930713
July'18	1820.870	1820870	74.2	3523217
August'18	1742.700	1742700	71.0	3722950
September'18	1653.170	1653170	69.6	2541527
October'18	2119.100	2119100	86.3	5479965
November'18	2038.860	2038860	85.8	4291384
December'18	2102.530	2102530	85.6	5648289
January'19	2055.32	2055320	83.7	5633734
February'19	1785.21	1785210	80.5	4427980
March'19	2206.28	2206280	89.8	4935921
YTD	**21665.48**	**21665480.000**	**74.9**	**49534444**

APML is treating waste water being generated from cooling tower blow down, DM plant, filter backwash water, boiler blow down and sanitary wash by diluting and neutralizing rinsed acidic water. The treated effluents from all internal uses being stored in a guard pond, from where the treated wastewater is being used for dust suppression and greenbelt development. The sanitary wastewaters is being treated in the STPs, and treated effluents being used for plantation. Thus, the APML can be recognized as the zero effluent discharge power plant. As the plant has been categorized as a consumptive water use type scheme, the APML has made provision to implement rainwater harvesting scheme for augmentation of groundwater resources by conservation of surface runoff.

2.1.4 Selection Criteria

Water Intake System

The selection of promising intake locations is usually based on the following considerations:

- The intake has to be placed at most feasible location where water is available in required quantum
- The intake should be near morphologically stable river bank
- The approach to the intake system should be easily accessible
- The intake should be near the thalweg (main flow)
- Considering existing or upcoming developments like pumping stations, barrage, navigation structure like terminal, bridges at upstream and downstream close to the proposed location
- Away from Protected Areas, National Parks, Wildlife Sanctuary (Ecological Considerations)

The selected locations were further examined using historical satellite images taken at different times to assess the bank line shifting or stability as well as observations from site visits. The study of the river morphology near the identified intake locations, is presented in subsequent sections.

Water Pipeline Route

The basis of selection of the pipe line corridor horizontal alignment include the following considerations:

- Shortest route
- Avoid habitation
- Close to road networks (accessibility)
- Minimum curves in horizontal as well as vertical alignment
- Minimum cross drainages
- Considering existing or upcoming development along the corridor
- Away from protected areas for example area of wildlife sanctuary, national park (ecological consideration)

2.2 WATER SOURCE SUSTAINABILITY

As such, there is no specific definition available in literature defining water source sustainability, however, experts have explained it in different ways; the explanation given by "Global Water Community" is as follows:

"Sustainable water systems should provide adequate water quantity and appropriate water quality for a given need, without compromising the future ability to provide this capacity and quality. Water systems in the realm of sustainable development may not literally include the use of water, but include systems where the use of water has traditionally been required".

2.2.1 Problem Statement

In the present case, daily water requirements of 1,91,760 m^3 for the Tiroda TPP is being sourced from the Dhapewada barrage at Kawalewada on the Wainganga River. The Dhapewada barrage, which is mainly a diversion structure having storage capacity of about 44 Mm^3, has been designed and constructed for supply of water to Tiroda Thermal Power Plant having annual water requirement of about 70 Mm^3 in addition to diversion of water to canal command area for irrigation. The water storage capacity of the barrage of 44 Mm^3 is about 220 times more than the daily water demands demand of the APML.

The inflows to the Dhapewada barrage site are governed by the variability of flow generated from the upstream catchment area of 18253 km^2. The outflows from the barrage are diverted flows to the canal commands, water required for allotted industrial uses, downstream environmental flows, losses from the barrage storage due to evaporation and groundwater seepage. Since the Dhapewada barrage is an intervened structure across the river intended to supply of water from its storage for industrial and irrigation uses, it is, therefore, considered as the system for studying the water source sustainability of the APML demands. The objective, in such case, was to check whether the inflows coming from the upstream catchment at any given time are capable to meet all the desired demands at the barrage site and downstream including the requirements of APML. In case, the inflows are less than the desired demands, how long the storage of water available at the barrage site would be able to sustain the demands of APML, and whether daily inflows received at the barrage site including its accumulated storage would be able to meet all its required demands without violating the ecosystem and technically – these are the issues to be answered. Thus, the problem of source water sustainability is envisaged as the water balance study emphasizing components of supply-side, demand-side and system-side assessment focusing mainly to examine whether the quantity of water available as inputs at a given time at the Dhapewada barrage can meet all desired demands at that site and downstream including the demands of APML. In other words, the inflows to the Dhapewada barrage including its storage at a given time should not be less than the demands of various designated uses at the barrage and downstream.

2.2.2 Source Sustainability Model

Water balance study is basically an accounting procedure to estimate balance of available water after taking all incomings, losses and outgoings flows from a hydrological system. The conceptualized scheme for assessment of source sustainability can be described by the schematic diagram (Figure 2.3).

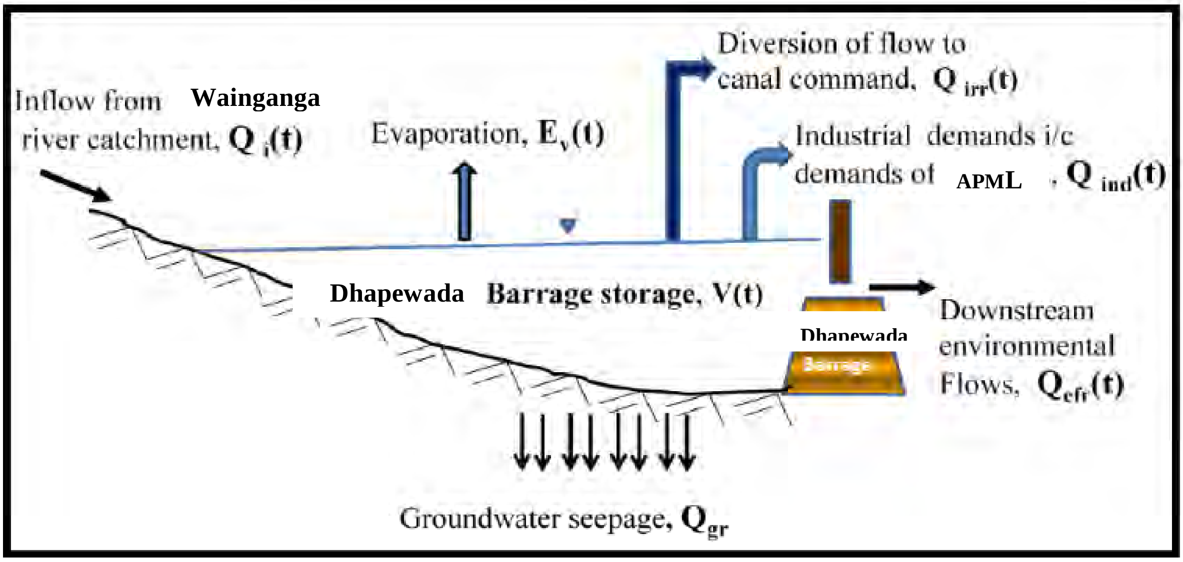


FIGURE 2.3: CONCEPTUALIZED MODEL FOR ASSESSING THE SOURCE SUSTAINABILITY

The water balance of a system can be expressed by the following equation:

Inflow – Outflow = Change in storage

In which, the incoming water to the system includes; precipitation, runoff transfer from other system, groundwater inflow, etc; the outgoing water from the system includes runoff, evaporation and transpiration, infiltration, groundwater outflow, etc.

$$Qi(t)\ \Delta t - [Ev(t) + Qirr(t) + Qind(t) + Qefr(t) + Qgr(t)]\ \Delta t = \Delta V(t) \quad ....(2.1)$$

in which,

Qi(t) = inflow of water in the Wainganga River at the u/s of the barrage, (L^3T^{-1})
Ev = evaporation rate, (L^3T^{-1})
Qirr(t) = diverted flow rate to the canal command area for irrigation, (L^3T^{-1})
Qind(t) = industrial demands of water i/c demands of APML, (L^3T^{-1})
Qefr(t) = downstream demands for environmental flows, (L^3T^{-1})
Qgr(t) = groundwater recharge from the storage, (L^3T^{-1})
Δt = time step, (T)
ΔV(t) = change in storage, (L3) = V(t) – V(t- t)

Denoting the demand of APML as Qkwp(t) and separating Qkwp(t) from Qind(t), the water balance equation (2.1) in terms of Qkwp(t) can be written as:

$$Qkwp(t)\,\Delta t = [Qi(t)\Delta t + \Delta V(t)] - [Ev(t) + Qgr(t)]\,\Delta t - [Qirr(t) + Q^{*}ind(t) + Qefr(t)]\,\Delta t \quad \text{...(2.2)}$$

in which, Q*ind(t) = industrial demands at the barrage site except the demand of APML, (L^3T^{-1}).

The time step, t can be considered according to the interest of water balance to be carried out.

The source will be considered sustainable for meeting the demand of APML, when the component, Qkwp(t) at any given time consequent to the value of components at the right hand side of eq.(2.2) is estimated to be more than the desired demands of APML at that time. For example, if the time period is chosen as one day, the calculated value of Qkwp(t) consequent to the values of other components in eq.(2.2) should be more than 95,890 m^3/day.

In other words, the inflows and storage available at the Dhapewada barrage at a given time should be more than all demands designated at the Dhapewada barrage at that particular time. In mathematical notations,

$$[Qi(t)\Delta t + \Delta V(t)] \geq V_L(t) + [Qirr(t) + Q^{*}ind(t) + Qkwp(t) + Qefr(t)]\,\Delta t \quad \text{..............(2.3)}$$

In which, $V_L(t) = [Ev(t) + Qgr(t)]\,\Delta t\ t$

This conceptualized framework, has been used to assess the source sustainability of the APML's water demand. Estimation of components in equation (2.3) depends on many factors, such as, meteorology, hydrology, hydro-geology and demands of water for various competitive uses. The subsequent sections deal with analysis of various components as envisaged in equation (2.3) for working out the water source sustainability.

2.2.3 Environmental Flows

Environment flows are defined as the flows required for the maintenance of the ecological integrity of the rivers and their associated ecosystems. The comparison of minimum environmental flows and the downward flow is necessary to know that the quantity of flow available at the downstream after meeting all committed demands is sufficient to meet the demands of ecosystem of the river. The National Water Policy also emphasized that the minimum flow in the perennial streams should be ensured for maintaining ecology and social considerations. In the present case, the downward flow estimated after considering all the losses and requirements are compared with the minimum environmental flows calculated using the method suggested by the National Water Development Agency (NWDA) and Water Quality Assessment Authority (WQAA) on the Minimum flows.

The NWDA for its Ken-Betwa river link project in Madhya Pradesh considered the environmental flows requirement (EFR) as 20% of 75% monthly probable volume in monsoon months and 15% of average volume in non-monsoon months. The month that has downward flow less than the above ERF criteria has been considered as the failure month.

The Ministry of Environment and Forests, Govt. of India has also developed guidelines for determining the EFR. The guidelines are yet to approve by the WQAA (SANDRP, 2008). The guidelines are as follows:

For Himalayans river: Minimum flow to be not less than 2.5% of 75% dependable annual flow (all flows expressed in cubic meters per second). There should be one flushing flow during monsoon with peak not less than 25% of 75% dependable annual flow.

For other rivers: Minimum flow in any ten daily periods should not be less than observed ten daily flows with 99% excedence. Where ten daily flow data are not available, this may be taken as 0.5% of 75% dependable annul flow. There should be one flushing flow during monsoon with peak not less than 60% of 75% dependable annual flow.

Dhapewada Barrage at Wainganga River

Location of Water Intake Well of APML at Dhapewada Barrage on Wainganga River

Raw Water Intake System of APML

Photo Plate-1

Up Stream Flow of Wainganga River near Confluence of Bagh River During Jan-Feb 2019

Up Stream Flow of Wainganga River near Khairlanji Bridge During Jan-Feb 2019

Water Inflow Rate near Bapera- Chanderi of Wainganga River During Jan-Feb 2019

Photo Plate-2

Photo Plate-3

Photo Plate-4

3.0 METHODOLOGY

3.1 WORK METHODOLOGY

The present study has been exploratory in nature based on primary as well as secondary data. The work methodology for this study as per the parameters of the scope of work was planned such that it would lead to the specific objective of the study, which are described as follows:

- Comprehensive Reconnaissance survey of site
- Meeting with Adani Power Maharashtra Limited (APML) officials.
- Preliminary study of River Wainganga Basin and understanding the water requirements at site
- Collection of rainfall and runoff data, maps, reports, etc if available.
- Study of the collected data
- Analysis, validation of the collected secondary data.
- Hydrological study of the River Wainganga.
- Water availability in the River Wainganga for all the situations such as lean season etc.
- Existing flood management plans and suggests measures if required for flood mitigation.
- River behavior for all the river flow condition.
- Impact assessment on the downstream flow due to the withdrawal of water for Tiroda TPP for all the river flow condition.

3.2 DATA COLLECTION

The water intake is located at Dhapewada barrage at river Wainganga near Kawalewada under Tiroda Block of Gondia District of Maharashtra State which is located approx. 5 km from the Tiroda TPP site.

Rainfall Data

Long term rainfall data for the entire Wainganga basin, particularly for project area have been collected from Indian Meteorological Department (IMD)

Stream Flow Data

For the present study the stream flow and sediment load data at Rajegaon as well as water availability and discharge data of Dhapewada Barrage have been collected being monitored by Central Water Commission (CWC) and Department of Water Resource, Government of Maharashtra.

Stream Flow Water Quality

Water sample has been collected from the downstream as well as upstream of water intake well of TTPP at river Wainganga and physio-chemical as well as bacteriological and biological quality of water has been analyzed.

Hydrographic Survey

Hydrographic survey for about 5 days during winter season (i.e. Jan/Feb) has been undertaken.

Bathymetry Survey

Current observations (ADCP) and Gauge levels at the Intake site as well as selected upstream and down-stream locations along the width of the river have been undertaken. The width of the river in this reach is approx. 1 to 1.5 km.

Topographic Survey

Topographic survey within 10 Km radious of intake site has been undertaken using remote sensing and GIS method.

Toposheet

The relevant toposheets of the intake well area along with its buffer zone have been collected and subsequently analysed.

Satellite Imagery

Satellite data products – Multispectral imageries have been acquired for time series analysis of various hydrological as well geomorphological features of river Wainganga near intake well. The following steps have been opted for the study –

I. Flood Frequency analysis for the design flood in the river stretch along with change detection studies has been carried out using SCS curve Number technique along with SWMM conceptual model. Base flow determination.

II. Analysis of River Bank using Satellite Images

III. Micro level study of water pocket near Intake location

IV. Hydraulic River Modelling using state-of-the-art software.

V. Estimation of Discharge for Intake structure has been carried out using the proposed water drawl schedule for TTPP.

The data requirements, their sources and status of procurement of the data are presented in Table 3.1.

TABLE 3.1: DATA REQUIREMENTS, SOURCES AND COLLECTION STATUS

Data Requirement	Source	Collection Status
Remote sensing images DEM Topography-sheets, Survey of India , 1: 50000 scale Open series map	USGS site Shuttle Radar Topographic Mission (SRTM), 90 M SOI , Dehradun	Collected Collected Collected
Rainfall IMD's Daily Gridded Data (0.250 x 0.250)	IMD Pune	Collected (1917-2016)
Gauge, Discharge, silt Data	Central Water Commission	Collected data for Rajegaon and Pauni GD&Q site of CWC
Water availability and discharge data of Dhapewada Barrage	Water Resource Department, Government of Maharashtra	Collected for Jan 2016-Dec 2018
Bathymetry survey near the intake location along with upstream and down strem site	Primary data	Collected
Water Quality & Ecological Monitoring near the intake location along with upstream and down strem site	Primary data	Collected

Seasonal river flow rate is calculated before and after the intake well point using the last 30 years' time series secondary data on monthly water level from recorded gauge height. Primary data of velocity and depth of channel also collected during pre – monsoon period near intake well for discharge computation and to ground check the authenticity and variation with the available secondary data. Subsequently, the sediment load also taken into consideration during river flow study. Based on the available monthly water flow in the river month - wise water demand are matched.

The study also analyses the impact of intake water from intake well on local subsurface water and downstream in the different season.

To study the river behaviour around 10 km upstream and 10 Km downstream from the intake well for the leanest period and flooding period, two sets of high-resolution satellite images of pre-monsoon and post-monsoon period are procured, the digital elevation model of the area created for geomorphology of the terrain and detailed analysis. This is to understand the lateral and vertical accretion, channel migration of the river in the area. The morphological changes are matched with the river flow data for understanding the river behaviour along the Intake well point.

To study the impact on hydrology and downstream flow due to water withdrawal for proposed expansion of TTPP monthly water availability is calculated and its impact on downstream water availability and impact on the behaviour of the river is assessed using digital model.

3.3 RECONNAISSANCE SURVEY

The reconnaissance survey was undertaken by a team led by Dr. Ashim Bhattacharya, Dr. K. M Agrawal and Ms Moumita Sarkar from AWTEM Consortium along with APML Team from 11th to 13th January, 2019. The team had a kick-off meeting at the Tiroda TPP site on 12th January 2019 to finalise the modalities for commencing the field study as well as collection of secondary data.

Initially, APML Team appraised the objective of proposed study and the required coverage of the same as per MoEF&CC Environmental Clearance condition. APML Team also shared the detailed information regarding water intake site as well as well as water pipeline corridor. They also shared the key features of existing water intake system. During the meeting detail plan for undertaking field study was also discussed and resolved that all the required primary data need to be collected before the onset of lean season, preferably within 20th February 2019.

The modalities for collection of secondary data from Water Resource/Irrigation Department, Government of Maharashtra; Ministry of Water Resource (MoWR), Government of India (GOI); National River Conservation Directorate (NRCD), GOI; Central Water Commission (CWC); Inland Water Authority of India (IWAI), Indian Meteorological Department (IMD), etc. APML Team assured their full support and guidance required for collecting the primary data as well as secondary data from local as well as district authority(s).

Accordingly, Dr. Bhattacharya and Dr. Agrawal suggested to commence the field study from third week of January and complete the same by third week of February 2019.

During the reconnaissance survey, AWTEM team member along with TTPP Team visited the intake well site as well as upstream and downstream of the same on 11th to 13th January 2019. During the field visit team members had interactions with local people to understand their water requirement along with usage and dependence on river Wainganga for domestic as well as agricultural activities. The irrigation water requirement being met from river Wainganga in both upstream and downstream of intake well were also explored through interaction with the local community. The existing weirs/barrage/dams in the river reach were also explored. The detailed public consultation was undertaken involving the various stake holder likely to be affected due to water intake for TTPP.

3.4 PRELIMINARY FIELD OBSERVATIONS

The water intake well is located at Dhapewada barrage at Wainganga river. In the vicinity of Intake well of TTPP there are intake well of Dhapewada Irragation Scheme I and Dhapewada Irrigation Scheme II is under construction. The Bamanthadi river is also meeting Wainganga river at the upstream of TTPP intake well. The observed bird species in this stretch during the winter season are mostly cranes, little black cormorant, etc. The adjoining agriculture land and pastures are flooded during monsoon. The site supports different trees and shrubs viz. Babool, Mango, Palm etc.

The villages falling within 2 km distance along with both the bank of the river Wainganga in down stream of water intake site upto Goshi dam have been identified using 2011 census atlas to assess the socio economic status of the people residing in the river reach. The demographic profile of these villages along downstream of the river Wainganga, on both the right and left side bank falling in the districts of Gondia and Bhandara as well as the land use pattern and irrigation facilities have been extracted using the latest census data i.e 2011 and other documents of Department of Water Resource and Irrigation, Government of Maharashtra. For public consultation to identify and asses the dependency of the local people on river Wainganga and likely impact caused due to drawl of water for Tiroda TPP the questionnaire has been developed and were for the purpose.

The discussions with local community around water intake system reveals that the dependency on river Wainganga for domestic water requirement is only for few villages which are very close to the bank of river Wainganga. In most of the villages the water requirement for domestic purpose is being met from ground water sources as the ground water level in these villages is very high i.e. less than 20-30 m. However for irrigation purpose the farmers whose land is very close to river Wainganga they directly withdraw the water from Wainganga using stand alone water pump system. The initial survey of the project site reveals that there are various minor, medium as well as major lift irrigation system. The major concern of the community people regarding availability of water is the deteriorating quality of the river water. It was observed that the agricultural land adjacent to the vicinity of the river Wainganga is usually flooded during the monsoon, whereas, bare minimum impact is on the village. It can be stated that the drawl of water for the Tiroda Thermal Power Plant could possibly provide intermittent flood relief due to the withdrawal of water as the surrounding area is highly flood prone during the monsoon season.

The initial observation on existing crop pattern of river reach area reveals that along the bank soil being very fertile the range of vegetable being cultivated by local people during the non-monsoon period i.e November to May. The adjacent agricultural area which is usually not affected by flooding is used for cultivation of paddy as well as wheat and pulses.

Over the last few decades, the river Wainganga network has been considerably fragmented by dams and barrages. These obstructions slice the rivers into several segments, thereby interrupting the flow of water, nutrient, sediments and aquatic biota of the river. So far a total of over 149 dams, 2 barrages and 3 weirs or other kinds of major structural obstruction were reported to exist on the Wainganga and its tributaries with Indian territory (Ministry of Water Resources, 2014).

It was observed that the water from the river is used basically for holy rituals, bathing, washing and agriculture purposes and immersion of idols. The main or primary users are the village communities residing in the vicinity of the river bank. It is observed that there is bare minimum waste disposal in and around the ghat area.

Small to medium boats operate here. The river bed as well as nearby area is used for farming, especially vegetables (brinjal, bottle groud, bitter groud, cucumber, parval, kakri, turai). The fishing community is basically residing near the ghat. Observed bird species **–** crane (white necked), shalik, house crow. Many fish species are found in the river, the daily catch consists of Palva (Tangra), Putia (Puti), Aar, baam, bele, prawns, baspata, kukri, phesa, kawalori/luri, batasi etc.

Photo Plate-5

Photo Plate-6

4.0 WAINGANGA RIVER BASIN

4.1 GODAVARI BASIN

River basins form the basic hydrological units for water resources planning. The basin has been recognized as a practical hydrological unit for water resources management. The Godavari is the second largest basin and accounts for nearly 9.5% of the total geographical area of the country. It extends over states of Maharashtra (48.7%), Andhra Pradesh (23.7%), Chhattisgarh (12.4%) and Odisha (5.7%) in addition to smaller parts in Madhya Pradesh (7.8%), Karnataka (1.4%) and Union territory of Puducherry (0.01%). The basin falls under division-All drainage flowing into Bay of Bengal and Region-Rivers draining in Bay of Bengal, delineated primarily based upon drainage of rivers to outlet.

It extends over an area of 312812.0 Sq. km, with a maximum length and width of about 995 km and 583 km, respectively. The basin falls in the Deccan Plateau lying between 73°24' to 83°4' east longitudes and 16°19' to 22°34' north latitudes. The basin is bounded on the north by the Mahadeo Hills, the Satmala Hills, on the north-west by the Ajanta Range, on the west by the North Sahyadri range of the Western Ghats, on the east and south-east by the Eastern Ghats and on the south by the Balaghat Range. The interior part of the basin lies in Maharashtra Plateau, the greater part of which is at an elevation of 300-600 m sloping eastward. The eastern part of the basin is majorly covered by the Dandakaranya Range with the Eastern Ghats forming the eastern boundary of the peninsula. The core components of the water network include the river Godavari, the largest of the peninsular river and its principal tributaries finally draining into the Bay of Bengal. The salient features for the Godavari basin are listed in Table 4.1.

The Godavari basin is divided into 8 sub-basins, each of which represents a different tributary system. The area distribution of the each sub-basin is shown in Figure 4.1.

Wainganga River Sub-basins have catchment area of 49695.40 sqkm with total of 80 water sheds having area ranging from 305 to 972 sqkm each.

4.2 WAINGANGA RIVER NETWORK

Wainganga is a tributary of the Godavari River and its name, which means 'Arrow of Water', is derived from Venu, or Benu, a king who ruled in Damoh during Puranic times, and goddess Ganga. The Wainganga River originates near village Partabpur or Mundara ($21^0$57'N & $79^0$34'E) about 20 Km from the town of Satapura plateau and flows in a wide half circle, bending and winding among the spurs of the hills from the west to the east of the Seoni District. Here it is directed to the South being joined by the Thanwar river from Mandla and forms boundary of Seoni for some Kilometers until it enters Balaghat. Subsequently emerging from the hills the river flows south & south-west through rich rice lands of Balaghat & Bhandara & Pauni. The principal tributaries of the river are Bagh in Balaghat, Bawanthari , Kanhan, Chulband in Bhandara & Garvhi in Chandrapur. It then flows through

Chandrapur & Gadchiroli Districts and after a course of about 570 Km joins the Wardha at Seoni in Chandrapur district. The total catchment area of the river upto It's confluence with river Wardha is about 51000 Sq. Km. The important uses of the river include agriculture, industries, fisheries, navigation and tourism. The details about its physiography, geology and hydrology are described in the subsequent sections.

TABLE 4.1: SALIENT FEATURES OF THE GODAVARI BASIN

Sl. No.	Feature	Description
1	Basin Extent	73°24' to 83°4' E 16°19' to 22°34' N
2	Area (Sq. km)	312812.00 (CWC Reported)
3	States in the basin	Maharashtra – 48.7% Andhra Pradesh – 23.7% Madhya Pradesh – 7.8% Odisha – 5.7% Karnataka – 1.4% Chhattisgarh – 12.4% Puducherry – 0.01%
4	Districts (Census 2011)	55
5	Parliamentary Constituencies (2009)	55
6	Mean Annual Rainfall (mm)	1093.21
7	Mean Maximum Temperature (° C)	33.04
8	Mean Minimum Temperature (° C)	20.63
9	Total Population (As per Census 2001)	60489310
10	Number of villages (As per Census 2001)	43492
11	Highest Elevation (m)	1664
12	Avg. Annual Water Potential (BCM)	110.540
13	Utilizable Surface Water (BCM)	76.30
14	Number of Sub Basins	8
15	Number of Watersheds	466
16	Number of water resources structures	Dams (921) Barrages (28) Weir (18) Anicuts (1) Lifts (62) Power House (16)
17	Highest Dam	Bandardhara Dam -82.35 m
18	Longest Dam	Sriramsagar(SRSP)/Pochampad dam-15.6 km
19	Highest Barrage	Kolar barrage-15.5 m
20	Longest Barrage	Kolar barrage-1.195 km
21	Number of Irrigation projects	Major-70 Medium-216 ERM-6
22	Number of HE projects	14
23	Number of Ground water observation wells	1875
24	Number of Hydro-Observation Sites	88
25	Number of Flood Forecasting Sites	18
26	Water tourism sites	53

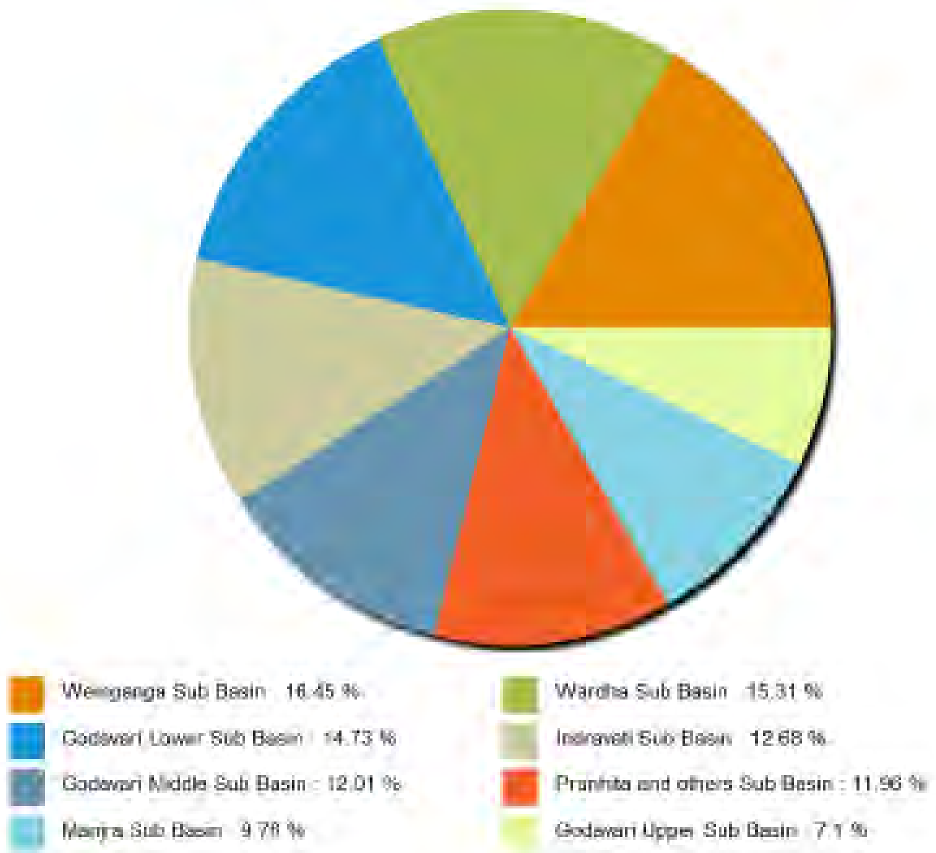


FIGURE 4.1: SUB BASIN-WISE DRAINAGE AREA OF THE GODAVARI BASIN

4.3 TOPOGRAPHY OF WAINGANGA BASIN

The Vidarbha plain i.e., the eastern part of Maharashtra forms the Wardha-Wainganga region. Here the basalt, so typical of Maharashtra plateau, comes in contact with the older crystalline rocks giving rise to granite-gneissic relief, different from the usual 'Mesa-and-valley' topography. This part comprises the Nagpur-Wardha plain on the west and the forest covered Wainganga valley in the south-east. The area is rich in natural vegetation that covers the rugged hilly land. A change in the structure and surface configuration with a concurrent increase in rainfall has changed the nature of soils, promoted a more luxuriant growth of vegetation. Much of the region except the eastern part of Wardha-Wainganga area and a small littoral patch in Ratangiri is underlain by basaltic rocks (Source: India A Regional Geography, 1971).

The western part of Vidarbha plain, drained by the Wardha and Penganga rivers and their tributaries, is the Wardha-Penganga plain. It is mostly underlain by basalt presenting the familiar trappean landscape of the plateau. The wardha plain is denuded so that its general elevation does not exceed 300 m asl, though the plateau and the hilly areas on the north-west, culminating into the upland of Arvi, stand out from the plains (Figure 4.2). The black or medium black soil occupying the valley is most fertile, but morand, the grey soil, forms the most extensive cover that is suitable for cotton, jowar and rice. The Wainganga sub-basin is a structural syncline it occupies a crystalline base, having more than 1500 mm of rainfall. Rapid fluvial erosion has reduced the land considerably leaving a number of isolated hills. Rocky surfaces, often devoid of thick soil cover, are usually covererd with forests. The valley comprising the Nagpur, Chandra and Bhandara districts of Maharshtra accounts for more than half of the forest area of the state. Tropical Decidous forests of Wainganga valley are the main sources of timber and bamboo and support the paper industry at Ballarpur.

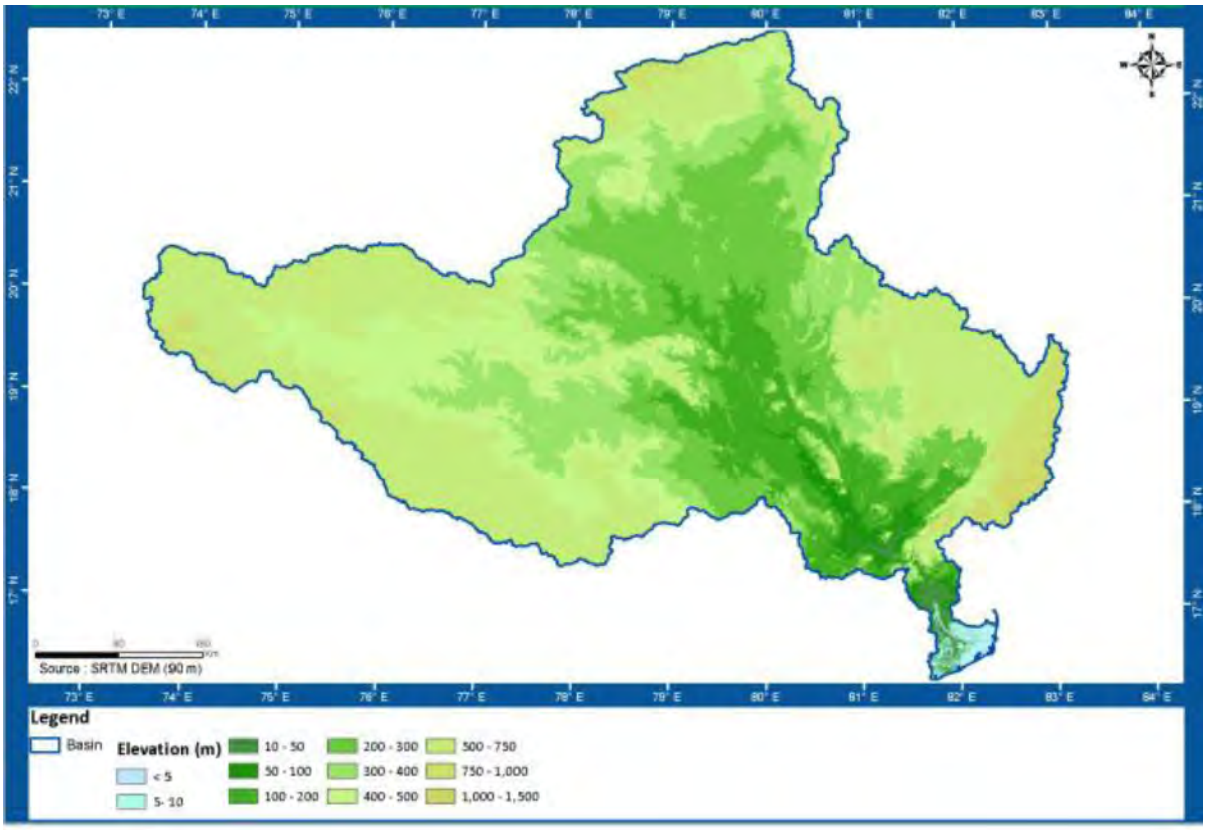


FIGURE 4.2: SRTM DEM MAP OF GODAVARI BASIN

4.4 GEOLOGICAL FEATURES OF WAINGANGA BASIN

The Wainganga sub-basin has varied rock formation and includes Precambrain rocks (granite gneisses) and Deccan traps which cover the major portion of the basin. Alluvial soils, laterite, granite, sandstone, shale, dolomite, mica, schist etc are also seen in fragments.

4.5 LAND USE AND LAND COVER OF WAINGANGA BASIN

The Land use pattern of Wainganga Sub-basin have been obtained from the database of 'Global Land Cover Facility' (athttp://ftp.glcf.umd.edu/index.shtml). Figure 4.3 present the land use and land cover of Wainganga Sub-basin.

Soil is composed of minerals, mixed with some organic matter, which differ from its parent materials in terms of its texture, structure, consistency, color, chemical, biological and other characteristics. Information on the soil profile is also required for simulating the hydrological character of the basin. Similarly the information on soil types was obtained from FAO Digital Soil Map (http://www.fao.org/geonetwork/srv/en/metadata.show). Analysis of data reveals that the soils of the Wainganga sub-basin may broadly be divided into three categories namely (i) black soil, (ii) red soil, and (iii) mixed black and red soil and, in terms of the soil type, clay and clayey loam soils dominate as the principal soil types of the study area as highlighted in Figure 4.4.

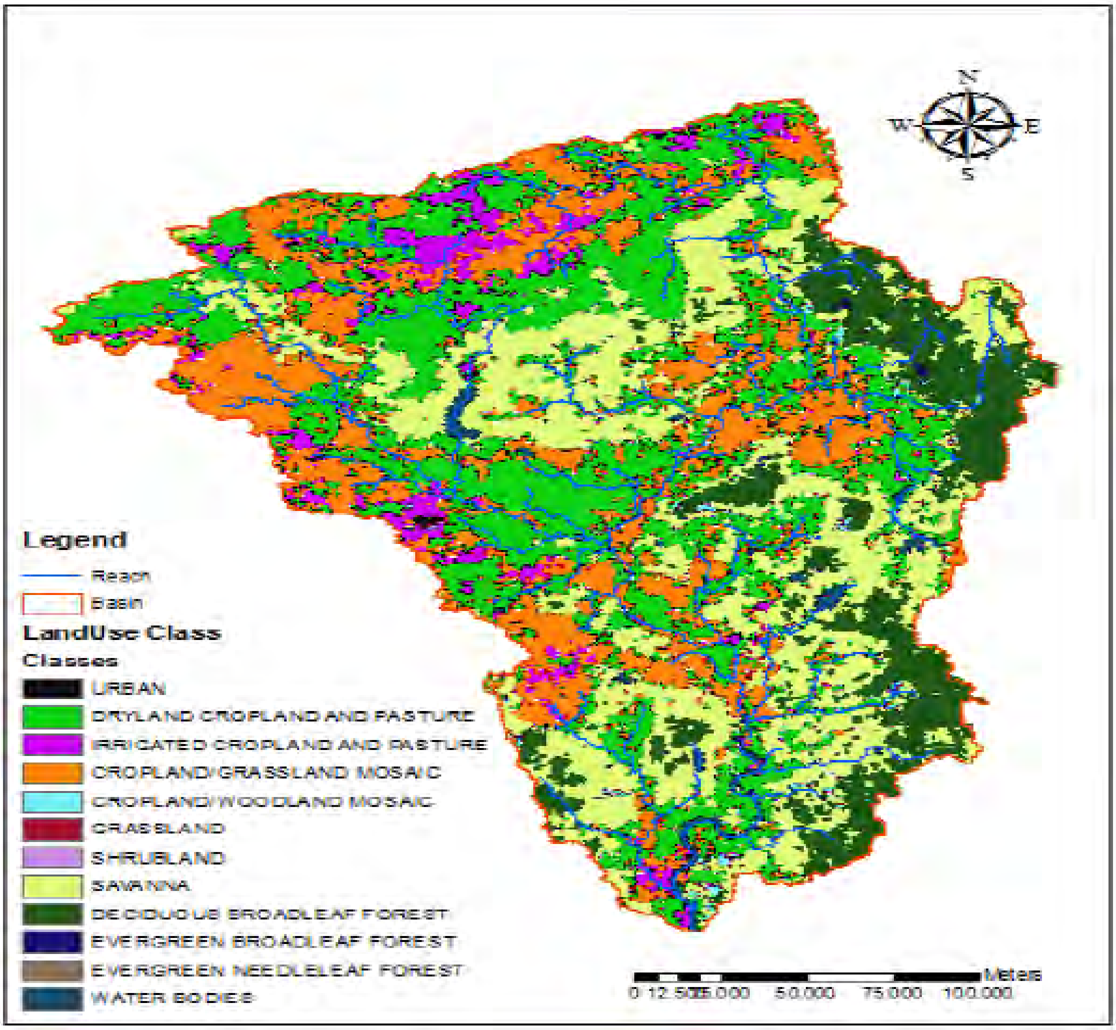


FIGURE 4.3: LAND USE AND LAND COVER OF WAINGANGA SUB-BASIN

The soil conditions along the valleys are rich with black regur loams while clay loams are also found along the river bed. These soils, known locally as kali soils, are very productive and suitable for rabi crops due to high moisture retention capacity.

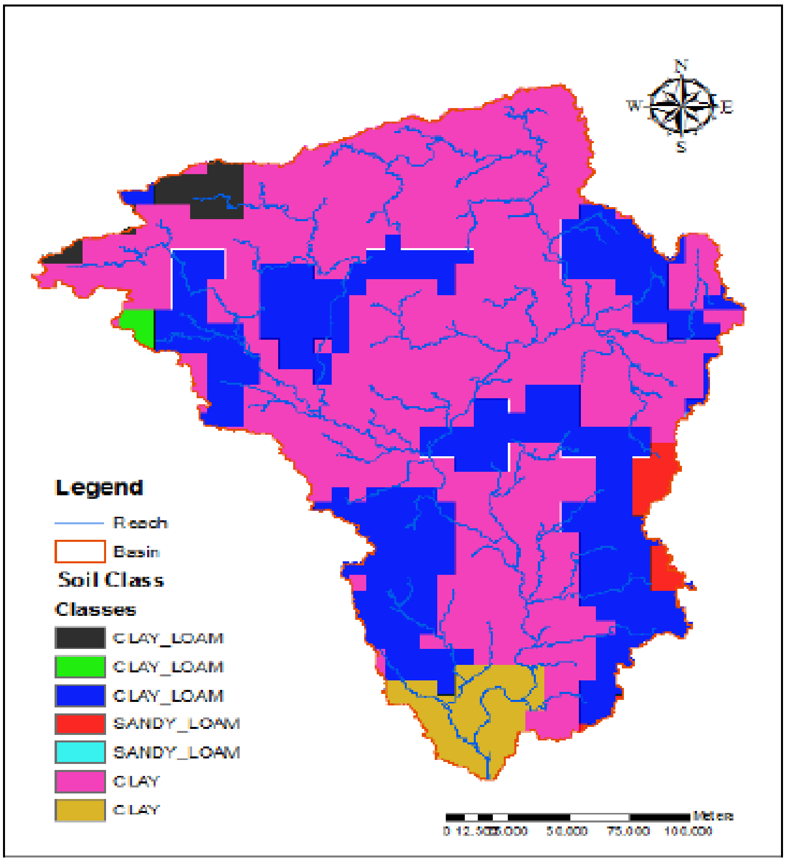


FIGURE 4.4: SOIL MAP OF WAINGANGA SUB-BASIN

4.6 CLIMATE OF WAINGANGA BASIN

Climate has assumed an important role in landscape evolution. The Godavari basin has a tropical climate and the evaporation losses vary from 1800 to 2440 mm over different parts of the basin (Source: Reassessment of Water Resources Potential of India, CWC 1999). The weather in the basin is cold from mid-October to mid-February and the wetsren and the north-eastern part being colder than the rest of the basin. Annual climatology is defined in terms of three dominant seasonal patterns that feature (i) summer season (March – May), (ii) monsoon season (June –October), and (iii) winter (November – February).

Rainfall Pattern

South-west monsoon sets in by July and ends by September receiving maximum part of its annual rainfall during it. The monsoon entering through the west and south-west coast of the Godavari basin meets the Sahyadri Range sweeps across the interior of the peninsula. Further east, there is a progressive increase in the amount of rainfall that changes the landscape and the cropping pattern in the eastern Maharashtra, the Wardha-Wainganga sub-basins. The rainfall, fairly heavy though irregular and unevenly distributed, is mostly caused by the south-west monsoon.

Based on daily rainfall data (0.5 X 0.5) of the last 34 years (1971-2005) collected from IMD the average annual variations in the Godavari basin is shown in Figure 4.5. Annual rainfall of the basin varies from 755 mm to 1531 mm. The average annual rainfall in the basin is 1096.92 mm. It is found that the rainfall varies temporally and spatially across the basin. In Godavari the high rainfall zone in the Western Ghats the annual rainfall varies from 1000 to 3000 mm in this reach. There is a belt some distance east of the Western Ghats experiencing less than 600 mm annual rainfall. After this area the rainfall again gradually increases to about 900 mm towards the East coast. January and February are the driest months in the basin with the annual rainfall ranging from less than 0.5 mm to 55 mm. During the next three months, upto end of May, it varies from less than 1 mm to 50 mm. The maximum rainfall recorded was 1531 mm in 1990 and minimum was 755 mm in 1952.

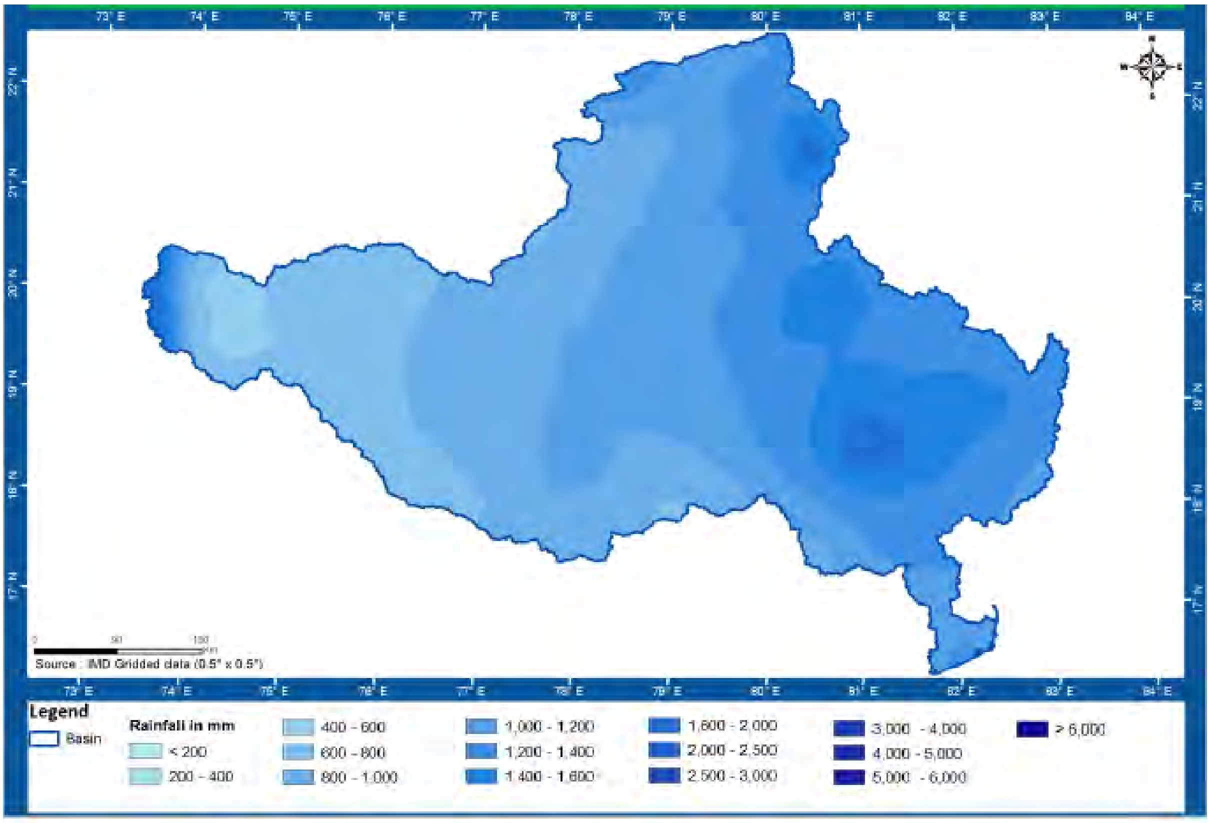


FIGURE 4.5: GRIDDED RAINFALL OF GODAVARI BASIN

Temperature Grids

Daily temperature (maximum, minimum and mean) gridded data (1 x 1) for 36 years (1969-2004) collected from IMD has been analysed. Mean temperature is calculated as the average of maximum and minimum temperature. Annual maximum temperature varies from 31^{O}C to 33.5^{O}C (1969-2004). Maximum and Minimum temperatures in the basin gradually increase as we move from west to east. During January, which may be taken as a typical winter month, the mean daily minimum temperature increases going from west to east; the mean daily maximum temperature generally exceeds 30^{O}C in the western part of the Godavari basin and is only slightly less than 30^{O}C in the eastern part. They are highest in April (39.14^{O}C recorded in 1999), which is a typical summer month. During July, this is a typical monsoon month, the minimum temperature increases from 22^{O}C in the Western Ghats to 24^{O}C near the east coast and the maximum temperature increases from 28^{O}C in the Western Ghats to 34^{O}C near the east coast. During October, which is a typical post monsoon month, the minimum temperature is 19^{O}C in most parts of the basin though to increases to about 23^{O}C near the coast. The mean daily maximum temperature is a little above 39C over the entire basin. During the last 36 years average annual maximum temperature and the average annual minimum temperature recorded was 32.85^{O}C in and 20.53^{O}C, respectively in the basin. Night temperatures are the main elements which make the winters more severe in central and eastern part of Maharashtra.

Temperature profile chart of the basin (Figure 4.6) shows that in the cold weather, January month records the lowest temperature (Mean Minimum Temperature-14.3°C) and May records the highest temperature (Mean Maximum Temperature-39.9°C) in the hot weather for the period of 36 years.

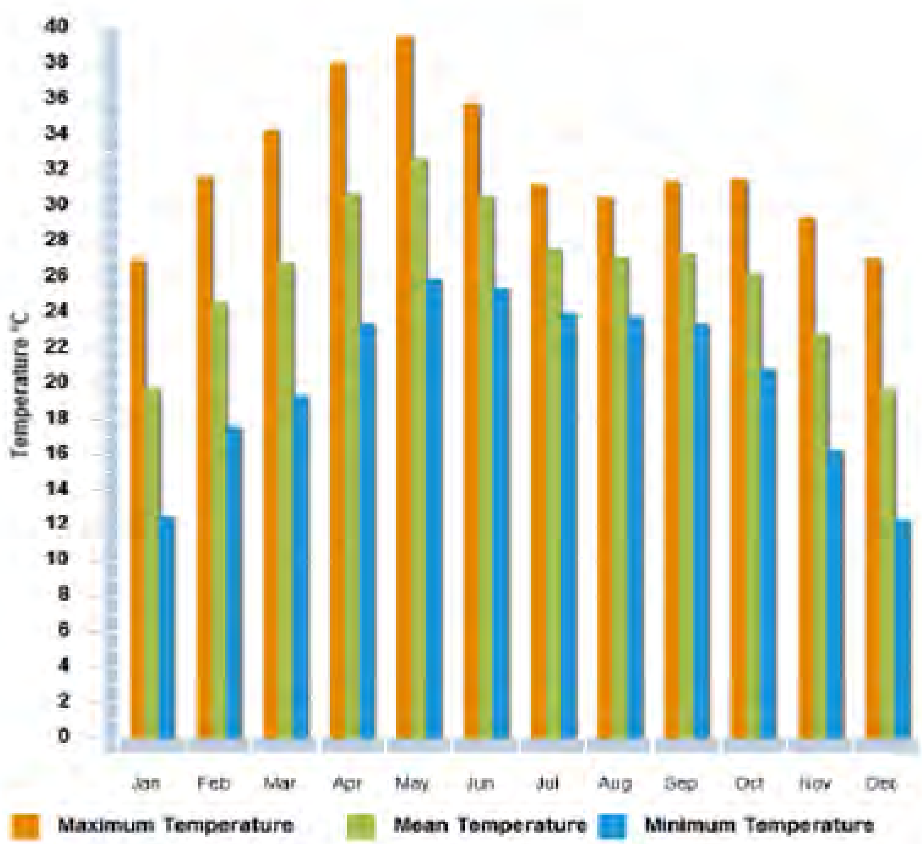


FIGURE 4.6: GRIDDED MEAN ANNUAL TEMPERATURE FOR WAINGANGA BASIN

4.7 AGRICULTURAL PATTERN OF WAINGANGA BASIN

Agriculture is the primary livelihood in the Wainganga sub-basin. The crops grown in the basin can be categorised as cereals (major crop), pulses, oilseeds, vegetables, fibres and spices and condiments. Among cereals, rice is the major crop in the basin. Other cereals grown in the basin are wheat, small millets and maize. Pulses include moong, biri, khesari, gram and kulthi and oilseeds include groundnuts, soyabean, sesame and mustard.

River Bed Cultivation:

During a field visit to the Wainganga, it was observed that river bed cultivation is a major source of livelihood, especially for the landless farmers. After monsoon, when the water starts retreating, farmers are growing water melons, musk melons, pumpkins and a wide variety of vegetables. In the basin, many barrages or small anicuts are being built which will create small ponds, affecting the farmers who depend on these river beds for their source of livelihood directly.

4.8 HYDROGEOLOGICAL FEATURES OF WAINGANGA BASIN

The diversity in the geological settings of the Wainganga sub-basin is reflected in the hydrogeological settings of the basin.

Sub-basins could be sub divided into smaller hydrological units namely, watershed for water resources management. Watershed is a natural hydrological entity that covers a specific areal expanse of land surface from which rainfall flows to a defined drain, channel, stream or river at any particular point. Watershed is delineated purely on the basis of hydrological principles. Size of the watershed is governed by the size of stream and its boundaries.

Watershed delineation, defined in terms of an identified outlet point, is carried out through terrain processing of the DEM, and, in addition, also yields its stream network. The watershed boundary of Wainganga sub-basin delineated using the ArcView interface of SWAT is shown along with important drainage features in Figures 4.7(a) and (b) for reference. Figure 4.7(a) depicts the generated drainage network and the points (based on the confluence of drains) where the basin may be subdivided into sub-basins. The Figure 4.7(b) depicts the location of the manmade structures such as dams.

4.9 DAMS AND BARRAGES OF WAINGANGA BASIN

Water resources structures are manmade structures to store the water for different purpose like hydropower generation, irrigation, drinking water supply etc. The Wainganga river network is intercepted by numerous dams and barrages. The detail of dams, barrages and wires of wainganga sub-basin is presented in Annexure 4.1. Dams and barrages affect river morphology, stability and ecological balance, fertility of the river and its floodplains, nature of flood events, human health, and basin performance. The location of major water reservoirs of Wainganga sub-basin are presented in Figure 4.8.

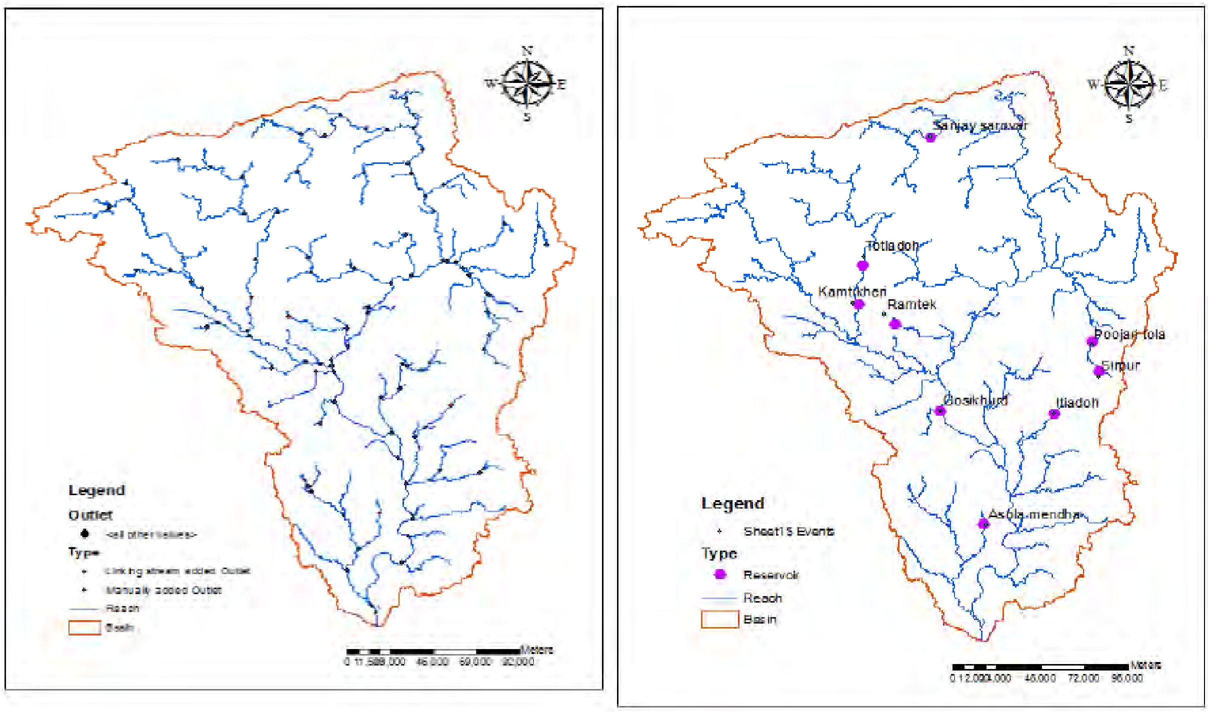


FIGURE 4.7 (a & b): DRAINAGE NETWORK OF WAINGANGA BASIN

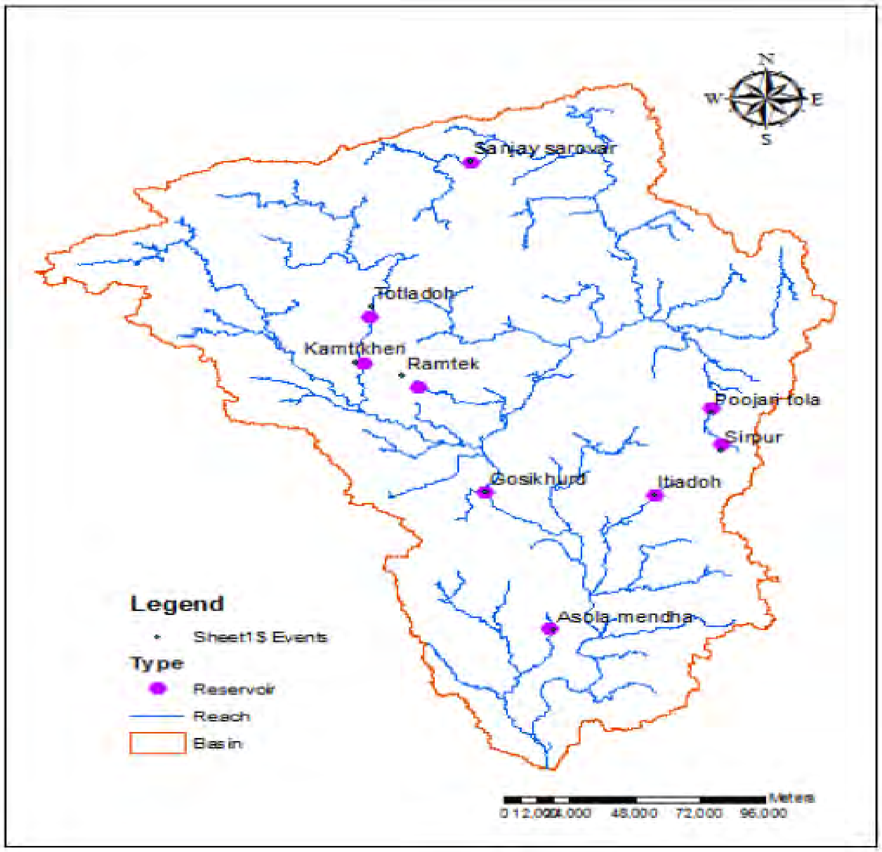


FIGURE 4.8: RESERVOIRS IN WAINGANGASUB-BASIN

So far nearby 170 Nos. of structure (Dams/Barrage/Weir/Anicuts) is constructed providing irrigation, diversion, storage purpose and other facilities in the Wainganga sub-basin. Out of which the number of dams are highest i.e. 149 followed by Lift Irrigation Systems (15) whereas barrage and weirs are 2 and 3 respectively. There is only one Hydro Electric Power Plant. Majority of dams (82.58%) have a storage capacity of less than 25 MCM. Around 94.5% dams constructed in the basin are used for the purpose of irrigation.

5.0 GEOMORPHOLOGICAL STUDY

To bring conformity with the actual field conditions, all spatially varying databases are analyzed with reference to the geographic coordinate system by their latitudes and longitudes under the geographical information system framework. Therefore, the data bases and various thematic maps have relevance with the actual field conditions.

The study area is located in the extreme north-eastern district (Gondia) of Maharashtra. The land in this part is partly undulating at higher elevation (more than 300 m on land away from river) while it becomes more or less flat near the river. The study area lies on theWainganga plains. The general elevation of the study area ranges from 301.11m to 338.4m. The area has rocky outcrops of granites and gneisses.

For hydrological and hydrogeological analyses, the survey of India (SOI) maps, and data collected from different sources, namely, Geological Survey of India (GSI), Water Resources Department (WRD), etc have been used.

5.1 REGIONAL GEOLOGY

Gondia district is unique in Maharashtra in sense that the entire area of the district is occupied by metamorphic rock and alluvium.

The brief description of various lithorites is given below:

Age	Formation	Lithology
Pleistocene to Recent	Alluvium and Laterite	Silt, Sand, Gravel, Laterite
Protozoic	Vindhyan Super Group	Quartzite and Shale
	Doongarh Super Group	Andesite, Sandstone granite, Ehyolite
	Sausar Group	Muscovite-boitite-schist, Granite, Tirodi Gneiss
	Sakoli Group	Schist, Phyllites, Quartzite
Archaean	Amagon Group	Granite & Gneisses

- Alluvium is developed all along major river courses such as Bagh, Chulbandh and Gadavi.
- Laterites are bdistributed all over the district but observed prominently in S. Arjuni and Arjuni Moregaon.
- Metamorphic rocks like various Granites, Gneiss, Schists, Phylites etc. are exposed throughout district.
- Gondia district is rich in economic minerals like Manganese, Kyonit, Sillimanite, Corundum and Pyrophyllite.

Geologically, the area essentially belongs to the Archeans sediments preserved in thesynclinal depressions of the landscape and is highly metamorphosed. The Tiroda TPP area is basically marked by the rock formations from the oldest granite and gneiss of pre-cambrian to recent alluvium. The gneisses comprise of biotite, hornblende gneiss and magnetite. The Biotite gneiss is composite in characterand forms the basement for younger metamorphoses sedimentary rocks. Two types of seriesof rocks viz. Sausar series and Sakoli Formation are found in the region.

In Tiroda region, especially the study area belongs to the Sausar series. Lithologically Sausar series consist of talc granulites, mica and hornblende schist, gneiss rocks of the Sausar group contain and biotite but not chlorite. Manganese deposits are associated with rocks of this group. The rocks comprise of low grade metamorphoses such as phyllites, chlorites, muscovite and hornblende schist, quartzite and kyanitesillimanite rocks. These are intruded by basic rocks and quartz veins. Along the bank of the river Wainganga alluvial cover varying from a few meters to 15 m thick has been observed.

5.2 GEOMORPHOLOGY

The study area was defined by 10 km buffer around the Water Intake Well (21º26'35" N, 79º53'06" E) as presented in Figure 5.1. Out of the total study area, 96% of the area falls in the Maharashtra, almost equally divided by the Waingana River into the districts of Bhandara (west) and Gondia (east).

It is situated in the Wainganga Basin of the Godavari System. The area within 10 km from the Tirora Thermal Power Plant Intake Well is characterised by a broad 7~9-km wide valley of the trunk stream—the Wainganga—and residual fringe hills of the Satpura Ranges of the Central Plateaus. The riverine plains of the southwest-flowing Waingana and its principal tributary,the east-flowing Bawanthari, are confined within 155–285 m, with the elevation of the riverbank at the location of the Water Intake Well at 267 m (Figure 5.2). Low-lying areas of this region, on the southwestern edge of the study area is liable to get flooded during the high-discharge years of the Wainganga. The floodplain region, and the area between 255 m and 265 m constitute a flattish plain which is fertile and used extensively for growing rice, pulses and vegetables. The height at the northwest and east reaches up to 400 m, rendering a relative relief value of 145 m for the study area. The underlying rocks of this region are mostly granitic genesis with some migmatites in the lower altitudes, and mica-schists and phyllites in the higher elevations of the west. Exposures of quartzites are also seen. Alluviums veneer the floodplains and central part of the Wainganga Valley. The region is dominated by the valley of the Wainganga System and outliers of the residual hills in the fringes. Elevation of the riverbank at the location of the Water Intake Well is 267 m.

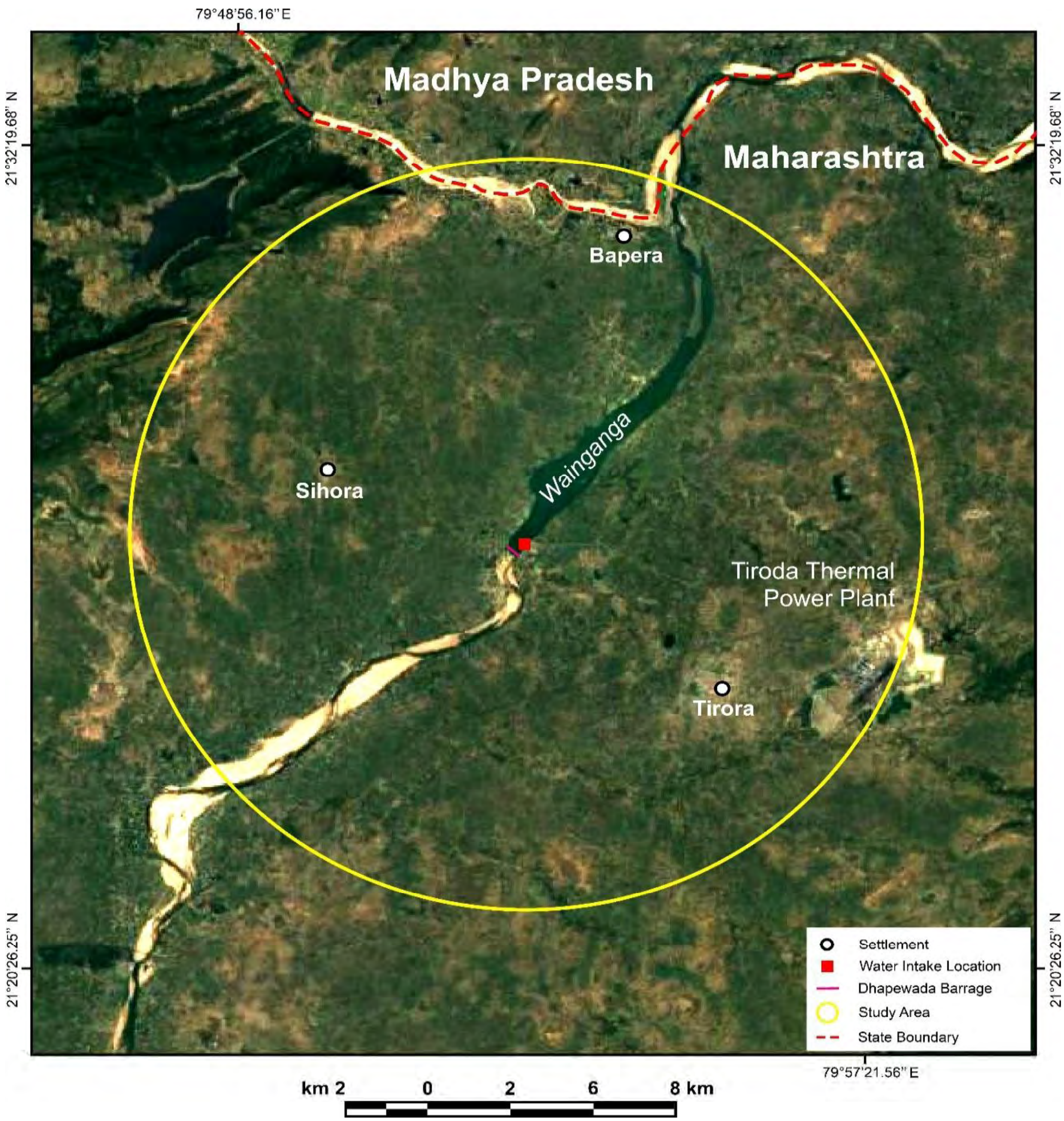


FIGURE 5.1: LOCATION OF THE STUDY AREA - 10-KM BUFFER AROUND THE WATER INTAKE POINT

Source: Image from Google Earth.

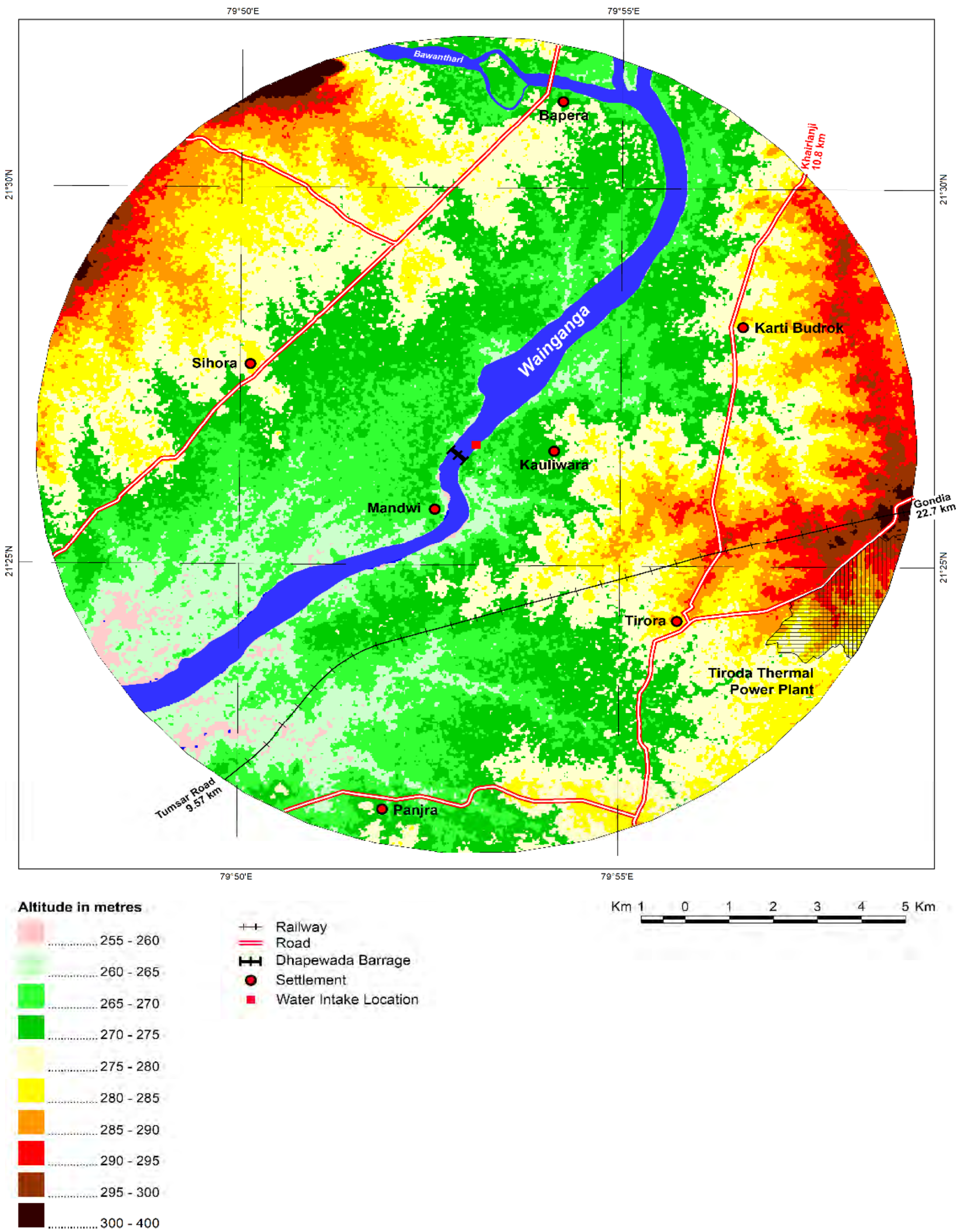


FIGURE 5.2: PHYSIOGRAPHY OF THE STUDY REGION

[*Source*: Digital Elevation Model prepared from 1 arc-second Shuttle Radar Topography Mission data of February 2000; Tile# N21-E79.]

Behaviour of River Bank at Intake Point

For studying the river bank behaviour at intake point, comparison of winter satellite images of 19-Jan-1988 and 29-Jan-2019 was undertaken. The analysis indicates that there is negligible change in riverbank positions of the Wainganga at the vicinity of the Water Intake Well during the last 30 years, attesting its position at a stable location (Figure 5.3 and 5.4).

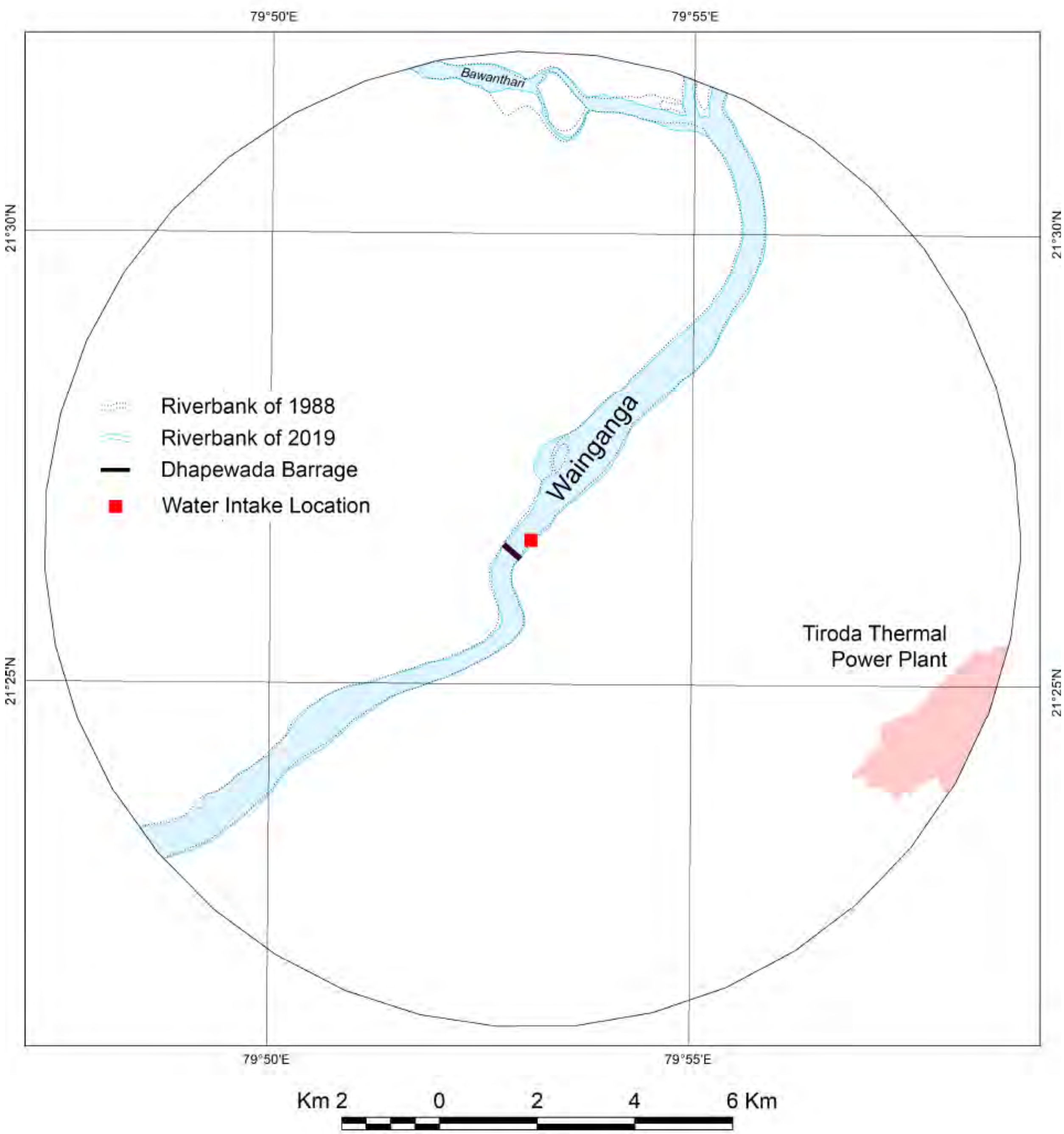


FIGURE 5.3: SHIFT IN THE COURSE OF THE WAINGANGA BETWEEN 1986 AND 2019

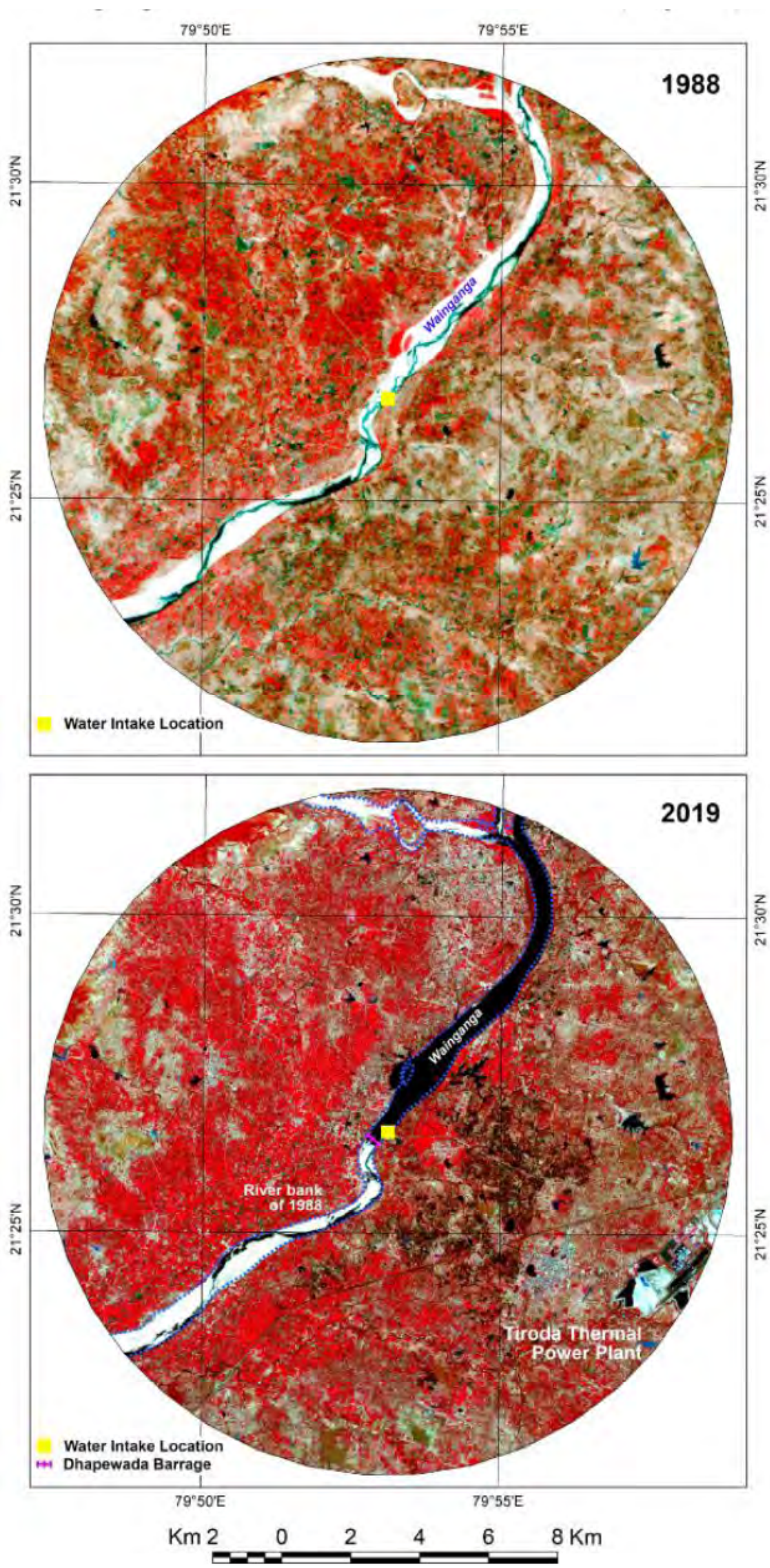


FIGURE 5.4: SHIFT IN THE COURSE OF THE WAINGANGA BETWEEN 1986 AND 2019

The underlying structure and disposition of the Waingana has rendered its channel a stable position that has remained largely unaltered for decades. This implies a safe location for the Water Intake Well at 21º26'35" N, 79º53'06" E, which has negligible risk of bank erosion.

5.3 LAND USE LAND COVER

To bring out the land use land cover characteristics of the area within 10 km from the Water Intake Well, Sentinel-2BMultispectral Instrument (MSI) dataset of 29-Jan-2019 (Table 5.1) was classified using maximum likelihood algorithm, after extensive ground truth verification. The results are shown in Figure 5.5 and Table 5.2. These indicate that the farmlands cover 69% of the region, dominated by mono-cropping (40%) owing to lack of irrigation facilities. The fallow regions are mostly colonised by grasses during winter. Orchards, mainly associated with sporadic villages, minor streams and plantations along agricultural bunds, occupy 18% of the region. The next large land cover types includegrasses and shrubs (3%) and built-up areasassociated with settlements (2%). The Dhapewada Barrage-impounded and downstream waters of the Wainganga and sporadic water bodies constitute 4% of the area. Extensive sand bars along the Batanghariand the Lower Waingangarivers, seen in the dry-season images (Figure 5.5), stand at 2%. All these bars are liable to get inundated at bankful stages of the rivers during the monsoons. Other notable landuse types of the region include the 15-ha coal yard and the 112-ha ash pond of the Tirora Thermal Power Plant, collectively occupying about 0.4% of the study area.

TABLE 5.1: DETAILS OF REMOTE SENSING DATA USED IN THE STUDY

Satellite	Sensor	Resolution	Path-Row / Tile Id	Date of Acquisition
—	SRTM	30 m (1 arc-second)	N21-E79	February 2000
Landsat-5	TM	30 m	Path 144, Row 45	19January 1988
Sentinel-2B	MSI	10 m	T44QL	29January 2019

TABLE 5.2: AREA STATISTICS OF LULC CLASSES OF THE AREA WITHIN 10 KM FROM THE WATER INTAKE WELL

LULC Classes	Area (ha)	Percentage of total area
Farmland: Cropped	8,872.70	28.24%
Farmland: Fallow	12,663.57	40.31%
Built-up	779.53	2.48%
Coal Yard	15.15	0.05%
Ash pond	111.52	0.35%
Plantation / Village Orchard	5,757.50	18.33%
Degraded Forest	116.34	0.37%
Forest	234.14	0.75%
Grass / Shrub	1,001.03	3.19%
Rock Outcrop	6.47	0.02%
Sand	625.60	1.99%
Water	1,232.43	3.92%
Total	31,416.00	100.00%

Source: Maximum Likelihood Classification of Sentinel–2B MSI data of 29-Jan-2019. Tile# T44QLJ

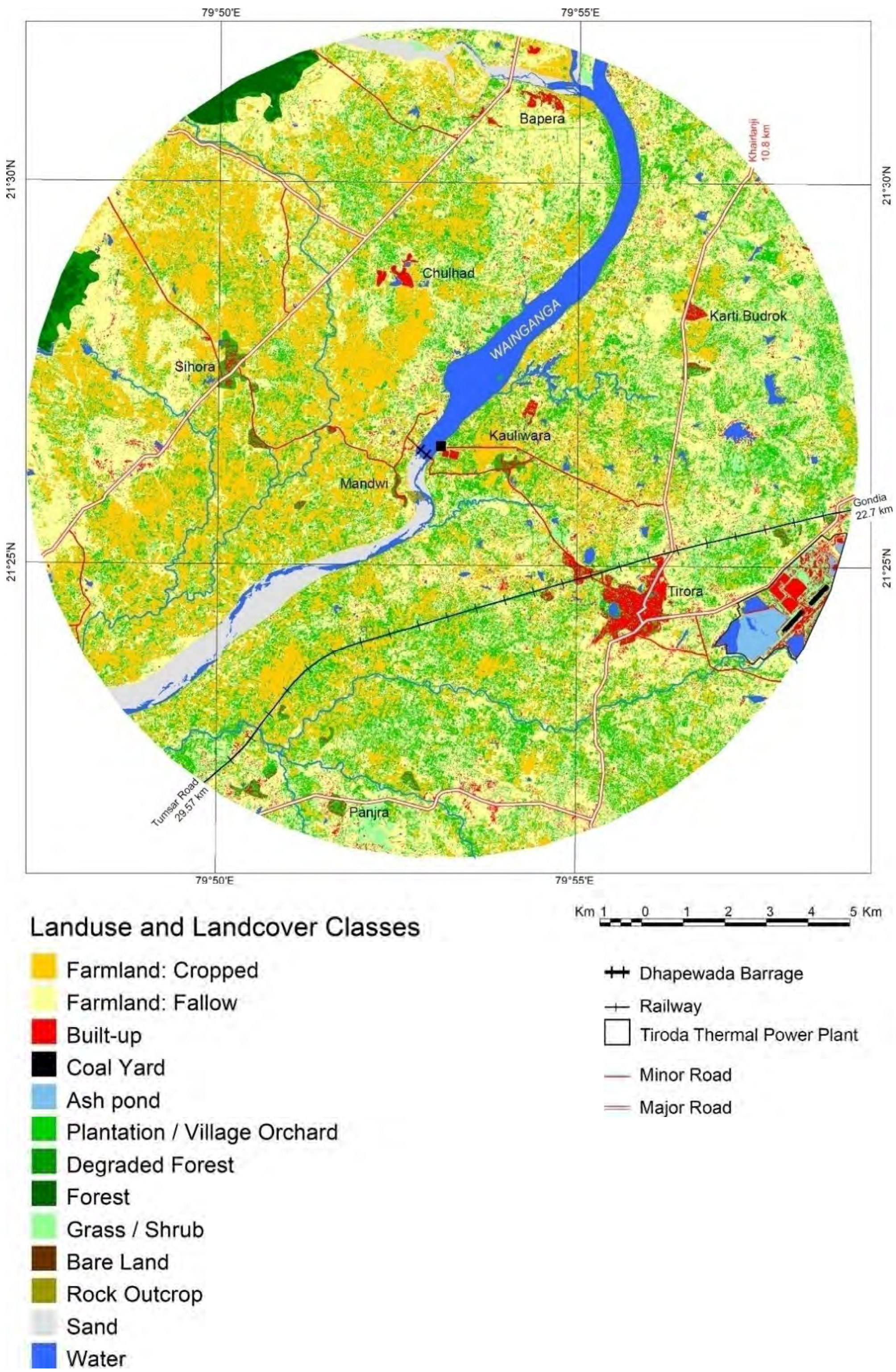


FIGURE 5.5: LAND USE LAND COVER CHARACTERISTICS OF THE STUDY AREA

Source: Maximum Likelihood Classification of Sentinel–2B MSI data of 29-Jan-2019. Tile# T44QLJ.

5.4 HYDROLOGY

Groundwater level conveys useful information about the groundwater system. The temporal variation of the groundwater level conveys the characteristics like its recharge potential due to precipitation, the withdrawal by different stresses like domestic use, agricultural use and industrial use.

One of the most common measurements in groundwater investigation is the determination of the depth to groundwater. Such data are needed to define depth to water level during pre-monsoon and post-monsoon periods, groundwater flow direction, changes in water level over time and effects of pumping. In the present study, groundwater level data of NEERI (2016) are used to study the groundwater fluctuation. It was observed that the pre-monsoon and post-monsoon water level (bgl) varied from 3.28 m to 22.06 m and 1.47 m to 10.71 m respectively . The groundwater level indicates that the wells are tapping the top unconfined aquifer. Majority of the sources are having shallow water table (<10 m below round level).

The water level measured as below ground level has been converted to water level (above mean sea level) by subtracting the water level (bgl) from the RL of the source. The water level (amsl) in the pre and post-monsoon indicates that the groundwater flow direction is from north east to south west (Figures 5.6 & 5.7).

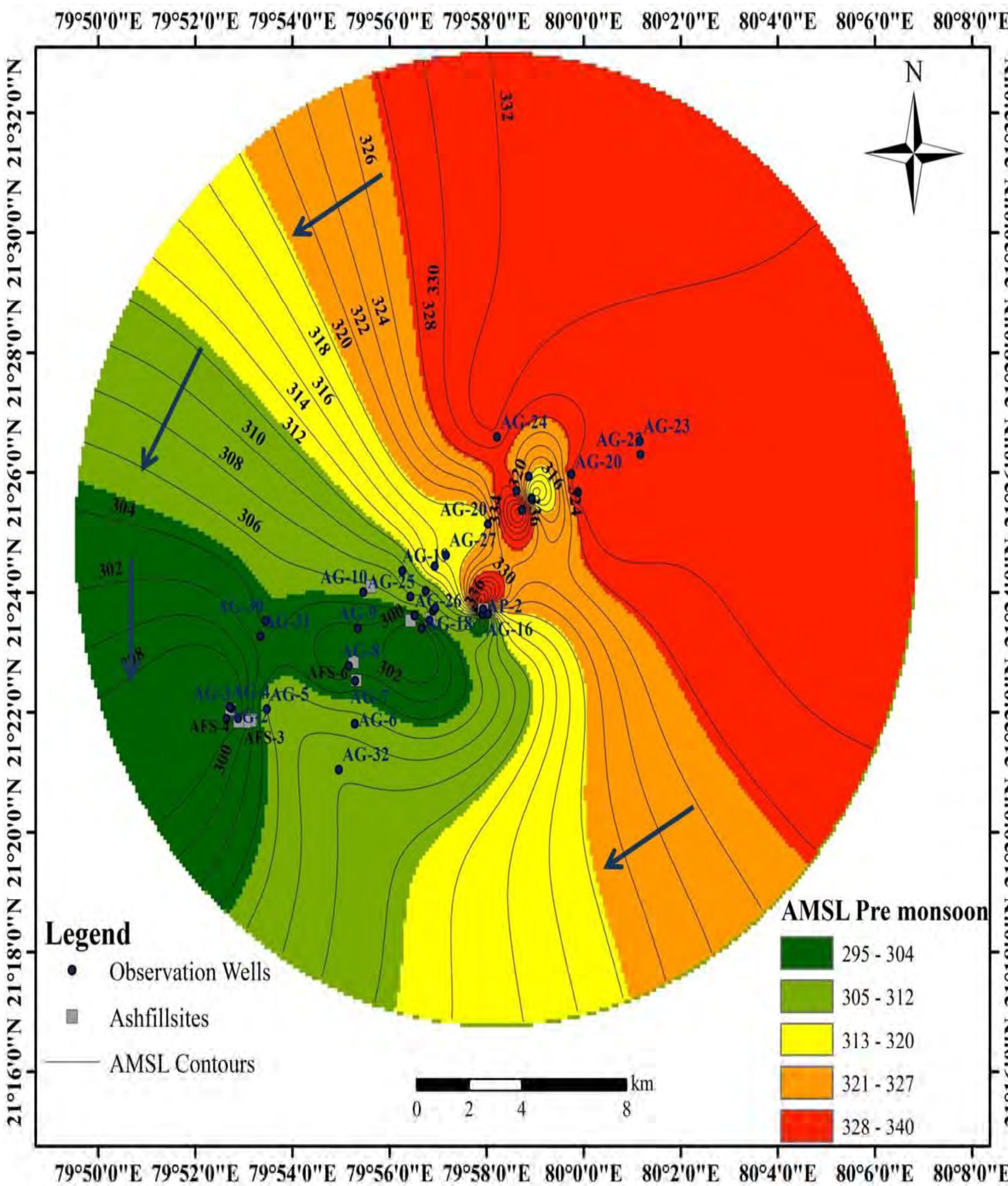


FIGURE 5.6: WATER LEVEL (AMSL) IN PRE-MONSOON SEASON

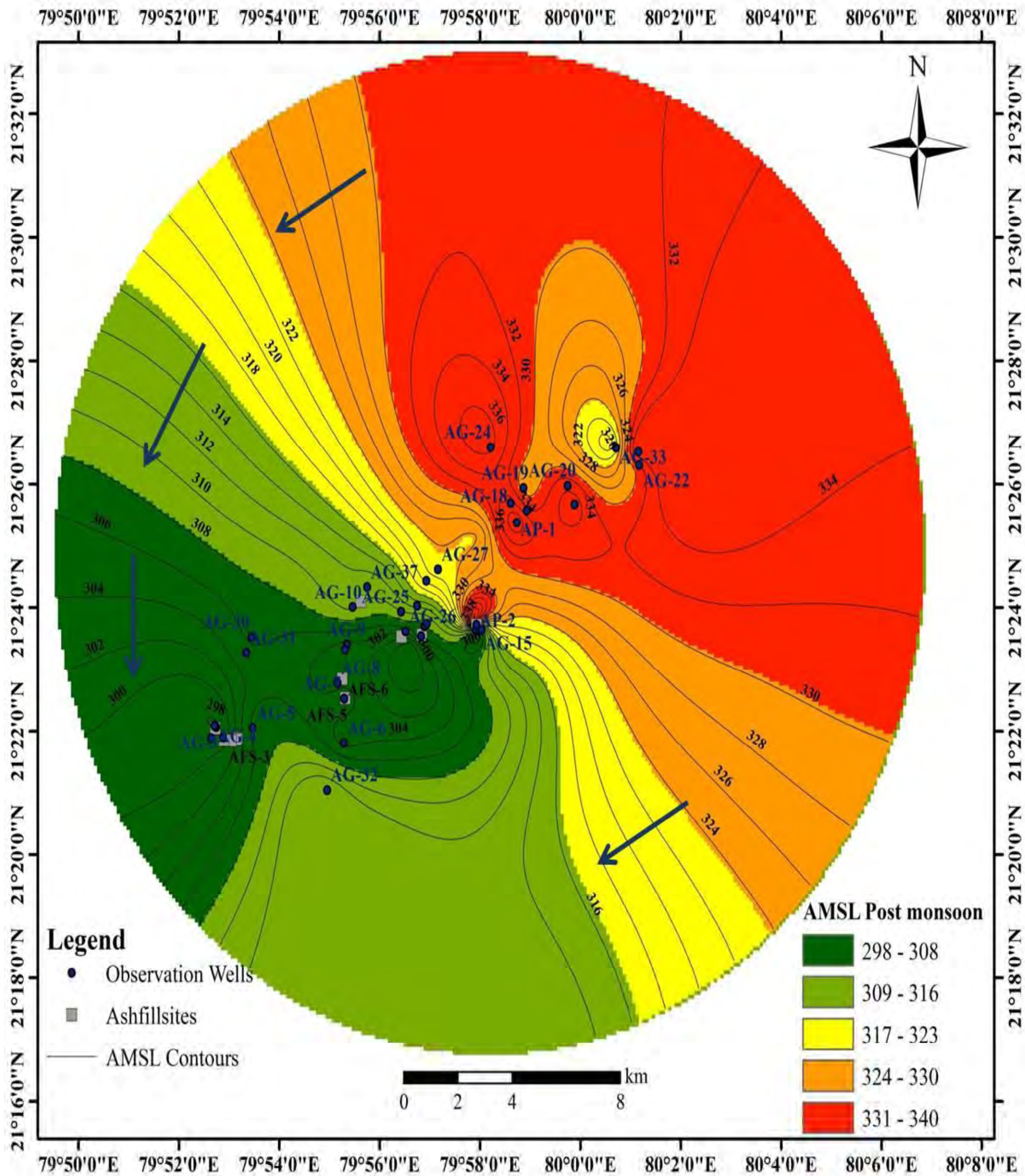


FIGURE 5.7: WATER LEVEL (AMSL) IN POST-MONSOON SEASON

Photo Plate-7

6.0 WATER AVAILABILITY & HYDROLOGICAL STUDY

The study area falls in the sub-tropical climate zone with hot summer followed by well distributed rainfall through South-West monsoon. The monsoon season starts from the middle of June and lasts till the end of September. May is the hottest month during which temperature rises up to 47°C and December is the coolest month during which the temperature decreases to 5°C. The average annual normal temperature for the area is 27°C. During the summer season humidity is lowest i.e. about 35% and is highest during the southwest monsoon period i.e. about 85%.

6.1 RAINFALL PATTERN

AWTEM has obtained the data of the Rain Gauge stations situated in the project vicinity of Wainganga sub-basin to assess the water availability including monthly inflow data in the river Wainganga. All the rain gauge stations are provided with ordinary rain gauge only.

The long term rainfall data for Vidarbha Region for 1917 to 2016 have been collected from National Data Centre, IMD, Pune to analyze the dependable rainfall and average duration curve for rainfall. Vidarbha Region has an yearly rainfall of 1087.3 mm with a Standard Deviation of ±206.7 (Figure 6.1). The long term trend of monthly variation in the rainfall for Vidarbha region is presented in Figure 6.2.

FIGURE 6.1: LONGTERM RAINFALL PATTERN FOR VIDARBHA REGION (1917-2016)

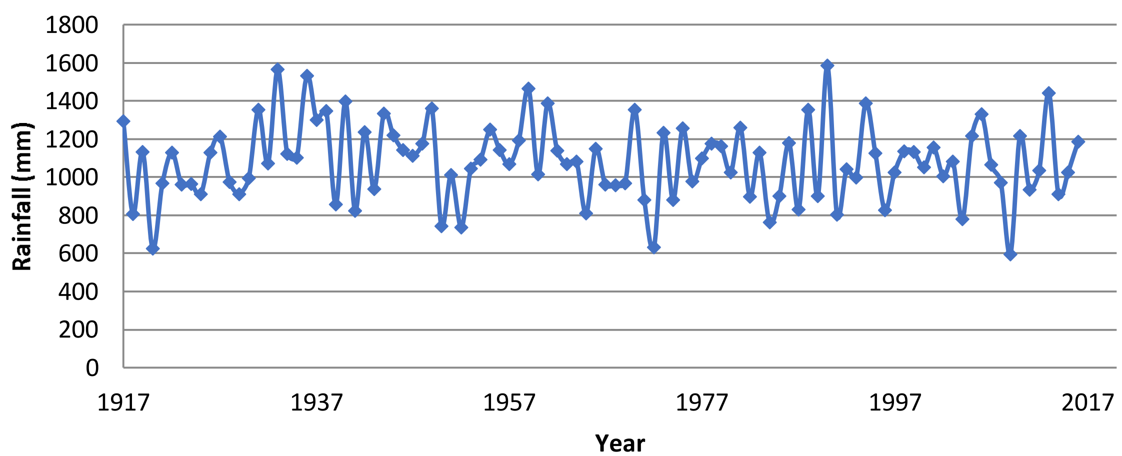
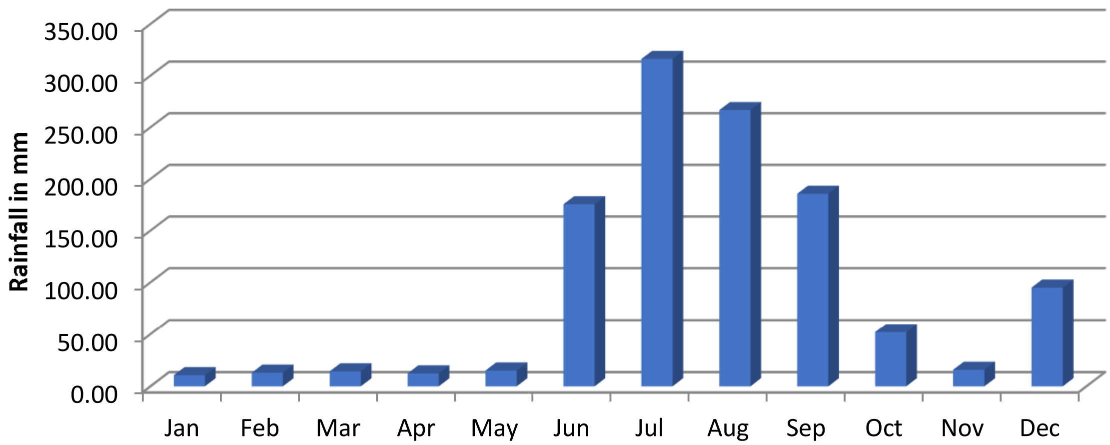
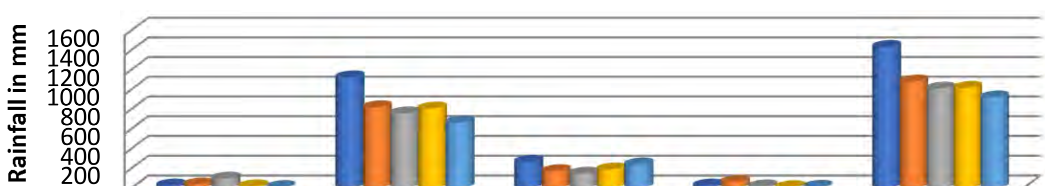


FIGURE 6.2: LONG TERM TREND OF MONTHLY VARIATION IN THE RAINFALL IN VIDARBHA REGION (1917-2016)



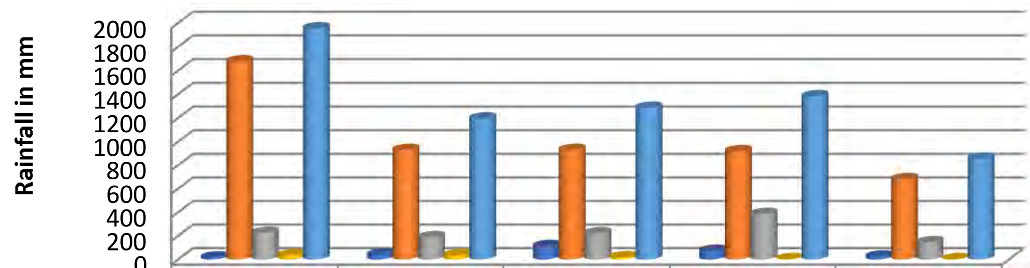
The rainfall data for four rain gauge stations namely Balaghat, Gondia, Bhandara and Nagpur have also been collected through Customized Rainfall Information System (CRIS), Indian Meteorological Department, Government of India to assess the inflow of water and water availability in the intake site at River Wainganga. Figure 6.3 to 6.6 present the long term trend (2013 to 2017) of rainfall at upstream as well as downtream stretch of intake site at river Wainganga. The analysis reveals that the annual rainfall at Balaghat region varies from 915.4 to 1028.8 mm, however, in Gondia region the annual rainfall varies from 856.2 to 1955.6 mm.

FIGURE 6.3: LONG TERM TREND OF RAINFALL - BALAGHAT (2013-2017)



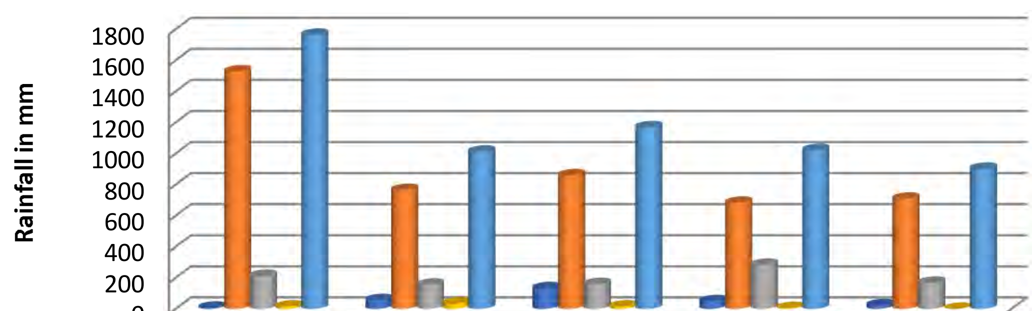
	PRE MONSOON	MONSOON	POST MONSOON	WINTER	ANNUAL
2013	23.7	1118.8	262.8	23.5	1428.8
2014	34.4	814.4	168.6	58.6	1076
2015	93.6	752.8	143.1	15.2	1004.7
2016	15.9	801.8	186.1	7.5	1011.3
2017	8.2	659.8	236.9	10.5	915.4

FIGURE 6.4: LONG TERM TREND OF RAINFALL - GONDIA (2013-2017)



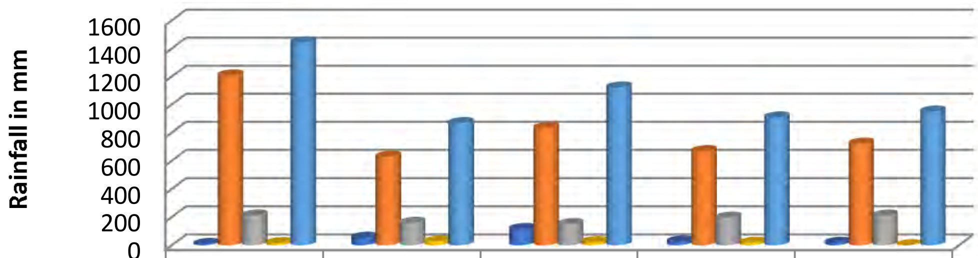
	2013	2014	2015	2016	2017
PRE MONSOON	16.6	40.8	114.2	73.6	24.5
MONSOON	1677.9	930.3	930.1	919.9	682.6
POST MONSOON	226.1	188.9	222.9	386.7	146.5
WINTER	35	35.7	19	3.4	2.6
ANNUAL	1955.6	1195.7	1286.2	1383.6	856.2

FIGURE 6.5: LONG TERM TREND OF RAINFALL - BHANDARA (2013-2017)



	2013	2014	2015	2016	2017
PRE MONSOON	7.9	56.6	133.6	49.5	23.7
MONSOON	1528.8	765.6	860.3	683.2	709.4
POST MONSOON	212.6	156.1	159.8	283.8	168.5
WINTER	15.4	33.9	15.5	5.9	0.6
ANNUAL	1764.7	1012.2	1169.2	1022.4	902.2

FIGURE 6.6: LONG TERM TREND OF RAINFALL - NAGPUR (2013-2017)



	2013	2014	2015	2016	2017
PRE MONSOON	9.1	53.1	115.6	26.3	17.6
MONSOON	1208	628.1	833.2	668.1	721.9
POST MONSOON	211.4	159.5	150.1	195.8	210.5
WINTER	15	27	22.9	17.8	0.6
ANNUAL	1443.5	867.7	1121.8	908	950.6

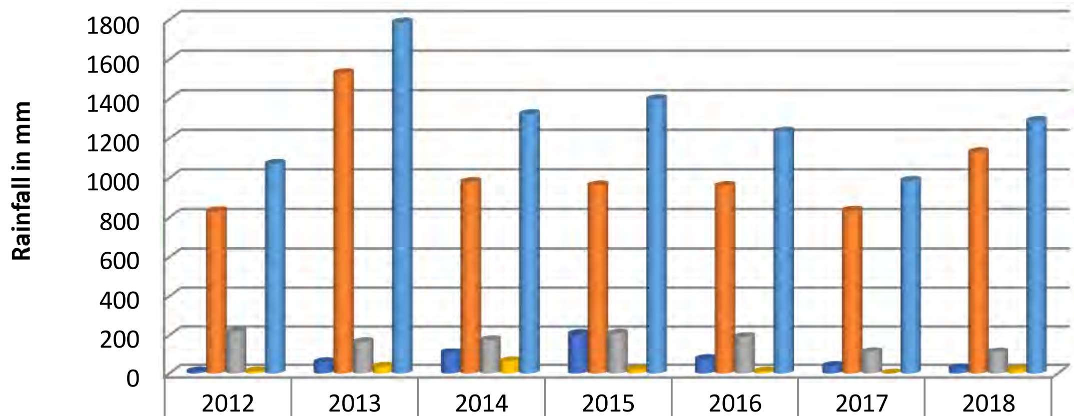
APML has setup weather station at TTPP since its inception to record and assess micro-meteorological status in and around power plant. Figure 6.7 presents the monthly trend of rainfall in the study area. The analysis reveals that rainfall in the study region varies from 987 to 1787 mm with an average of 1298.0 mm (Table 6.1).

TABLE 6.1: STATUS OF RAINFALL IN STUDY REGION (1912-2018)

Month	Year						
	2012	2013	2014	2015	2016	2017	2018
Jan	3.5	7.0	-	2.0	-	-	-
Feb	7.0	27.0	61.5	17.5	10.0	-	18.8
Mar	-	6.5	26.5	170.5	25.5	9.5	-
Apr	8.5	51.0	52.5	26.5	10.5	-	18.5
May	1.5	-	27.5	10.0	37.5	28.5	7.5
June	101.0	284.0	88.0	300.5	96.0	143.5	146.2
Jul	389.3	737.8	699.4	255.5	454.5	359.0	615.0
Aug	342.4	508.7	193.2	407.6	410.0	333.0	370.4
Sep	192.5	71.0	129.0	208.8	162.0	85.5	111.5
Oct	1.0	94.0	45.8	-	29.0	28.0	-
Nov	25.5	-	-	-	-	-	-
Dec	-	-	0.2	-	-	-	1.5
Total	1072.2	1787.0	1323.1	1398.9	1235	987.0	1289.4

Source: Environment Management Department, APML, January, 2019

FIGURE 6.7: LONG TERM TREND OF RAINFALL AT TIRODA TPP REGION (2012-2018)



	2012	2013	2014	2015	2016	2017	2018
Pre-monsoon	10	57.5	106.5	207	73.5	38	26
Monsoon	832.7	1530.5	980.6	963.6	960.5	835.5	1131.6
Post-Monsoon	219	165	174.8	208.8	191	113.5	111.5
Winter	10.5	34	61.7	19.5	10	0	20.3
Annual	1072.2	1787	1323.6	1398.9	1235	987	1289.4

Dependable Rainfall

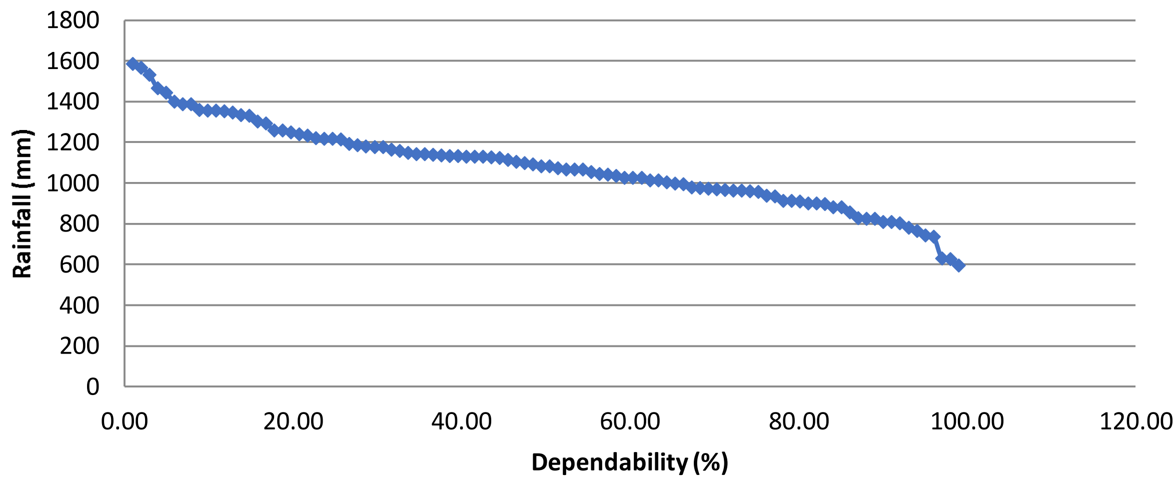
To ascertain the certainty of rainfall that may occur (dependable rainfall), the probability analysis of the rainfall data for the period from 1917 to 2016 is also carried out for different probability levels of 50%, 80% and 90%. For doing the analysis, daily rainfall data has been converted to the average monthly data. The monthly rainfall data has thereafter been analyzed for different probability levels. The analyzed rainfall results will help in the estimation of river discharge during the lean season, or during various months and also during the year. Lower probability indicates, less assurance to the occurrence of rainfall, while higher probability indicates, rainfall has more chance to occur. The weighted average monsoon rainfall at different percentage dependability for the Wainganga sub-basin (i.e. Vidarbha Region) has been worked out and calculation for the same are kept at Annexure 6.1**.**

The probability of annual rainfall at different percentage of probability is shown in Figure 6.8 and Table 6.2. Figures 6.6 showed that as the probability increases, the magnitude of rainfall decreases implying more assurance in the occurrence of the corresponding rainfall. As the 75% and 90% dependability are of great importance in the field of hydrology the same were estimated and found to be 1194 mm and 1023 mm.

TABLE 6.2: DEPENDABLE RAINFALL IN CHATTISGARH REGION (1917-2016)

Sl. No.	% Dependability	Rainfall in mm
1	10	1355.5
2	20	1249.7
3	30	1177.4
4	40	1132.9
5	50	1082.9
6	60	1025.0
7	70	927.7
8	80	910.2
9	90	808.4

FIGURE 6.8: DEPENDABLE RAINFALL FOR VIDARBHA REGION (1917-2016)



6.2 WATER AVAILABILITY ANALYSIS

There are several approaches to determine the water yields of a basin. Most of these approaches can be classified either as empirical approaches or as continuous- time simulation approaches using the water balance equation. Water availability in a basin depends on many factors, viz. climatic, basin characteristics, hydrological and hydro-geological response of the basin to the rainfall, etc. Time and space distribution of rainfall, its intensity and duration, surface vegetation, soil moisture, soil characteristics, topography and drainage network are some of the important factors, which characterize the water availability in a basin. Determination of water availability or basin yield is required for addressing water resource related problems.

The Water Resources Department, Government of Maharashtra has given permission to APML to withdraw total of 70 Mm^3/annum (about 1,95,000 m^3/day) of raw water for the TTPP from the Dhapewada barrage, on the river Wainganga near Kawalewada village.

6.2.1 Dhapewada Barrage

The Dhapewada barrage have been constructed on the river Wainganga after confluence with the river Bagh, Chandan and Bamanthadi. The site is defined by $29^0$21'16''N and $79^0$48'50''E on Topo-Sheet No. 55O/14. The site is located about 35 km away from Gondia district. The salient features of Dhapewada Barrage are presented in Table 6.3. The total catchment area of the Dhapewada barrage site is 18213 sq km. Due to non-availability of gauge and discharge (G & D) data at the barrage site, the data of Rajegaon G&D site of CWC, which is about 40 km upstream of the Dhapewada barrage, are considered for analysis. The 100 year return period flood worked out from the available data of the Rajegaon G&D site and the upgraded flood value for catchment area of 18213 sq km has been used for designing of the barrage (Irrigation Projects Investigation Circle, Nagpur, Government of Maharashrta, 1998).

TABLE 6.3: SALIENT FEATURES OF DHAPEWADA BARRAGE ON RIVER WAINGANGA

S No	Description	Details
1	Name of Project :	Dhapewada Lift Irrigation Project
2	District & State	Gondia, Maharashtra
3	Village & Tahisl/Block	Kawlewada, Tirora
4	Name fo River	Wainganga River
5	Name of Basin/Sub-basi	Godawari/Wainganga
6	Toposheet No	55 O/14, 55O/15,64C/2 64C/3, 55O/16, 64C/4
7	Longitude and Latitude of Barrage	E $79^0$48'50" N $29^0$21'16"
8	Nearest Airport	Nagpur (137 KM)
9	Nearest Road head	Kawlewada (2 KM)
10	Nearest Rail head	Tirora (6 KM)
11	Estimated Project Life	100 years
12	Type of Project	Lift Irrigation Project
13	Gross command area for Irrigation	1,47,274 Ha
14	Culturable command area for irrigation	1,03,825 Ha
15	Area under irrigation	67506 Ha
	(A) Kharif	73% (49279.38 Ha)
	(B) Rabi	53% (35778.18 Ha)
	(C) Perennial	5% (3375.30 Ha)
	(D) Two Seasonal	15% (10125.90 Ha)
	(E) Gross irrigated area (G.I.A)	146% (98558.76 Ha)
	(F) Intensity of irrigation	65%

16	Command area details	Details of command area G.C.A, C.C.A and I.C.A as per census 1981
17	Virgin Command of irrigable area	15313 Ha
18	Existing tanks for receiving irrigation	21687 Ha
19	Existing tanks for deprived of irrigation	8835 Ha
20	Tanks under construction for planned irrigation	7523 Ha
21	Irrigable area for state sector	11128 Ha
22	Irrigable area for Local sector	3020 Ha
	TOTAL	**67506 Ha**
23	Project performance	Simulation Number of Period 1914-1990 (77 years) Failure-19
24	Gross Catchment area	18,213 Sq.km
25	Free catchment area	4736.70 Sq.Km
26	Influencing Rainguage	Harai, lakhanadon, Mandla, Amarwada, Keolari, Rumal, Seoni, Baihar, Balaghat, Waraseoni, Chuikhadan, Khairagarh, Ramtek, Khindsi, Chandpur, Bodalkasa, Khairbanda, Gondia & Sakoli
27	(A) Yield Available in monsoon	8082.01 Mm^3
	(B) Yield Available in Post monsoon	395.21 Mm3
	TOTAL	**8477.22 Mm^3**
28	(A) U/s Reservation in Madhya Pradesh	6146.80 Mm^3
	(B) U/s reservation in Maharashtra	1221.50 Mm^3
	TOTAL	**7368.30 Mm^3**
29	Yield Available	(8477.22 – 7368.30) = 1108.92 Mm^3
30	Add regulated flow (to be received by M.S)	424.73 Mm^3
31	Add generated flow	85.75 Mm^3
32	Net available yield for planning	(1108.92+424.73+85.75)= 1619.40 mm^3
33	Completed upstream project	1206.500 mm^3
34	Under Construction up stream project	15.000Mm^3
35	Under Construction downstream project	1. Gosikhurd = 1634.00Mm^3 2. Karajkheda = 55.575 mm^3
36	**Proposed Utilisation**	
	(A) Kharif	193.391 Mm^3
	(B) Rabi	184.224 Mm^3
	(C) Two seasonal	62.443 Mm^3
	(D) Perennial	71.894 Mm^3
	TOTAL	511.952 Mm^3
37	**Utilization from Barrage**	
	(A) Quantum of water lifted from barrage	281.78 Mm^3
	(B) Lifting from Barrage for free command area	25.10 Mm^3
	(C) Evaporation Losses from	19.77 Mm^3

	barrage	
	Total water utilisation from barrage	**326.65 Mm^3**
38	From Tanks (Excluding feeding) (Integrated in the system)	
	(A) Existing	226.32 Mm^3
	(B) Under construction	56.63 Mm^3
	(C) Administrative Approved	18.73 Mm^3
	(D) Local sector and state sector	61.42 Mm^3
	TOTAL	**363.10 Mm3**
39	**Total utilisation under stage II**	**(326.65+363.10) = 689.75 Mm^3**
40	Utilisation Completed in stage I	48.61 Mm^3
41	Total utilisation in stage I+II (Barrage)	375.26 Mm^3
42	Head Work (DAM)	
	(A) Type of Dam	Earthen dam
	(B) Length of Dam	6375.00m
	(C) Top Width	5.50m
	(D) Max. Height of Dam	1250m
	(E) Type of Cut-off	Positive
	(F) Maximum Height	1.40m
	(G) Upstream Blanket	Grouting proposed
43	Barrage	
	(A) Location	R.D. 2430m to 2823m
	(B) Length	393m
	(C) Spillway Gate	22 No (size 15.00x8.50)m2
	(D) Minimum Water level	260.00m
	(E) Maximum height of spillway (Crest) above deepest foundation	8.50m
	(F) Crest level	251.500
	(G) Size of Gate	15.00m x 8.50m
	(H) Type of Gate	Vertical Gate
	(I) Type of energy dissipation arrangement	Stilling basin of 106.00m length
	(J) Maximum discharging capacity	48700 cumec
	(K) Controlling levels	
	(1) T.B.L	271.80m
	(2) A.H.F.L	269.80m
	(3) H.F.L	267.750m
	(4) Inglis Flood L	263.00m
	(5) F.R.L	260.000m
	(6) Crest Level	251.500m
	(7) Dead Storage Level	254.00m
	(8) Free Board	2.00m
	(L) Live Storage (M cum)	44.052 Mm^3
	(M) Capacity at (M cum)	

	(1) Full reservoir level	44.05 Mm^3		
	(2) Minimum draw down level	1.76 Mm^3		
44	(A) Land & Property Submerge			
	(1) Gross affected land	1589.60 ha (only in river bed)		
	(2) Culturable Land	Nil		
	(3) Irrigated Land	Nil		
	(B) Village affected			
	(1) Full	Nil		
	(2) Partial	Nil		
	(C) Building/Houses No.			
	(1) Private	Nil		
	(2) Temple	Nil		
	(3) Well	Nil		
	(4) Any other	Nil		
	(D) No. of families affected	Nil		
	(E) No. of persons affected	Nil		
45	Lift (Pump House)	Kawlewada and Bodalkasa		
	Location of DC	Sarra	Bodalkasa	Mangezari
	Length rising main	19950m	18570m	9240m
	Diameter of rising main	1.597m	1.597m	1.397m
	Size of delivery chamber	18.50mX25m	30mX22.70m	48mx24m
	Discharge in rising main	4.17m3/sec	13.13m3/sec	11.865m3/sec
	HP needed	6000	17360	9816
	Pumps provided	3 nos of 2000 HP each	7 nos of 2480 HP each	5 nos of 1970 HP each
46	Cost			
	(A) Total cost of project in Rs. lakhs	76238.00 lakhs		
	(1) I – head work	54223.09 lakhs		
	(2) II – main canal and distribution	6962.94 lakhs		
	(3) Direct charges	14355.00 lakhs		
	(4) Indirect charges	697.00 lakhs		
	(B) Cost per h.a of gross irrigated area 98558.76 Ha	Rs. 77353/- per Ha		
	(C) Cost for 1000 Cu m utilisation 738.36 Mm3 OR 738360 TCM	Rs. 10325/-		
	(D) B.C ratio	10928 Say 1.93		

Source:DPR Dhaphewada Lift Irrigation Project Stage II, Irrigation Projects Investigation Circle Nagpur, Government of Maharashtra, 1998

Total length of the barrage is kept 393.0 m with 22 no spillway gate (15x8.5M) and maximum discharging capacity is 34000 cumec. The live storage of barrage is 44.052 Mm^3.

The crest level of under sluices is at lowest river bed level i.e. 251.5 m. A free board of 2 m above the upstream HFL 267.75 m have been maintained. The design details of Dhapewada barrage is given in Table 6.3.

6.2.2 Water Inflow

The water inflow analysis has been carried out using water storage and discharge data for the period of 2016-2018 being recorded by Dhapewada Irrigation Project-II, VIDC, Tiroda as well as long term average monthly river runoff data of Pauni site (1975-2010) and Rajegaon site after applying necessary correction factor to convert the flows near Dhapewada barrage. The analysis has been carried out based on average monthly flow data. The average monthly flows and their statistical variations viz. maximum, minimum, standard deviation have been presented in Table 6.4. The analysis reveals that the average monthly inflow of water varies from 14.99 to 2579.32 mcum/month. The status of daily and monthly inflow of water in Dhapewada Barrage is presented in Figure 6.9 and 6.10. Figure 6.11 presents average annual inflow of water in Dhapewada Barrage.

TABLE 6.4: STATUS OF MONTHLY INFLOW AT DHAPEWADA BARRAGE

Parameter	Monthly Inflow of Water (mcum/month)												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Annual
Avg	77.44	56.61	32.83	21.16	14.99	202.19	1250.49	2579.32	1723.76	453.97	160.36	95.92	555.75
Min	17.88	2.65	0.19	0.11	0.03	18.72	208.50	539.23	211.14	88.72	39.67	4.22	134.99
Max	438.92	227.94	107.37	105.10	59.48	1143.28	5340.35	4819.30	5645.30	1711.42	785.37	789.76	1496.54
Std Dev	76.90	49.15	27.83	25.50	16.89	236.45	994.11	1180.14	1371.41	407.45	144.06	131.98	259.71

Figure 6.9: Status of Daily Water Inflow in Dhapewada Barrage

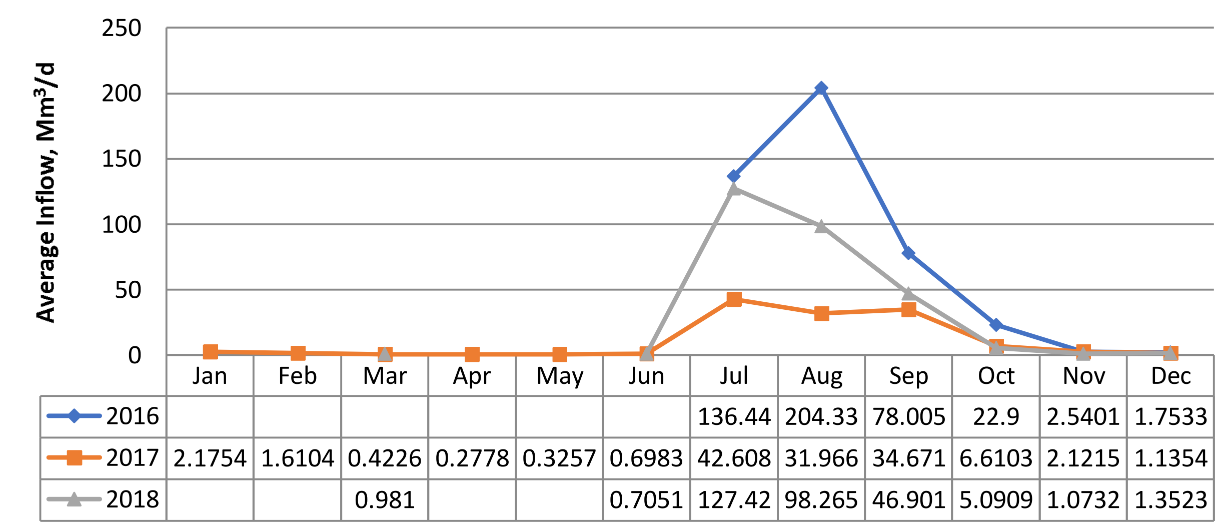


Figure 6.10: Status of Average Monthly Inflow in Dhapewada Barrage (1975-2010)

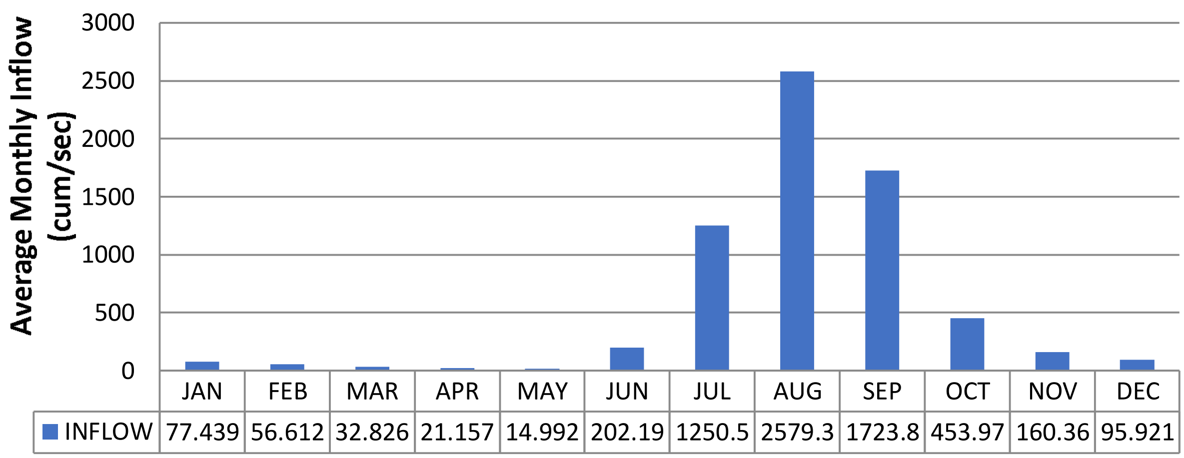
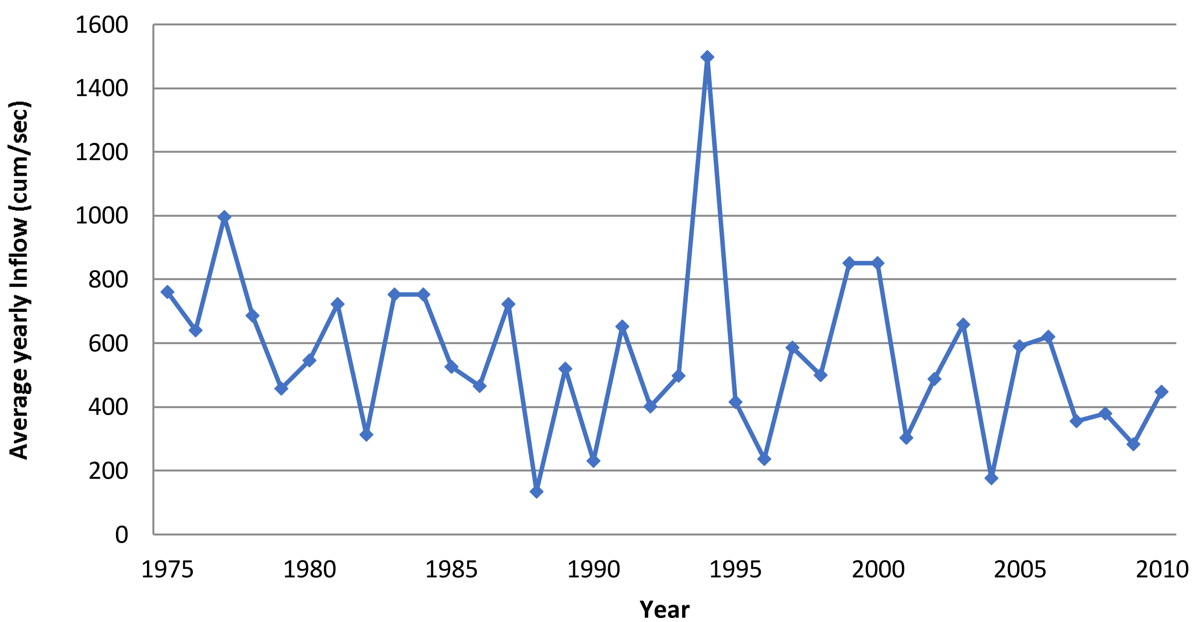


Figure 6.11: Status of Average Yearly Inflow (1975-2010)



Flow Duration Curve (FDC) has been drawn to know the temporal water availability at the water intake site of APML. It shows a discharge which has equaled or exceeded certain percentage of time out of the total time period which is generally taken one year. From FDC minimum flow for any dependability may be obtained/interpolated. The probable water discharge for various desired dependability has been estimated by arranging average monthly discharge of the concerned month in descending order and using Weilbul's formula:

$$P = (M/N+1) \times 100$$

Where,

P = Probability that a given flow will be equaled or exceeded (% of time)
M = Ranked position on the listing (Dimension less)
N = Number of events for period of record (Dimension less)

Accordingly monthly FDC has been developed on the basis of average monthly discharge data for years 2016 to 2018 collected from VIDC, Tiroda and 1975 to 2010 collected from CWC for nearest G&D Station at Pauni and Rajegaon. Figure 6.12 to 6.23 present monthly FDC from January to December developed based on average monthly discharge of 3 years (2016-2018) as well as long term data for 36 year (1975 to 2010) (Figure 6.24 to 6.35). The monthly flows at different probability levels have been presented in Table 6.5 and 6.6. From the analysis of probable flows, it is evident that river is perennial and the maximum flow occurred in the month of July-August, while minimum in the month of April-June in all the analyzed probability levels.

FIGURE 6.12: FLOW DURATION CURVE - JANUARY
[Using Monthly Inflow Data]

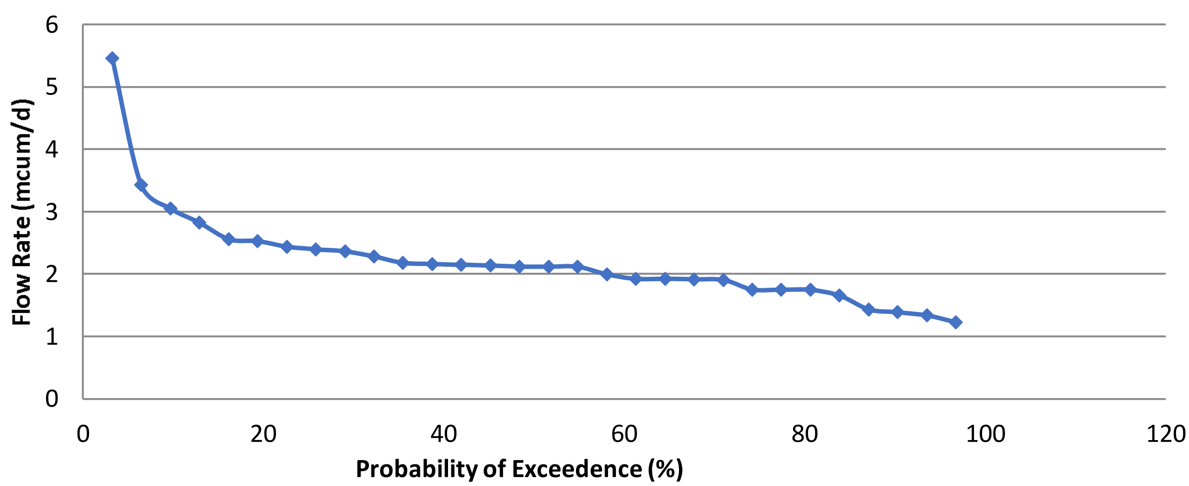


FIGURE 6.13: FLOW DURATION CURVE - FEBRUARY
[Using Monthlys Inflow Data]

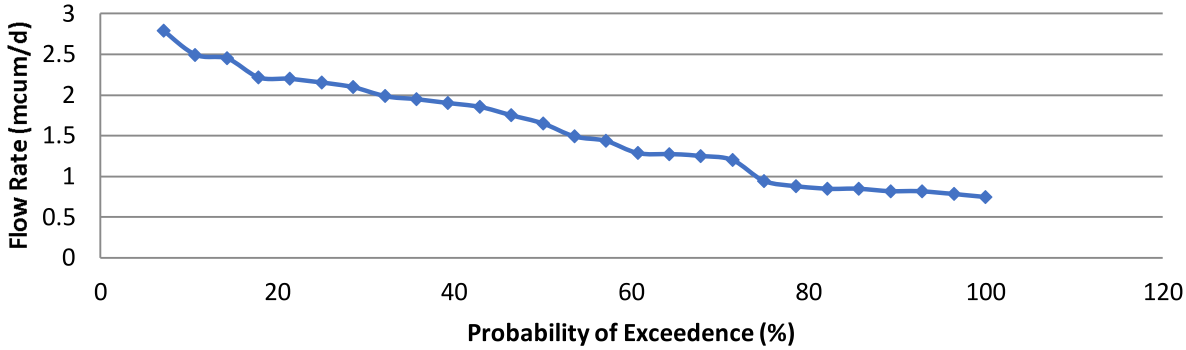


FIGURE 6.14: FLOW DURATION CURVE - MARCH
[Using Monthly Inflow Data]

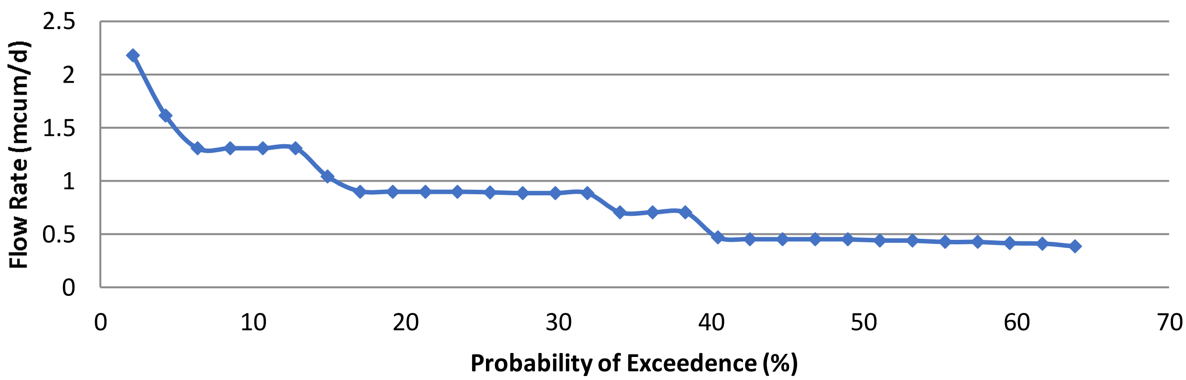


FIGURE 6.15: FLOW DURATION CURVE -APRIL
[Using Monthly Inflow Data]

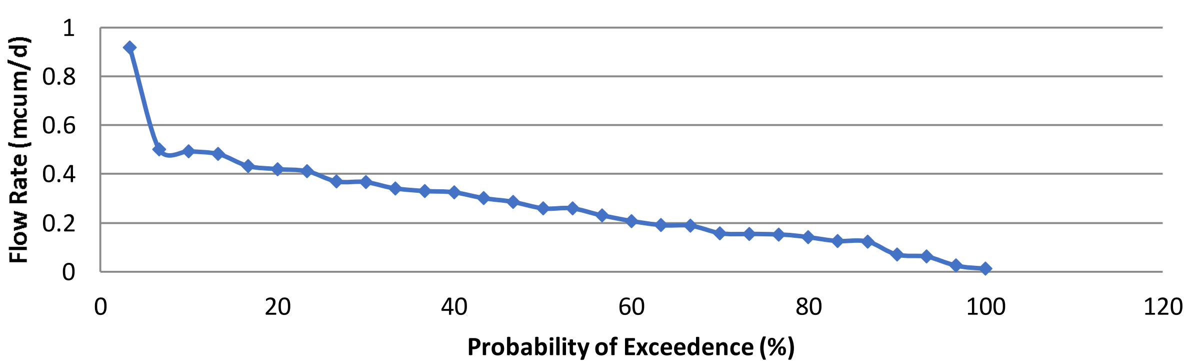


FIGURE 6.16: FLOW DURATION CURVE - MAY
[Using Monthly Inflow Data]

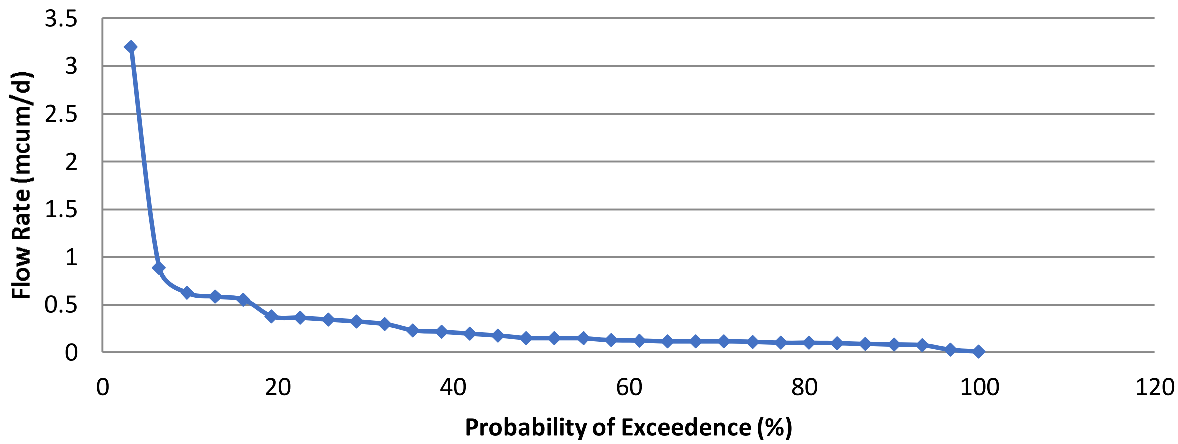


FIGURE 6.17: FLOW DURATION CURVE - JUNE
[Using Monthly Inflow Data]

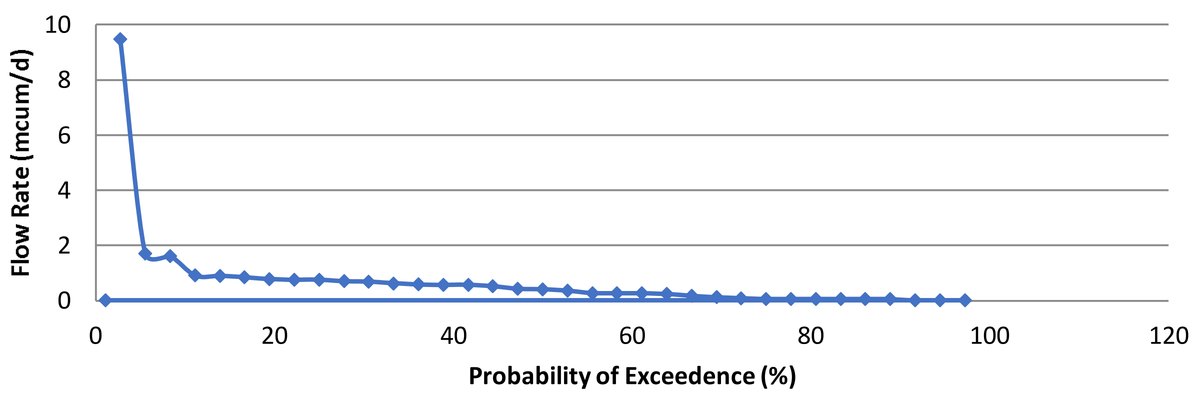


FIGURE 6.18: FLOW DURATION CURVE - JULY
[Using Monthly Inflow Data]

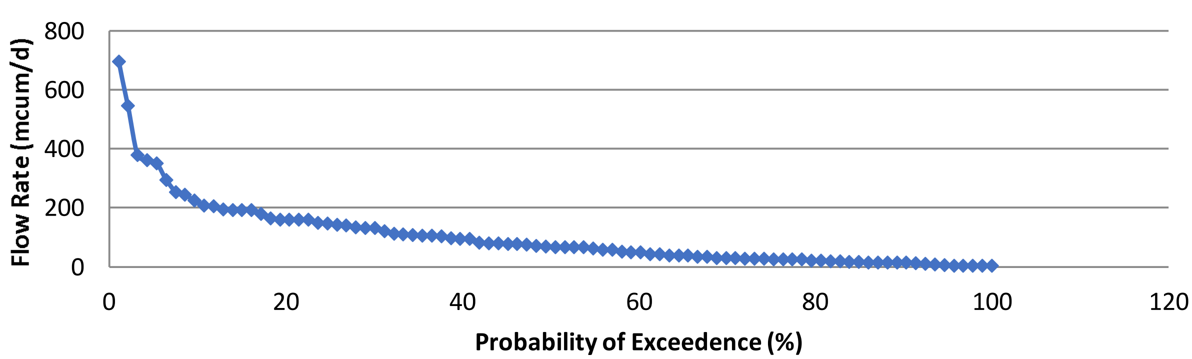


FIGURE 6.19: FLOW DURATION CURVE - AUGUST
[Using Monthly Inflow Data]

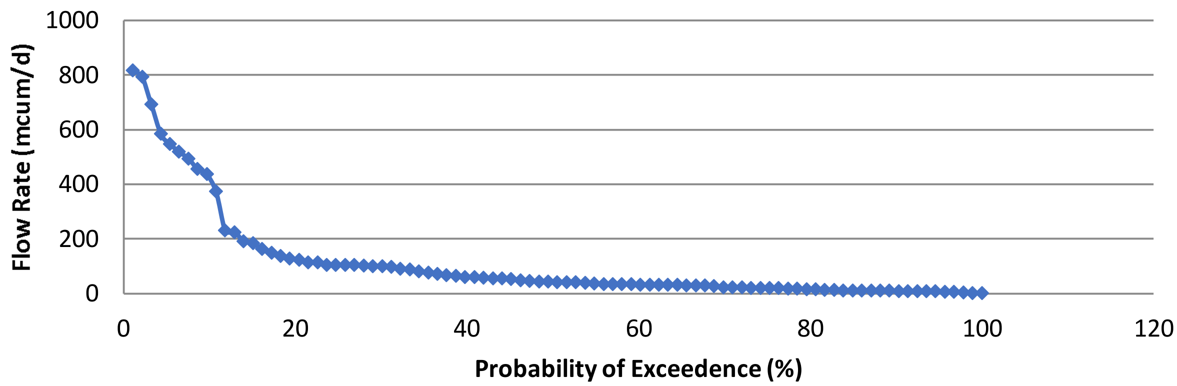


FIGURE 6.20: FLOW DURATION CURVE - SEPTEMBER
[Using Monthly Inflow Data]

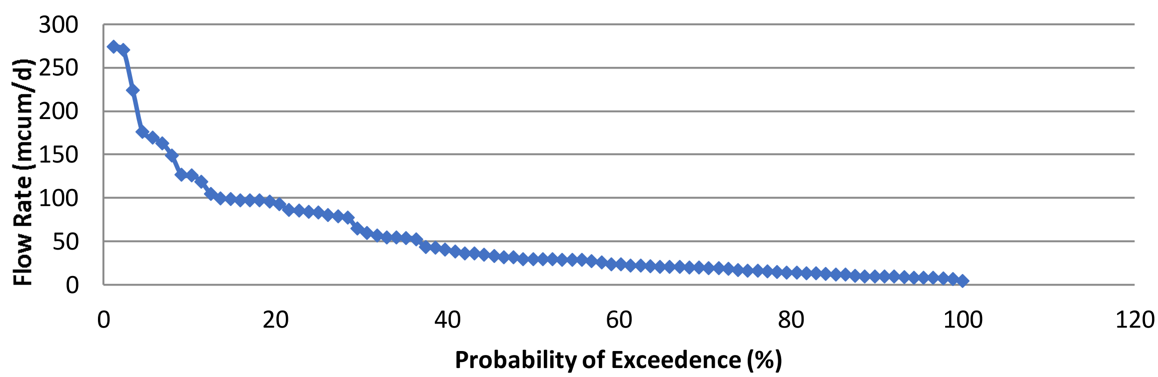


FIGURE 6.21: FLOW DURATION CURVE - OCTOBER
[Using Monthly Inflow Data]

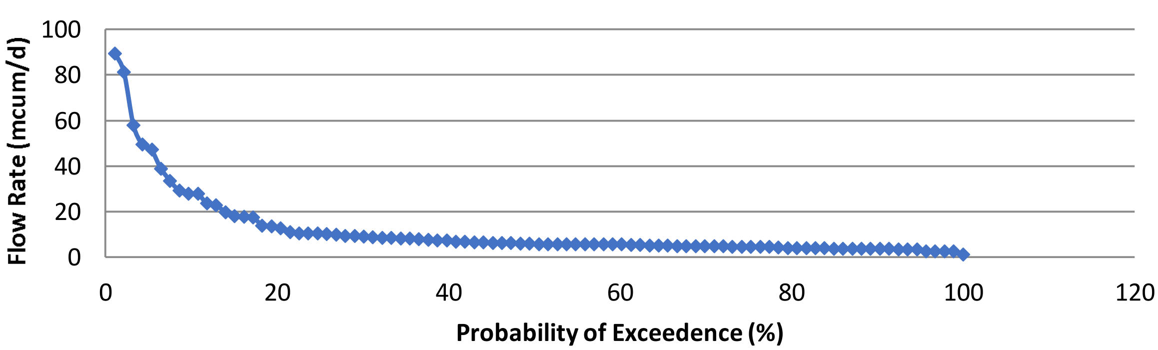


FIGURE 6.22: FLOW DURATION CURVE - NOVEMBER
[Using Monthly INFLOW Data]

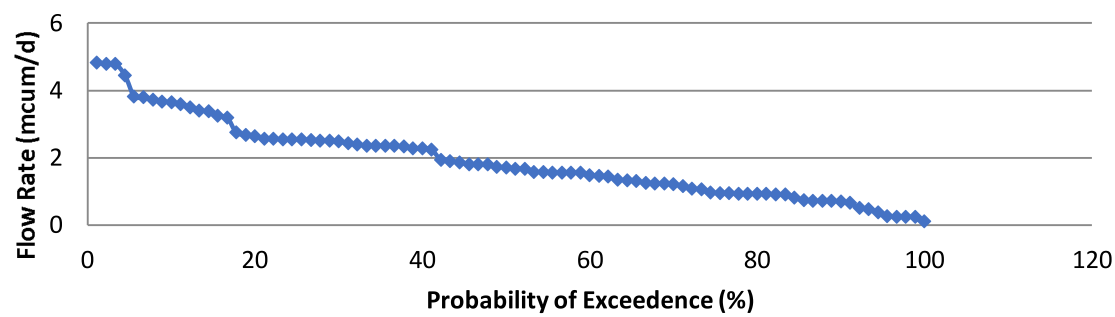


FIGURE 6.23: FLOW DURATION CURVE - DECEMBER
[Using Monthly INFLOW Data]

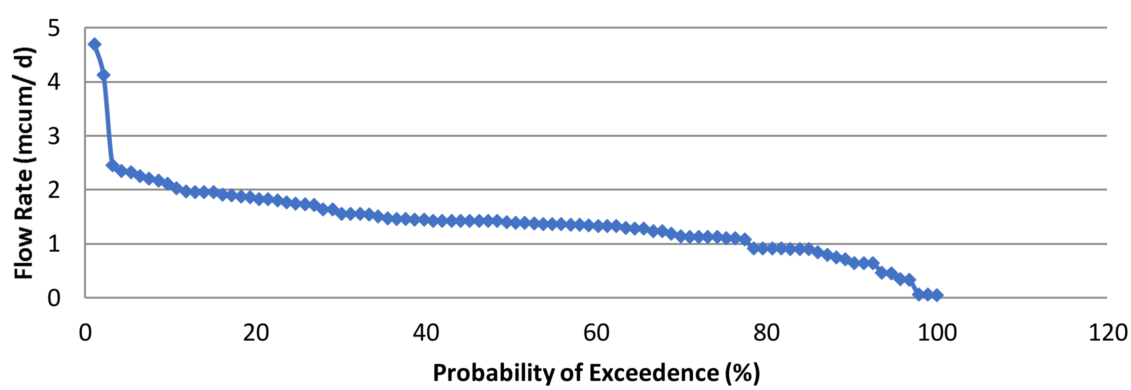


TABLE 6.5: PROBABLE MONTHLY INFLOW IN DHAPEWADA BARRAGE

S No	Month	Probable Inflow (Mm^3/day)		
		75%	90%	95%
1	Jan	1.750456	1.385168	1.335943
2	Feb	0.944638	0.817812	0.780447
3	Mar	0.347544	0.25696	0.252449
4	Apr	0.152819	0.069185	0.061318
5	May	0.112231	0.081556	0.07572
6	Jun	0.067846	0.055627	0.018289
7	Jul	26.06361	13.39184	6.3347
8	Aug	20.54193	9.399588	7.985325
9	Sep	16.44664	9.545167	7.895688
10	Oct	4.642461	3.751687	3.41233
11	Nov	0.958117	0.706209	0.376389
12	Dec	1.1037	0.644599	0.454922

Similarly, monthly FDC has been developed on the basis of average monthly inflow data for the year 1975 to 2010 collected from CWC for nearest G&D Station at Pauni. Figure 6.24 to 6.35 present monthly FDC from January to December developed based on long term data for 36 year (1975 to 2010). From the analysis of probable flows, it is evident that river is perennial and the maximum flow occurred in the month of July-August, while minimum in the month of April-June in all the analyzed probability levels. Figure 6.36 presents the annual FDC on the basis of average monthly inflow data.

FIGURE 6.24: FLOW DURATION CURVE - January
[Using 1975-2010 Inflow Data]

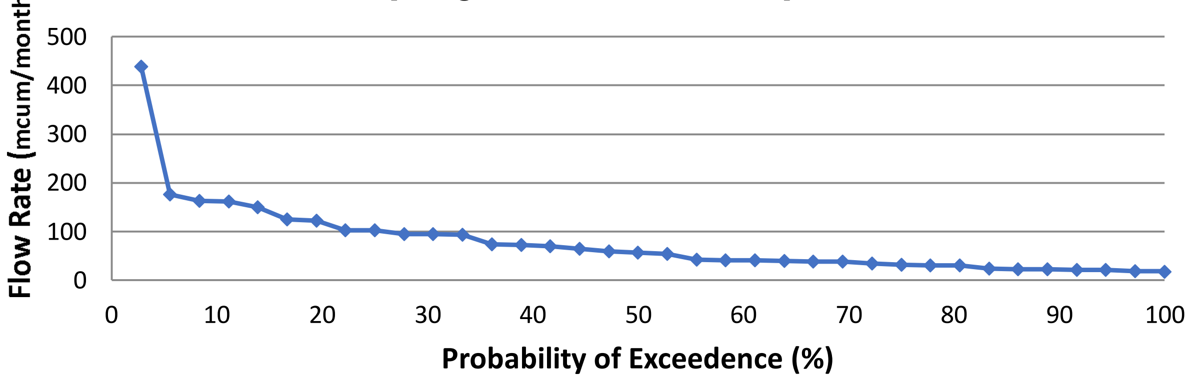


FIGURE 6.25: FLOW DURATION CURVE - February
[Using 1975-2010 Inflow Data]

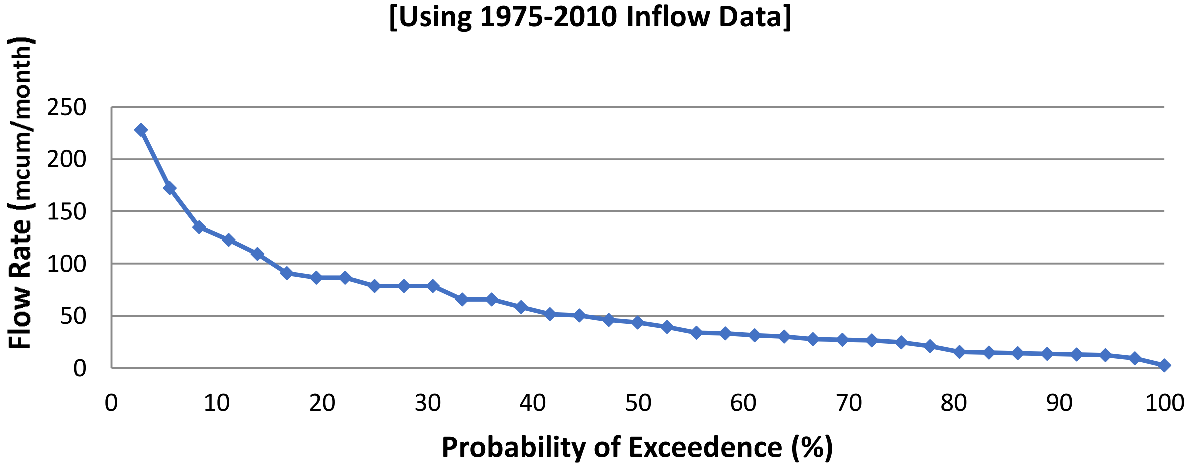


FIGURE 6.26: FLOW DURATION CURVE - March
[Using 1975-2010 Inflow Data]

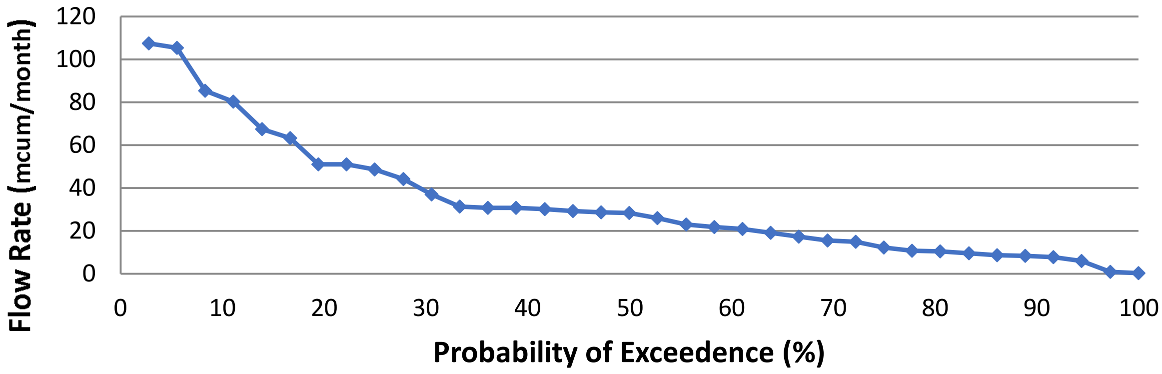


FIGURE 6.27: FLOW DURATION CURVE - April
[Using 1975-2010 Inflow Data]

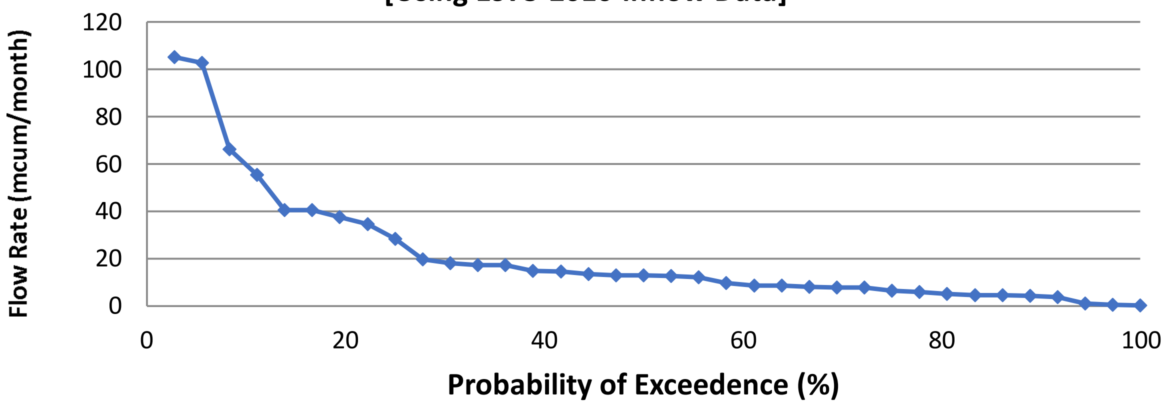
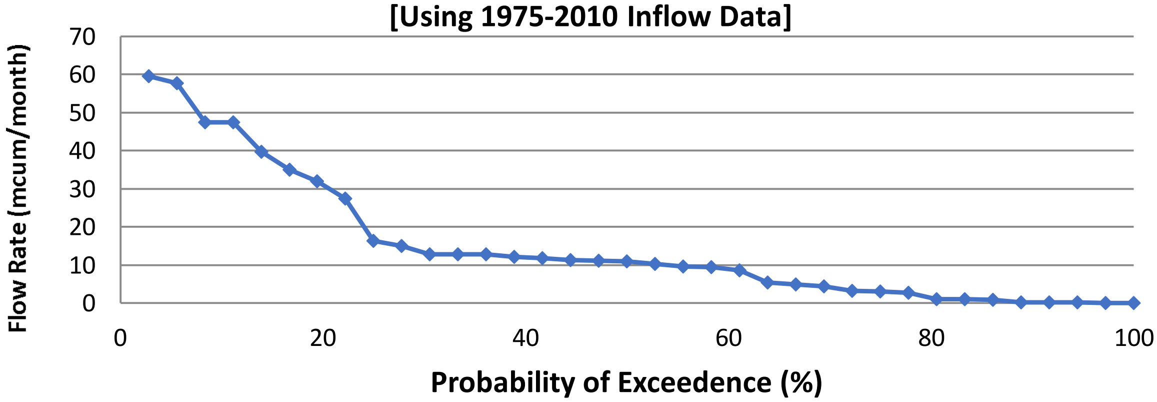


FIGURE 6.28: FLOW DURATION CURVE - May
[Using 1975-2010 Inflow Data]



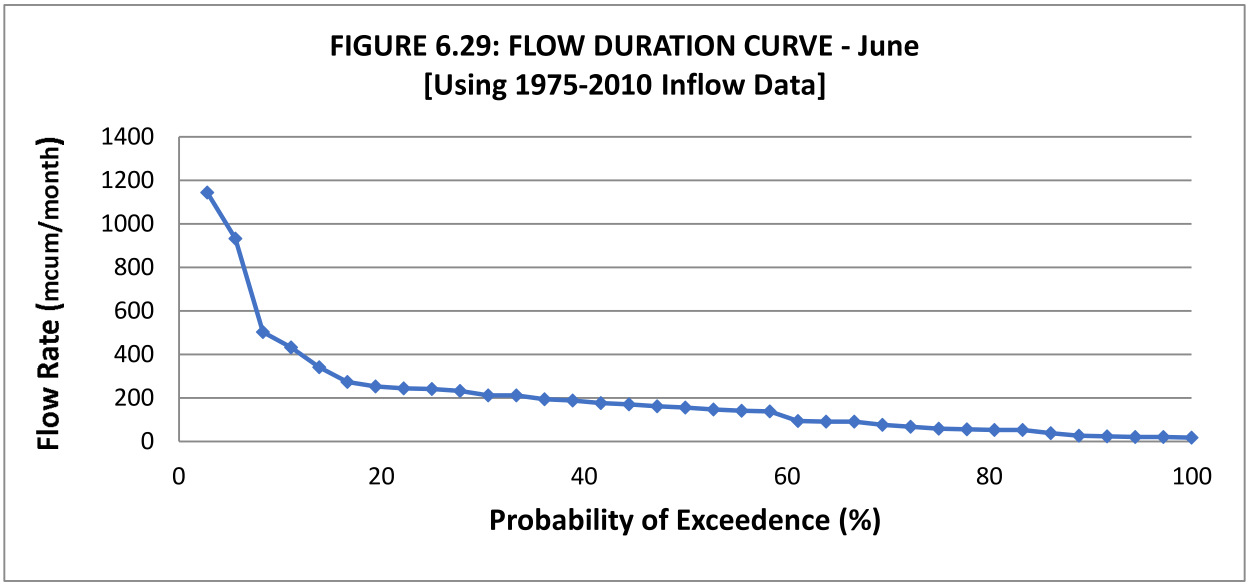


FIGURE 6.29: FLOW DURATION CURVE - June
[Using 1975-2010 Inflow Data]
Flow Rate (mcum/month)
1400
1200
1000
800
600
400
200
0
0
20
40
60
80
100
Probability of Exceedence (%)

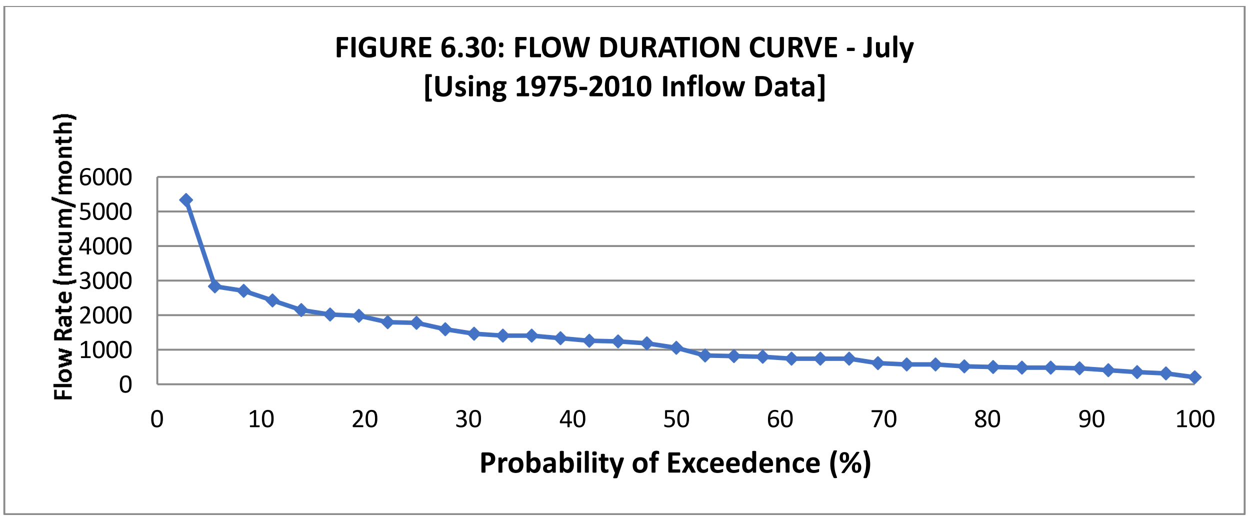


FIGURE 6.30: FLOW DURATION CURVE - July
[Using 1975-2010 Inflow Data]
Flow Rate (mcum/month)
6000
5000
4000
3000
2000
1000
0
0
10
20
30
40
50
60
70
80
90
100
Probability of Exceedence (%)

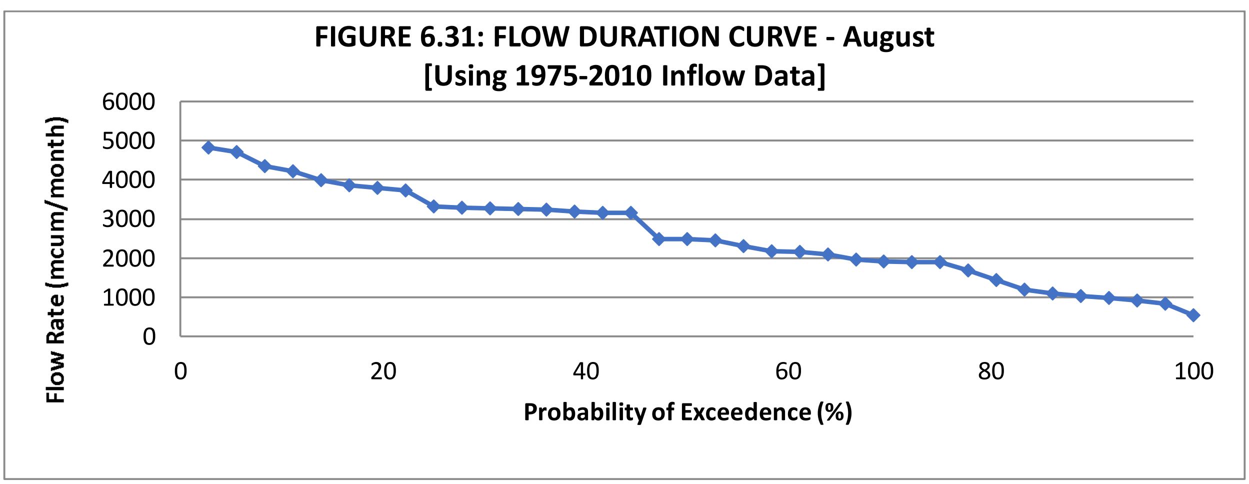


FIGURE 6.31: FLOW DURATION CURVE - August
[Using 1975-2010 Inflow Data]
Flow Rate (mcum/month)
6000
5000
4000
3000
2000
1000
0
0
20
40
60
80
100
Probability of Exceedence (%)

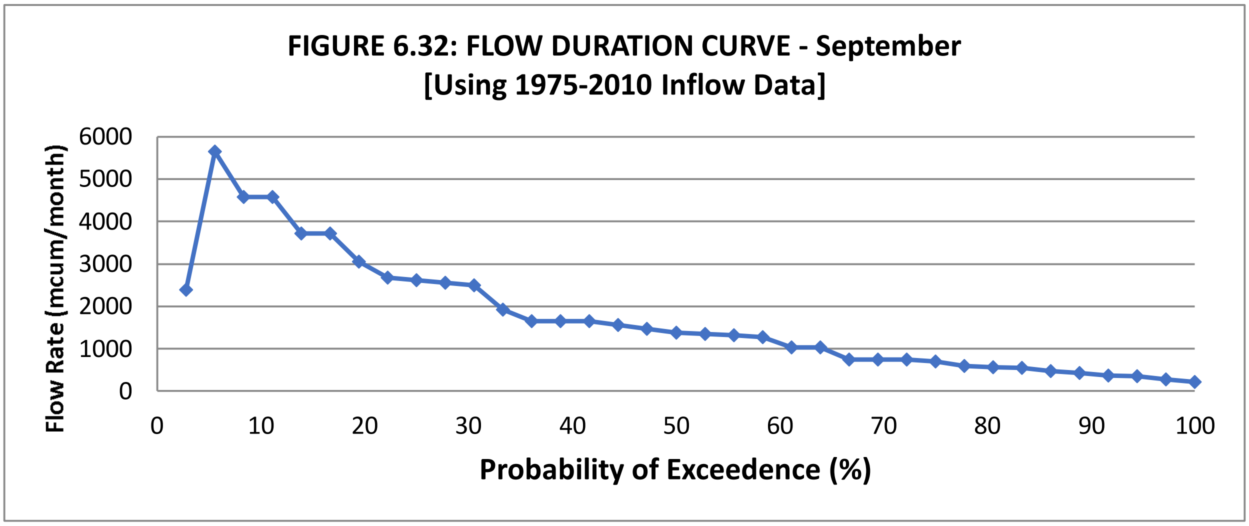


FIGURE 6.32: FLOW DURATION CURVE - September
[Using 1975-2010 Inflow Data]
Flow Rate (mcum/month)
6000
5000
4000
3000
2000
1000
0
0
10
20
30
40
50
60
70
80
90
100
Probability of Exceedence (%)

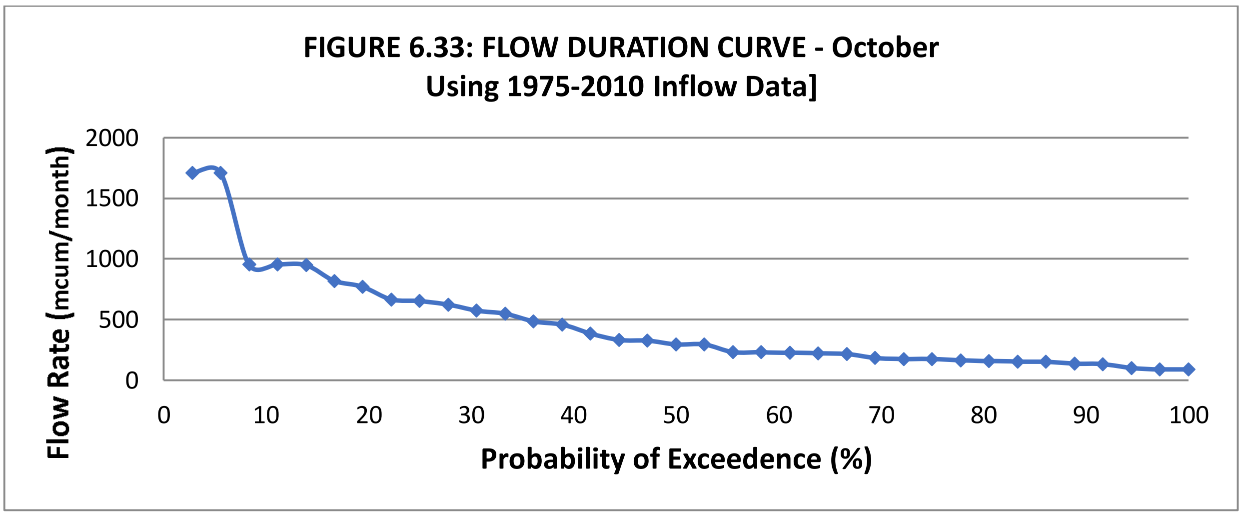


FIGURE 6.33: FLOW DURATION CURVE - October
Using 1975-2010 Inflow Data]
Flow Rate (mcum/month)
2000
1500
1000
500
0
0
10
20
30
40
50
60
70
80
90
100
Probability of Exceedence (%)

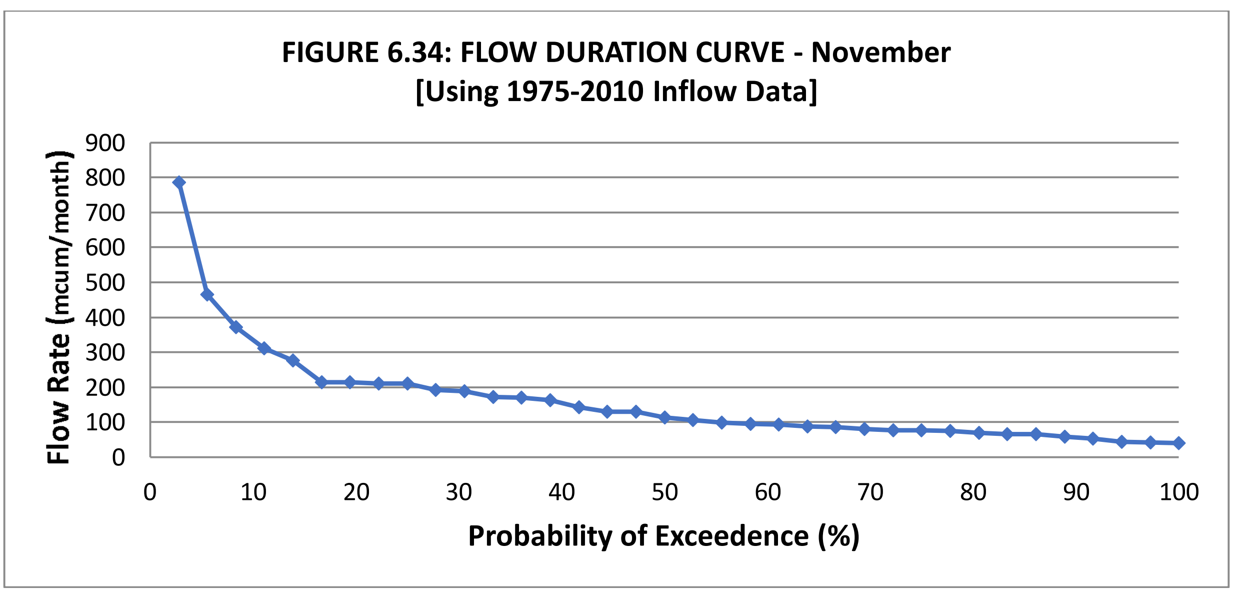


FIGURE 6.34: FLOW DURATION CURVE - November
[Using 1975-2010 Inflow Data]
Flow Rate (mcum/month)
900
800
700
600
500
400
300
200
100
0
0
10
20
30
40
50
60
70
80
90
100
Probability of Exceedence (%)

FIGURE 6.35: FLOW DURATION CURVE - December
[Using 1975-2010 Inflow Data]

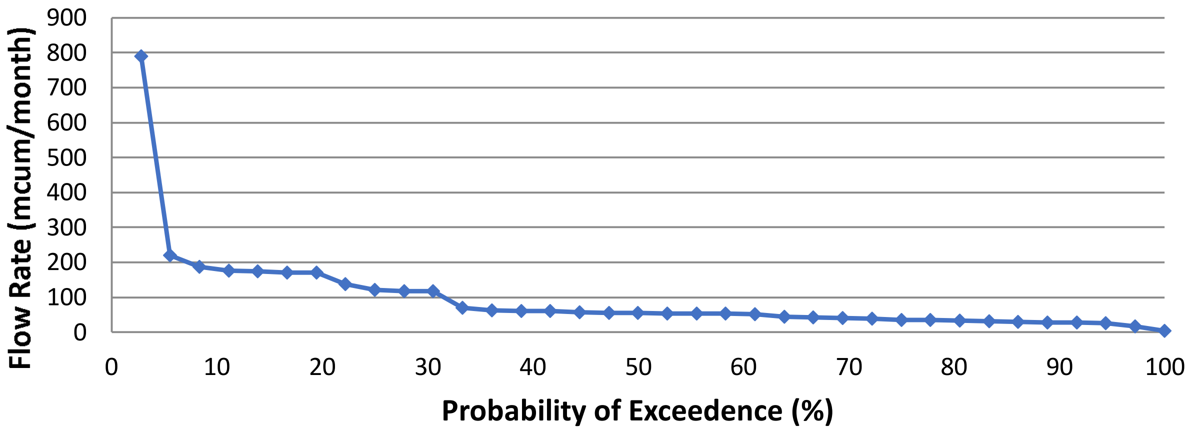
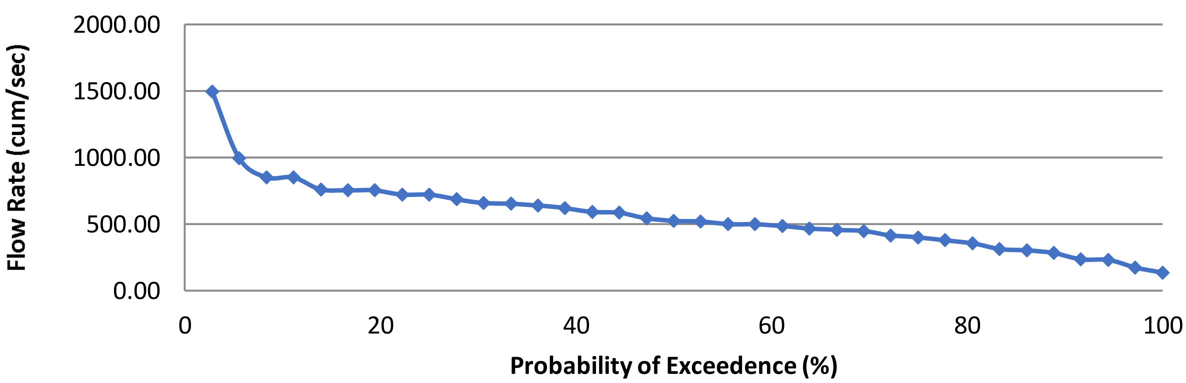


FIGURE 6.36: FLOW DURATION CURVE - ANNUAL
[USING AVERAGE INFLOW DATA - 1975-2010]



6.2.3 Water Level & Discharge at Dhapewada Barrage

To assess the actual water availability at Dhapewada barrage for TTPP the water level and discharge data for the period of January 2016 to December, 2018 were collected form VIDC, Government of Maharashtra. Figure 6.37 presents daily discharge rate of water from Dhapewada Barrage. The analysis reveals that the minimum discharge rate during the lean months varies between 0.0108 to 0.4781 mcumd, whereas the maximum discharge rate during the monsoon months varies between 29.6872 to 202.8574 mcumd. Figure 6.38 presents monthly discharge rate of water from Dhapewada Barrage. Figure 6.39 to 6.42 present monthlythe seasonal discharge rate of water from Dhapewada Barrage. The monthly variations in water level and storage of water at Dhapewada barrage is presented in Figure 6.43.

Figure 6.37: Daily Discharge Rate of Water from Dhapewada Barrage

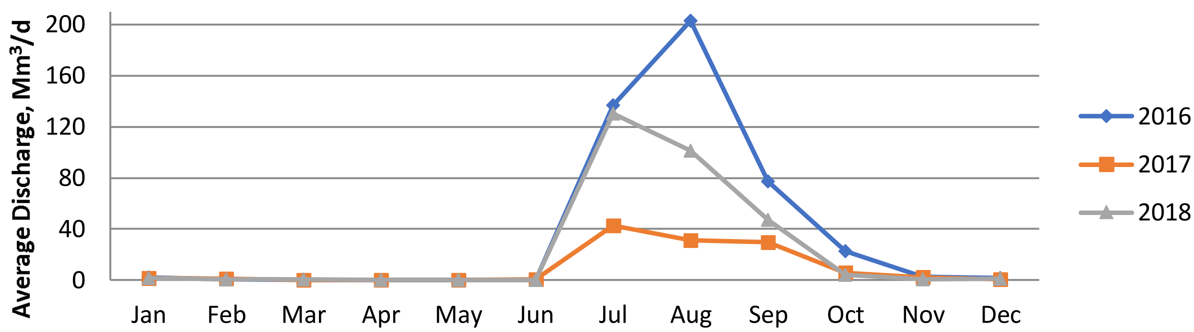
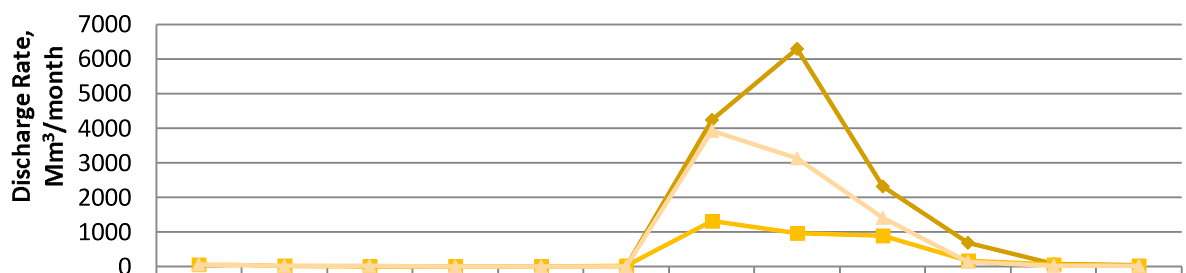


Figure 6.38: Monthly Discharge Rate of Water from Dhapewada Barrage



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	62.08	16.7	9.453	2.446	0.3359	0.039	4234.1	6288.6	2319.5	697.82	73.907	45.005
2017	54.645	30.709	0.505	0	2.9703	19.588	1317.5	972.02	890.62	179.79	51.702	25.096
2018	56.97	18.152	14.821	0	0	12.451	3915.2	3133.9	1411	134.9	21.533	29.497

Figure 6.39: Seasonal Average Daily Discharge Rate of Water from Dhapewada Barrage - Pre-Monsoon

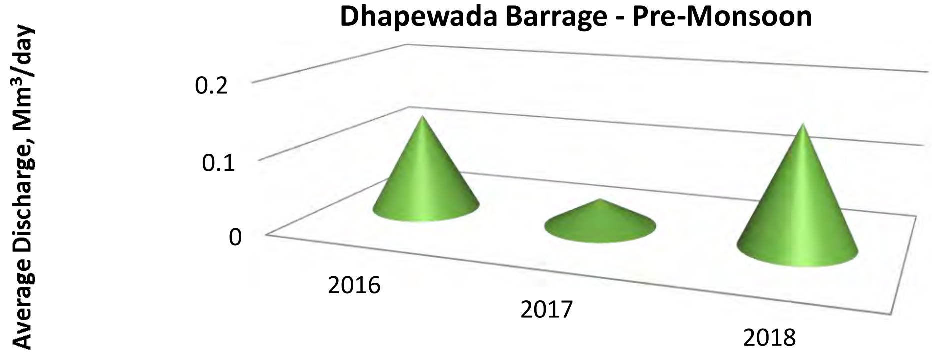


Figure 6.40: Seasonal Average Daily Discharge Rate of Water from Dhapewada Barrage - Monsoon

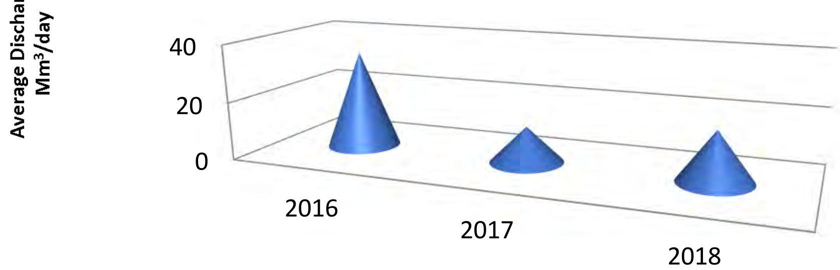


Figure 6.41: Seasonal Average Daily Discharge Rate of Water from Dhapewada Barrage - Post-Monsoon

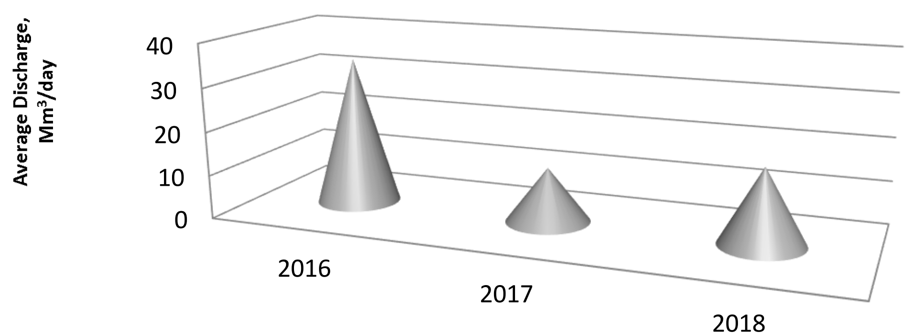


Figure 6.42: Seasonal Average Daily Discharge Rate of Water from Dhapewada Barrage - Winter

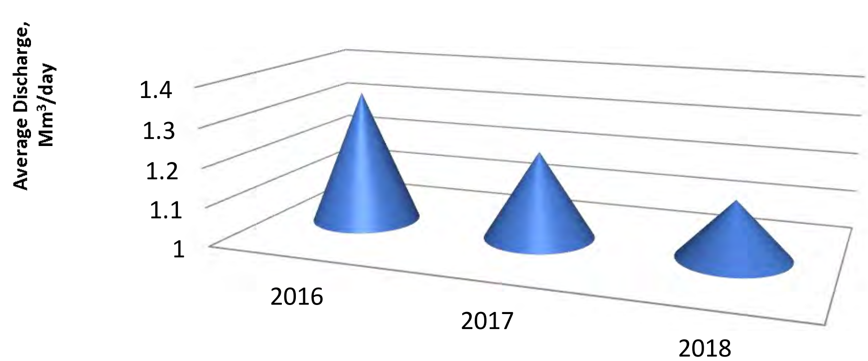
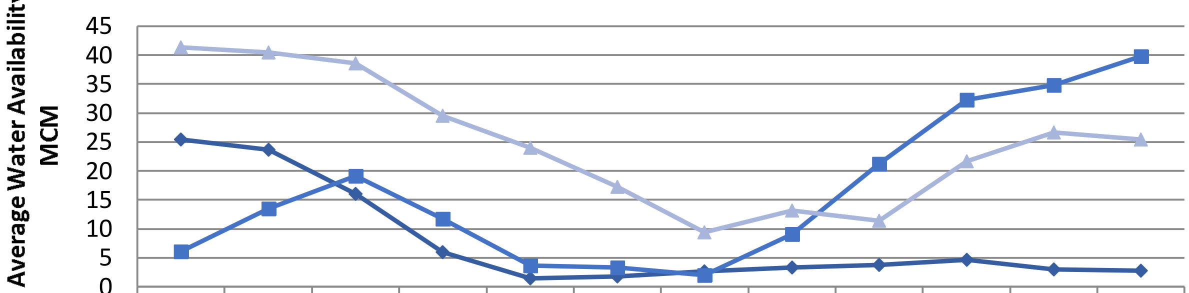


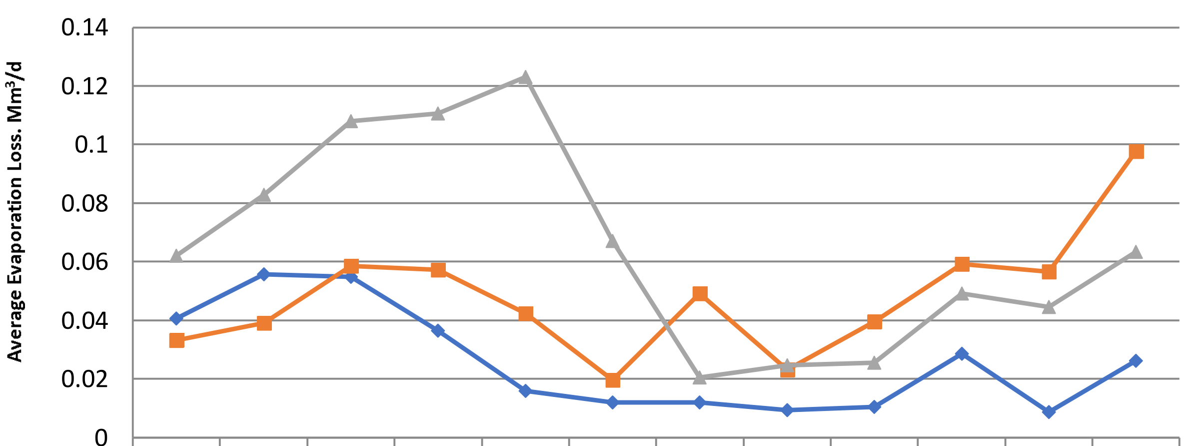
Figure 6.43: Status of Average Monthly Water Availability in Dhapewada Barrage



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	25.464	23.628	16.089	5.9484	1.4738	1.838	2.7074	3.3736	3.7449	4.716	3.0509	2.7756
2017	6.0764	13.464	19.155	11.68	3.7169	3.3827	1.981	9.0308	21.206	32.313	34.798	39.801
2018	41.389	40.486	38.556	29.547	24.037	17.205	9.4402	13.17	11.436	21.715	26.645	25.419

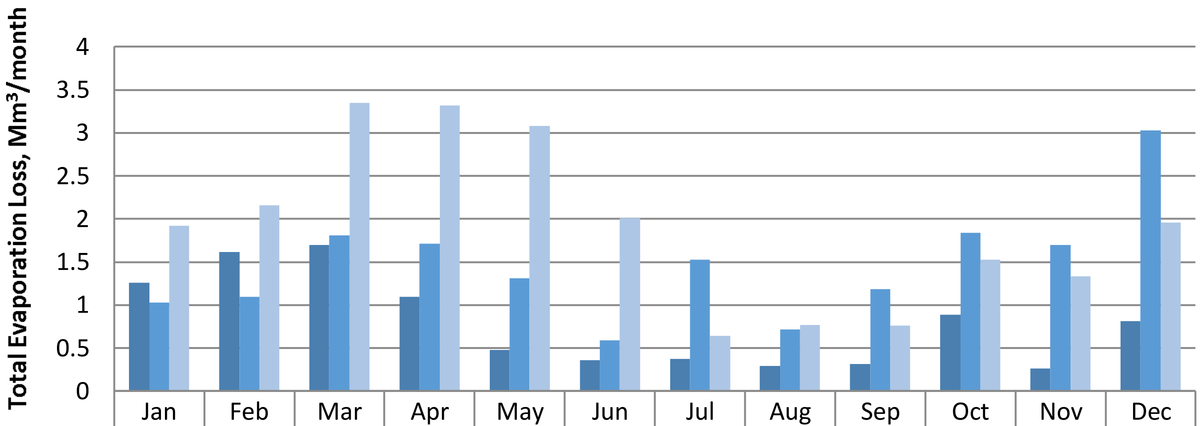
Figure 6.44 and 6.45 present daily as well as monthly evaporation losses of water from Dhapewada Barrage. Figure 6.46 and 6.47 present daily as well as monthly status of water consumption for irrigation from Dhapewada Barrage. The daily as well as monthly water consumption pattern for industrial purpose from Dhapewada Barrage is presented in Figure 6.48 and 6.49 respectively. Figure 6.50 presents yearly water consumption pattern for industrial purpose from Dhapewada Barrage.

Figure 6.44: Status of Evaporation Loss in Dhapewada Barrage



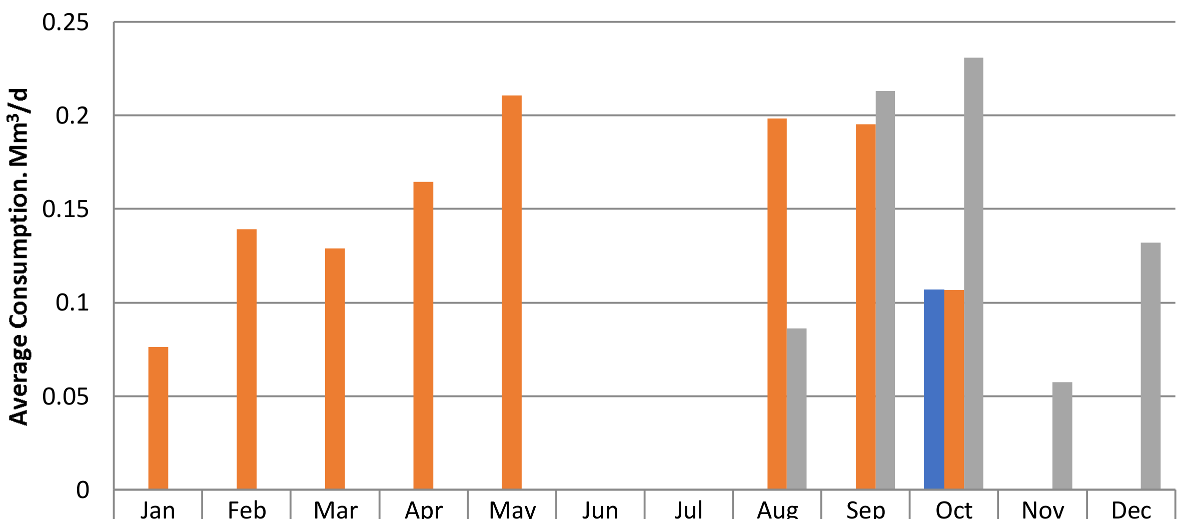
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	0.0406	0.0557	0.0548	0.0366	0.0159	0.012	0.012	0.0093	0.0105	0.0286	0.0086	0.0263
2017	0.0331	0.0391	0.0585	0.0572	0.0423	0.0197	0.0492	0.023	0.0396	0.0593	0.0565	0.0978
2018	0.062	0.0829	0.108	0.1106	0.1231	0.0671	0.0206	0.0247	0.0255	0.0492	0.0445	0.0633

Figure 6.45: Status of Monthly Evaporation Loss in Dhapewada Barrage



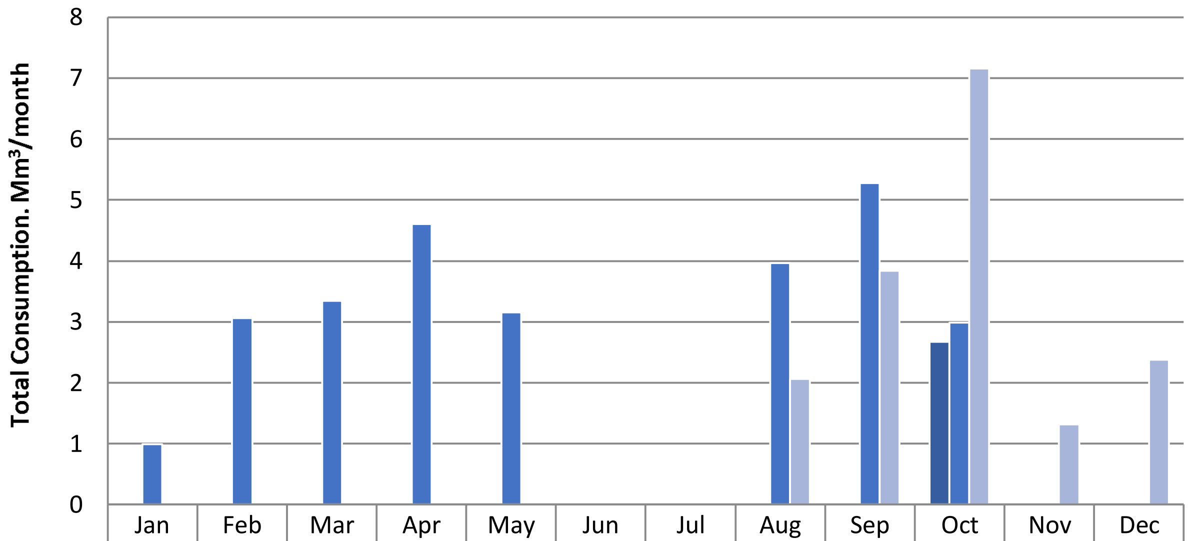
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	1.258	1.614	1.699	1.0971	0.4776	0.3613	0.3726	0.2888	0.3144	0.8856	0.2592	0.8139
2017	1.0274	1.0943	1.812	1.716	1.3102	0.5898	1.5241	0.7143	1.1882	1.8374	1.6943	3.0308
2018	1.9208	2.1563	3.3472	3.3191	3.0775	2.0134	0.6385	0.7647	0.7639	1.5248	1.3335	1.961

Figure 6.46: Status of Consumption of Water for Irrigation from Dhapewada Barrage



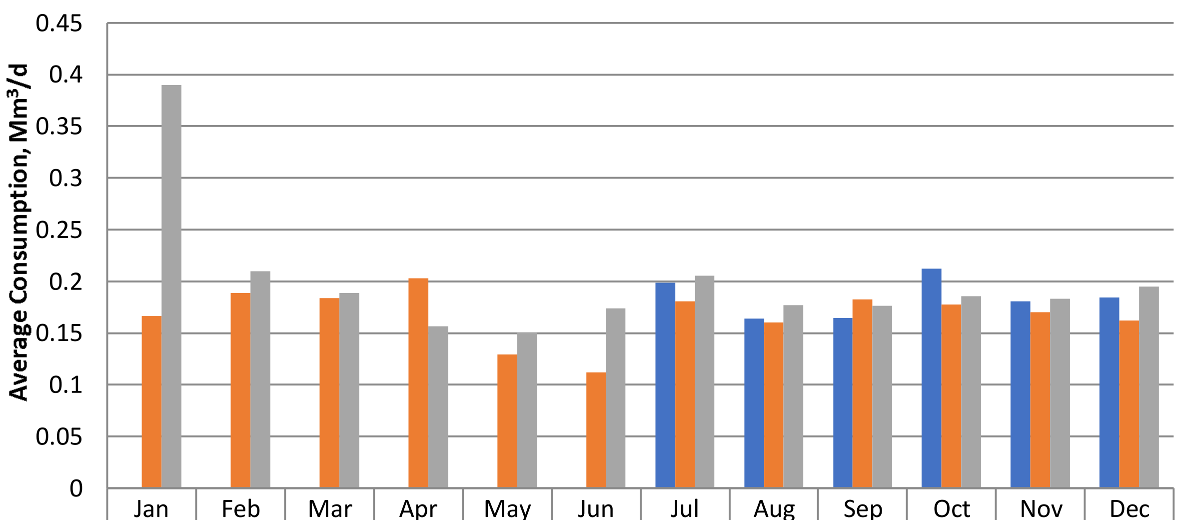
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016										0.1069		
2017	0.0761	0.1391	0.1288	0.1646	0.2107	0	0	0.1982	0.1954	0.1066	0	0
2018	0	0	0	0	0	0	0	0.0862	0.2132	0.2309	0.0573	0.1321

Figure 6.47: Status of Monthly Consumption of Water for Irrigation from Dhapewada Barrage



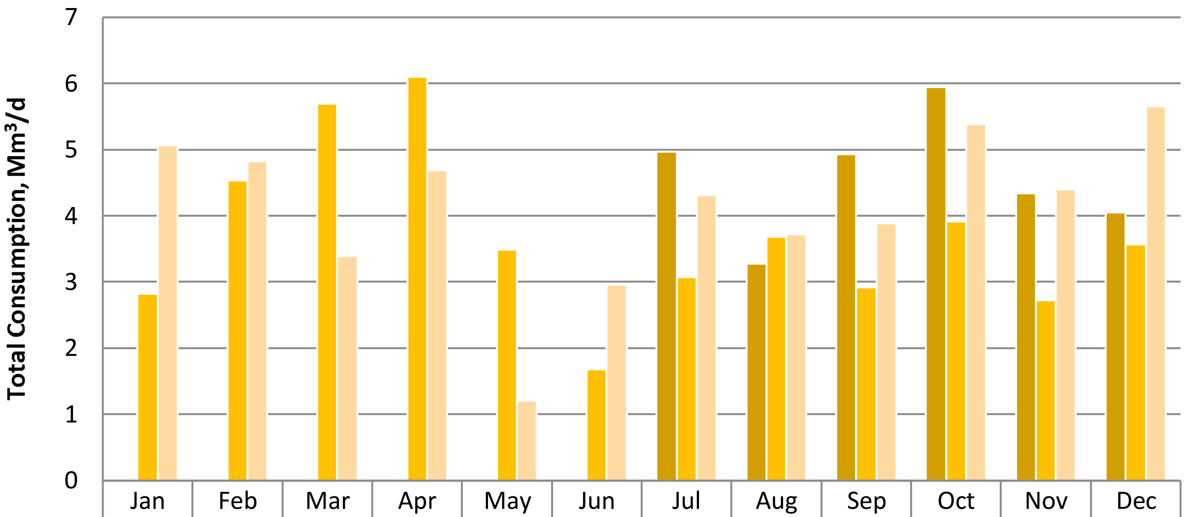
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016										2.672		
2017	0.9892	3.0601	3.3478	4.6075	3.1607	0	0	3.9641	5.2763	2.9847	0	0
2018	0	0	0	0	0	0	0	2.0681	3.8375	7.1568	1.3178	2.3786

Figure 6.48: Status of Water Consumption for Industrial Purpose from Dhapewada Barrage



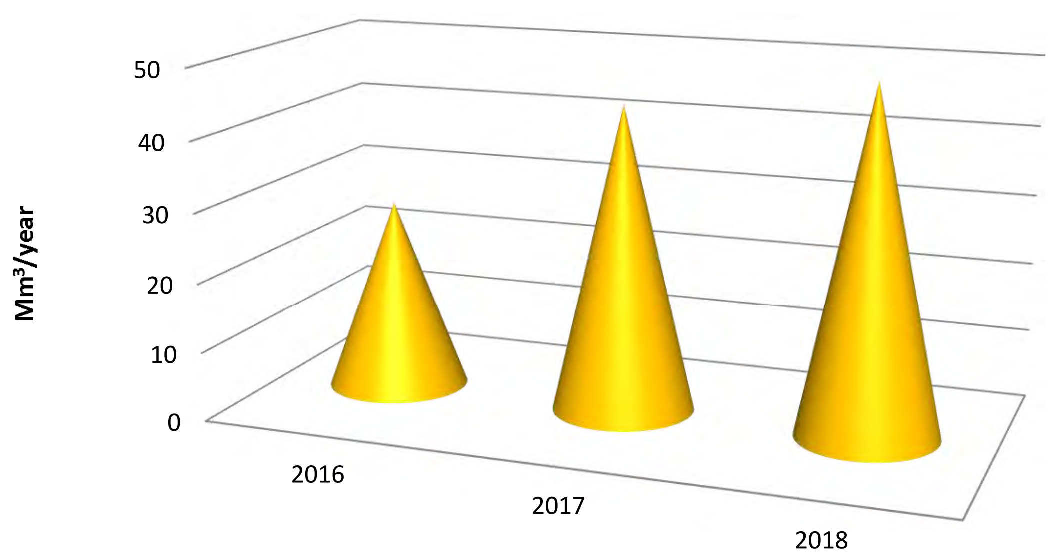
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016							0.1989	0.164	0.1643	0.2124	0.1806	0.1841
2017	0.1661	0.189	0.1836	0.2032	0.1294	0.1118	0.1807	0.16	0.1823	0.1778	0.1702	0.1621
2018	0.3897	0.2096	0.1885	0.1564	0.1503	0.1739	0.2053	0.1773	0.1765	0.1855	0.1831	0.1948

Figure 6.49: Status of Monthly Water Consumption for Industrial Purpose from Dhapewada Barrage



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	0	0	0	0	0	0	4.9716	3.2799	4.9296	5.9467	4.3355	4.0508
2017	2.8245	4.5369	5.6924	6.0953	3.4925	1.6775	3.072	3.6792	2.916	3.9114	2.7228	3.5656
2018	5.0667	4.8204	3.3935	4.6919	1.2027	2.9559	4.312	3.723	3.8821	5.38	4.3936	5.6499

Figure 6.50: Status of Yearly Water Consumption for Industrial Purpose from Dhapewada Barrage



6.3 MEASUREMENT OF WATER DISCHARGE

The real time water discharge was measured at upstream as well as down stream of intake site on 1st to 3rd February, 2019. Methodology adopted for water discharge measurement at locations of upstream as well as down stream were as follows:

Stream velocity measurements were conducted with a Current Meter (Valeport Model 106 Current Meter). This Current Meter works on a basic one second cycle, during which the impeller counts are taken and a single compass heading reading is made, from which the east and north velocity vectors are calculated and then summed over the averaging period. The Current meter was attached to the side of the Boat, just below the water surface, and the measured stream velocity was digitally displayed and recorded at regular points and intervals along the taken cross-section, with simultaneous measurement of the depth at each of these points. The cross- section was divided into a number of sections and the average velocity for each of these sections was used to compute the respective discharge for each section, which were finally summed up to compute the total discharge for that cross section.

The measurement of depth in terms of bathymetry survey has been done by using Eco- sounder (Velport Medas surveyor Sl. No. 45663) with single transducer along the cross sections. This eco-sounder works on a basis of transmitting sound pulses into water. The data is recorded according to the time interval between emission and return of pulse and the data is used for determining the depth along with the speed of sound in water at the time. The transducer was fixed to the side of the boat, just below the water surface; so that it can work easily with the movement of the boat. The data was stored and transferred to the computer separately according to the sections. The cross-sections were divided in to no. of sections and the average depth of each section was used for computation of discharge for each sections in all respective cross sections. Finally, to compute the total discharge, value of each section has been added.

There were two cross-sections which have been surveyed at upstream i.e. Bapera-Chandori (Aprox 10 km u/s of APML intake well) and Kumli-Sawra (Aprox 15 km u/s of intake well) to assess the inflow of water at Dhaphewada barrage. Similarliy at down-stream i.e. Mandavi (Aprox 3 km d/s of APML intake well) to assess the discharge rate of water from Dhaphewada barrage.

Bathmetric survey detail at cross section 1 of River Wainganga i.e U/S of intake site at Bapera-Chandori (Approx 10 km u/s of APML intake well) is presented in Figure 6.51 to 6.52.

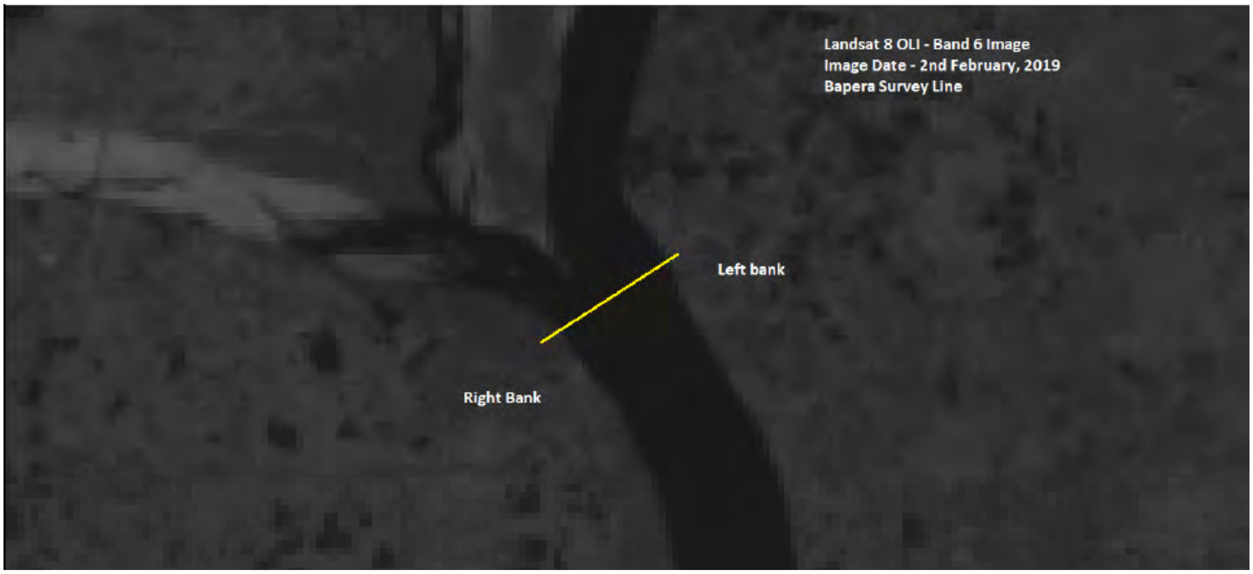


FIGURE 6.51(A): BATHYMETRIC SURVEY AT CROSS SECTION 1 OF RIVER WAINGANGA – BAPERA – CHANDORI (APPROX. 10 KM U/S OF INTAKE WELL)

FIGURE 6.51(B): BATHYMETRIC SURVEY AT CROSS SECTION 1 OF RIVER WAINGANGA – BAPERA – CHANDORI (APPROX. 10 KM U/S OF INTAKE WELL)

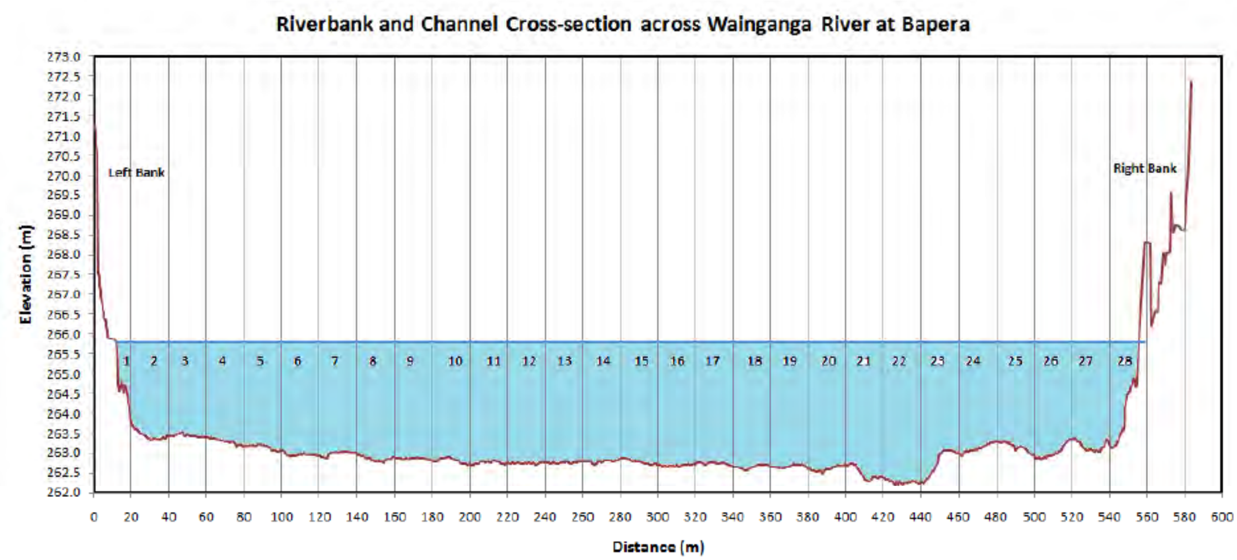


FIGURE 6.52(A): DETAIL OF SEGMENT AT CROSS SECTION 1 OF RIVER WAINGANGA - BAPERA – CHANDORI (APPROX. 10 KM U/S OF INTAKE WELL)

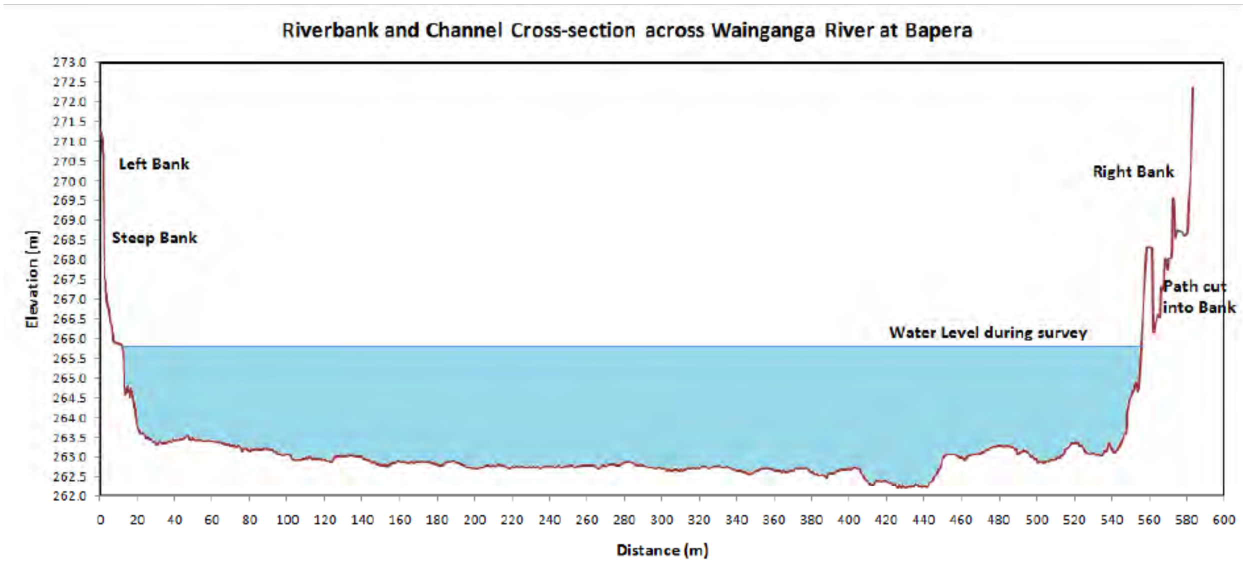


FIGURE 6.52(B): PROFILE OF WATER LEVEL AND DEPTH AT CROSS SECTION 1 OF RIVER WAINGANGA - BAPERA – CHANDORI (APPROX. 10 KM U/S OF INTAKE WELL)

TABLE 6.6: ESTIMATION OF INFLOW IN CUMECS FOR CROSS SECTION 2 OF RIVER WAINGANGA – KUMALI – SAWRA (APPROX. 15 KM U/S OF INTAKE WELL)

Section_ID	CS_AREA (m^2)	Avg. Velocity (m/s)	Inflow (m^3/s)
1	9.035261	0.098333	0.888464
2	47.085972	0.360500	16.974493
3	47.252002	0.520652	24.601850
4	50.082208	0.558300	27.960897
5	52.954411	0.660250	34.963150
6	56.493878	0.752375	42.504581
7	56.141852	0.703750	39.509828
8	60.769626	0.699375	42.500757
9	58.769893	0.690400	40.574734
10	60.058846	0.686500	41.230398
11	61.183724	0.704000	43.073341
12	60.685418	0.771250	46.803628
13	60.720034	0.785500	47.695587
14	60.258841	0.801625	48.304994
15	60.769627	0.754750	45.865876
16	61.999547	0.747300	46.332262
17	61.375579	0.694500	42.625340
18	63.372275	0.626750	39.718573
19	62.253257	0.710750	44.246503
20	63.663315	0.700375	44.588194
21	66.471709	0.712250	47.344475
22	70.101462	0.627500	43.988667
23	62.976517	0.714875	45.020338
24	53.076382	0.605625	32.144384
25	52.868574	0.861125	45.526451
26	55.855803	0.644600	36.004651
27	52.471298	0.611900	32.107187
28	28.617955	0.414250	11.854988
Total Inflow (m^3/s)			**1054.954590**

Bathmetric survey detail at cross section 2 of River Wainganga i.e Kumli-Sawra (Approx 15 km u/s of intake well) is presented in Table 6.7 and Figure 6.53 to 6.54.

FIGURE 6.53: BATHYMETRIC SURVEY AT CROSS SECTION 2 OF RIVER WAINGANGA – KUMALI – SAWRA (APPROX. 15 KM U/S OF INTAKE WELL)

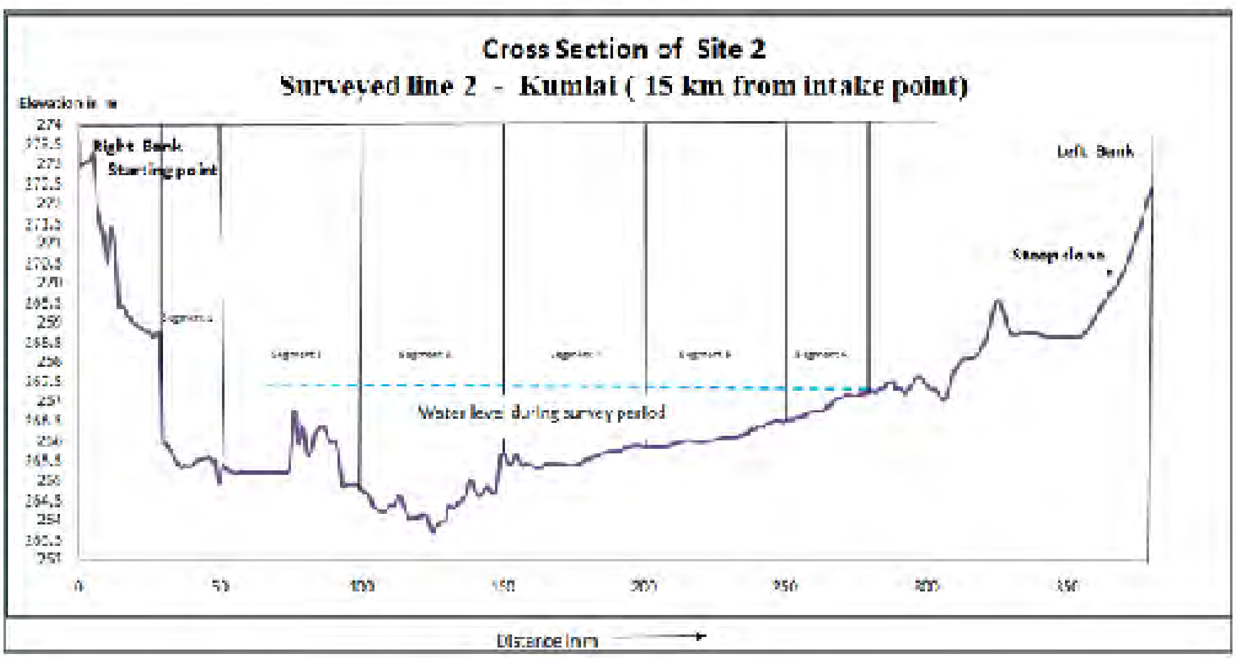


FIGURE 6.54: PROFILE OF WATER LEVEL AND DEPTH AT CROSS SECTION 2 OF RIVER WAINGANGA – KUMALI – SAWRA (APPROX. 15 KM U/S OF INTAKE WELL)

TABLE 6.7: ESTIMATION OF INFLOW IN CUMECS FOR CROSS SECTION 2 OF RIVER WAINGANGA – KUMALI – SAWRA (APPROX. 15 KM U/S OF INTAKE WELL)

Segment_ID	CS_AREA (m^2)	Avg. Velocity (m/s)	Inflow (m^3/s)
	3.415996	0.100	0.341600
	2.882977	0.241	0.694797
	4.252941	0.140	0.595412
	3.204075	0.060	0.192244
	3.594709	0.134	0.481691
	3.445761	0.120	0.413491
	3.507909	0.111	0.389378
	3.475109	0.139	0.483040
1	3.478562	0.167	0.580920
	3.464751	0.250	0.866188
	4.937758	0.173	0.854232
	4.821516	0.260	1.253594
	4.806354	0.144	0.692115
	4.758341	0.133	0.632859
	4.908950	0.131	0.643072
	3.346186	0.064	0.214156
	5.743871	0.123	0.706496
	3.465010	0.115	0.398476
	5.237309	0.056	0.293289
	5.305143	0.108	0.572955
	5.372595	0.037	0.198786
	5.305048	0.036	0.190982
	5.321982	0.000	0.000000
	5.333208	0.027	0.143997
	5.320079	0.027	0.143642
	3.889764	0.000	0.000000
	5.323362	0.025	0.133084
	5.324456	0.000	0.000000
	5.324182	0.024	0.127780
	5.324364	0.024	0.127785
	5.324334	0.045	0.239595
	5.324294	0.136	0.724104
	5.324331	0.268	1.426921
	2.067086	0.345	0.713145
	2.941428	0.376	1.105977

	4.212004	0.370	1.558441
2	3.646461	0.300	1.093938
	4.621883	0.273	1.261774
	4.480371	0.286	1.281386
	3.798081	0.280	1.063463
	3.626245	0.168	0.609209
	3.598448	0.294	1.057944
	2.656827	0.363	0.964428
	4.141753	0.378	1.565583
	4.134172	0.381	1.575120
	5.091905	0.382	1.945108
	3.991283	0.399	1.592522
	5.797949	0.383	2.220614
	5.815710	0.382	2.221601
	5.794411	0.419	2.427858
	5.900545	0.421	2.484129
	6.059746	0.349	2.114851
	6.158299	0.298	1.835173
	6.590416	0.339	2.234151
	6.721820	0.362	2.433299
	6.831564	0.377	2.575500
	6.754671	0.365	2.465455
	6.567673	0.327	2.147629
	6.580308	0.360	2.368911
	6.216420	0.464	2.884419
	6.467676	0.524	3.389062
	6.964412	0.551	3.837391
	4.826828	0.561	2.707851
	7.037695	0.570	4.011486
	7.016974	0.582	4.083879
	6.963690	0.590	4.108577
	7.047298	0.593	4.179047
	7.578473	0.605	4.584976
	7.452123	0.559	4.165737
	7.241371	0.531	3.845168
3	7.186788	0.562	4.038975
	6.592943	0.589	3.883243
	6.661172	0.609	4.056654
	6.549984	0.619	4.054440
	6.416558	0.623	3.997516

	6.136278	0.644	3.951763
	5.604886	0.651	3.648781
	5.978882	0.640	3.826484
	6.233748	0.635	3.958430
	6.079962	0.620	3.769576
	5.877802	0.643	3.779427
	6.127975	0.634	3.885136
	6.038808	0.630	3.804449
	4.674950	0.627	2.931194
	4.609248	0.638	2.940700
	4.957974	0.640	3.173103
	3.358064	0.655	2.199532
	4.600584	0.676	3.109995
	3.331823	0.695	2.315617
	5.066635	0.718	3.637844
	3.428498	0.727	2.492518
	5.079270	0.748	3.799294
	5.112121	0.685	3.501803
	3.532078	0.692	2.444198
	5.144972	0.686	3.529451
	3.461298	0.697	2.412525
	4.994363	0.705	3.521026
	5.003460	0.710	3.552457
	5.003460	0.717	3.587481
	5.055444	0.721	3.644975
	3.444035	0.708	2.438377
	5.066635	0.706	3.577044
	5.074216	0.670	3.399725
	5.024687	0.663	3.331367
4	4.957974	0.660	3.272263
	4.856894	0.646	3.137554
	3.286939	0.645	2.120075
	4.760868	0.648	3.085042
	4.677477	0.644	3.012295
	3.152285	0.659	2.077356
	4.563762	0.697	3.180942
	4.510695	0.720	3.247700
	4.518276	0.697	3.149238
	3.070111	0.669	2.053904
	4.490118	0.711	3.192474

	4.396980	0.687	3.020725
	4.354021	0.707	3.078293
	4.300954	0.698	3.002066
	2.912670	0.691	2.012655
	4.269186	0.705	3.009776
	4.366656	0.726	3.170192
	4.338498	0.730	3.167104
	4.323697	0.721	3.117386
	4.326224	0.703	3.041335
	4.341386	0.688	2.986874
	2.954989	0.697	2.059628
	4.264854	0.700	2.985398
	4.252941	0.682	2.900506
	2.853629	0.687	1.960443
	4.157420	0.711	2.955926
	2.792517	0.705	1.968724
	4.095906	0.705	2.887614
	4.101321	0.695	2.850418
	4.141753	0.673	2.787400
	2.834639	0.667	1.890704
	4.136194	0.708	2.928425
	4.096772	0.682	2.793999
	4.078578	0.694	2.830533
	2.770765	0.701	1.942306
5	4.010349	0.697	2.795213
	3.957282	0.700	2.770097
	3.974610	0.680	2.702735
	3.948618	0.670	2.645574
	2.703438	0.675	1.824821
	3.937066	0.703	2.767757
	3.866310	0.699	2.702551
	3.814759	0.694	2.647443
	2.525280	0.672	1.696988
	2.527352	0.692	1.748928
	3.204880	0.674	2.160089
	3.547908	0.650	2.306140
	2.426731	0.616	1.494867
	3.430944	0.594	2.037981
	3.350802	0.550	1.842941
	2.282213	0.501	1.143389

	3.353329	0.456	1.529118
	3.383653	0.418	1.414367
	3.279324	0.461	1.511768
	2.271855	0.461	1.047325
	2.218338	0.484	1.073676
	3.232033	0.469	1.515823
	2.169261	0.445	0.965321
	2.142626	0.367	0.786344
	3.047562	0.353	1.075789
	2.959117	0.372	1.100792
	2.938396	0.051	0.149858
	2.937096	0.045	0.132169
	2.817605	0.030	0.084528
	1.879977	0.030	0.056399
6	2.595734	0.000	0.000000
	2.486568	0.023	0.057191
	1.680955	0.000	0.000000
	2.365272	0.000	0.000000
	1.596858	0.000	0.000000
	1.634492	0.000	0.000000
	2.397762	0.000	0.000000
	1.606970	0.000	0.000000
	1.586254	0.900	1.427628
	1.570963	0.990	1.555254
	1.506053	0.800	1.204843
	2.213652	0.060	0.132819
	2.226648	0.990	2.204382
	2.122680	0.094	0.199532
	2.084775	0.254	0.529533
	1.305108	0.331	0.431991
	1.903914	0.369	0.702544
	1.286464	0.171	0.219985
	Total Inflow (m3/s)		**370.940350**

Bathmetric survey detail at cross section 3 of River Wainganga i.e Mandvi (Approx 3 km d/s of intake well) is presented in Table 6.8 and Figure 6.55 to 6.56.

FIGURE 6.55: BATHYMETRIC SURVEY AT CROSS SECTION 3 OF RIVER WAINGANGA – MADVI (APPROX. 3 KM D/S OF INTAKE WELL)

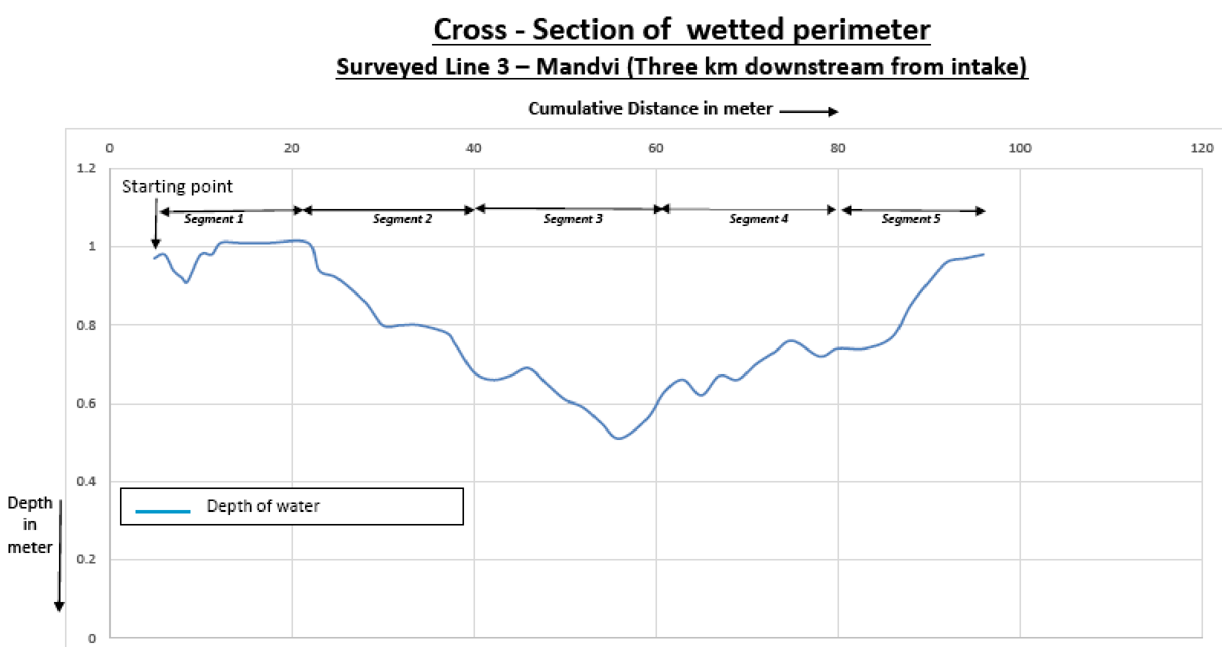


FIGURE 6.56(A): DETAIL OF SELECTED SEGMENT AT CROSS SECTION 3 OF RIVER WAINGANGA – MANDVI (APPROX. 3 KM D/S OF INTAKE WELL)

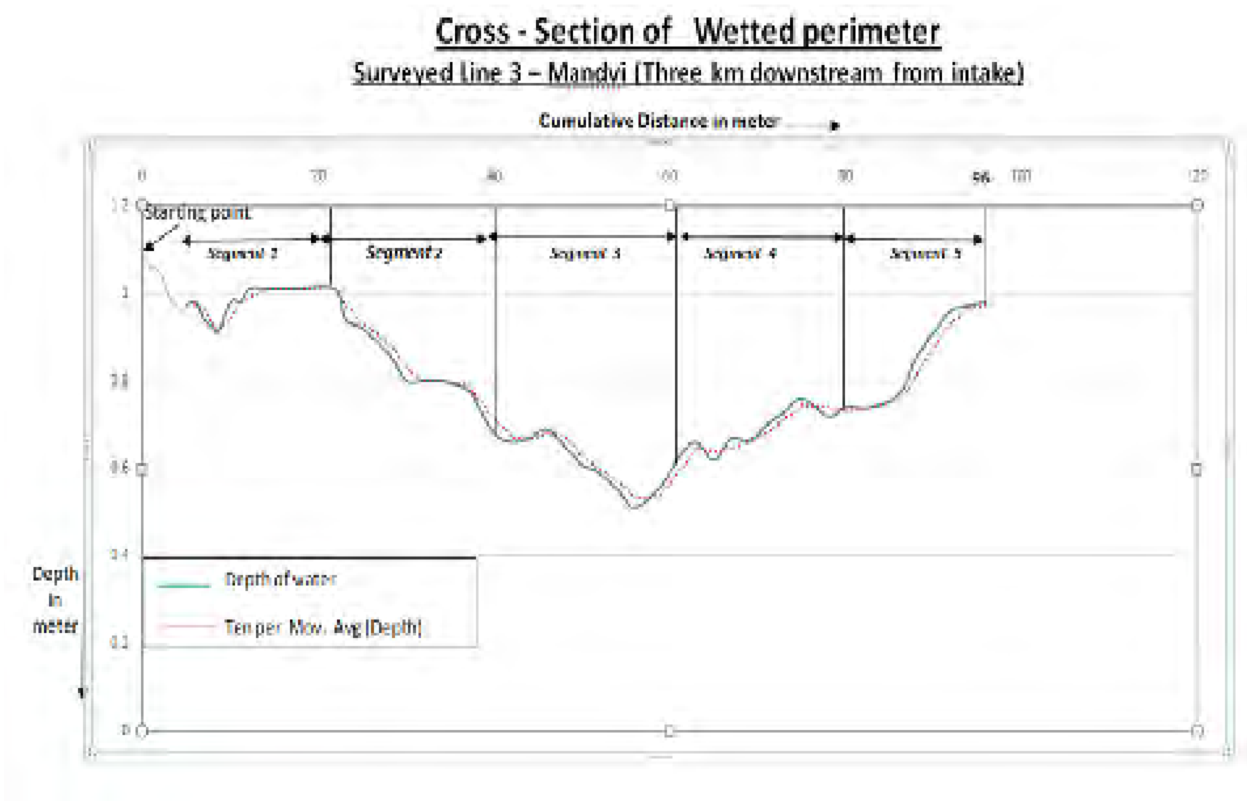


FIGURE 6.56(B): PROFILE OF DEPTH AT CROSS SECTION 3 OF RIVER WAINGANGA – MANDVI (APPROX. 3 KM D/S OF INTAKE WELL)

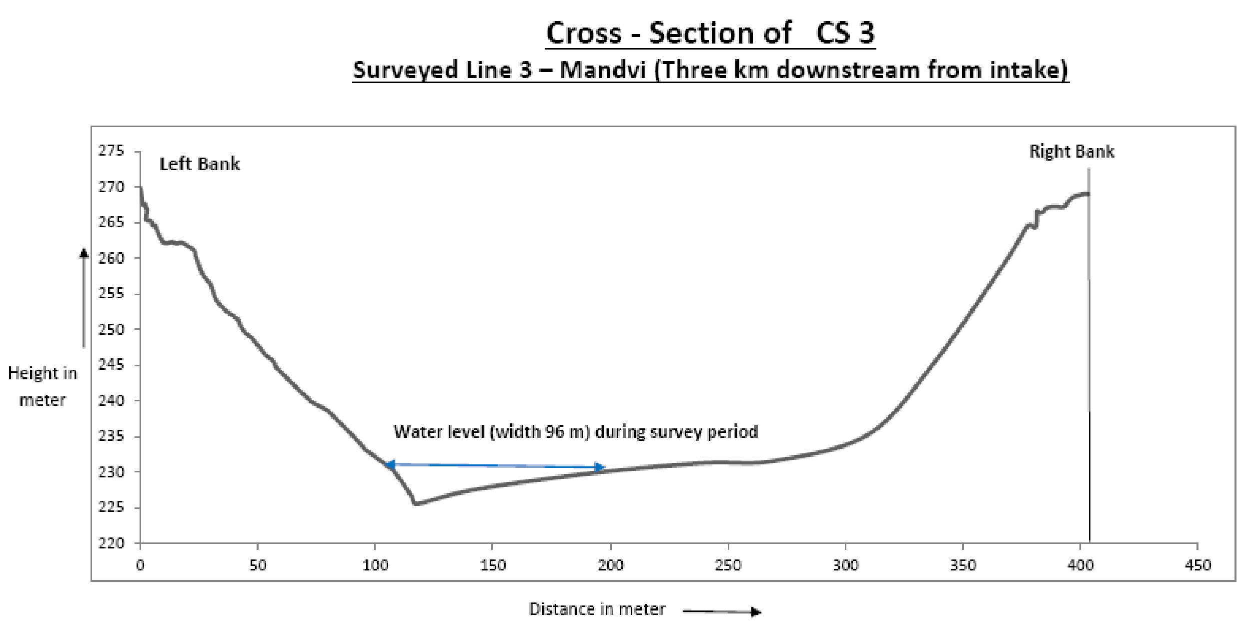


FIGURE 6.56(C): PROFILE OF WATER LEVEL AND DEPTH AT CROSS SECTION 3 OF RIVER WAINGANGA – MANDVI (APPROX. 3 KM D/S OF INTAKE WELL)

TABLE 6.8: ESTIMATION OF DISCHARGE IN CUMECS FOR CROSS SECTION 3 OF RIVER WAINGANGA – MANDVI (APPROX. 3 KM D/S OF INTAKE WELL)

Segments	Area in square meter	Avg velocity m/sec	Discharge in cumecs
	4.753	0.274571429	1.305038
	0.98	0.282428571	0.27678
	0.94	0.270571429	0.254337143
	0.92	0.243833333	0.224326667
	1.365	0.265333333	0.36218
Segment 1	2.45	0.252142857	0.61775
	1.176	0.318	0.373968
	1.01	0.360857143	0.364465714
	2.121	0.382285714	0.810828
	3.232	0.371285714	1.199995429
	4.343	0.370857143	1.610632571
	1.128	0.377333333	0.425632
	1.84	0.3715	0.68356
	2.58	0.433285714	1.117877143
	1.6	0.431833333	0.690933333
Segment 2	1.6	0.4328	0.69248
	1.6	0.433	0.6928
	2.34	0.4065	0.95121
	0.75	0.365	0.27375
	1.36	0.3665	0.49844
	1.32	0.343833333	0.45386
	1.34	0.315	0.4221
	1.38	0.316	0.43608
	1.3	0.337333333	0.438533333
Segment 3	1.22	0.336166667	0.410123333
	1.18	0.320333333	0.377993333
	1.1	0.278666667	0.306533333
	1.53	0.279	0.42687
	1.68	0.267833333	0.44996
	1.26	0.2225	0.28035
	1.32	0.239714286	0.316422857
	1.24	0.267833333	0.332113333
	1.34	0.2625	0.35175
	1.32	0.239714286	0.316422857

Segment 4	1.4	0.267833333	0.374966667
	1.46	0.2225	0.32485
	1.52	0.239714286	0.364365714
	2.16	0.179	0.38664
	2.22	0.2465	0.54723
	2.22	0.292571429	0.649508571
	2.31	0.245714286	0.5676
	1.7	0.223714286	0.380314286
Segment 5	1.82	0.23925	0.435435
	1.92	0.224214286	0.430491429
	0.97	0.269230769	0.261153846
	1.96	0.247307692	0.484723077
Discharge in cumecs			**23.95337497**

6.4 WATER BALANCE STUDY

Water balance study is basically an accounting procedure to estimate balance of available water after taking all incomings, losses and outgoings flows from a hydrological system. The descriptions of all inflows and outflows have been given in earlier section.

The water balance analysis have been carried out based on the probable monthly flows for all the 12 months with flows at 75%, 90% and 95% of exceedance, and by assuming that the barrage is normally full at the beginning.

The capacity of the Dhapewada barrage is 44.05 Mm^3 and the losses due to evaporation and groundwater seepage corresponding to 20% of barrage capacity that worked out to be 8.81 Mm^3/year is divided proportionately to all months. The daily losses are worked out to be 0.024 Mm^3/day. Similarly, irrigation and other daily demands (15% of the barrage storage capacity) and industrial requirements of 70 Mm^3/year have been calculated with daily demands as 0.191781 Mm^3/day for the industrial purposes.

The water balance has been carried out Making use of all inflows and outflows, the storage available at the end of each month has been determined. If the storage has been found more than the storage capacity of the barrage then the downward flow has been calculated using equation as mentioned in earlier sections. The calculated downward flows have thereafter been compared with the estimated environmental flows as per working group recommendation and the failure months representing the downward flows less than the estimated environmental flows have been identified for different exceedance of probabilities.

For determination of EFR as per the Working Group norms, probability curves for annual flows has been prepared. The probable annual flows at 75% exceedance has been worked out to be

400.43 Mm^3/month. Using this value, EFR in different months and flushing flows requirement have been estimated.

The water balance analysis has been carried out with the industrial demand of water including APML from the Dhapewada barrage site. The water balance for the Dhapewada barrage at 75%, 90% and 95% probability levels considering industrial demands has been presented in Tables 6.9 to 6.11.

TABLE 6.9: WATER BALANCE AT DHAPEWADA BARAGE FOR 75% PROBABLE MONTHLY FLOW

Month	Previous Storage	Inflow	Losses	Domestic Demand	Industrial Demand	Downward Flow	Balance	Environmental Flow	
								EFR	Excess Flow
Jan	44.05	54.2641	1.4012	0.031	5.8333	46.9986	44.05	0.9446	46.054
Feb	44.05	26.4499	1.6576	0.028	5.8333	18.931	44.05	0.8532	18.0778
Mar	44.05	10.7739	2.2847	0.031	5.8333	2.6249	44.05	0.9446	1.6803
Apr	44.05	4.5846	2.043	0.03	5.8333	0.9141	35.23	0.9141	-
May	35.23	3.4792	1.8724	0.031	5.8333	0.9446	26.55	0.9446	-
Jun	26.55	2.0354	0.987	0.03	5.8333	0.9141	18.79	0.9141	-
Jul	18.79	807.9719	0.8463	0.031	5.8333	801.2613	44.05	0.9446	800.3167
Aug	44.05	636.7998	0.589	0.031	5.8333	630.3465	44.05	0.9446	629.4019
Sep	44.05	493.3992	0.756	0.03	5.8333	486.7799	44.05	0.9141	485.8658
Oct	44.05	143.9163	1.4167	0.031	5.8333	136.6353	44.05	0.9446	135.6907
Nov	44.05	28.7435	1.095	0.03	5.8333	21.7852	44.05	0.9141	20.8711
Dec	44.05	34.2147	1.9344	0.031	5.8333	26.416	44.05	0.9446	25.4714

All values are in Mm3, EFR = Environmental Flow Requirement (as per Working Group Recommendation, MoEF&CC, GoI)

TABLE 6.10: WATER BALANCE AT DHAPEWADA BARAGE FOR 90% PROBABLE MONTHLY FLOW

Month	Previous Storage	Inflow	Losses	Domestic Demand	Industrial Demand	Downward Flow	Balance	Environmental Flow	
								EFR	Excess Flow
Jan	44.05	42.9402	1.4012	0.031	5.8333	33.3156	44.05	0.9446	32.3710
Feb	44.05	22.8987	1.6576	0.028	5.8333	11.4850	44.05	0.8532	10.6318
Mar	44.05	7.9658	2.2847	0.031	5.8333	0.9446	34.96	0.9446	-
Apr	34.96	2.0756	2.043	0.03	5.8333	0.9141	26.14	0.9141	-
May	26.14	2.5282	1.8724	0.031	5.8333	0.9446	17.46	0.9446	-
Jun	17.46	1.6688	0.987	0.03	5.8333	0.9141	9.70	0.9141	-
Jul	9.70	415.1470	0.8463	0.031	5.8333	408.4364	44.05	0.9446	407.4918
Aug	44.05	291.3872	0.589	0.031	5.8333	280.5257	44.05	0.9446	279.5811
Sep	44.05	286.3550	0.756	0.03	5.8333	273.6067	44.05	0.9141	272.6926
Oct	44.05	116.3023	1.4167	0.031	5.8333	104.4302	44.05	0.9446	103.4856
Nov	44.05	21.1863	1.095	0.03	5.8333	12.5090	44.05	0.9141	11.5949
Dec	44.05	19.9826	1.9344	0.031	5.8333	8.0888	44.05	0.9446	7.1442

All values are in Mm^3, EFR = Environmental Flow Requirement (as per Working Group Recommendation, MoEF&CC, GoI)

TABLE 6.11: WATER BALANCE AT DHAPEWADA BARAGE FOR 95% PROBABLE MONTHLY FLOW

Month	Previous Storage	Inflow	Losses	Domestic Demand	Industrial Demand	Downward Flow	Balance	Environmental Flow	
								EFR	Excess Flow
Jan	44.05	41.41423	1.4012	0.031	5.8333	34.1487	44.05	0.9446	33.20413
Feb	44.05	21.85252	1.6576	0.028	5.8333	14.3336	44.05	0.8532	13.48042
Mar	44.05	7.825919	2.2847	0.031	5.8333	0.9446	34.96	0.9446	-
Apr	34.96	1.83954	2.043	0.03	5.8333	0.9141	26.14	0.9141	-
May	26.14	2.34732	1.8724	0.031	5.8333	0.9446	17.46	0.9446	-
Jun	17.46	0.54867	0.987	0.03	5.8333	0.9141	9.70	0.9141	-
Jul	9.70	196.3757	0.8463	0.031	5.8333	189.6651	44.05	0.9446	188.7205
Aug	44.05	247.5451	0.589	0.031	5.8333	241.0918	44.05	0.9446	240.1472
Sep	44.05	236.8706	0.756	0.03	5.8333	230.2513	44.05	0.9141	229.3372
Oct	44.05	105.7822	1.4167	0.031	5.8333	98.5012	44.05	0.9446	97.55663
Nov	44.05	11.29167	1.095	0.03	5.8333	4.3334	44.05	0.9141	3.41927
Dec	44.05	14.10258	1.9344	0.031	5.8333	6.3039	44.05	0.9446	5.359282

All values are in Mm^3, EFR = Environmental Flow Requirement (as per Working Group Recommendation, MoEF&CC, GoI)

From the analysis of the water balance components at different probability levels, followings have been observed:

(i) At 75% dependence level, all demands including the environmental flows requirement has been found satisfied.

(ii) At 90% dependence level, deficit in environmental flows of in the month of May as per WG recommendations has been observed but all other demands have been found satisfied.

(iii) At 95% dependence level, deficit in environmental flows estimated using WG recommendations during May to June months are slightly less. But the demands of all other competitive uses have been found satisfied.

Water balance study to assess the water availability at the Dhapewada barrage has also been carried out using real time inflows, losses and demands for computation of environmental flows. The analysis has been carried out using long term inflow data of June 1975 to Dec 2010.

In drought years, it is a general crisis and all water uses are affected. EFR is an essential component for ecosystem maintenance that has to be maintained and cannot be compromised. To overcome the occasional deficits of water, which may be once in 5-8 years, followings alternatives are suggested:

(i) in drought year (s), all water uses are affected and there is a general crisis.

(ii) in other normal deficit year(s), the situation can be overcome by some efficient water management approaches, either by reducing intervened demands (viz. Irrigation and industrial demands) or by enhancing river flows adopting some water conservation measures, such as, artificial groundwater recharge.

6.5 STATUS OF WATER QUALITY

The physio-chemical and bacteriological quality of water need to be assessed not only to estimate various treatment required for it ultimate use in TPP but it is also important to have details on presence of salts and nature of water (acidic or alkaline) which may have effect on intake well structure and equipments. The prime parameter includes pH, electrical conductivity, dissolve solids, suspended solids. Total hardness, sulphates, carbonates, bi-carbonates, chlorides, iron, calcium, magnesium, etc.

Accordingly, water quality of River Wainganga at intake site along with upstream as well as the down stream was assessed during the study. For the purpose 5 sampling location were selected as presented in Table 6.12. The sample were collected and preserved for subsequent analyses using the standard methods. The prime parameters analyzed as per BIS 10500 Guidelines were analised to asses the quality of water at River Wainganga in the intake project site. The major essential parameters includes, pH, Conductivity/TDS; TSS; Total Hardness; Ca hardness; Alkailinity; Chloride; Silica, Iron; Sulphate; Phosphate; Nitrate; Bacterilogical Count- E-Coli; and Insecticides/ Pesticides. The status of water quality of River Wainganga at intake site along with upstream as well as the down stream is presented in Table 6.13. Table 6.14 presents the status of Pesticide / Insecticides present in the water of River Wainganga at intake site. Figure 6.57 to 6.63 present the spatial variation of water quality of Wainganga in the vicinity of intake as well as upstream and downstream stretch.

TABLE 6.12: DETAILS OF WATER SAMPLING LOCATION AT RIVER WAINGANGA

Sample No.	Location	North Coordinmates	East Coordinates	Date of Sampling	Remarks
S-1	Intake Well	21°69 ’95.5’’	79°53’01’’	02.02.2019	Kawalewad village
S-2	Karti	21°26’35.42’’	79°53’01’’	01.02.2019	U/s (aprox 5 km)
S-3	Bapera	21°42 19.96’’	79°53’01’’	01.02.2019	U/s (aprox 10 km)
S-4	Sawara	21°33’21.2’’	79°58’20.4’’	01.02.2019	U/s (aprox 15 km)
S-5	Mandvi	21°67 ’98.73’’	79°53’01’’	02.02.2019	D/s (aprox 3 km)

TABLE 6.13: STATUS OF WATER QUALITY AT RIVER WAINGANGA

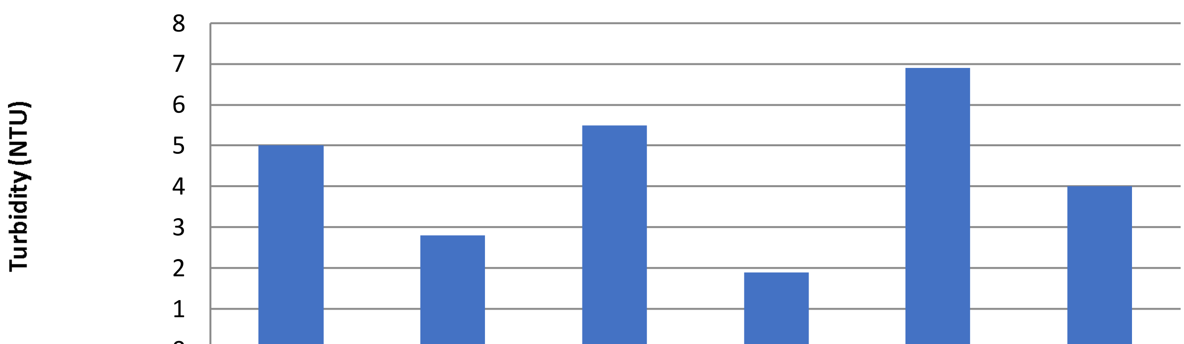
Sl. No	Parameter	Method of Analysis	Unit	Permissible Limits	Intake well (Kawalewada Village)	Karti	Bapera	Sawara	Mandvi
1	pH	4500H+B	-	6.5-8.5	8.1	8.1	8	7.9	7.9
2	Turbidity	2130B	NTU	5	2.8	5.5	1.9	6.9	4
3	Total Suspendede Solids (TSS)	2540D	mg/L		21	23	20	23	22
4	Total Dissolved solids (TDS)	2540C	mg/L	2000	350	320	310	340	330
5	Total Alkalinity (as $CaCo_3$)	2320B	mg/L	600	109	117	113	108	121
6	Chloride (as Cl-)	4500Cl-B	mg/L	1000	14	14	14	19	14
7	Sulphate (as SO_4)	$4500SO_4^{-2}$ 2E	mg/L	400	12	13	15.4	15	13.7
8	Nitrate (as NO_3-N)	4500NO3-E	mg/L	45	0.28	0.28	0.68	0.71	0.14
9	Total Hardness (as $CaCo_3$)	2340C	mg/L	600	180	137	137	146	141
10	Calcium (as Ca)	3500CaB	mg/L	200	36	34	38	39.4	39
11	Magnesium (as Mg)	3500MgB	mg/L	100	22	12	10	11	10
12	Chemical Oxygen Demand	5220B	mg/L		14	11.4	13.3	18.1	15.2
13	BOD (3 days at 27 °C)	5210B	mg/L		5	3.5	4.5	6.1	5.1
14	Iron (as Fe)	3500FeB	mg/L	0.3	0.24	0.1	<MRL>	0.14	<MRL>
15	Total coliform	9221B	MPN/100ml	Shall not be detectable in any 100 ml sample	16000			2800	9200
16	Fecal coliform	9221E	MPN/100ml	Shall not be detectable in any 100 ml sample	2200			330	1700

MRL= minimum reporting Limit (MRL for CN= 0.02 mg/L, for Mn=1.0 mg/L, for Residual Chlorine = 1mg/L, for Ni=0.5 mg/L, for As= 2.0, for Hg =2.0

TABLE 6.14: STATUS OF WATER QUALITY AT RIVER WAINGANGA - PESTICIDE

Sl No	Parameter	Unit	Permissible Limit	Concentration
				Location Intake Well Wain Ganga River
1	Alachlor	µg/L	20	<MRL
2	Aldrin	µg/L	0.03	0.009
3	Dieldrin	µg/L	0.03	0.01
4	Butachlor	µg/L	125	<MRL
5	Alpha-Endosulfan	µg/L	0.4	0.008
6	Malathion	µg/L	190	0.012
7	Parathion Methyl	µg/L	0.3	<MRL
8	Chlorpyrisfos	µg/L	30	0.028
9	Atrazine	µg/L	2	<MRL
10	Ethion	µg/L	3	<MRL
11	Monocrotophos	µg/L	1	<MRL
12	Phorate	µg/L	2	<MRL
13	4-4 DDT	µg/L	1	0.002

Figure 6.57: Variation in Water Quality of Wainganga - Turbidity



	Permissible Limits	Intake well (Kawalewada Village)	Karti	Bapera	Sawara	Mandvi
Turbidity Level	5	2.8	5.5	1.9	6.9	4

Figure 6.58: Variation in Water Quality of Wainganga - TSS

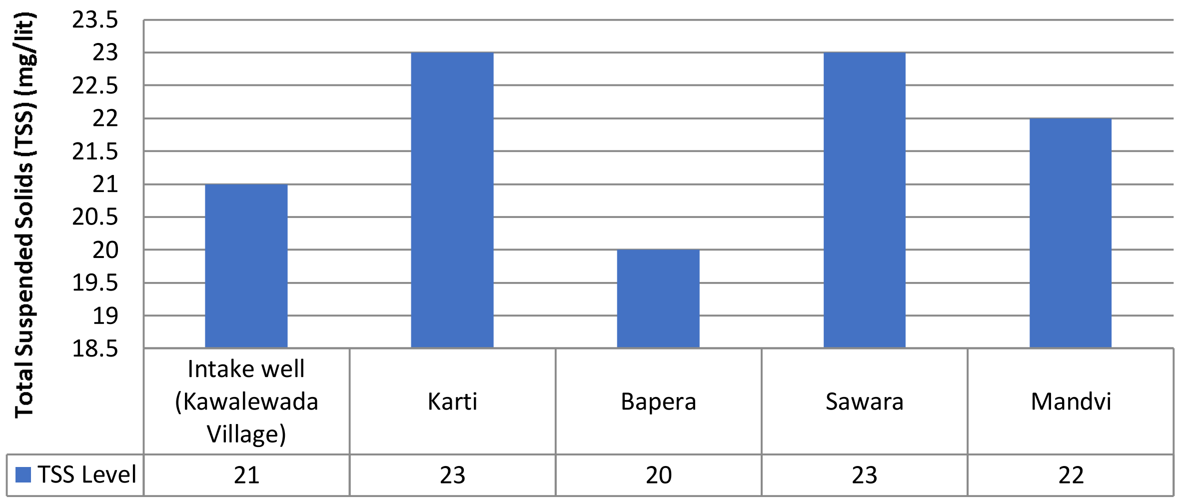


Figure 6.59: Variation in Water Quality of Wainganga - TDS

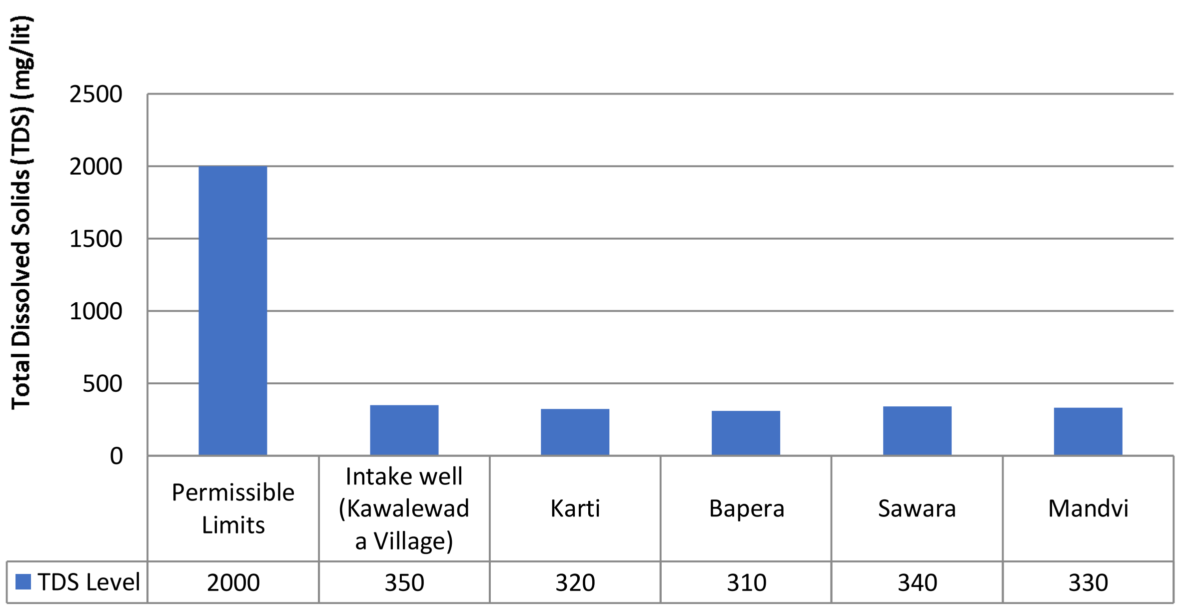
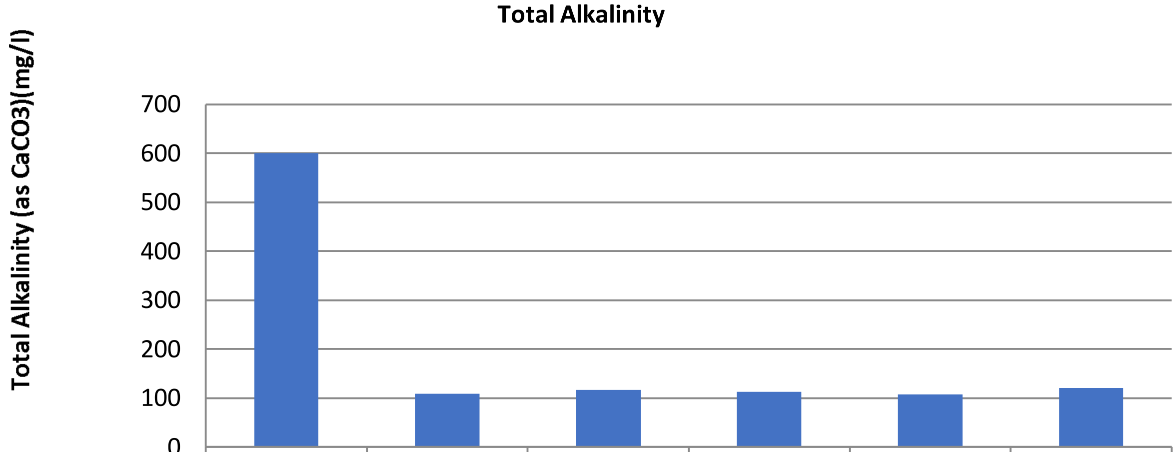
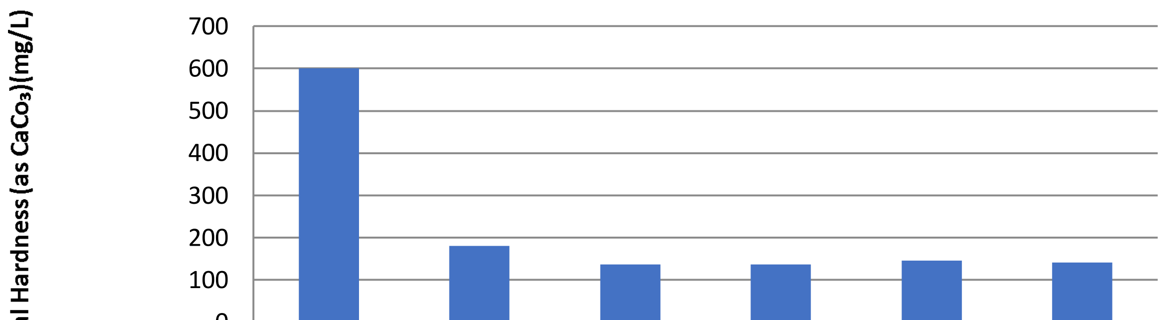


Figure 6.60: Variation in Water Quality of Wainganga - Total Alkalinity



	Permissible Limits	Intake well (Kawalewada Village)	Karti	Bapera	Sawara	Mandvi
Alkalinity Level	600	109	117	113	108	121

Figure 6.61: Variation in Water Quality of Wainganga - Total Hardness



	Permissible Limits	Intake well (Kawalewada Village)	Karti	Bapera	Sawara	Mandvi
Total Hardness Level	600	180	137	137	146	141

Figure 6.62: Variation in Water Quality of Wainganga - Biological Oxygen Demand

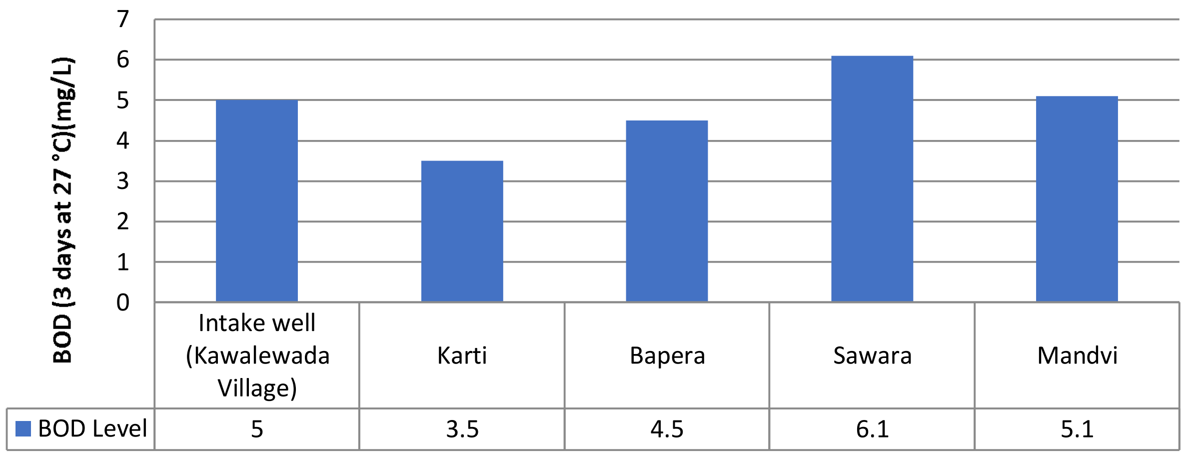
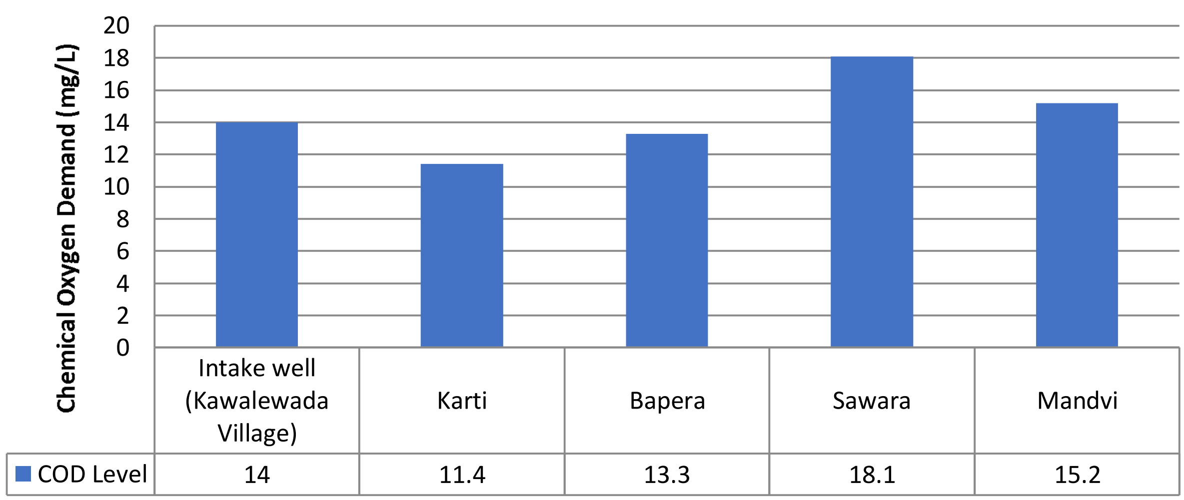
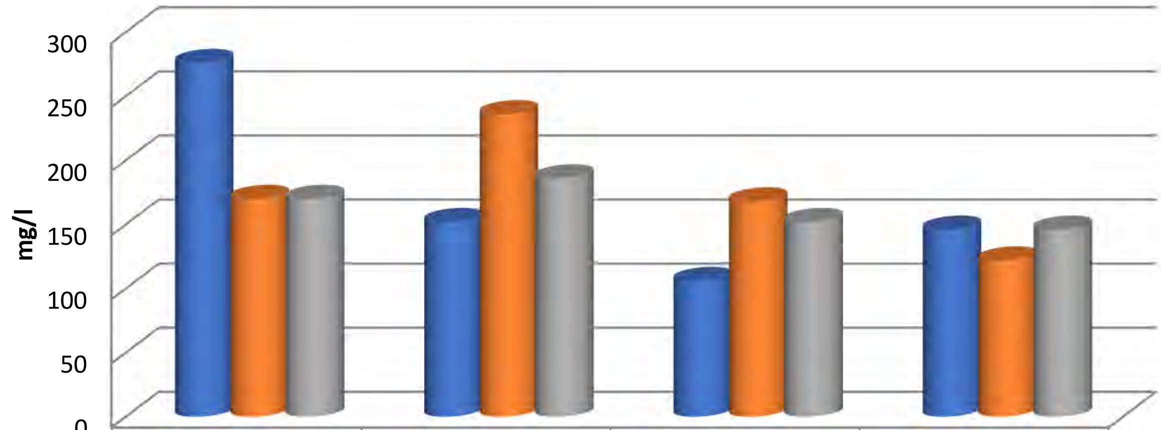


Figure 6.63: Variation in Water Quality of Wainganga - COD



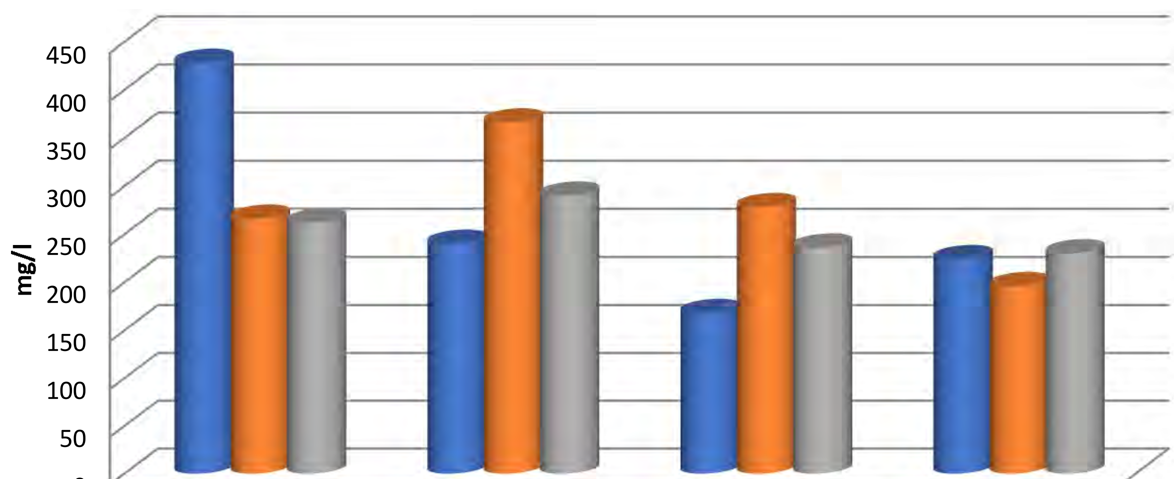
APML is regularly monitoring the raw water quality at intake well. The long term trend of variationa in raw water quality of Wainganga river at intake well for the period of 2016 to 2018 is presented in Table 6.15 and Figure 6.64 to 6.72.

FIGURE 6.64: SEASONAL CHANGES IN WATER QUALITY OF WAINGANGA RIVER- TDS



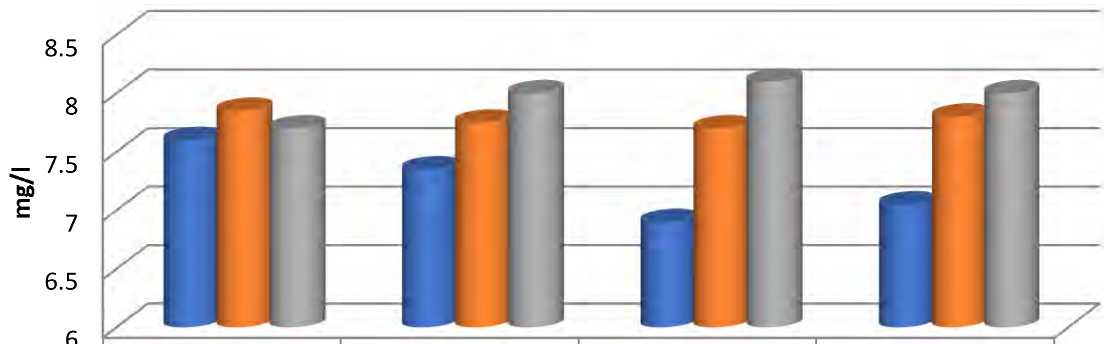
	Pre Monsoon	Monsoon	Post Monsoon	Winter
2016	276	152	106	146
2017	170	236	168	122
2018	170	186	152	146

FIGURE 6.65: SEASONAL CHANGES IN WATER QUALITY OF WAINGANGA RIVER- EC



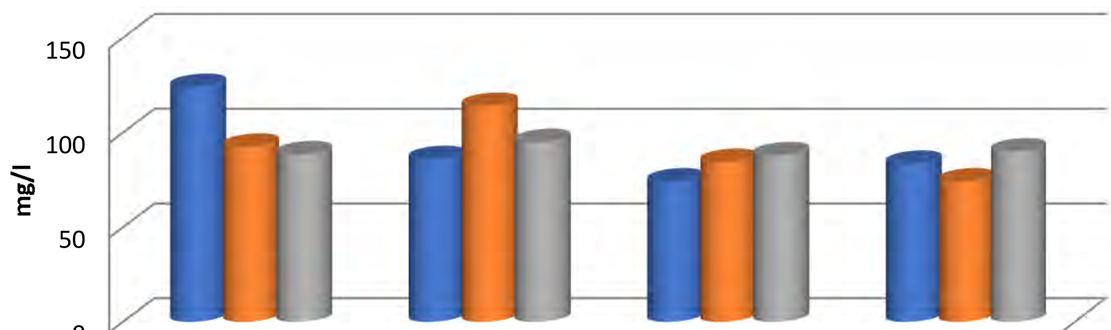
	Pre Monsoon	Monsoon	Post Monsoon	Winter
2016	428	240	168	224
2017	266	366	278	196
2018	262	290	236	230

FIGURE 6.66: SEASONAL CHANGES IN WATER QUALITY OF WAINGANGA RIVER- pH



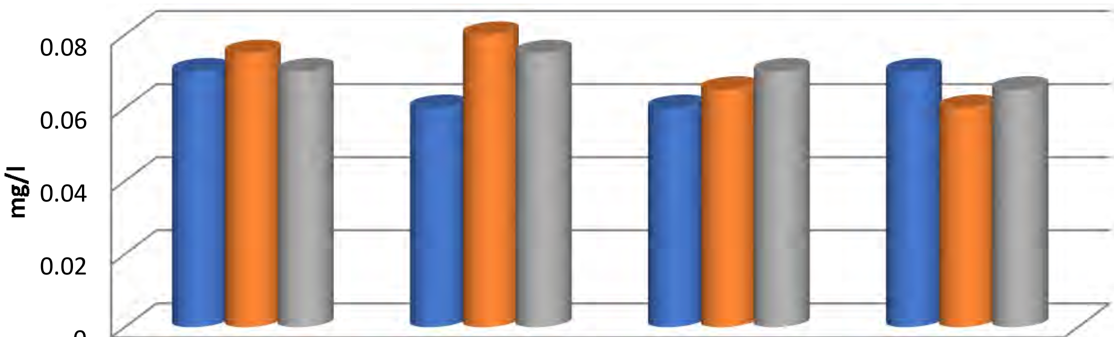
	Pre Monsoon	Monsoon	Post Monsoon	Winter
2016	7.6	7.35	6.9	7.05
2017	7.85	7.75	7.7	7.8
2018	7.7	8	8.1	8

FIGURE 6.67: SEASONAL CHANGES IN WATER QUALITY OF WAINGANGA RIVER- TOTAL HARDNESS



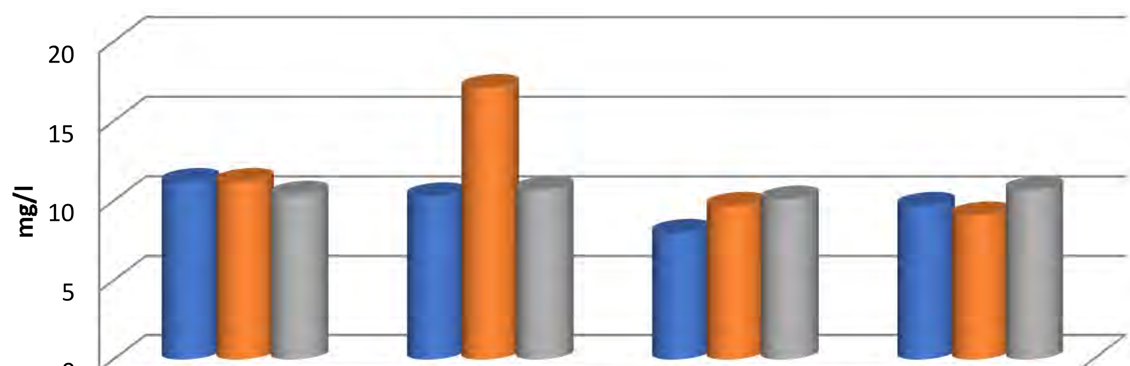
	Pre Monsoon	Monsoon	Post Monsoon	Winter
2016	124	86	74.2	83.5
2017	92.5	114	84.5	74.2
2018	88.5	95	88	90

FIGURE 6.68: SEASONAL CHANGES IN WATER QUALITY OF WAINGANGA RIVER- IRON



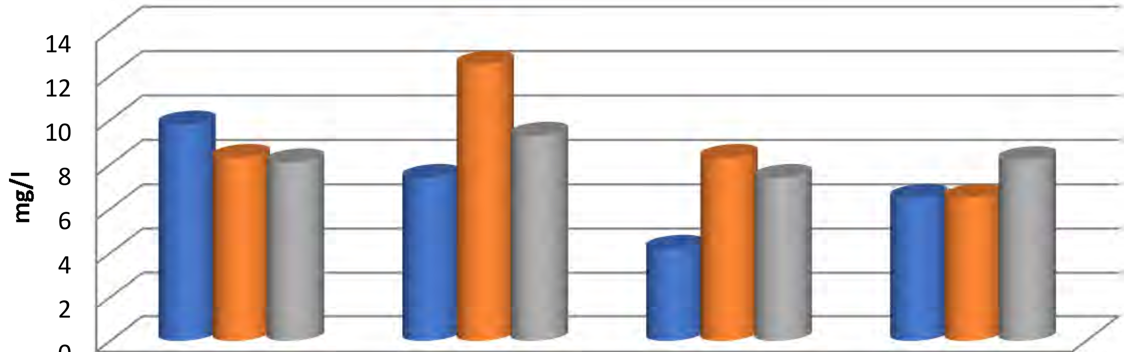
	Pre Monsoon	Monsoon	Post Monsoon	Winter
2016	0.07	0.06	0.06	0.07
2017	0.075	0.08	0.065	0.06
2018	0.07	0.075	0.07	0.065

FIGURE 6.69: SEASONAL CHANGES IN WATER QUALITY OF WAINGANGA RIVER- CHLORIDES



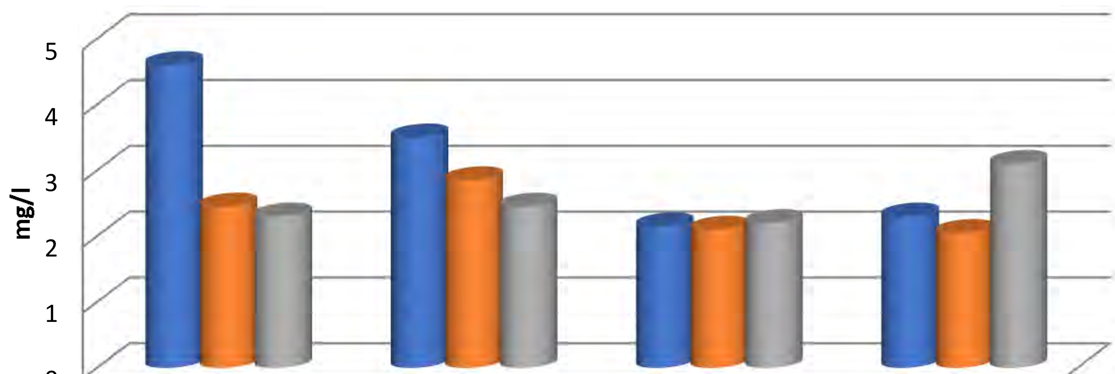
	Pre Monsoon	Monsoon	Post Monsoon	Winter
2016	11.2	10.3	8	9.7
2017	11.2	17.1	9.7	9.1
2018	10.4	10.7	10.1	10.7

FIGURE 6.70: SEASONAL CHANGES IN WATER QUALITY OF WAINGANGA RIVER- SULPHATE



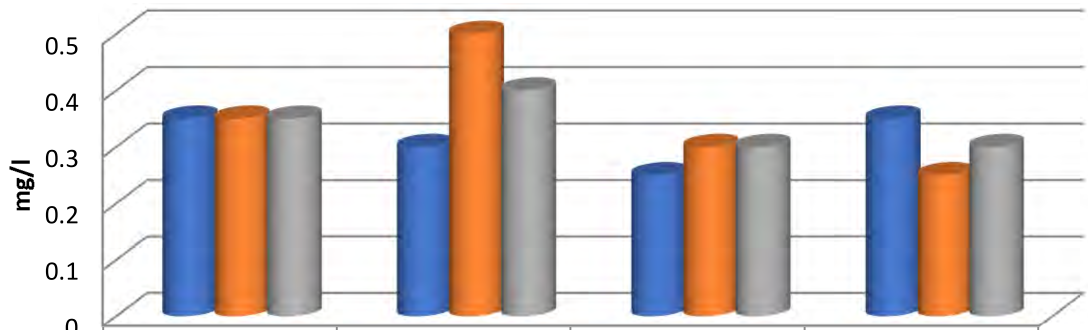
	Pre Monsoon	Monsoon	Post Monsoon	Winter
2016	9.8	7.4	4.2	6.5
2017	8.3	12.5	8.3	6.5
2018	8.1	9.3	7.4	8.2

FIGURE 6.71: SEASONAL CHANGES IN WATER QUALITY OF WAINGANGA RIVER- NITRATES



	Pre Monsoon	Monsoon	Post Monsoon	Winter
2016	4.6	3.5	2.15	2.3
2017	2.45	2.85	2.1	2.05
2018	2.3	2.45	2.2	3.1

FIGURE 6.72: SEASONAL CHANGES IN WATER QUALITY OF WAINGANGA RIVER- FLUORIDE



	Pre Monsoon	Monsoon	Post Monsoon	Winter
2016	0.35	0.3	0.25	0.35
2017	0.35	0.5	0.3	0.25
2018	0.35	0.4	0.3	0.3

6.6 SEDIMENT LOAD

Over 95% of the annual sediment load is carried in the monsoon season. Generally the amount of sediment load transportd by rivers, termed as capacity, increasers exponentially with discharge. Large magnitude floods carry large amount of suspended sediments as well as bed load and can b conidered as channel clearing events. The sediment load transported by the river is dominated by suspended and wash load. The bed load transport is low. The suspended sediment load for Wainganga river recorded at Pauni is 0.48 g/l. The annual rate of siltation varies between 2 and 20 ha m/100 km^2. Water withdrawn primarily during monsoon period with high silt laden water may cause damage to under water components of intake well system resulting in costly repair and maintence of equipment. The problem is more severe in River Wainganga which carries lot of sediment containing quartz during monsoon.

Hence, the characteristics of sediment i.e. size, shape, hardness and concentration, which are site specific has to be assessed. Sediment sampling at intake site for concentration, sieve analysis and petro-graphic analysis (for mineral composition and shape) is essential for assessing their possible removal.

TABLE 6.15: STATUS OFWATER QUALITY OF WAIN GANGA RIVER AT INTAKE POINT OF APML

Test Parameters	Concentration											
	Mar-16	Jul-16	Sep-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	May-18	Aug-18	Nov-18
Apparent Colour	2	3.5	2	1.2	1.5	2.5	1.5	1	1.2	1.5	1.7	1.2
Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
Taste	-	-	-	-	-	-	-	-	-	-	-	-
Turbidity NTU	1	1.5	0.7	0.5	0.8	1.5	1	0.8	0.5	1	1.2	1
Total Dissolved Solid, mg/l	276	152	106	146	170	236	168	122	170	186	152	146
Electrical Conductivity,µmhos	428	240	168	224	266	366	278	196	262	290	236	230
Total Alkalinity, mg/l	130	114	62	86	110	142	136	128	108	136	130	128
pH Value	7.6	7.35	6.9	7.05	7.85	7.75	7.7	7.8	7.7	8	8.1	8
Total Hardness ($CaCO_3$), mg/l	124	86	74.2	83.5	92.5	114	84.5	74.2	88.5	95	88	90
Calcium (as Ca),mg/l	32	28.2	26	28.2	30.8	36.8	29.2	25.8	29.2	30.2	28	28.8
Magnesium (as Mg), mg/l	10.7	3.8	2.2	3.1	3.8	5.3	2.8	2.4	3.7	4.7	4.4	4.4
Copper as(Cu),mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron (as Fe),mg/l	0.07	0.06	0.06	0.07	0.075	0.08	0.065	0.06	0.07	0.075	0.07	0.065
Manganese as (Mn),mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Chlorides (as Cl) , mg/l	11.2	10.3	8	9.7	11.2	17.1	9.7	9.1	10.4	10.7	10.1	10.7
Sulphate (as SO_4), mg/l	9.8	7.4	4.2	6.5	8.3	12.5	8.3	6.5	8.1	9.3	7.4	8.2
Nitrates (as NO_3),mg/l	4.6	3.5	2.15	2.3	2.45	2.85	2.1	2.05	2.3	2.45	2.2	3.1
Fluoride (as F),mg/l	0.35	0.3	0.25	0.35	0.35	0.5	0.3	0.25	0.35	0.4	0.3	0.3
Phenolic Compounds,mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	BDL
Mercury as (Hg),mg/l	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Cadmium as (Cd),mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Selenium as (Se),mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic as (As),mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	BDL

Cyanide as (CN),mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Lead as (Pb),mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc as (Zn),mg/l	0.17	0.1	0.08	0.12	0.18	0.24	0.18	0.12	0.15	0.157	0.12	0.12
Chromium as (Cr^{+6}),mg/l	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Mineral Oil,mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Residual Chlorine,mg/l	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Total Coliform, MPN	< 16	< 16	12	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	> 16
E.Coli, MPN	7	10	8	10	14	< 16	< 16	< 16	12	15	8	14

Source: Environmental Laboratory - APML



Bathymetry Survey using ADCP & Eco- sounder at Upstream of Wainganga River



Bathymetry Survey using ADCP & Eco- sounder at Upstream of Wainganga River



Bathymetry Survey using ADCP & Eco- sounder at Upstream of Wainganga River

Photo Plate-8

Photo Plate-9

7.0 ECOLOGICAL IMPACT ASSESSMENT

7.1 FRAMEWORK FOR ECOLOGICAL IMPACT ASSESSMENT

The river Wainganga and its tributaries are home to a wide variety of aquatic biota (microscopic flora and fauna to higher invertebrates, vertebrates and plants). The status of flora and fauna of River Wainganga and its riparian zones have been documented over past few decades. The overall biological profile of River Wainganga is shown in Figure 7.1.

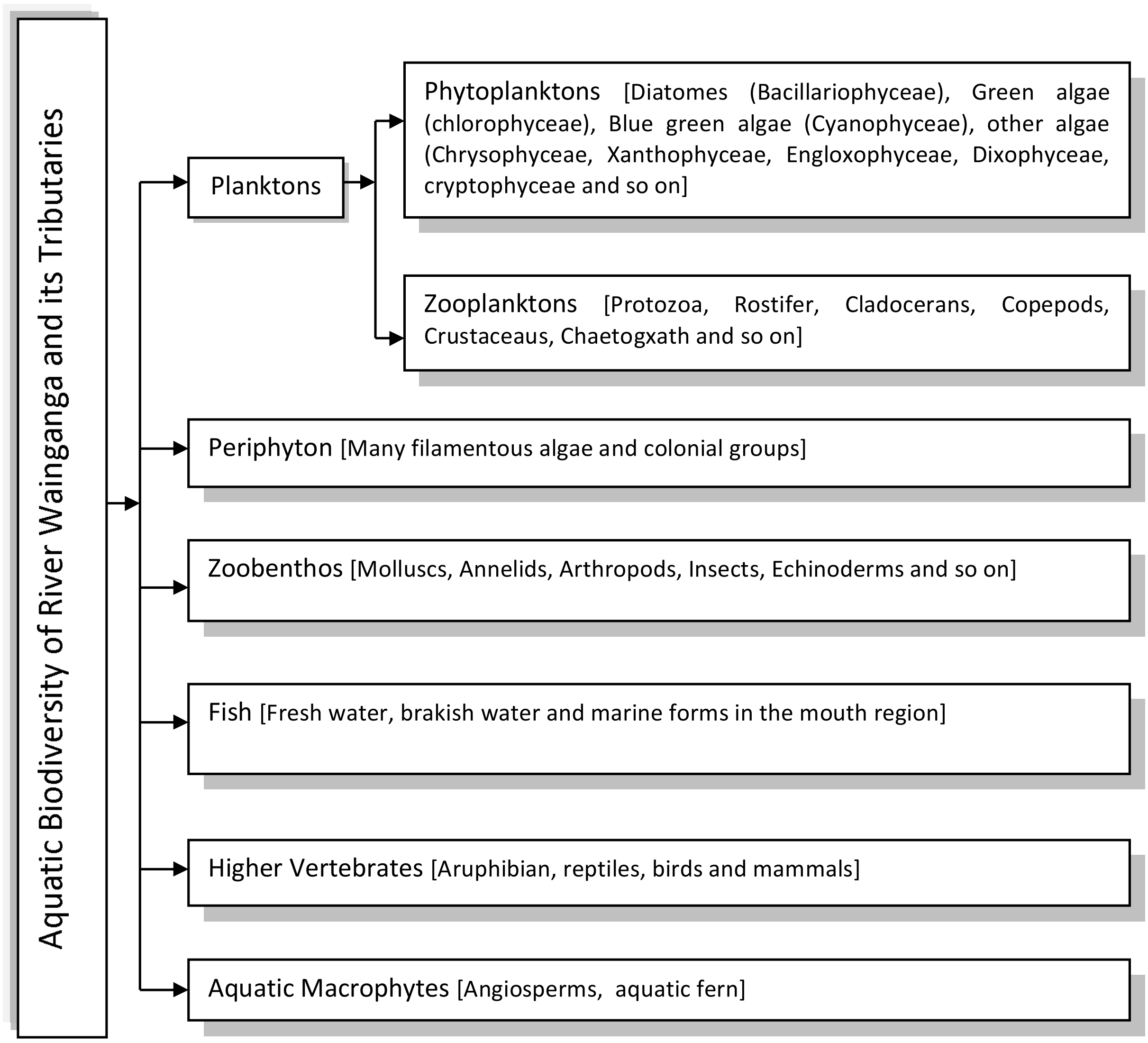


FIGURE 7.1: AQUATIC BIODIVERSITY OF RIVER WAINGANGA AND ITS TRIBUTARIES

The aquatic ecosystem of river Wainganga comprises of producers (viz., Planktons, Macrophytes, Periphytons) and consumers like benthic organisms and fishes, amphibian, reptiles, birds and aquatic mammals).

The present study was undertaken to understand the likely ecological impact of 70 MCM water withdrawl from Dhapewada barrage at river Wainganga for operation of Tiroda Thermal Power Plant.

The aquatic biodiversity of River Wainganga is unique and categories in three major regions namely upper reach , middle reach and lower reach . The present study confined in middle reach covering 10 - 15 km upstream and 10 km downstream of water intake site at Dhapewad Barrage.

7.2 ECOLOGICAL SAMPLING TECHNIQUES

The field survey was undertaken in winter season (January-February, 2019). During field survey sampling locations were identified through field visit along the river course of study area. For plankton study, five locations were selected include the water intake site of Tiroda TPP (Table 7.1). With the help of mechanised/manual vessel, water sample of mid river streams was collected (at a depth of 0.5 – 1.0 meter) and filtered through plankton net (mesh 40 nm). At each sampling location 100 litter of river water was filtered and samples were collected and preserved. The samples were brought to laboratory for microscopic study to ascertain the taxa. Periphytons were collected at random at river banks. Zoobenthios and other macro flora/fauna were examined along the study stretch. The aquatic macrophytes and riparian vegetation composition were also recorded during field survey.

TABLE 7.1: DETAILS OF THE SAMPLING LOCATION FOR ECOLOGICAL MONITORING

Sample No.	Location	Latitude	Longitude	Date of Sampling	Village
S_1	Tiroda TPP water intake point, near Dhapewada Barrage	$21^0$26′31″	$79^0$53′01″	01.02.19	Devada
S_2	2-3 km upstream of Barrage	$21^0$27′51.5″	$79^0$53′44″	01.0 2.19	Bhandara
S_3	10 km upstream of Barrage (Near confluence of Bamunthadi River and Wainganga River)	$21^0$30′47.7″	$79^0$55′30″	01.02.19	Bupera-Chandori river link
S_4	14-15 km upstream from Barrage	$21^0$32′52.6″	$79^0$55′29.5″	01.02.19	Sawriya-Kumli river link
S_5	5 km downstream from Barrage	$23^0$68′83″	$82^0$74′70″	02.02.19	Mandavi

Plankton samples were preserved after collection on site using FAA preservative and then brought to laboratory for further qualitative and quantitative analysis. Other aquatic biota were collected/observed at the field site and the proper recording were made with the help of standard literature of flora and fauna and previous biotic information of the Wainganga river.

7.3 STATUS OF AQUATIC FLORA & FAUNA

The aquatic ecosystem of Wainganga river comprises of river network, adjoining swamps and a couple of reservoirs or artificial lakes viz., Khairbanda, Bodalkasa and Chorkhamara. The prominent biotic components include producers like planktons, periphytons, macrophytic plants and consumers like benthic invertebrates, fishes, amphibian, reptiles, water birds and aquatic mammals. The biotic distribution in river Wainganga as revealed in the present study are summarised below:

(a) Plankton Diversity and Plankton Load analysis

The details of plankton diversity and the corresponding load of each sample thus collected were analysed and tabulated in Table 7.2 and 7.3. On careful analysis of plankton diversity, it appears that upstream of the intake well represents the diverse distribution of both phyto and zooplankton than the downstream samples. The most dominant phytoplanktons were *Microcystis*, *Merismopedia*, *Nostoc*, *Anabaena*, *Scenedesmus*, *Navicula*, *Cymbella*, *Gonatozygon*, *Zygnema*, *Spirogyra* and *Oedogonium* species (Figure 7.2). Identically dominant zooplanktons were *Brachionus*, *Keratella*, *Cyclops*, *Bosmina*, *Cypris* and *Naupilus* larvae (Figure 7.3).

.

TABLE 7.2: PHYTOPLANKTON DIVERSITY AND PLANKTON LOAD IN WAINGANGA RIVER

Phytoplanktons			Sampling Locations with Load (no/100 ml)				
			S_1 (Intake)	S_2 (U/s)	S_3 (U/s)	S_4 (U/s)	S_5 (D/s)
(A)	**Chlorophyceae:**						
	1.	*Scenedesmus* sp.	40	50	60	40	10
	2.	*Spirogyra* sp.	60	70	40	50	20
	3.	*Zygnema* sp.	50	60	40	40	10
	4.	*Oedogonium* sp.	40	50	40	40	10
	5.	*Gonatozygon* sp.	30	30	30	20	-
(B)	**Bacillariophyceae:**						
	6.	*Cymbella* sp.	40	60	740	40	10
	7.	*Navicula* sp.	50	40	40	45	10
	8.	*Nitszia* sp.	40	30	30	30	-
(C)	**Cyanophyceae:**						
	9.	*Microcystis* sp.	60	70	60	50	20
	10.	*Nostoc* sp.	40	40	40	30	10
	11.	*Anabaena sp.*	50	50	40	30	-
	12.	*Merisruopedia sp.*	60	50	40	30	20
	13.	*Oscillatoria sp.*	30	40	40	40	20

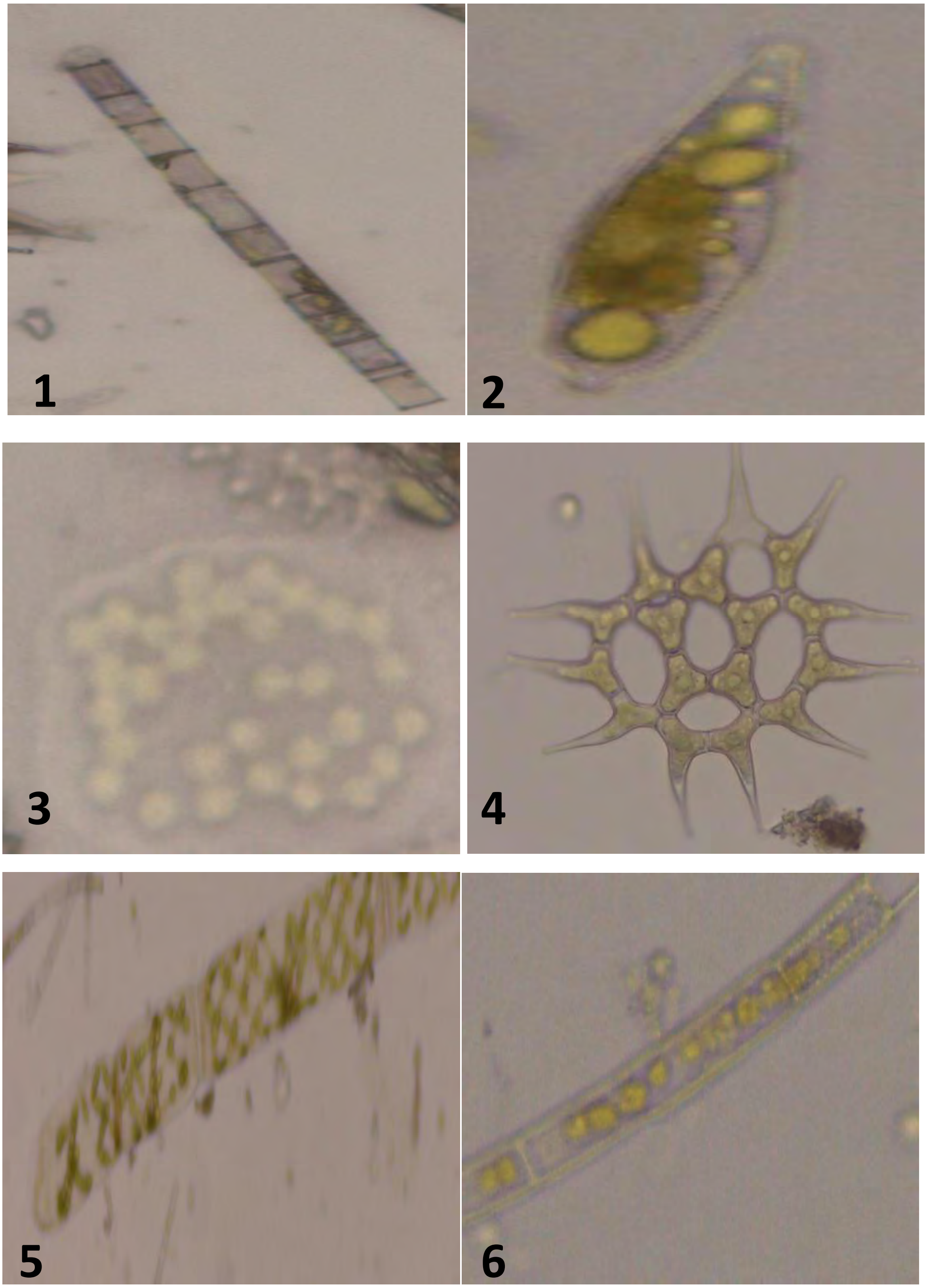
Sampling Locations: S1: Water Intake Point; S2: Bhandara Village; S3: Bupera Village; S4:Sawraya Village; S5: Mandvi Village; U/s: Upstream; D/s: Downstream

TABLE 7.3: ZOOPLANKTON DIVERSITY AND PLANKTON LOAD IN WAINGANGA RIVER

Zooplanktons			Sampling Locations with Load (no/100 ml)				
			S_1 (Intake)	S_2 (U/s)	S_3 (U/s)	S_4 (U/s)	S_5 (D/s)
(A)	**Rotifer:**						
	1.	*Brachionus* sp.	30	40	30	30	10
	2.	*Keratella* sp.	40	30	40	40	-
(B)	**Cladocera:**						
	3.	*Bosmina* sp.	20	30	30	30	10
	4.	*Cypris* sp.	20	30	20	20	-
(C)	**Copepoda:**						
	5.	*Cyclops* sp.	30	30	40	30	10
	6.	*Naupilus* sp.	40	20	20	20	20

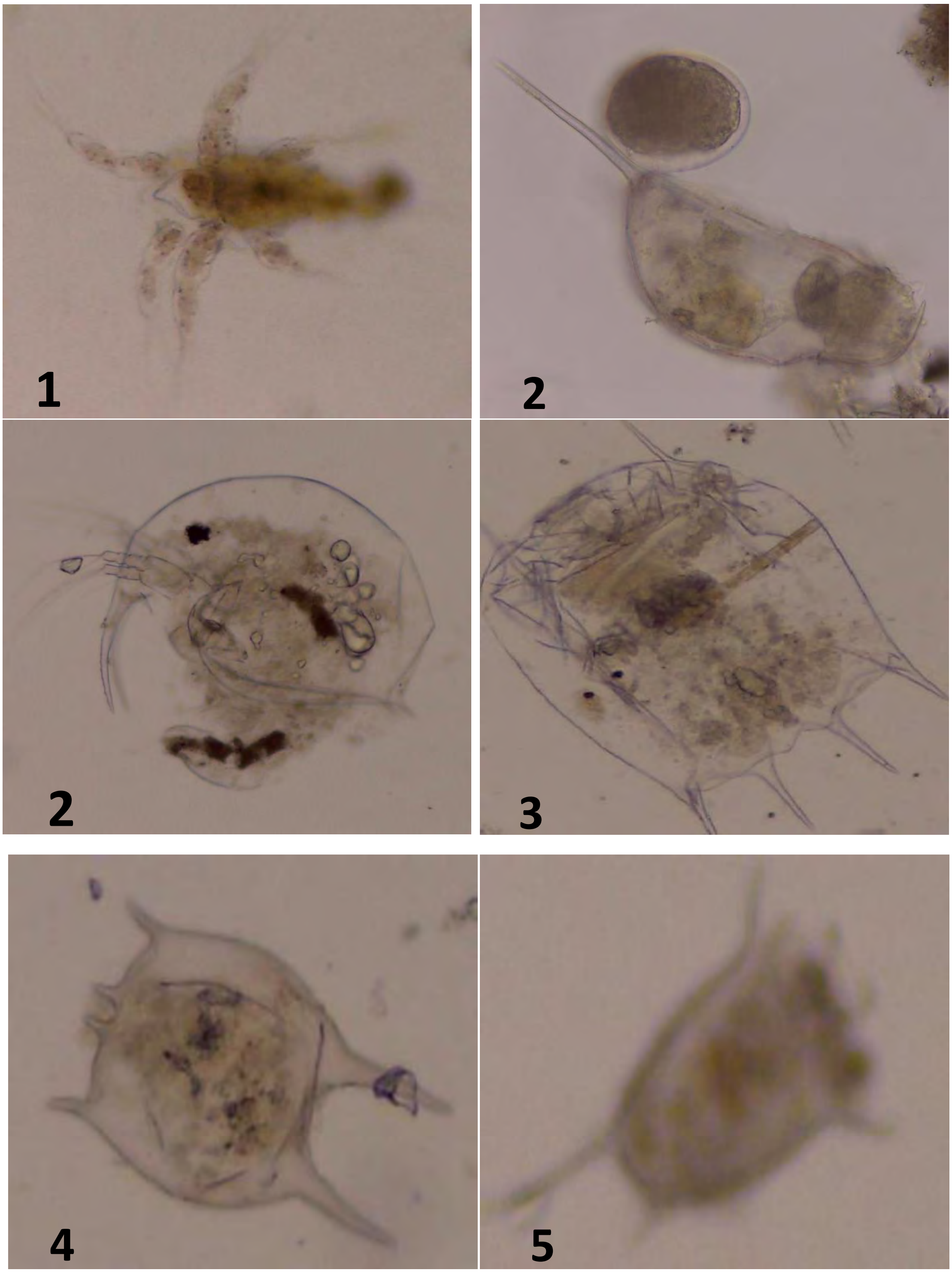
Sampling Locations: S_1: Water Intake Point; S_2: Bhandara Village; S_3: Bupera Village; S_4:Sawraya Village; S_5: Mandvi Village;
U/s: Upstream; D/s: Downstream

By and large the dominant phytoplanktons belong to Chlorophyzeae, Bacillariophyceae and Cyanophyceae, while dominant zooplanktons are Rotifers, Cladocera and Copepoda.



1.*Melosira* sp.; 2. *Euglena* sp.; 3. *Microcystis* sp.; 4. *Pediastrum sp.*; 5, *Spirogyra sp.* 6. *Zygnema sp.*

FIGURE 7.2: VIEW OF SELECTED PHYTOPLANKTON AT RIVER WAINGANGA



1. Nauplius sp. , 2. Daphnia sp.; 3 & 4. Brachionus sp.; 5. Keratella sp.

FIGURE 7.3: VIEW OF SELECTED ZOOPLANKTON AT RIVER WAINGANGA

Species Diversity Index: Species Diversity, which measures the bio-diversity and heterogeneity of aquatic ecosystem, was calculated based on the Shanon Weiner's function as follows:

$$H = -\sum_{i=1}^{n} \left(\frac{ni}{n}\right) log_2{}^{(n_i/n)}$$

Where ,

H= Species Diversity
n_i = Number of individuals of each species in sample
n= Total number of individuals of all species in the sample

As species diversity of a community got two components : (i) species richness, and (ii) species evenness, to calculate evenness Pielou's Index was used.

Pielou's Index of equitability (E): $E = {}^{H}/_{H_{max}}$

Where ,

E=Equitability Index (Range 0-1)
H= Observed Species Diversity
H_{max} = Maximum species diversity = Log_2 S
S= Total number of species in the community

The species diversity index and equitability index for phytoplanktons and zooplanktons at the study area is presented in Table 7.4 to 7.5. The analysis reveals that the phytoplankton diversity ranges from 3.239-3.665 whereas the equitability index ranges from 0.875 to 0.991. The analysis further reveals that the zooplankton diversity ranges from 1.922 to 2.556 whereas the equitability index ranges from 0.744 to 0.989. This indicate moderately water pollution.

TABLE 7.4: SHANON WEINER'S SPECIES DIVERSITY INDEX AND PIELOU'S INDEX OF EQUITABILITY FOR PHYTOPLANKTONS

S. No	Location	North Coordinates	East Coordinates	Date of Sampling	Diversity Index	Equitability Index
1.	S_1: Water Intake Point	$21^0$26′31″	$79^0$53′01″	01.02.19	3.660	0.989
2.	S_2: Bhandara Village	$21^0$27′51.5″	$79^0$53′44″	01.02.19	3.650	0.986
3.	S_3: Bupera Village	$21^0$30′47.7″	$79^0$55′30″	01.02.19	3.656	0.988
4.	S_4: Sawriya Village	$21^0$32′52.6″	$79^0$55′29.5″	01.02.19	3.665	0.991
5.	S_5: Mandvi Village	$23^0$68′83″	$82^0$74′70″	02.02.19	3.239	0.875

TABLE 7.5: SHANON WEINER'S SPECIES DIVERSITY INDEX AND PIELOU'S INDEX OF EQUITABILITY FOR ZOOPLANKTON

S. No	Location	North Coordinates	East Coordinates	Date of Sampling	Diversity Index	Equitability Index
1.	S_1: Water Intake Point	$21^0$26′31″	$79^0$53′01″	01.02.19	2.530	0.979
2.	S_2: Bhandara Village	$21^0$27′51.5″	$79^0$53′44″	01.02.19	2.556	0.989
3.	S_3: Bupera Village	$21^0$30′47.7″	$79^0$55′30″	01.02.19	2.530	0.979
4.	S_4: Sawraya Village	$21^0$32′52.6″	$79^0$55′29.5″	01.02.19	2.544	0.984
5.	S_5: Mandvi Village	$23^0$68′83″	$82^0$74′70″	02.02.19	1.922	0.744

(b) Periphytons: A good number of peryphytonic algal samples were collected from floating and semi-merged macrophytes of the area. They are mostly filamentous green and blue green algae. The dominant species were _Oedogonium_, _Zygnema,_ _Spirogyra_, _Oscillatoria_, and _Phormidium_.

(c) Macrobenthos: Diverse categories benthic macro invertebrates water collected during field survey and they were analyzed for taxonomic certainty. Mostly they belong to Annelida, Arthropoda and Mollusca groups. The checklist of dominant macro invertebrates are given in Table 7.6. The predominant annelida belongs to Oligochaeta viz., _Tubifex_ and _Limnodrilus_ species. Identically predominant arthropoda belongs to *Decapoda*, *Copepoda*, *Diptera*, *Odonata* and *Hemiptera*. The most abundant Molluscs belongs to gastropoda and bivalvia.

TABLE 7.6: CHECKLIST OF BENTHIC MACROINVERTEBRATES OF WAINGANGA RIVER OF THE STUDY AREA

Groups	Class/Order/Family	Scientific Name
Annelida	Oligochaeta - Tubificidae - Naididae	1. _Tubifex tubifex_ 2. _Limnodrilus_ sp. 3. _Pristina_ sp.
Arthropoda	Crustacea - Decapoda Insecta - Copepoda - Hemiptera - Diptera - Odonata	4. _Macrobrachium_ sp. 5. _Laccophilus_ sp. 6. _Gerris_ sp. 7. _Culex_ larvae 8. _Limnophora_ sp. 9. _Chironomus_ sp. 10. _Gomphus_ sp. (Nymph)
Mollusca	Gastropoda - Mesogastropoda - Basnumatophora Bivalvia - Unionoida	11. _Bellamya dissimilis_ 12. _Pila globosa_ 13. _Lymnaea_ sp. 14. _Lamellidens_ sp.

(d) Aquatic/Semiaquatic macrophytes: A good number of macrophytes were colected and identified from river sides, swamps and other categories of water bodies during the field survey. A detailed checklist of most dominant macrophytes are give in Table 7.7. Among the macrophytes, *Hydrilla* and *Vallisneria* species are submerged in shallow water bodies, while species of *Azolla*, *Eichhornea*, *Salvinia pistia*, *Lemna and Spirodella* are floating forms in stagnant water. The commonest reeds are *Typha angustifolia*. A checklist of aquatic and semi aquatic macrophytes are given in Table 7.7.

TABLE 7.7: CHECKLIST OF MACROPHYTES OF SWAMPS, WATERBODIES AND RIVERSIDE AREA

Group	Family	Scientific Name
Waterfern:		
	Azollaceae	1. *Azolla pinnata*
	Salviniaceae	2. *Salvinia molesta*
Aquatic angiosperms:		
	Alismataceae	3. *Sagittaria trifolia*
	Amaryllidaceae	4. *Crinum viviparum*
	Araceae	5. *Pistia stradiotes*
	Hydrocharitaceae	6. *Hydrilla verticillata*
		7. *Vallisneria spiralis*
	Lemnaceae	8. *Lemna minor*
		9. *Spirodela polyrrhiza*
	Najadaceae	10. *Najas indica*
		11. *Najas marina*
	Pontederiaceae	12. *Eichhornia crassipes*
	Potamogetonaceae	13. *Potamogeton crispus*
	Typhaceae	14. *Typha angustifolia*
	Acanthaceae	15. *Hygrophila spinosa*
	Amranthaceae	16. *Alternanthera sessilis*
		17. *Aerva lanata*
		18. *Celosia argentea*
	Asteraceae	19. *Eclipta alba*
		20. *Sphaeranthus indicus*
		21. *Spilanthus pariculata*
	Cyperaceae	22. *Cyperus* sp.
		23. *Scirpus articulatus*
	Gentianaceae	24. *Limanthemum speltatum*

(e) Fishes: The river Wainganga happens to be the home of good number of freshwater fishes. A total of 21 species of most dominant fishes were recorded, those belong to 8 families and 6 orders (Table 7.8). Except two/three species most of them were very common. The fish like *cotio* (bhongi), *olive barb* (darai) and butter catfish (Gongavari) are said to vulnerable categories as per IUCN status. Though the diversity of the fishes are not declining so much but the catch delines with time due to overfishing.

TABLE 7.8: FRESHWATER FISHES OF WAINGANGA RIVER

Order/Family	Scientific Name	Common Name (Local Name)	IUCN Status
Order – Cyprixiformes Family: Cyprindae			
	1. *Rasbora daniconius*	Stenderbarts (Dardai)	LRNT
	2. *Osteobrama cotio*	Cotio (bhongi)	VU
	3. *Puntius sarana*	Olive barb (darai/chalti)	VU
	4. *Puntius sophore*	Pool barb (Pothi)	LRNT
	5. *Puntius ticto*	Ticto barb (Pothia)	LRNC
	6. *Cirrhinus mrigala*	Indian Major Carp (Mirgal)	LRNC
	7. *Catla catla*	Indian Major Carp (Catla)	VU
	8. *Labeo rohita*	Indian Major Carp (Rahu)	LRlc
	9. *Salmostoma baciala*	(Chela)	LRlc
	10. *Samostoma boopis*	(Amali)	LRlc
Order – Siluriformes Family: Siluridae			
	11. *Ompok bimaculatus*	Butter catfish (Gougavarti)	Vu
Order – Beloriformes Family: Belonidae			
	12. *Xenextodon cancila*	Garfish (sooimasa)	LRlc
	13. *Hyporhamphus xanthopterus*	Red-tipped halfbeak (Choch maasa)	LRlc
Order – Osteoglossiformes Family: Osteoglossidae			
	14. *Notopterus notopterus*	(Pholi)	LRNT
Order – Synbranchiformes Family: Mastacerubelidae			
	15. *Macrognathus pancalus*	Barred spiny eel (Vambat)	LRLt
	16. *Mastacerubelus armatus*	Spiny eel (Varu)	LRLc
Order – Perciformes Family: Chandidae			
	17. *Chanda nama*	Elongate glass perchlet (chand)	LRLc
	18. *Parambassis ranga*	Indian glassy fish (ranga chanda)	LRLc
Family: Gobiidae			
	19. *Gobbius giuris*	Bar eyed goby (bailla)	LRLc
Family: Channidae			
	20. *Channa punctatus*	Spotted snakehead (lata)	LRNT
	21. *Channa striatus*	Stripped snakehead (dhoke)	LRLc

LRNT: Low Risk Nearly Threatened; LRLc: Low Risk Least Concern;
Vu: Vulnerable

(f) Amphibians: The commonest amphibians are Bull frog, six toed frog, tree frog and small frogs of water edges viz., *Limnocharis* sp.

(g) Reptiles: Water snakes are quite common in this area along with some fresh water turtles and water monitor, particularly in swamps and tributaries of the river.

(h) Aquatic mammals: There is no report of major aquatic mammals in this area.

(i) Water Birds: Due to predominance of riverian network and several other categories of water bodies outside and inside the Tiger Reserve and sanctuary within the radius 30 km, a good number water birds are frequently noticed/recorded in this region. A few of them are migratory categories. A checklist of dominant water birds and their residential and abundance status is shown in the Table 7.9. A total of 51 water bird species belong to 12 families and 6 orders were so far enlisted.

The population diversity of the birds in the study area is significantly fluctuating between months. Till now many migratory birds species were noticed in this region. Due to presence of a good number artificial lakes/reservoirs and swampy zone along with sanctuary areas, the habitat is very much suitable for both resident and migratory birds.

TABLE 7.9: CHECKLIST OF WATER BIRDS OF THE WAINGANGA RIVERS AND ADJOINING ARTIFICIAL LAKES/RESERVOIRS AROUND TIRODA TPP

Order/ Family	Sl. No.	Scientific Name	Common Name	Residential Status	Abundance Status
Order I Anseriformes Family: Analidae					
	1	*Dendrocygna javanica*	Lesser Whistling Duck	SV	UC
	2	*Anser anser*	Greylag Goose	PV	Rr
	3	*Anser indicus*	Bar-headed Goose	WV	O
	4	*Sarkidiorxis melanotos*	Comb Duck	PV	Rr
	5	*Tadorna ferruginea*	Ruddy Shelduck	WV	UC
	6	*Nettapus coromandelianus*	Cotton Pygmy Goose	R	VC
	7	*Anas strepera*	Gadwall	WV	O
	8	*Anas penelope*	Eurasian Wigeon	PV	Rr
	9	*Anas platyrhynchos*	Mallard	PV	Rr
	10	*Anas poecilorhyncha*	Western Spot Billed Duck	R	C
	11	*Anas acuta*	Northern Pintail	WV	UC
	12	*Anas crecca*	Common Teal	WV	O
	13	*Netta rufina*	Red Crested Pochard	WV	O
	14	*Athya Ferina*	Common Pochard	WV	O
	15	*Athya nyroca*	Ferruginous Duck	PV	Rr
	16	*Athya fuligula*	Tufted Duck	WV	O

Order II Podicipediformes **Family: Podicipedidae**					
	17	*Tachyba ptusruficollis*	Little Grebe	R	UC
Order III Ciconiiformes **Family: Ciconiidae**					
	18	*Mycteria peucoceptala*	Painted Stork	WV	O
	19	*Anastromus oscitaus*	Asian Openbill	R	VC
	20	*Ciconia nigra*	Black Storx	WV	O
	21	*Ciconia episcopus*	Wooly-necked Stork	WV	O
Family: Threskio rnithidae					
	22	*Treskiornis melaxocephakes*	Black Headed Ibis	SV	UC
	23	*Pseudibis papillosa*	Red-Naped Ibis	R	C
Family: Ardeidae					
	24	*Ardeola grayii*	Indian Pond Heron	R	VC
	25	*Ardea cinerea*	Grey Heron	WV	O
	26	*Ardea purpurea*	Purple Heron	R	C
	27	*Bubulcus ibis*	Cattle Egret	R	VC
	28	*Casmerodius albus*	Great Egret	R	VC
	29	*Mesophoyxinter media*	Internediate Egret	WV	UC
	30	*Egretta garzetta*	Little Egret	R	VC
Order IV Pelecariformes **Family: Phalacrocoracidae**					
	31	*Phalacrocorax niger*	Little Cormorants	R	VC
	32	*Phalacrocorax fuscicollis*	Indian Cormorant	WV	O
	33	*Phalacrocorax carbo*	Great Cormorant	WV	O
Family: Anlingidae					
	34	*Anluinga melanogaster*	Oriental Dater	PV	R
Order V Gruiformes **Family: Rallidae**					
	35	*Porphyrio porphyrio*	Purple Swamp Hen	R	UC
	36	*Gallinula chloropus*	Common Moor Hen	R	UC
	37	*Fulica atra*	Common Coot	WV	O
Order VI Charadriiformes **Family: Recurvirostridae**					
	38	*Hamantopushi mantopes*	Black Winged Stilt	R	C
Family: Charadriidae					
	39	*Vanellus duvancelii*	River Lapwing	PV	Rr
	40	*Vanellus indicus*	Red-Wattled Lapwing	R	VC
	41	*Pluvialis fulva*	Pacific Golden Plover	PV	Rr
	42	*Charadrius dubius*	Little Pringed Plover	R	VC
Family: Jacanidae					
	43	*Hydrophasianus chirurgus*	Pheasant-tailed Jacana	R	UC
	44	*Metopidius indicus*	Bronze Winged Jacana	R	UC

Family: Scolopacidae					
	45	Gallinago gallinago	Common Snipe	WV	O
	46	Tringa stragratilis	Marsh Sandpiper	WV	UC
	47	Tringa nebularia	Common Green Shark	WV	O
	48	Tringa glareola	Wood Sandpiper	WV	UC
	49	Achits hypoleucos	Common Sandpiper	WV	O
	50	Calidris temminckii	Teraminch's Stint	WV	O
	51	Calidris alpina	Dunlin	PV	Rr

R: Resident; WV: Winter Visitor; SV: Summer Visitor; PV: Passage Visitor; Rr: Rare; O: Occasional; UC: Uncommon; C: Common; VC: Very Common

Among the 51 water birds, a good number of them are said to be threatened (Table 7.10) but some of them are very common in this region due to abundance of waterbodies.

TABLE 7.10: THREATENED WATER BIRDS OF GONDIA DISTRICT, MAHARASHTRA

Sl. No.	Scientific Name	Common Name	Residential Status	Abundance Status
1	Sarkidiornis melanotos	Comb Duck	PV	Rr
2	Aythya nyroca	Ferruginous Duck	PV	Rr
3	Mycteria leucocephala	Painted Stork	WV	O
4	Anastomus oscitans	Asian Openbill	R	VC
5	Threskiornis melanocephalus	Black Headed Ibis	SV	UC
6	Bubulcus ibis	Cattle Egret	R	VC
7	Casmerodius albus	Great Egret	R	VC
8	Mesobhoyx intermedia	Inermediate Egret	WV	UC
9	Phalacrocorax niger	Little Cormorant	R	VC
10	Anhinga melanogaster	Oriental Darter	PV	Rr
11	Vanellus duvancelii	River Lapwing	PV	Rr
12	Pluvialis fulva	Pacific Golden Plover	PV	Rr
13	Hydrophasianus chirurgus	Pheasant-Tailed Jacana	R	UC
14	Metopidius indicus	Bronze-Winged Jacana	R	UC
15	Calidris alpina	Dunlin	PV	Rr

PV: Passage Visitor; WV: Winter Visitor; SV: Summer Visitor; R: Resident; Rr: Rare;
O: Occasional; VC: Very Common; UC: Uncommon.

7.4 ECOLOGICAL IMPACT

There are many factors which may affect the ecological integrity of river Wainganga of which anthropogenic activities along the river Wainganga is of the prime concern. These causatives are of major concern today with respect to threat of aquatic biodiversity of river Wainganga. The some of the major causes includes habitat fragmentation, shrinkage, alteration, Invasion by Alien Species, encroachment, disturbances and malnutrition, etc.

There are multiples causes of habitat alteration viz., river pollution, changing river geomorphology, etc. The high levels of pollutants in the river have their own fatal effects on river biota.

Exotic species like *Cyprirus* carp, filapia, thaimagur, grass carp, brown front influenced very much on riverian biotic distribution. Many such exotic species consume the native wild spcies as food or spread the parasiic diseases.

Since longtime human beings have been encroaching upon river especially by occupying much of the flood plains and parts of river banks for various purposes. In adition, the increased constructions on flood plains have led to altered run off pattern into rivers, increased pollution inflows with runoff, reduced ground water recharge and hence decreased base flows in rivers and curtailed ecological linkages between the river, its flood plains and flood plain wetlands. On the other hand, river bed farming together with modern chemical pesticides such as DDT and HCH, have polluted the river bed, thus affecting the health of the aquatic creatures (especially the hyporpheic biota) and disturbing the breeding sites of higher aquatic animals. During the field survey it was observed that massive river bed farming of crops and vegetables with pesticides and fertilizer and anthropogenic changes of river connectivity with wetland like.

The recent study of avifauna distribution around the power plant (Puri and Virani, 2017) does not indicate any adverse effects of Adani Thermal Power Plants in the surround environment in and around due to its unique geographical/physiographic location.

In general, the shallow water regime of river system can support the small fishes, but major carps Catla, Rahu, Calbasu and some larger catfishes could not survive and breed in shallow water bodies as they did not receive the desired ecological flow requirement (0.9-1.2 m/s) of rivers and also the depth (0.6 to 1.5 m).

Frequent disturbances of the Wainganga river habitat by anthropogenic activities like intensive fishing, frequent shipping and waste disposal from municipal/township area and so on, often possess serious concern on survibility and population growth of aquatic biota of river.

Eutrophication of river either by inorganic pollutant/organic pollutants lead to loss of riverine biodiversity. Sometimes some essential micronutrients may not be available in river for proper bloom of plankton thus affecting riverian ecosystem food chain.

Based on the above threat assesment, the following essential actions are envisaged to restore the ecological balance of the River Wainganga:

(a) Restoration of longitudinal connectivity along with maintenance of environmental flows and sediments throughout the Wainganga river network;

(b) Maintenance of lateral and vertical connectivity across rivers and flood plains is also needed to provide breeding sites of fish and other aquatic/amphibious animals and plants as well as the periodic exchange of river biota with flood plain wetlands;

(c) Restoration of unpolluted flow in the river by appropriate measures to control anthropogenic pollution;

(d) Restrictions on anthropogenic alterations of river morphology by gravel and sand mining as well as by river bed and river bank modifications by structural measures;

(e) Elimination of alien invasive species from the Wainganga river network and establishing norms to prevent future introductions of exotic species.

The efficient water use in agriculture and industries certainly reduces the requirement of lifting of water from flowing perennial rivers particularly in pre-monsoon period. Water conservation through rain water harvesting and ground water recharge is the need of the hours.

As the water availability at intake site is very high, the water abstraction of only 70 MCM/year from Dhapewada barrage at river Wainganga for Tiroda Thermal Power Plant is not likely to have any significant ecological impact. However, it may have some ecological impact in the form of habitat shrinkage and alteration. To combat/compensate the habitat shrinkage sand bars which were formed on the river bed need to be dredged in a periodic interval.

There is need for proper water storage planning as monsoon rainfall in this area is moderate to high. The rainfall of the area particularly in the Wainganga catchment area varies from 1200-1500 mm/year. The river having significant sediment load as such water storage capacity decline with times due to the formation of sand bar and sand bar on river bed particularly in the downstream of Dhapewada barrage in this case. There are a number construction across the river, particularly bridges and water lifting structures. In this river there is no reports of large mammals in aquatic habitat, only fishes of some families are said to be rare and threatened. Ex-situ conservation of those species through inland captive culture practices can alleviate the immediate problem. Over fishing in the river can also be regulated through enhanced planning along with promotion for inland aquaculture practices. Appropriate water audit in power plant and dry ash disposal system can be explored/strengthened.

Photo Plate-10

8.0 SOCIO-ECONOMIC PROFILE

To assess the socio economic profile the villages falling within 2 km distance along with both the bank of the river Wainganga in down stream up to Gose Dam have been identified using 2011 census atlas and the list of the same is presented in Annexure 8.1. The demographic profile of these villages along with the downstream of the river Wainganga, on both the right and left side bank falling in the districts of Gomdia, Bhandara and Nagpur in Maharashtra as well as the land use pattern and irrigation facilities have been extracted using the latest census data i.e 2011 and other documents of Department of Water Resource and Irrigation, Government of Maharashtra and have been analysed to assess the existing water usage pattern and livelihood dependency on river Wainganga at down stream upto the nearest next barrage from water intake location i.e Gose Dam. For public consultation to identify and assess the dependency of the local people on river Wainganga and likely impact caused due to drawl of water for Tiroda TPP. The questionnaire has been developed and were used for the purpose (Annexure 8.2).

8.1 DEMOGRAPHIC PROFILE

The villages at the downstream reach of river Wainganga lies in Tirora block of Gondia district and Tumsar, Mohadi, Bhandara & Pauni blocks of Bhandara district as well as Kuhi block of Nagpur in Maharashtra. The village wise demographic profile of the population in the area under influence of the project is attached in the Annexure 8.3.

In total 116 villages lies in this zone, of which 105 villages are inhabited. The detail of downstream villages falling under the river reach of Wainganga are presented in Table 8.1. Figure 8.1 and 8.2 present the geographical and administrative distribution (i.e. District /Block wise) of downstream villages.

TABLE 8.1: GEOGRAPHICAL DISTRIBUTION OF VILLAGES IN DOWNSTREAM OF RIVER WAINGANGA

Sl. No.	State	District	Block	No. of Villages		
				Inhabited	Uninhabited	Total
1	Maharashtra	Gondia	Tiroda	11	-	11
2		Bhandara	Tumsar	17	-	17
3			Mohadi	15	-	15
4			Bhandara	33	6	39
5			Pauni	10	-	10
6		Nagpur	Kuhi	19	5	24
TOTAL				105	11	116

Figure 8.1: District Wise Distribution of Downstream Villages

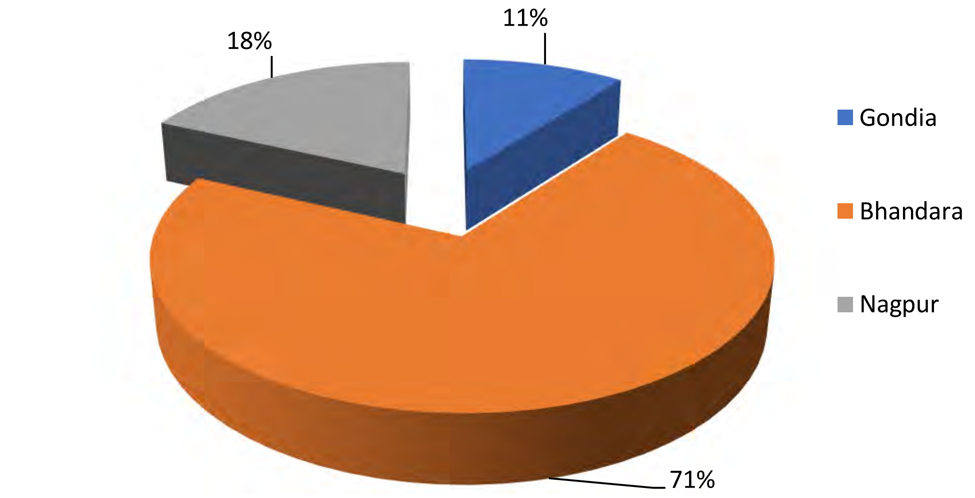
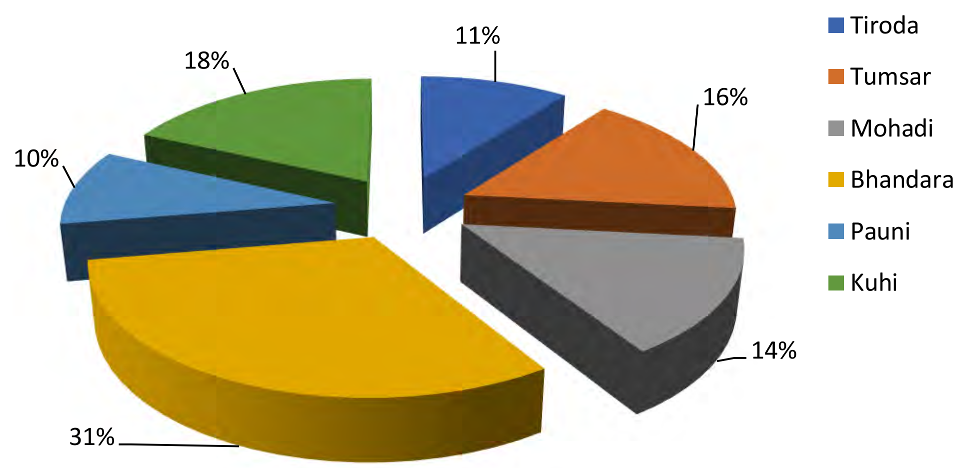


Figure 8.2: Block Wise Distribution of Downstream Villages



8.1.1 Household & Population

As per Census of India, 2011 data, total populations in the downstream villages at river reach upto next barrage i.e. Gose is 1,27,529 covering a total of 29,203 households on both the right and left side bank of the Wainganga river. The detail of households and total population in this zone are depicted in Table 8.2. Block wise distribution of number of households and popuation are presented in Figure 8.3 and 8.4.

TABLE 8.2: DEMOGRAPHIC PROFILE OF VILLAGES IN DOWNSTREAM OF RIVER WAINGANGA

Sl. No.	State	District	Block	No. of Household	Total Population
1	Maharashtra	Gondia	Tiroda	2543	11603
2		Bhandara	Tumsar	5978	27000
3			Mohadi	4227	18785
4			Bhandara	11248	48346
5			Pauni	2492	10451
6		Nagpur	Kuhi	2715	11344
				29203	127529

Figure 8.3: Block Wise Distribution of Households in Downstream Villages

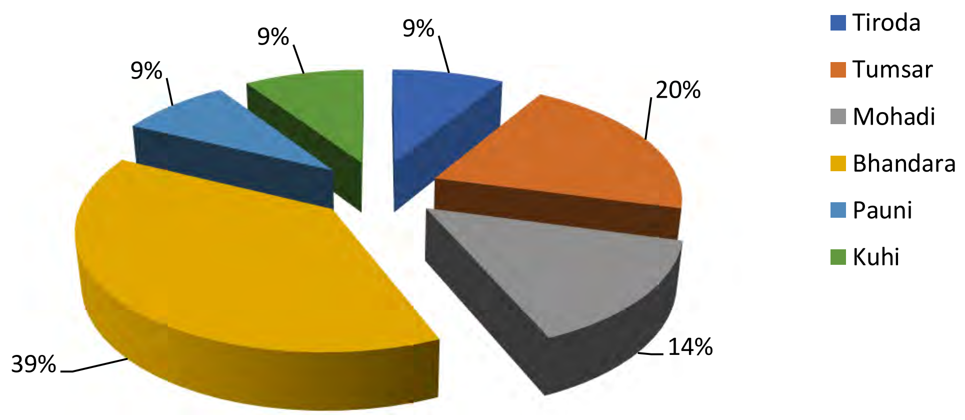
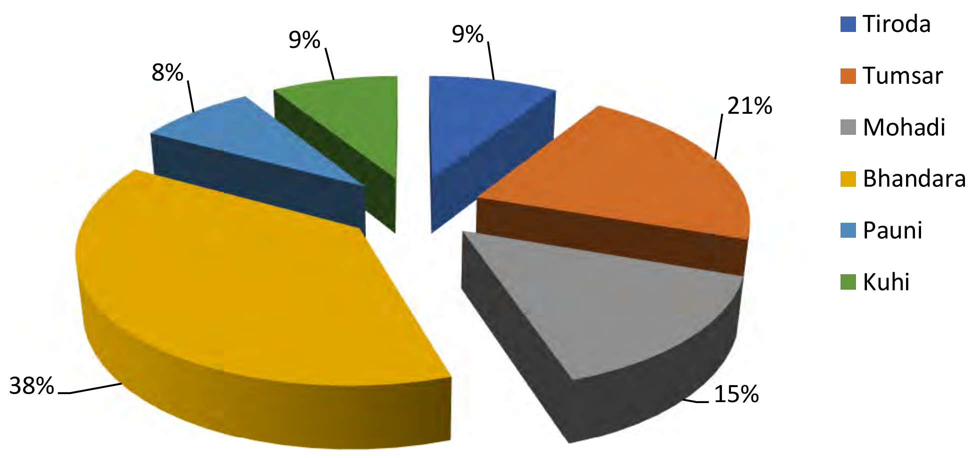


Figure 8.4: Block Wise Distribution of Population in Downstream Villages



8.1.2 Gender Wise Distribution

Gender wise distribution of population in downstream villages is presented in Figure 8.5. It shows that in Pauni Block 51.27% of the population are male and remaining 48.73% are female. Whereas in Tiroda Block, male population is 50.14% against 49.86% female population. Overall gender wise distribution of population in river reach is presented in Figure 8.6. It reveals that 50.55% of the population are male and remaining 49.45% are female in the downstream villages of Wainganga river.

Figure 8.5: Gender Wise Distribution of Population

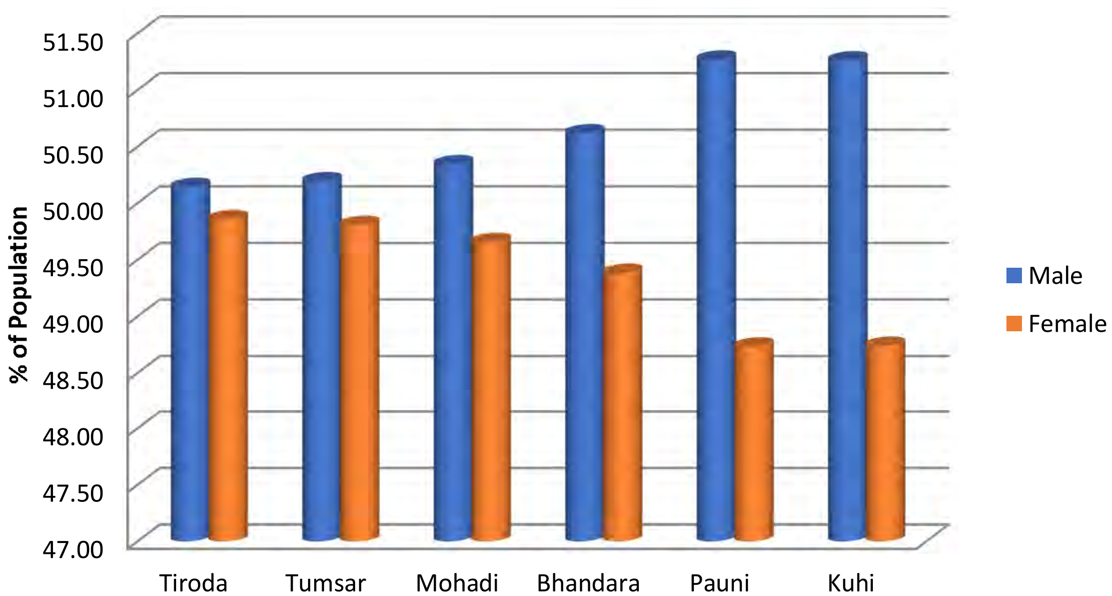
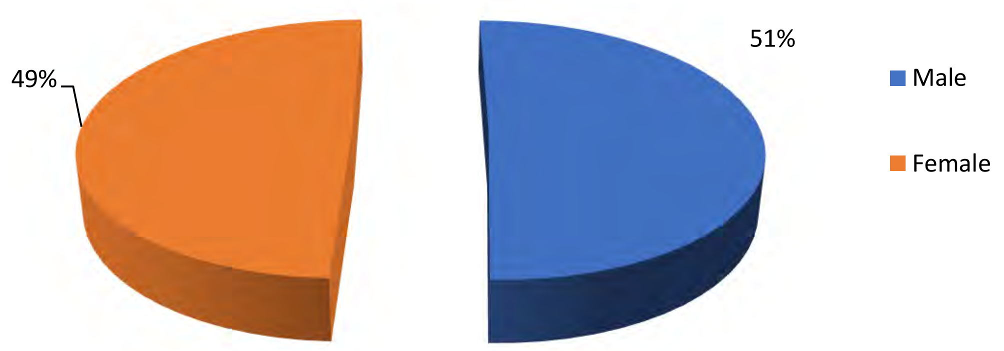


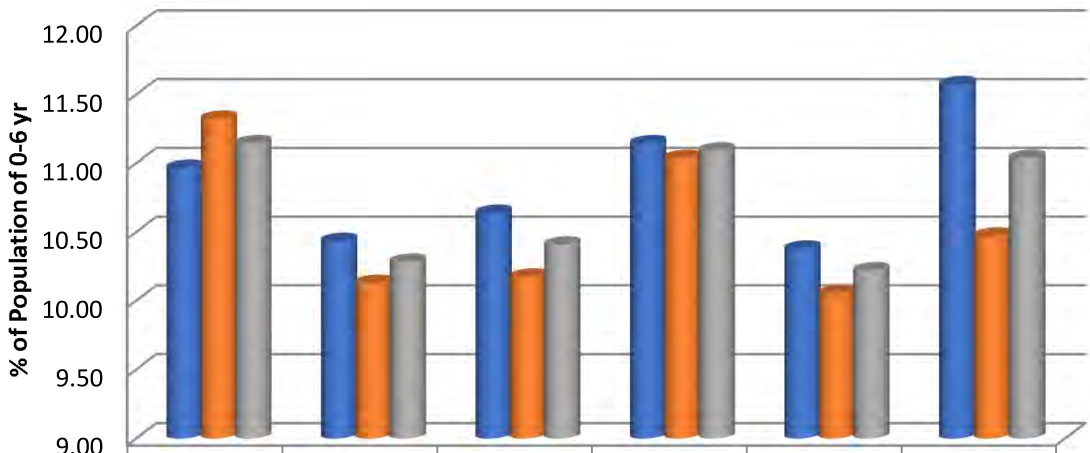
Figure 8.6: Overall Gender Wise Distribution of Population



8.1.3 Status of Child Population

Analysis of status of child population (0-6 years) in downstream villages of Wainganga River reveals that 10.75% are children (0-6 years) of total population in downstream villages (Figure 8.7). The analysis further shows that the sex ratio among child population is slightly lower i.e. 954 females per 1000 male as compared to overall sex ratio i.e. 978 females per 1000 male in downstream villages.

Figure 8.7: Block Wise Percentage Distribution of Population of 0-6 Yr



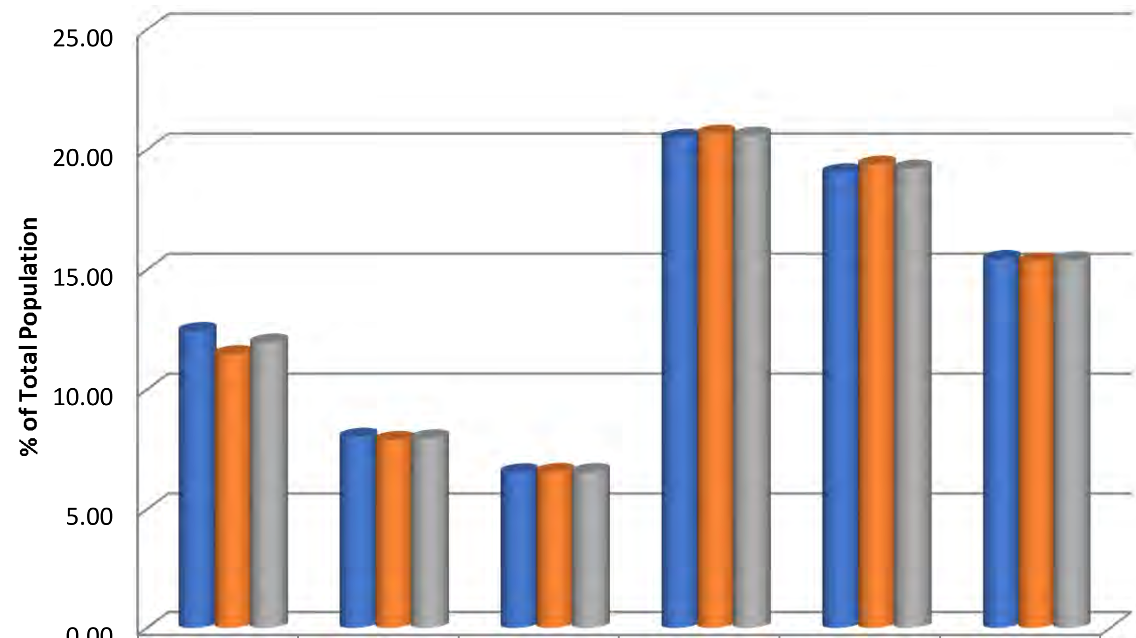
	Tiroda	Tumsar	Mohadi	Bhandara	Pauni	Kuhi
Male	10.97	10.43	10.64	11.14	10.38	11.57
Female	11.32	10.13	10.17	11.04	10.05	10.47
Population	11.14	10.28	10.41	11.09	10.22	11.04

8.1.4 Social Stratification

Distribution of scheduled caste population in downstream villages of Wainganga River is presented in Figure 8.8. It reveals that 14.49% are scheduled caste of total population in downstream villages of Wainganga River. The analysis further shows that 14.53% are male SC of the total male population and 14.45% are female SC of the total female population of downstream villages of Wainganga river.

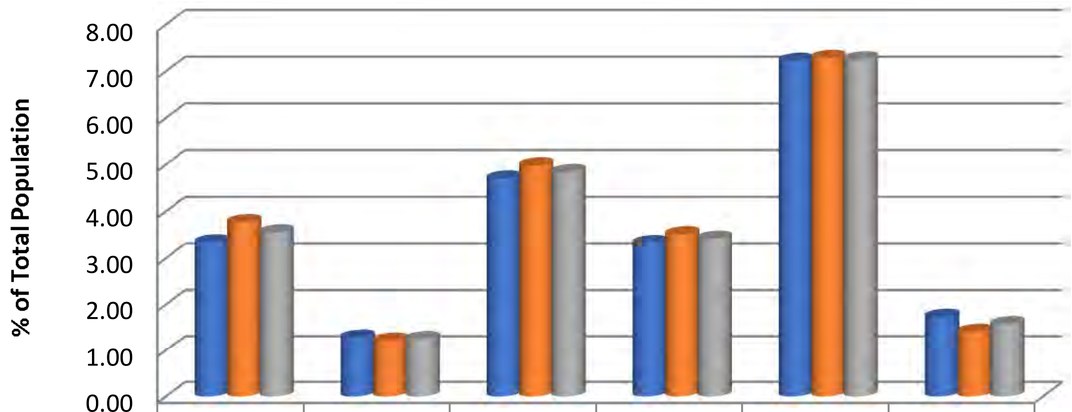
Distribution of scheduled tribe population in downstream villages of Wainganga River is presented in Figure 8.9. It reveals that 3.33% are scheduled tribe of total population in downstream villages of Wainganga river. The analysis further shows that 3.28% are male ST of the total male population and 3.38% are female ST of the total female population of downstream villages of Wainganga river.

Figure 8.8: Block Wise Percentage Distribution of SC Population



	Tiroda	Tumsar	Mohadi	Bhandara	Pauni	Kuhi
Male	12.44	8.04	6.56	20.49	19.06	15.44
Female	11.48	7.90	6.57	20.67	19.38	15.34
Population	11.96	7.97	6.56	20.58	19.21	15.39

Figure 8.9: Block Wise Percentage Distribution of ST Population

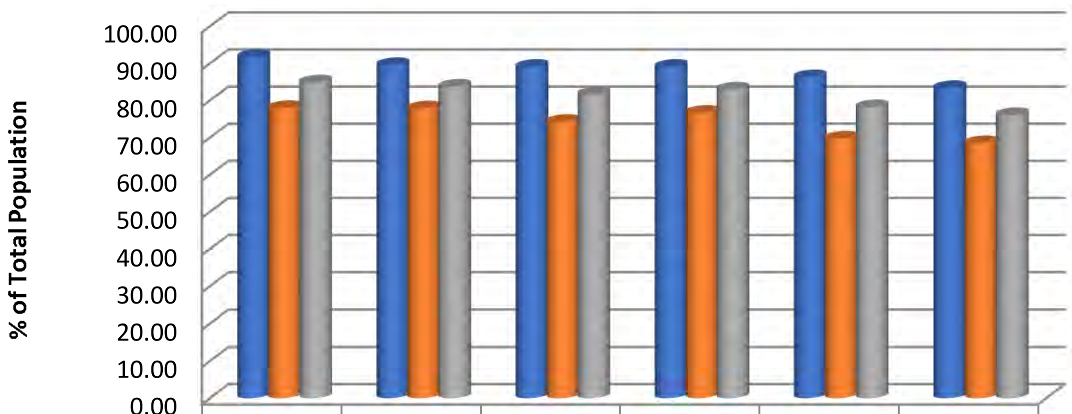


	Tiroda	Tumsar	Mohadi	Bhandara	Pauni	Kuhi
Male	3.33	1.28	4.71	3.32	7.22	1.74
Female	3.77	1.22	4.98	3.51	7.28	1.41
Population	3.55	1.25	4.84	3.41	7.25	1.58

8.1.5 Literacy Rate

Status of literacy in downstream villages of Wainganga River is presented in Figure 8.10. It shows that in downstream villages 82.07% of the population are literates. Gender wise status of literacy in downstream villages of Wainganga River reveals that 88.63% are male literates of the total male population against 75.38% female literates of the total female population.

Figure 8.10: Block Wise Status of Literacy in Downstream Villages



	Tiroda	Tumsar	Mohadi	Bhandara	Pauni	Kuhi
Male Literacy	91.72	89.50	89.03	89.04	86.23	83.31
Female Literacy	77.91	77.83	74.22	76.65	69.72	68.48
Total Literacy	84.85	83.68	81.66	82.92	78.17	76.04

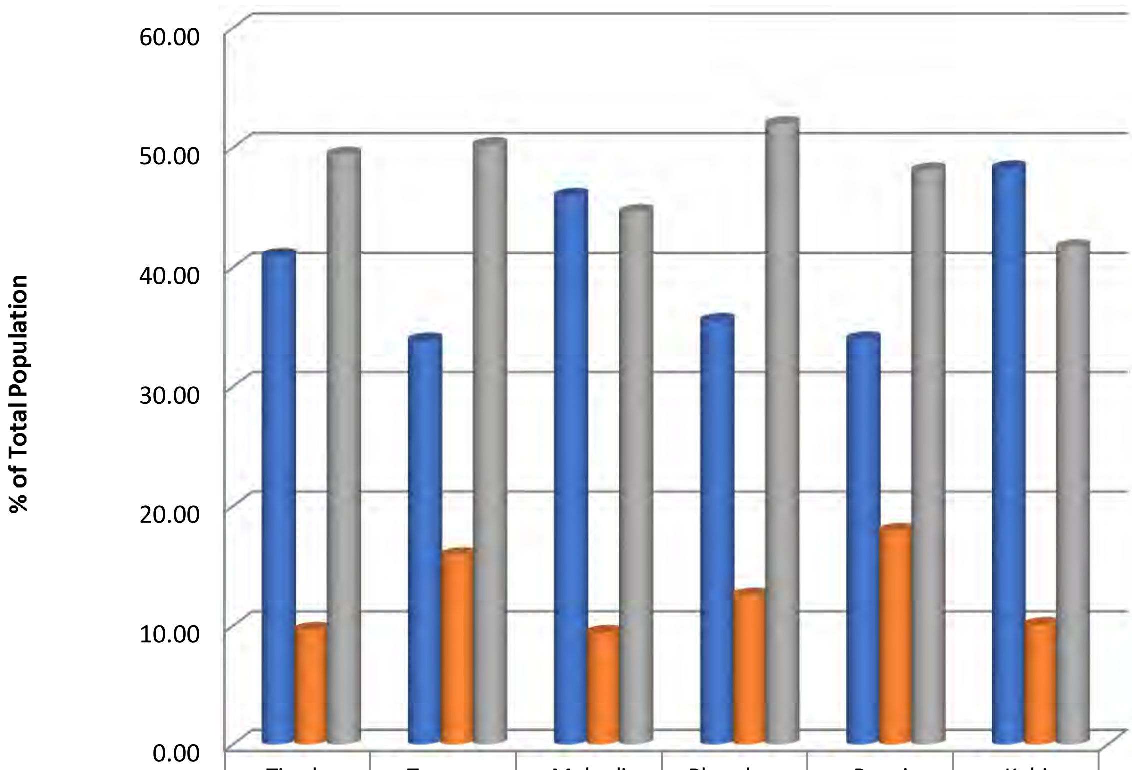
8.1.6 Occupational Pattern

Block wise status of workers in downstream villages of Wainganga River is presented in Figure 8.11. It shows that out of total working population, 75% are main workers and remaining 25% are marginal workers in downstream villages. Figure 8.12 shows that 38.22% are main workers of the total population, 12.74% are marginal workers and remaining about 50% are non-workers of the total population.

Detail of main workers in downstream villages of Wainganga River is presented in Figure 8.13. Out of total main workers, majority (48.58%) are agricultural labour followed by cultivators (28.36%). Overall status of main workers in downstream villages of Wainganga River is presented in Figure 8.14.

Detail of marginal workers in downstream villages of Wainganga River is presented in Figure 8.15. Out of total marginal workers, majority (65.67%) are agricultural labour followed by cultivators (13.71%) (Figure 8.16).

Figure 8.11: Block Wise Status of Workers in Downstream Villages



	Tiroda	Tumsar	Mohadi	Bhandara	Pauni	Kuhi
Main worker	40.95	33.89	45.97	35.52	33.99	48.27
Marginal worker	9.64	15.90	9.41	12.52	17.92	10.06
Non-Worker	49.41	50.21	44.63	51.96	48.09	41.67

Figure 8.12: Status of Workers in Downstream Villages

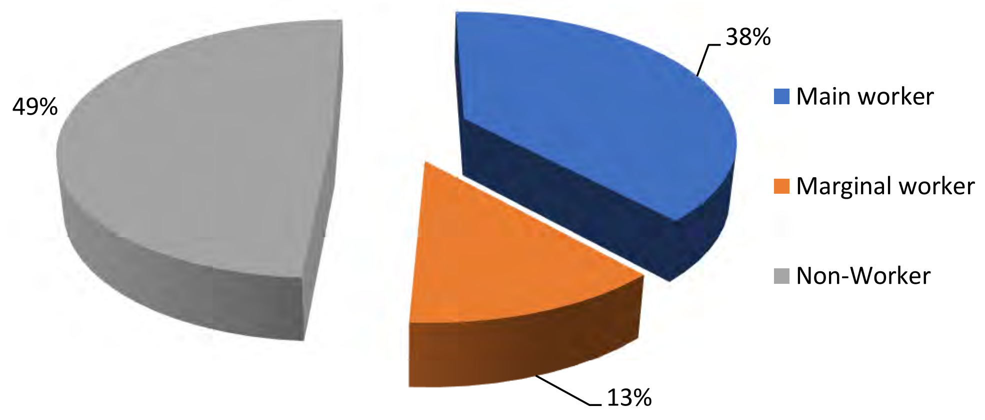
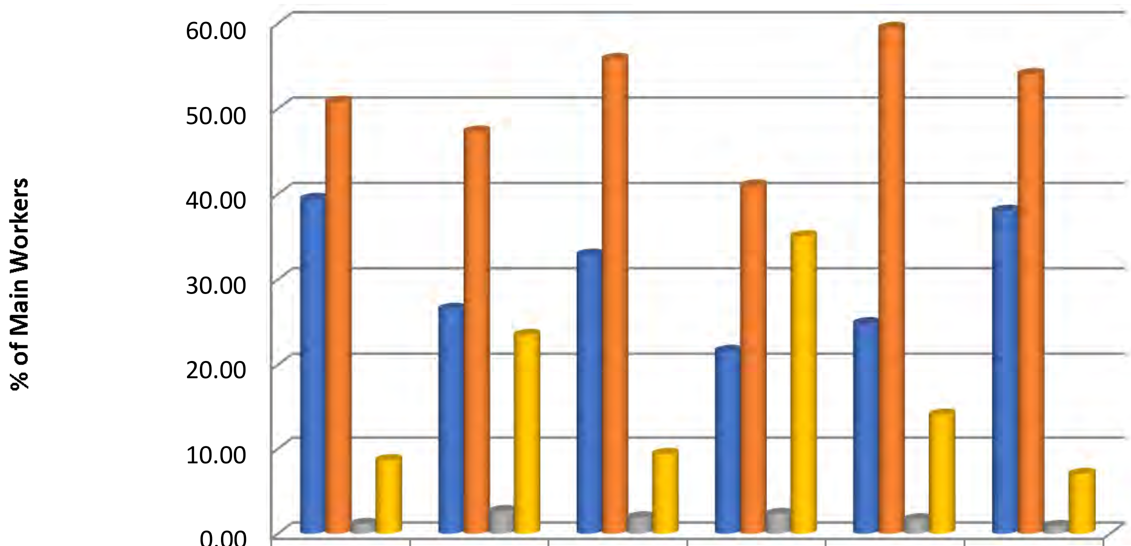


Figure 8.13: Block Wise Status of Main Workers in Downstream Villages



	Tiroda	Tumsar	Mohadi	Bhandara	Pauni	Kuhi
Cultivator	39.42	26.56	32.90	21.63	24.86	38.04
Agricultural Labourer	50.79	47.31	55.82	41.00	59.46	54.04
Household Industries	1.14	2.64	1.91	2.32	1.69	0.89
Other Workers	8.65	23.49	9.37	35.05	13.99	7.03

Figure 8.14: Status of Main Workers in Downstream Villages

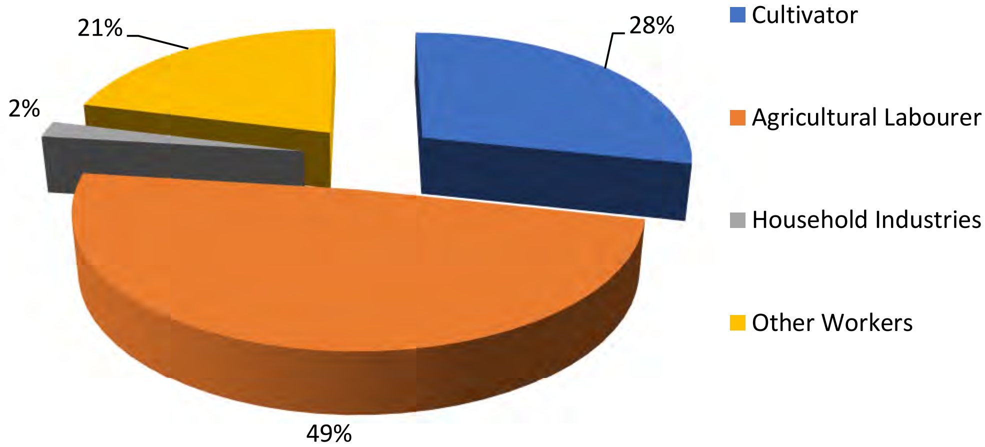
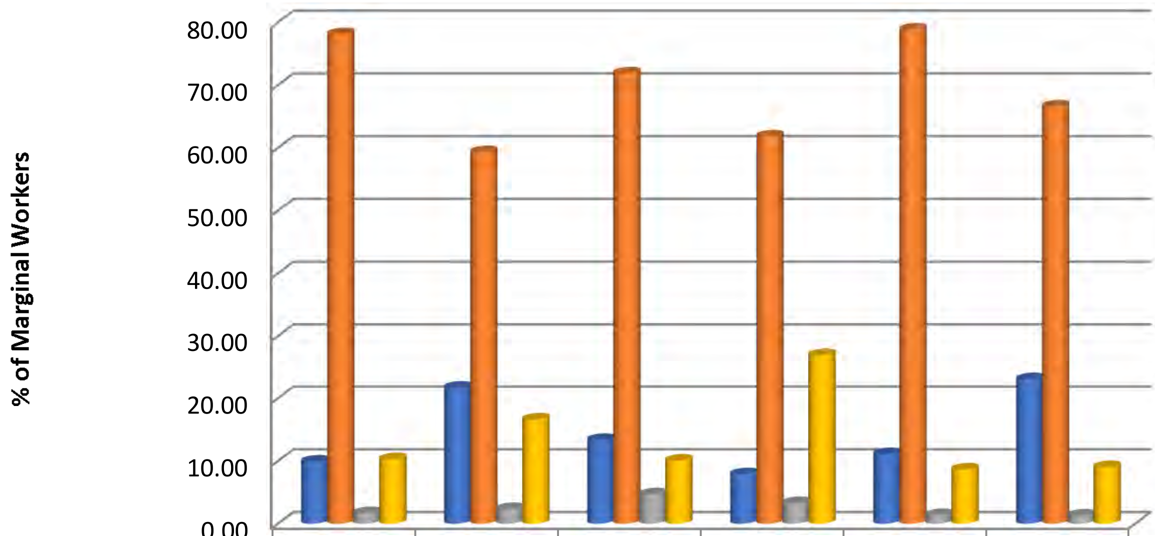
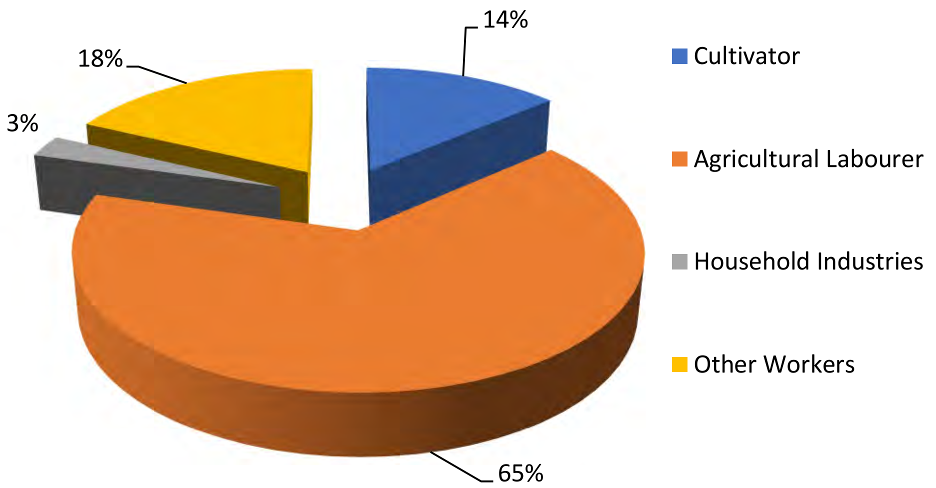


Figure 8.15: Block Wise Status of Marginal Workers



	Tiroda	Tumsar	Mohadi	Bhandara	Pauni	Kuhi
Cultivator	9.92	21.70	13.36	7.90	11.11	23.05
Agricultural Labourer	78.11	59.32	71.87	61.82	78.86	66.61
Household Industries	1.70	2.35	4.70	3.30	1.39	1.31
Other Workers	10.28	16.63	10.07	26.98	8.65	9.03

Figure 8.16: Status of Marginal in Workers



8.2 LAND USE PATTERN

The total geographical area of downstream villages under river reach of Wainganga is 64094.18 ha (Table 8.3).

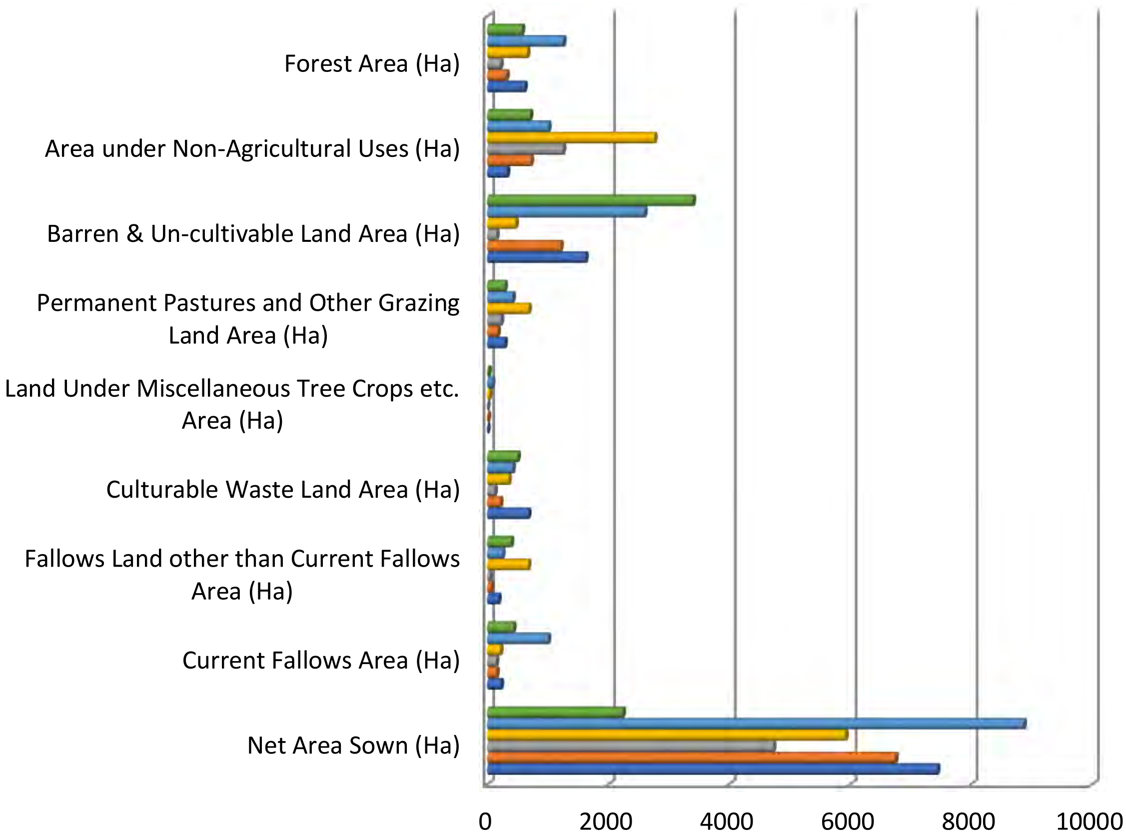
TABLE 8.3: GEOGRAPHICAL AREA OF DOWNSTREAM VILLAGES UNDER RIVER REACH OF WAINGANGA

Sl. No.	State	District	Block	Total Geographical Area (Ha)
1	Maharashtra	Gondia	Tiroda	11377.31
2		Bhandara	Tumsar	9600.48
3			Mohadi	6880.78
4			Bhandara	11776.21
5			Pauni	15911.32
6		Nagpur	Kuhi	8548.08
TOTAL				64094.18

District wise landuse pattern of downstream villages under river reach of Wainganga is presented shows that in downstream villages under Gondia, net sown area is 65.45% followed by area under barren & un-cultivable land (14.27%), whereas in Bhandara, maximum (59.51%) landuse is exhibited by net sown area followed by area under non-agricultural uses (13.01%) and barren & un-cultivable land area (10.03%). Of the total geographical area of the study region, 35,969.56 ha is the net sown area, barren & un-cultivable land area is area under barren & un-cultivable land and 6,780.55 ha is area under non-agricultural uses.

Block wise landuse pattern of downstream villages under river reach of Wainganga is presented in Figure 8.17. It shows that villages falling in Tumsar Block net sown area is 70.34%, whereas in downstream villages under Mohadi Block, net sown area is 68.76% followed by area under non-agricultural uses (18.20%).

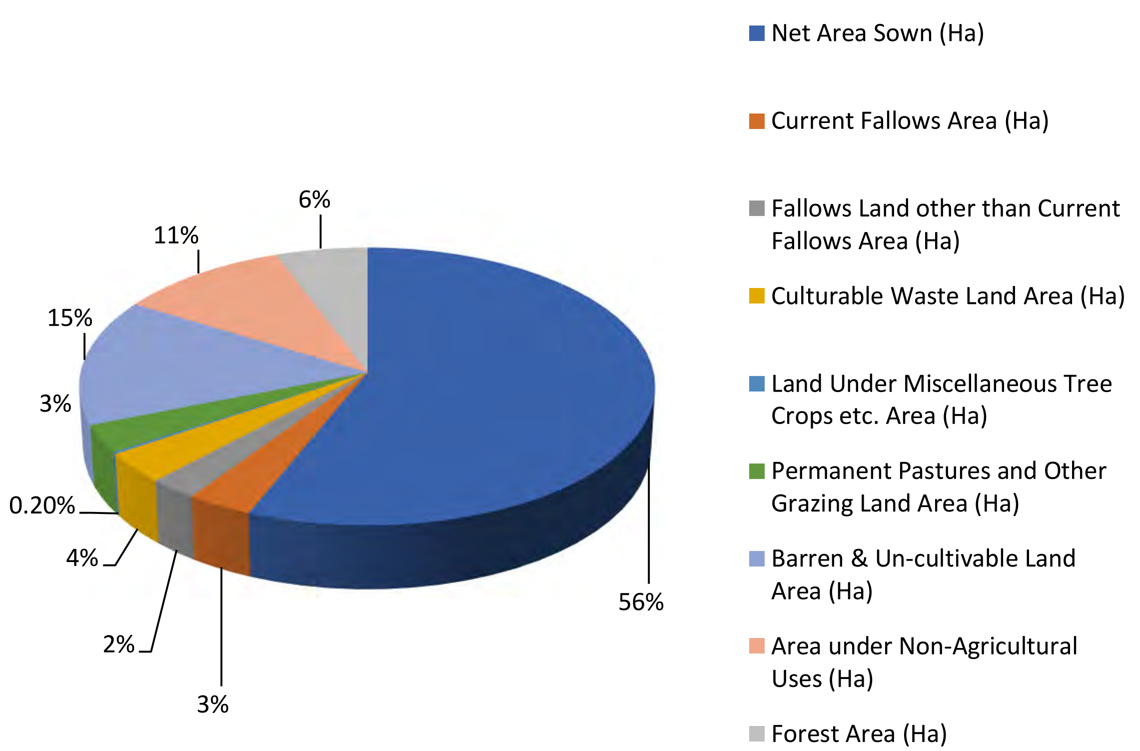
Figure 8.17: Block Wise Landuse Pattern of Downstream Villages Under River Reach of Mahanadi



	Net Area Sown (Ha)	Current Fallows Area (Ha)	Fallows Land other than Current Fallows Area (Ha)	Culturable Waste Land Area (Ha)	Land Under Miscellaneous Tree Crops etc. Area (Ha)	Permanent Pastures and Other Grazing Land Area (Ha)	Barren & Un-cultivable Land Area (Ha)	Area under Non-Agricultural Uses (Ha)	Forest Area (Ha)
Kuhi	2239.08	428.9	392.17	499.94	20.29	286.18	3401.39	706.96	573.17
Pauni	8872.87	1004.98	248.68	417.5	80.45	417.92	2600.39	1011.38	1257.15
Bhandara	5927.54	214.4	675.21	351	35.01	682.13	468.39	2764.02	658.51
Mohadi	4730.91	144.39	43.14	120.07	0	224.17	149.89	1252.24	215.97
Tumsar	6753.16	151.37	59.81	211.59	8.03	169.48	1210.54	719.57	316.93
Tiroda	7446	222.84	181.86	676.11	0	285.39	1623.26	326.38	615.47

Overall landuse pattern of downstream villages under river reach of Wainganga is presented in Figure 8.18. It shows that out of total geographical area, maximum is net sown area (56.12%) followed by area under barren & un-cultivable land (14.75%).

Figure 8.18: Landuse Pattern of Downstream Villages Under River Reach of Mahanadi



Total land area in the downstream side of the intake location of river Wainganga is 35,969.56 ha (Table 8.4), out of which majority of the area i.e. 18,408.98 ha (51.18%) is unirrigated followed by irrigated area of 17,560.58 ha (48.82%) (Figure 8.19).

TABLE 8.4: STATUS OF IRRIGATION IN DOWNSTREAM VILLAGES OF RIVER WAINGANGA

Sl. No.	State	District	Block	Land Area (in Ha)		
				Unirrigated	Irrigated by Source	Total
1	Maharashtra	Gondia	Tiroda	4784.52	2661.48	7446
2		Bhandara	Tumsar	3910.23	2842.93	6753.16
3			Mohadi	2280.17	2450.74	4730.91
4			Bhandara	3265.74	2661.8	5927.54
5			Pauni	3403.26	5469.61	8872.87
6		Nagpur	Kuhi	765.06	1474.02	2239.08
TOTAL				18408.98	17560.58	35969.56

Figure 8.19: Overall Status of Irrigation in Downstream Villages

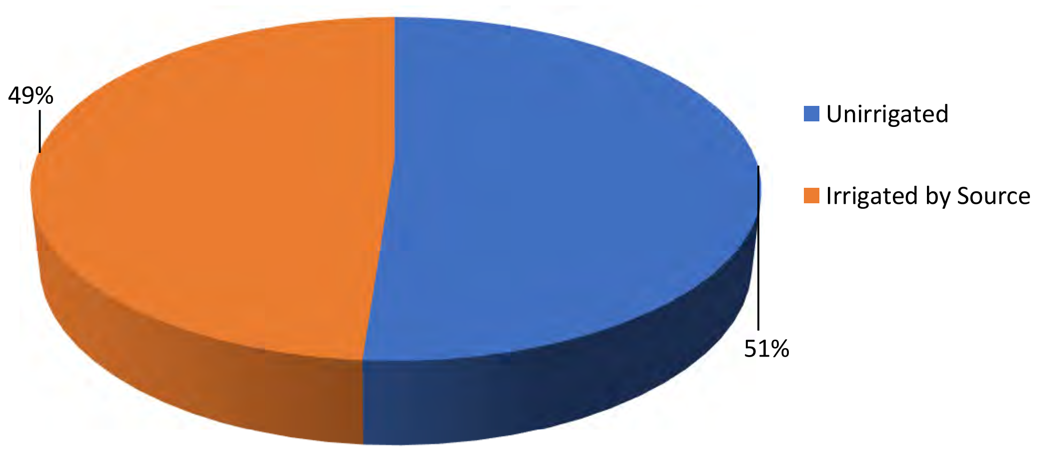


Figure 8.20 depicts block wise analysis of total land area in the downstream side of the intake location of river Wainganga. It shows that in Tiroda Block, 64.26% are unirrigated area against only 35.74% irrigated area of total land area of the Block, whereas in the Block of

Kuhi, majority (65.83%) are irrigated area against 34.17% unirrigated area of total land area of the Block.

Figure 8.20: Block Wise Status of Irrigation in Downstream Villages

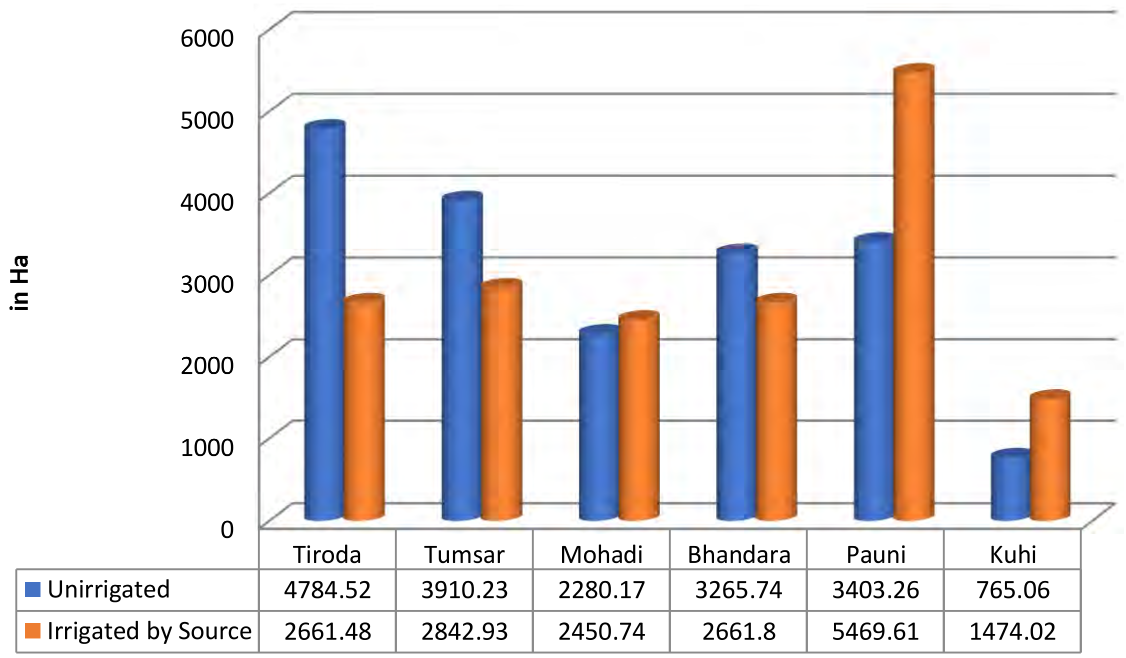


Table 8.5 shows distribution of various sources of irrigation in the downstream side of the intake location of river Wainganga. It presents that majority (47.04%) of the irrigated area is fed by weels/tubewells followed by canal (25.45%) (Figure 8.21).

TABLE 8.5: SOURCES OF IRRIGATION IN DOWNSTREAM VILLAGES OF RIVER WAINGANGA

Sl. No.	State	District	Block	Sources of Irrigation Area (in Ha)				
				Canals	Wells/ Tube Wells	Tanks/ Lakes	Water fall	Other 136
1	Maharashtra	Gondia	Tiroda	2653.5	819.73	759.17	0	552.12
2		Bhandara	Tumsar	530.1	2367.31	926.32	13	73.5
3			Mohadi	5.9	1259.23	412.5	119.4	483.14
4			Bhandara	1068.95	1511.28	101.1	0	584.41
5			Pauni	404.92	2463.14	346	0.2	189
6		Nagpur	Kuhi	21.39	238.65	69.26	0	435.76
TOTAL				4684.76	8659.34	2614.35	132.6	2317.93

Figure 8.21: Distribution of Various Sources of Irrigation in Downstream Villages

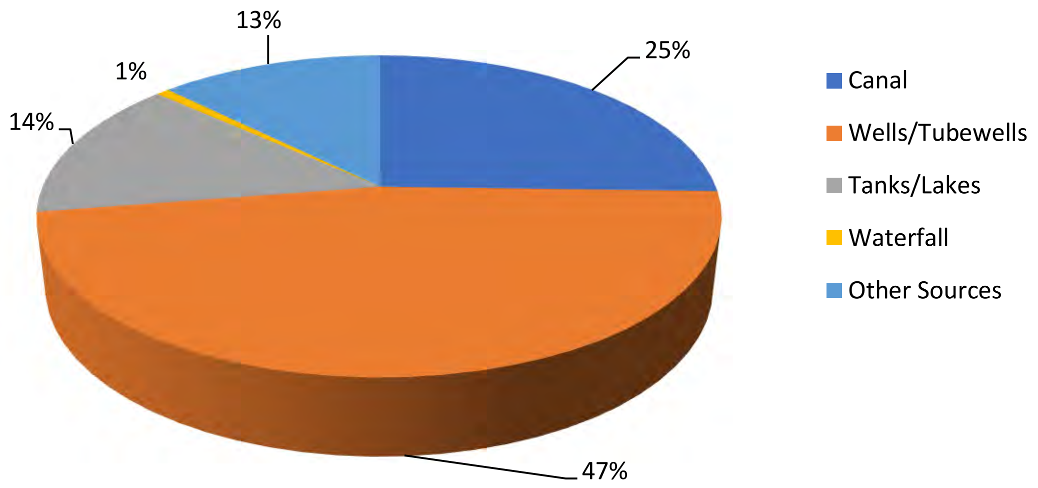
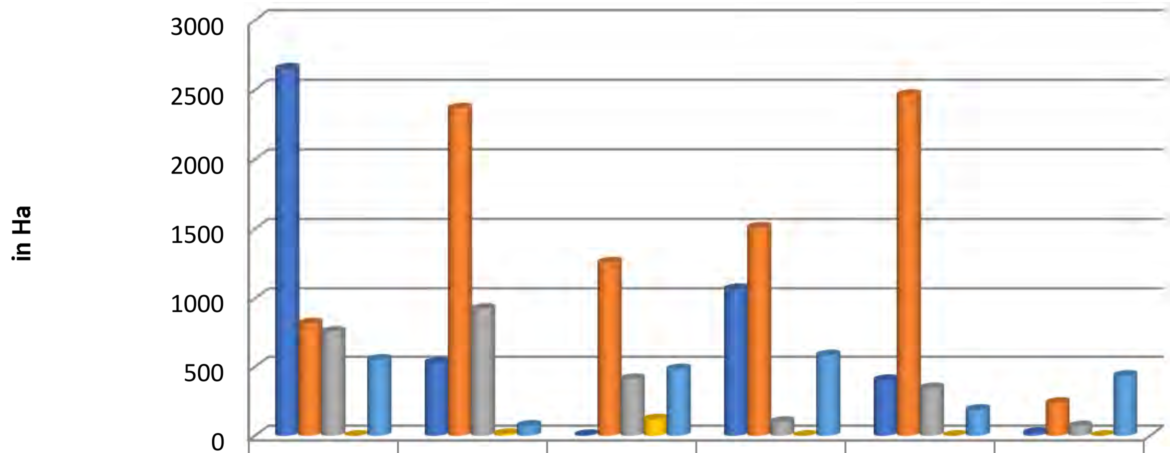


Figure 8.22 depicts block wise analysis of source of irrigation in the downstream of the intake location of river Wainganga. It shows that in Tiroda Block, majority (55.46%) of the irrigated area is fed by canal followed by wells/tubewells (17.13%), whereas in the Block of Pauni, majority (72.38%) of the irrigated area is fed by wells/tube wells followed by canal (11.90%).

Figure 8.22: Block Wise Status of Sources of Irrigation in Downstream Villages



	Tiroda	Tumsar	Mohadi	Bhandara	Pauni	Kuhi
Canal	2653.5	530.1	5.9	1068.95	404.92	21.39
Wells/Tubewells	819.73	2367.31	1259.23	1511.28	2463.14	238.65
Tanks/Lakes	759.17	926.32	412.5	101.1	346	69.26
Waterfall	0	13	119.4	0	0.2	0
Other Sources	552.12	73.5	483.14	584.41	189	435.76

8.3 PUBLIC CONSULTATIONS

Rivers have been very useful to mankind in all parts of the earth since very early times. They provide water to slake the thirst of people, to fertilize their lands and to provide a means of communication for the goods that they transport from place to place.

Wainganga valley is best known for its fertile soil and flourishing agriculture. Before the Gosekhurd dam was built, the river carried a huge amount of silt and its delta had one of the highest yield per acre in the whole of India. At present, agriculture primarily depends on a network of canals that arise from the river. Rice, oilseeds and sugarcane are the principal crops here.

The techniques used for public consultation & information collection to assess the dependency of local people on Wainganga river at immidiate down stream of intake site of TTPP includes:

- Focus Group Discussion (FGDs)
- Questionnaires and Surveys
- Interviews & Observations

For the purpose, 8-10 villages were selected which are in close proximity of river Wainganga falling under three blocks namely Tirora, Bhandara and Mohadi representing the wider cross section. For an in-depth assessment of dependebality of downstream users, series of FGDs were conducted by the survey team with the local people of selected villages. Their opinion was captured and doccumented. Salient features of these FGDs are mentioned in subsequent sections:

Mandvi:

Mandvi village is located on the left bank of the downstream of Wainganga river. This village has an approx population of 1403 people comprising of about 295 households. Most of the villagers (75%) practice cultivation as their occupation. Rest of 10% follow mix of cultivation and fishing. The other 15% are seasonal cultivators and wage laborers. It has come to our observation through the discussion that Kawalewada Canal, which is fed by the water of Waingangā river, is used extensively by maximum of the cultivators, almost 80%. At least 10 number of households have been found to have installed pumps for irrigation purpose. Other sources of water includes bore well and hand pump. The bore well are underground source of water and are used for irrigation as well as for minimal domestic purpose. It has been reported that the local administration had built up 55,000 ltr. Reservoir for the villagers to supply drinking water to every household. The number of tap water connection are 75. The local administration has also provided an intake well and installed a pump house near the bank of Waingangā river. This facility was provided to sustain irrigation and associated water utility for villagers. But it has been reported that due to sand filling in the pump impeller, the pump station has collapsed since last 2 years. Major cultivated crops include Paddy, lin seed, tomato, coriander, peanuts, bengal gram etc.

Ghatkuroda:

Ghatkuroda village is also located on the downstream of the river Wainganga along its left bank. The village is located at a distance of 200 m from the Wainganga river. Total population of this village is approx. 1900 with a household of 500. 40 families receive water for domestic activities from the 3 kl overhead tank through water tap connections. Bore wells have also been found in use for drinking and domestic purposes within this village.

As it has been observed that the main occupation of this village is agriculture. Thus most of the households are involved in this profession. The local Government had set up a Pump Station along the river bed to tap water from the river and provides it to the village folk to support their irrigational needs but the pump station has become non-functional a few years back due to some operational defects. In addition to that the local Government has also set up 3 more pump stations in Ghatkaruda village to support the water requirement of nearby villages viz., Mundikota, Patilkota, Gagra and Sarandi. The pump stations were set up here because the river water source is nearby from Ghatkaruda village. Out of these villages, the first two villages have their separate pump stations, whereas Gagra and Sarandi use common pump station. However, access to use water from these pump stations has been provided to dwellers of Ghatkaruda village. The Kawalewada canal runs beside this village, however no tapping channels are existing as branch channel to support the irrigation. However, the bore wells are being used for irrigation in these villages by few farmers, whereas majority of farmers are dependent on seasonal rain for cultivation and able to have single crop only. In addition to that, 10-12 number of small pumps have been also set up on the river by farmers. The main cultivated crops include Paddy, Wheat, Linseed and vegetables include: Brinjal, Coriander, Tomato etc.

Narsingtola:

The village Narsingtola is situated at 1.5km distance from the Wainganga river. The village is on the left bank of the river along the downstream. The total population is approx. 1800 and the number of HH in the village are around 450. The source of drinking water in the village is ground water which is being supplied to households through a 15000 litre OH tank. Domestic tap connections are provided to selected households from the tank. The main occupation of villagers is agriculture which account for around 80% of people and 20% are daily wage labourers. Although the maximum inhabitants of this village are farmers the situation of irrigation facilities are not very good. Availability of water for irrigation is not there as the canal from Kawelawada does not pass through this village. About 23 families use mono block pumps to tap the water directly from river for domestic purposes. Similarly few farmers use bore well pumps for irrigation. However the majority of the people depend on seasonal rain for quenching the need of water for irrigation. It has been reported that since last 5 years, there has been no significant agricultural production. There is Manas Sugar factory within this village which has their pump station at river Wainganga for meeting water requirement. Most villagers have shifted their occupation from cultivation to daily wage earner. The water level in this village is good, as this village is close to the river.

Chandori:

Chandori village is located at 1 km on the left bank of downstream of Wainganga River. Approximately 250 Households and around 1500 people reside in this village. A overhead tank has been installed to meet the drinking water requirement through bore well. In addition to that there are 10 numbers of bore wells which taps water from 300-400 feet below the ground. These bore wells provide water to the villagers for their daily domestic purposes. Like its surrounding villages the maximum occupants of this village also (approx. 80%) practice cultivation as their main occupation. Rice and wheat are the main crops that are cultivated. About 10% practice fishing as their main occupation especially from the month of October to April. Rest 10% villagers are involved in wage earning as labourers. For irrigation, water from Kawalewada canal is available in this village. However, it has been reported that the area around which this canal passes it helps only 40% of those who are involved in cultivation the rest 60% do not get the benefit as their farm lands are far away from the canal. So many farmers of this village have set up their own bore well for the purpose. Around 10 nos. farmers have set up mono block pumps on the bank of the Wainganga river to tap the river water for farming. Cultivable vegetables includes: tomatoes, brinjal, coriander, bengal-gram etc. Thus in this village most of the farmers are dependent on the river water for cultivation.

Nilja:

The village Nilja is located on the left bank of Wainganga river. It is on the downstream of the river and is at a distance of 1km from the river. The total households are approximately 550 and around 2300 people are there. Source of water in this village is primarily from bore wells. There are 20nos. of bore wells which they utilize for domestic and drinking purposes. This village has a 1,00,000 liter OH tank to supply the drinking water in the village from the Wainganga river. Around 70% of the people in this village practise cultivation. To support cultivation 20 families have put up mono block pumps on the river banks to draw water from Wainganga river. The significant no of farmers are also using bore wells dug on their agricultural lands for irrigation. Others are solely depend on seasonal rain for the purpose. Around 10% of the people practise fishing and the rest 20% people are wage labourers.

Dewada:

Dewada is a village located along the left bank of Wainganga River on its downstream. It has a population of around 2300 and the number of HH is 350. This village has a Filter Water Plant with a capacity of 1,00,000 liters. Water is made available round the year to the villagers through this plant. Around 80% of the people within this village practice cultivation. About 20-30 families who have their fields close to the river they use mono block pumps to tap the water for irrigation. Few farmers have dug up bore well on their fields to support their cultivation. The rests depend on seasonal rains. The Kawalewada canal passes through this village. Other than cultivation about 20% people are seasonal fishermen however, during off season they turn into wage laborers. The main crops of this village includes: paddy and wheat, vegetables include tomatoes, egg-plant etc. Fruits include water melon but it is cultivated seasonally on river bed when the water from the river recedes.

Mundipar:

Mundipar village is located on the downstream of river Wainganga along its left bank. The village is located at a distance of 200m from Wainganga river. It has a population of around 1500 and the number of HHs is around 250. About 80 % people are engaged in agriculture. For cultivation irrigation canal water is used. Earlier the agriculture production was low because of the lack of irrigation facilities. Previously, the canal water was not used by cultivators because of non availability of canal. After the cannal for irrigation water is provided the agriculture production increased gradually and the quality of production has also improved. But this canal water is used only by 50% of the villagers. Others have installed bore well in their own land and some people are using river water through mono block pumps placed on the river banks. The rest rely totally on rain water to cultivate once in a year. Paddy and wheat are cultivated on these farmlands mainly. For drinking purpose villagers use bore well. In dry season some bore well go dry at that moment villagers have to travel 200 m for their water needs. It appears that in this village the people are partially dependent on the river Wainganga and they have also nowadays improvised various water curing and collecting methods rather than depending on the river solely as the level of water in the river is decreasing gradually.

In present study the dependency on Wainganga river of the villagers have been analysed in three various aspects as follows:

Domestic Aspects:

For centuries rivers have supported livelihood of people by providing drinking water and other essential domestic use. The present study reveals that most of the village people are dependent on river Wainganga for their domestic requirements.

However, there are certain perplex situations. Villages in close vicinity of Wainganga River depend exclusively on the river. But these villages have bore well/ hand pumps, tank and pond as alternate source of water. On the other hand the outlying villages away from the vicinity of Wainganga fully depend on alternate source of water as mentioned above and in dry seasons they fetch water from the river.

In some villages all of the above water facilities are not functioning. In a year for six months they depend fully on river and six months they use the other source of water. The reason behind that in rainy season the water level is very high and in dry season water level declines. So their main source of water lacks to provide their daily requirement. That time villagers are totally depends on rivers.

Drinking Water:

Throughout human evolution water has been a significant resource. One of the most essential parts of it is drinking followed with essential livelihood activities to sustain life. Thus communities, towns and centers develop around rivers. Technological and scientific development has enabled human beings to obtain natural resources in pure form; Water Treatment Plants are its creation. Dwellers of cities, towns and even villages nowadays use water from treatment plants to protect themselves from water borne diseases.

Agriculture Aspects:

One of the significant sources of water is the river. The early men are known to settle on the banks of rivers in order to avail the comforts and benefits provided, that included supplies of fresh water, fertile soil for cultivation purposes, and more. River valleys and plains provide fertile soils. Farmers in dry regions irrigate their cropland using water carried by irrigation ditches from nearby rivers.

In this study the major part comprises about Wainganga its use for agriculture and other important associated facts connected to livelihood and sustainability. In socio-economic context maximum villagers main source of income is agriculture. Most of the part of Gondia District is semi drought area. The texture of soil is not meant for farming. But most of the fertile land lay close to river Wainganga. Most of the people cultivate their crops close to Wainganga to avail easy irrigation and proper water feeding facilities for their produce. In dry season most of the cultivators solely dependent on Wainganga for irrigation purpose. Meanwhile to add a few more instances; the villagers of a few villages which lie a little kilometers away from the banks of Wainganga, depend mainly on bore well and hand pumps for their agricultural purposes. However, as per discussions with these villagers it is evident that during the dry spell months i.e., October to March especially when the underground water level reduces, the villagers of these villages begin to depend fully on Wainganga river for their water consumption. Farmers cultivate paddy twice or thrice in a year namely during Ravi, early Kharif in autumn season and late Kharif in winter season. They cultivate vegetables once a year and to name a few those are viz., pumpkin, gourd, peanuts, bitter gourd etc. So an inference can be drawn that Wainganga river play on incredibly vital role and works as a support to Agricultural livelihood sustainability.

Occupational Aspects:

Rivers are the cradle of a civilization. Cities, towns, villages, many cultural centers have evolved in and around the rivers. It is so because the rivers are the source of livelihood either directly in the form of farming, irrigation, crop cultivation etc., or indirectly as providers of food source, viz. fish which in turn form a commercial basis of livelihood. Thus the rivers are actually the regions of human, infrastructure growth and commercial development. River Wainganga plays the same pivotal role. The villagers who by occupation directly depend on Wainganga are basically the fishermen. There are a many variety of fish available in Wainganga river namely Rahu, Gaja, Chingri, Katla, Khegda etc. During the fishing season these fishermen grab good quantity of fish to maintain their livelihood, but the scenario changes during the dry months of winter i.e October to March when the fish in the river decreases. Then these fishermen turn to alternate source of income mainly as wage labourers to maintain their household sustenance. So, through this assessment about the dependency on Wainganga can be drawn. As it is seen that during the peak season the fishermen solely depend on the river and procure good quantity of fish from the river, however the entire view changes during the off season when the water level in the river reduces bringing about a change on the occupation of these fishermen.

Flood is one of the natural disasters that create enormous havoc and myriad miseries in the affected area. It causes loss of life, disruption of human activities, damage to properties, agricultural crops and health hazard.

Although river Wainganga is the main bearer of livelihood for the villagers who reside along its banks, but rising water level during the rainy months creates devastation as well. During the most recent flood the villagers of the villages along the banks of Wainganga, had to be evacuated to other safer grounds and far away villages. Later on as the waters receded, the villagers on returning to their village had to rebuild their homes with much hardship and difficulty. Though the Local Administration with the State Govt. did support them by providing 50% of aid but the livelihood of many resident villagers was lost and thus regaining or restarting their occupation was hard.

On the other hand during the winter months when the underground sources of water dry up viz., the bore well, hand pumps etc., at that moment the villagers turn to the river exclusively for their livelihood and agricultural needs. The fishermen do not get much benefit at that season as fish in the river becomes scanty but for other domestic and associated works, irrigation for agricultural land Wainganga remains the main source of water provider. Hence, it is evident that Wainganga acts as a life giver and sometimes as a life changer for the residing villagers along its banks.

Industrialization and modernization builds a Nation strong, the regions which are rich in mineral reserves seldom turn in to regions of heavy Industrial influence. So the natural reserves there in those regions get manipulated and compromised. To support these industries and other ancillary requirements, Power sectors have evolved. Most power generating units are Thermal based units. Therefore, requirement of water to generate power from thermal process is followed. The water is collected from Wainganga by the power generating unit and others, who have set up water intake pump stations along the course of the river.

Since it has already been mentioned that the river dries up extensively during summer season the pumping of water for power generation however does not decline in quantity it remains same all throughout the year. Therefore, the industrial consumption remains same but the human consumption for the villagers and other dwellers depending on river water may gets affected partially.



Public Consultation with Upstream Users of Wainganga River



Public Consultation with Upstream Users of Wainganga River



Public Consultation with Down stream Users of Wainganga River

Photo Plate-11



Public Consultation With Down Stream Users of Wainganga River



Public Consultation With Down Stream Users of Wainganga River



Public Consultation With Down Stream Users of Wainganga River

Photo Plate-12

9.0 IMPACT ASSESSMENT STUDY- DOWN STREAM USERS

9.1 PROLOUGE

As a part of the study, probable downstream users impacts associated with the withdrawal of water from Dhapewada Barrage at River Wainganga have been identified. For evaluation of impacts due to the Tiroda TPP , the baseline data has been utilized.

9.2 PROBABLE IMPACT ON UPSTREAM USERS

The entire catchment area of Dhapewada Irrigation Scheme –II Barrage at Kawalewada was visited during field survey to assess the domestic and irrigation water drawal from river Wainganga within barrage catchment area i.e. upto 12 km upstream from barrage near Sawara village under Tiroda thesil of Gondia district. During the field survey it was observed that various gram panchyat under National Rural Drinking Water Scheme have setup/developed intake well for drawal of water to meet domestic water requirement in right as well as left banks of Wainganga river. The detail of developed drinking water supply system based on River Wainganga within catchment area is presented in Table 9.1. From survey it was found that most of the GPs surface water supply system have 2x5 Hp pumping capacity and one pumping being operated another is kept standby. The water from the intake well is pumped to overhead reservoir of 50 to 100 KL and then supplied to household without any treatment in majority of GPs. However during the monsoon season bleaching power is given in the intake well. The water is being supplied to H/H for 3-4 hrs everyday.

TABLE 9.1: DETAIL OF DRINKING WATER SUPPLY SYSTEM BASED ON RIVER WAINGANGA WITHIN CATCHMENT AREA OF BARRAGE AT KAWALEWADA

Village /GP	Pumping Capacity (in HP)	Operation Time (in hr)	Storage Capacity (in KL)	AVG Daily Water Requirement (in KLD)
Karti Kh.	5x2	4	50	137.000
Indora Br.	5x2	4	50	70.760
Chandori Kh	5x2	4	50	65.560
Gond Mohadi	5x2	4	50	103.480
Arjuni	10x2	4	100	167.960

During the survey it was also observed that farmer has developed minor river lift irrigation system by installing 3-10 Hp pumping system and farmer whose land is within approx 2 km stretch in right bank are significantly benefitted by the construction of the barrage at Kawalewada. As their irrigation facilities has increased many fold and they are able to have 3-4 crops in a year mostly paddy and vegetables. The crop yield also have improved significantly leading to improving their quality of life and economic progress. The village/GP wise detail of the minor river lift irrigation system developed within catchment are present in Table 9.2. For the purpose farmers have taken demand certificate from their respective thesil office and got separate electrical connection from Maharashtra State Electricity Distribution Company Limited (MSEDCL).

TABLE 9.2: DETAIL OF MINOR LIFT IRRIGATION SYSTEMS ON RIVER WAINGANGA WITHIN CATCHMENT AREA OF BARRAGE AT KAWALEWADA

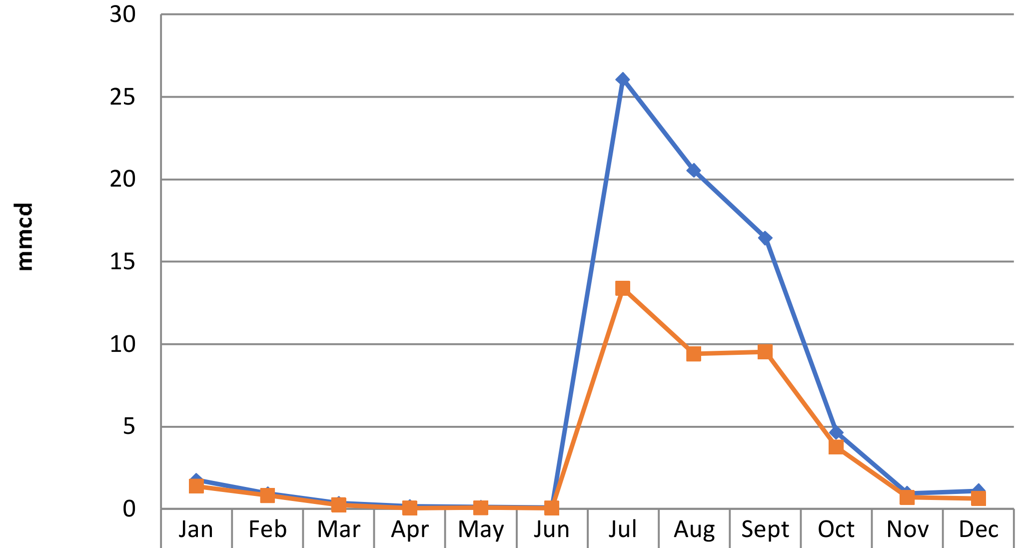
Village /GP	Pumping Capacity (in HP)	Average Pumping (in hr)	Number of Pumps	AVG Daily Water Requirement (in KLD)
Karti Kh.	3, 5, 10	10-15	35	42000
Indora Br.	3, 5, 10	10-15	25	30000
Chandori Kh	3, 5, 10	10-15	75	90000
Gond Mohadi	3, 5, 10	10-15	40	48000
Arjuni	3, 5, 10	10-15	180	216000

9.3 PROBABLE IMPACT ON DOWNSTREAM USERS

Mainly the water is used for irrigation, drinking and other domestic purposes by downstream users. Due to the withdrawal of water from Dhapewada Barrage at Wainganga River, water availability during the monsoon and winter season will not be affected for downstream users as per the water availability study as sufficient water is available in the river. But it may affect up to certain extent during the summer/lean season. However, minimum water drawl is proposed during lean season as four number of raw water reservoir can store water required for about 40 days operation of Tiroda TPP. Accordingly due to the withdrawal of water from the River, there will be no major negative impacts on the water availability of the river and also the d/s competing users.

Impact due to water drawl for Tiroda TPP on water availability, water quality, ecology as well as socio-economy of local people at downstream of the intake point has been assessed on the basis of data collected from CWC for nearest GD&Q site Pauni for the year 1975 to 2010, Rajegaon for the year 1969-2005 and water level data of Dhapewada Barrage and discharge data recorded by Water Resource Department, Government of Maharashtra for January 2016 to December 2018. The impact on water availability at downstream due to withdrawl of water for Tiroda TPP is presented in Table 9.3. It is clearly seen from the analysis of monthly inflow data that the water availability at intake site at river Wainganga varies from 0.055627 to 13.39184 mcumd at 90% dependability (Figure 9.1). However, the average inflow required to pumped is only 0.191780 mcumd (including sediment flushing which come back in the river) for TTPP. The analysis of change in the water flow at downstream of intake point after the withdrawl of water for Tiroda TPP from Dhapewada Barrage at river Wainganga varies from 0.74 to 20.30% at 75% dependability, whereas 1.43 – 23.45% at 90% dependability of flow except pre-monsoon season. As the overall change in the water flow at downstream of the intake point is likely to be not significant at 75% as well as 90% dependability. Therefore APML can withdraw the 70 MCM water from the intake site at Dhapewada Barrage without affecting the downstream users. However, the actual intake of water is less than 50 MCM by APML for TTPP.

Figure 9.1: Monthly Trend of Inflow of Water in Dhapewada Barrage on Wainganga River



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
75% Dependability	1.7505	0.9446	0.3475	0.1528	0.1122	0.0678	26.064	20.542	16.447	4.6425	0.9581	1.1037
90% Dependability	1.3852	0.8178	0.257	0.0692	0.0816	0.0556	13.392	9.3996	9.5452	3.7517	0.7062	0.6446

TABLE 9.3: IMPACT ON INFLOW OF WATER DUE TO DRAWL FOR TTPP

Wainganga sub basin contributes to third highest storage of water with total 149 dams which are constructed over Wainganga and its different tributaries. There are two barrages, three weires and fifteen numbers of medium & large lift irrigation schemes constructed in Wainganga sub-basin. The storage capacity of dams/barrages/weirs are mostly filled in June & mid of July month. The store water is used for agricultural and ground water recharge in these regions.

Thus substantial quantity of water shall be discharge/overflow these water resource structure during monsoon and flows towards the downstream of intake structure and finally disposal in the Gose Dam.

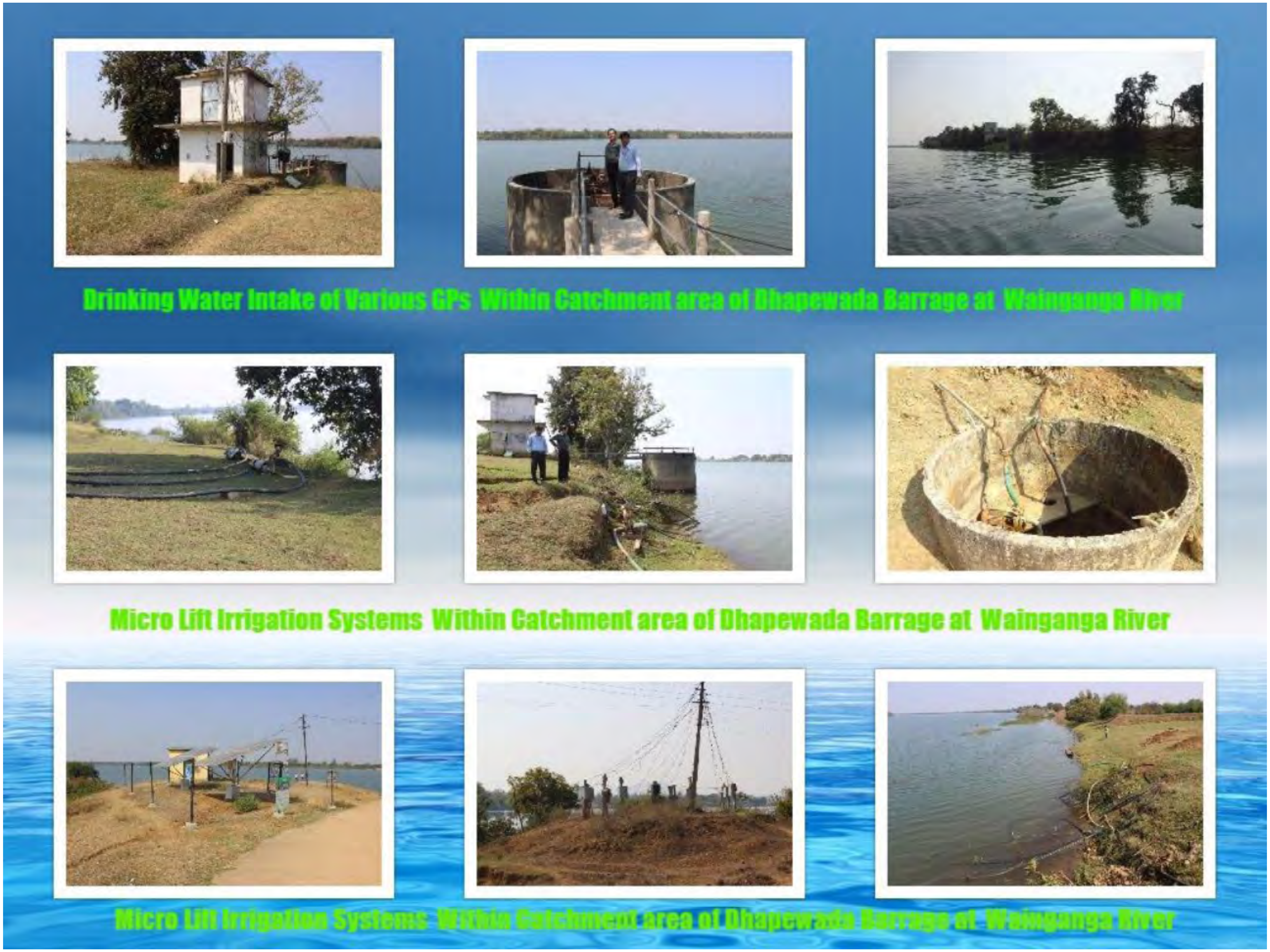


Photo Plate-13

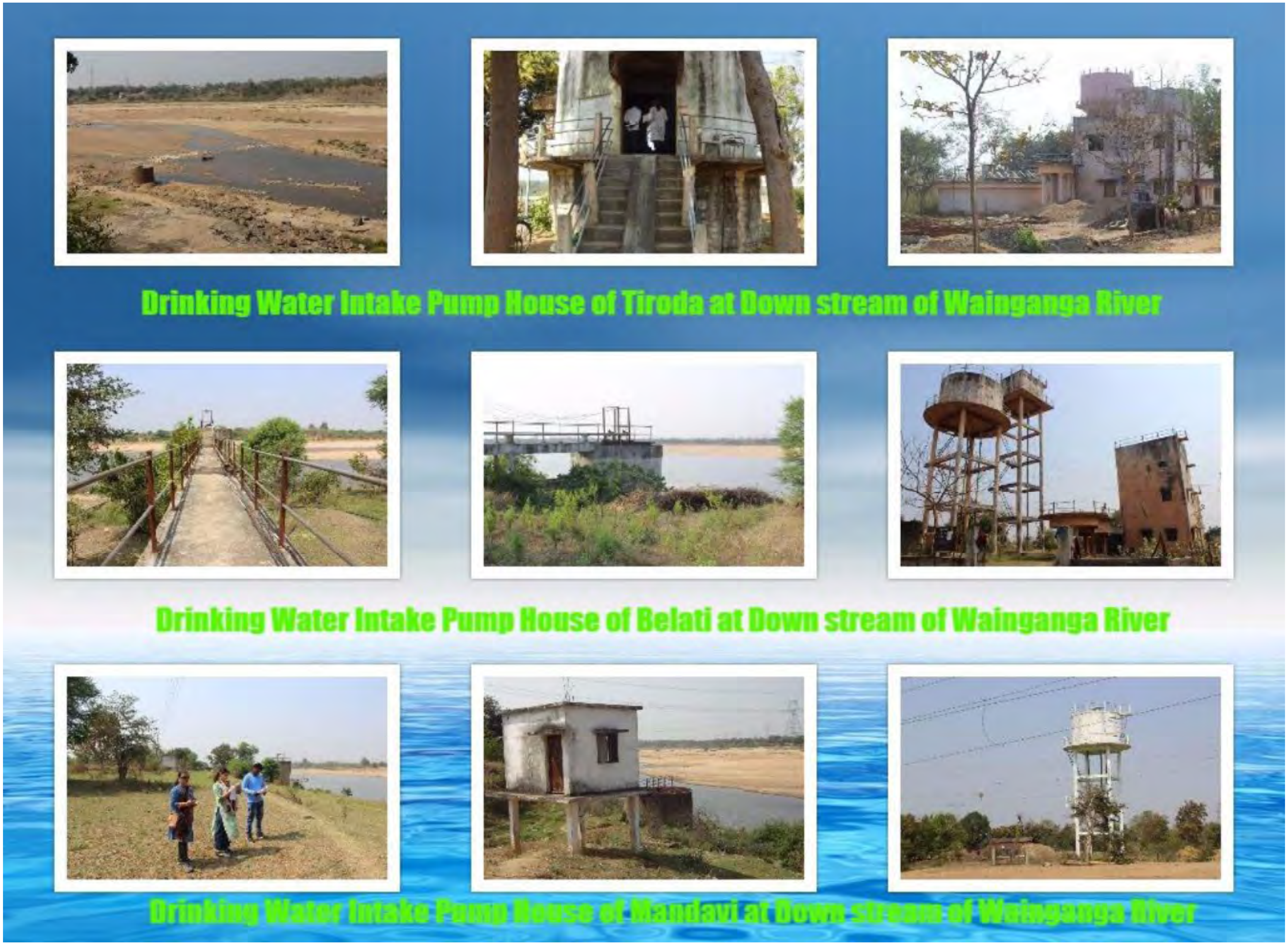


Photo Plate-14

Elora Paper Mill Water Intake Pump House at Down stream of Wainganga River

Manas Sugar Factory Water Intake Pump House at Down stream of Wainganga River

Irrigation Pumps at Down stream of Wainganga River

Photo Plate-15

10.0 WATER MANAGEMENT AND CONSERVATION PLAN

The water management & conservation plan for the Tiroda Thermal Power Plant of APML has been prepared with a view to help in conserving water during lean season/drought situations and ultimately reduce the demand of fresh water consumption from the Dhapewada Barrage at River Wainganga. However, the plan may not be limited to lean season, but shall be followed all the year round.

The Government of Maharashtra has allowed APMLL to draw annually 70 MCM raw water from Dhapewada Barrage at Kawalewada for TTPP and store water at plant reservoirs. Moreover, in order to reduce fresh water demand for the TTPP, various water conservation steps are being followed as recapturing & recycling this water which has a significant potential for water savings.

10.1 WATER CONSERVATION PLAN

The following water conservation steps are being implemented throughout the whole year with special emphasis during lean months/season for water conservation and reducing the ultimate water demand:

- APML have constructed four number of raw water reservoirs of total 7.340 MCM storage of water, so that sufficient water can be stored for utilizing during summer season, when enough water is not available.

- APML is also strengthening Rain Water harvesting measures, which may play an important role in conservation of water.

- Closed circuit cooling system have been adopted with minimum 5.5 COC for the thermal power plant to optimize fresh water requirement.

- In the Conventional Thermal Power Plants apart from cooling towers, water is also consumed in ash handling process. Bottom Ash from the boilers is being converted to slurry using the partially treated wastewater in water impounded bottom ash hopper and transported to co processing units for disposal. HCSD have been also adopted to optimize water requirement for disposal of unutilized ash.

- Moreover, in order to reduce the water demand in fly ash handling and disposal, a dry phase pneumatic conveying system is also adopted.

- The major waste-water generated from the plant like DM Plant discharge is being treated in a Effluent Treatment Plant and recycled for its reuse in the Plant. No discharge of liquid waste is foreseen from the TTPP. The coal pile area runoff water during monsoon season is being led to a well-designed Coal Setting pond. Coal particles settle down in the Pond and clear water allowed to overflow to the Central Monitoring Basin for treatment in the Effluent Treatment Plant (ETP).

- Automation of control systems has been done to the extent possible to reduce water losses.
- The rain water may be collected separately in the Storm Water Drain running all around the project. Rain Water Harvesting Pit may be connected to the Storm Water Drain. Excess rain water shall flow to common collection pit from where water can be pumped for use in the ash handling system.
- Regular maintenance of pumps and valves shall be carried out.
- Water audits shall be carried out regularly and records of water consumption and wastewater generation shall be maintained.

10.2 RAIN WATER HARVESTING

The APML has envisaged implementing some more rainwater harvesting schemes as a measure to enhance groundwater resources in line with the goal of deficit management and maintenance of source sustainability.

The hydro-geological analysis as discussed in earlier sections showed that the depths to groundwater levels in the buffer zone area vary between 0.10 m to 10.75 m below the ground surface during post- and pre-monsoon period and the groundwater occurs in unconfined to semi-confined conditions. Further, the hydro-geological formations of the area represent rocks of Gondia and Bhandara formation which has fairly good soil cover of thickness varying from a foot to about six feet. These signify that aquifer possesses necessary hydro-geological characteristics and properties for groundwater recharge.

The direction of groundwater flow in the area represents that both Wainganga and Bagh River are fed by the adjoining aquifer and they are effluent (gaining) rivers. This indicates that by aquifer recharge the river flows can be enhanced. The Intake site is located in the embrace of the Wainganga and Bagh River. The land surface topography in and around the TTPP site is of undulating type having slopes from northeast to southwest and southern direction, i.e., towards the Wainganga and Bagh River.

Development of rainwater harvesting schemes in appropriate locations in the embrace of the Wainganga and Bagh River around the project site will help in capturing the surface runoffs and in aquifer recharge. The direction of groundwater flows in that area is towards the Wainganga and Bagh River. If situation allows, and it is possible for the APML, the rainwater harvesting schemes can also be developed on the other (right) side of the Wainganga River, where it has good scope for developing recharging scheme. The rainwater harvesting based artificial recharge schemes can be developed in areas where surface water can be captured and a large quantity can be stored. Normally, 1st /2nd order drainage channel can be preferred for capturing surface runoffs and groundwater recharge.

10.2.1 Groundwater Recharge Schemes

A number of groundwater recharge schemes are practiced in India. The selection of suitable technique for artificial groundwater recharge depends on various factors, which includes:

- Quantum of non-committed surface run-off available.
- Rainfall pattern
- Land use and vegetation
- Topography and terrain profile
- Soil type and soil depth
- Thickness of weathered / granular zones
- Hydrological and hydro-geological characteristics
- Socio-economic conditions and infrastructural facilities available
- Environmental and ecological impacts of artificial recharge scheme proposed.

The following guidelines can be followed to select site for artificial groundwater recharge scheme:

- Adequate space for surface storage is available.
- Water level is deep enough (> 8 m) and adequate sub-surface storage is available.
- Permeable strata are available at shallow/moderate depth.
- Adequate quantity of surface water is available for recharge to ground water.
- Adequate surface drainage density is present.
- Considering the geological and hydro-geological formations of the area, following
- groundwater recharge schemes are recommended:
- Contour Trenches.
- Gully Plugs, Nala Bunds, Check Dams.
- Recharge pit/Recharge Shaft.

Contour Trenches

Contour trenches are rainwater harvesting structures, which can be constructed on hill slopes as well as on degraded and barren waste lands in both high- and low- rainfall areas. Cross section of a typical contour trench is shown in Figure 10.1**.** The trenches break the slope at intervals and reduce the velocity of surface runoff. The water retained in the trench will help in conserving the soil moisture and ground water recharge.

The size of the contour trench depends on the soil depth and normally 1000 to 2500 sq. cm cross sections are adopted. The size and number of trenches are worked out on the bas112

is of the rainfall proposed to be retained in the trenches. The trenches may be continuous or interrupted and should be constructed along the contours. Continuous trenches are used for moisture conservation in low rainfall area whereas intermittent trenches are preferred in high rainfall area. The horizontal and vertical intervals between the trenches depend on rainfall, slope and soil depth. In steeply sloping areas, the horizontal distance between the two trenches will be less compared to gently sloping areas. In areas where soil cover is thin, depth of trenching is restricted and more trenches at closer intervals need to be constructed. In general, the horizontal interval may vary from 10m in steep slopes to about 25 m in gentle slopes.

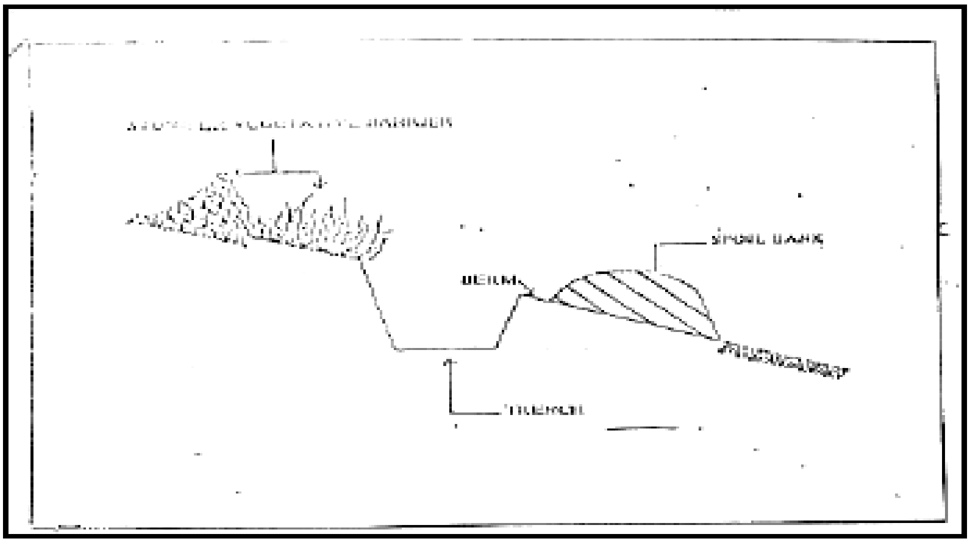


FIGURE 10.1: A TYPICAL SECTION OF CONTOUR BUNDS

Gully Plugs, Nala Bunds and Check Dams

These structures are constructed across gullies, nalas or streams for impeding the flow of surface water in the stream channel and water is retained for a longer duration in the pervious soil or rock surface. As compared to gully plugs, which are normally constructed across 1st order streams, nala bunds and check dams are constructed across bigger streams, in areas having gentler slopes. These may be temporary structures such as brush wood dams, loose/ dry stone masonry check dams constructed with locally available material or permanent structures constructed using stones, brick and cement. Competent civil and agro-engineering techniques are to be used in the design, layout and construction of permanent check dams to ensure proper storage and adequate outflow of surplus water to avoid scours on the downstream side for long term stability of the dam. Gabion structure is also a kind of check dam constructed across small streams to conserve stream flows using locally available stones and a steel wire mesh, with practically no submergence beyond the stream course.

The site selected for check dam should have sufficient thickness of permeable soils or weathered material to facilitate recharge of stored water within a short span of time. The water stored in these structures is mostly confined to the stream course and the height is normally less than 2 m. These are designed based on stream width and excess water is allowed to flow over the wall. In order to avoid scouring from excess run off, water cushions are provided on the downstream side. To harness the maximum run off in the stream a series of such check dams can be constructed to have recharge on a regional scale.

A series of small bunds or weirs may be constructed across selected nala sections such that the flow of surface water in the stream channel is impeded and water is retained on pervious soil/rock surface for a longer duration. A nala bund acts like a mini percolation pond. A typical section of a check dam/Gulley Plugs is given in Figure 10.2.

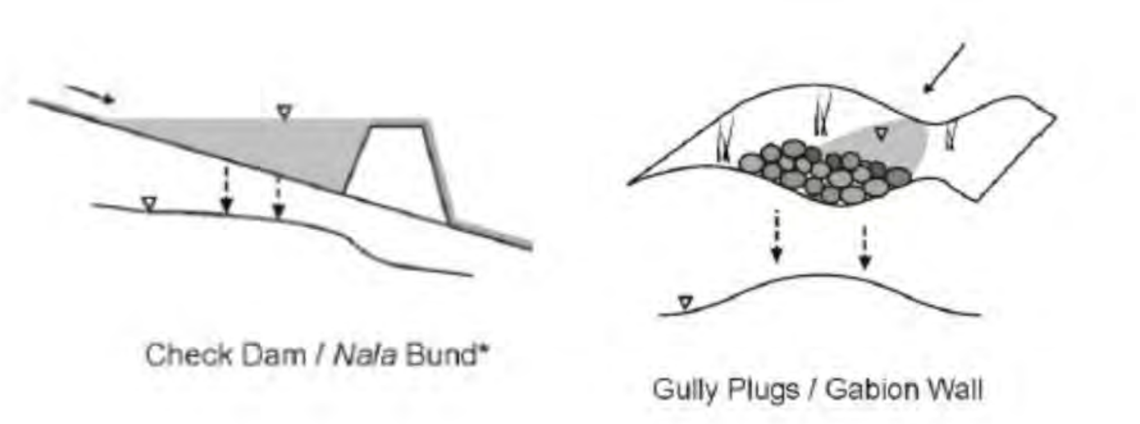


FIGURE 10.2: TYPICAL SECTION OF A CHECK DAM/GULLEY PLUGS

Recharge Pit/Recharge Shaft

Recharge pits are normally excavated pits, which are sufficiently deep to penetrate the low-permeability layers overlying the unconfined aquifers (Figure 10.3). They are similar to recharge basins in principle, with the only difference being deeper and having restrictedbottom area.

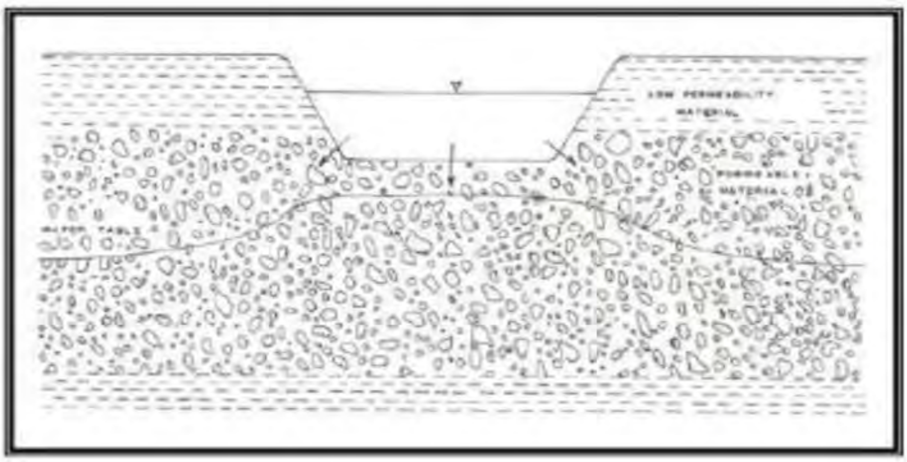


FIGURE 10.3: A TYPICAL SECTION OF A RECHARGE PIT

Recharge Shafts are similar to recharge pits but are constructed to augment recharge into phreatic aquifers where water levels are much deeper and the aquifer zones are overlain by strata having low permeability (Figure 10.4)**.**

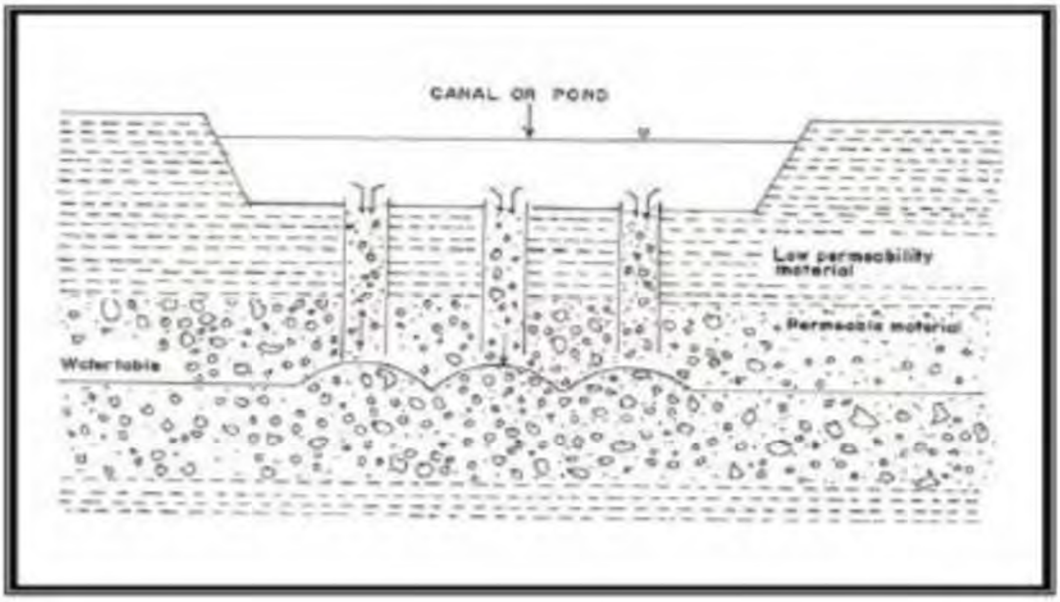


FIGURE 10.4: A TYPICAL SECTION OF A RECHARGE SHAFT

10.2.2 Number of Groundwater Recharge Schemes

The maximum deficit of water in the river flow to meet the requirement of environmental flows in 36 years at 90% dependability during the month of April and May. The monthly withdrawal of raw water from the Dhapewada barrage site by the APML is about 5.8333 Mm^3. The demand of APML is about 20% of the total water demands from Dhapewada barrage including irragation as well as domestic. Therefore, the APML can take responsibility to develop rainwater harvesting schemes for groundwater recharge of about 20% of 363.10 Mm^3, i.e., about 50 Mm^3 in a year.

Considering recharge potential of each scheme to be about 350000 m3 , the number of recharge scheme suggested is 5 (five). Environmental flow requirements in a river are necessary for ecosystem sustainability. It is to mention here that the project of the APML is largely a consumptive water use type with marginal return of water to the natural water system. Therefore, it is recommended that APML should volunteer to develop such number of rainwater harvesting based artificial groundwater recharge schemes as a corporate social responsibility.

11.0 SUMMARY AND CONCLUSIONS

11.1 SUMMARY OF IMPACTS

Adani Power Maharashtra Limited [APML], has setup Tiroda TPP (5x660 MW). The total annual water requirement of TTPP is 70 MCM, which is being drawn from Dhapewada Barrage at Wainganga River.

The study has been carried out in order to identify the likely impacts on water availability and downstream users due to withdrawal of water from the Dhapewada Barrage at River Wainganga. All the impacts associated with the withdrawal of water from the Dhapewada Barrage at River Wainganga which were likely to have an effect on the availability of water and downstream competing users have been identified and studied in detail.

The positive as well as negative impacts of withdrawal of 70 MCM water from Dhapewada barrage at Wainganga river for operation of Tiroda TPP are presented in Table 11.1. The foremost positive impact is increase in agricultural production as the water from the Dhapewada Barrage at river Wainganga would also be lifted for irrigation and Storage of water at Dhapewada Barrage will help in increasing the water table of that area. Irrigated agriculture besides providing food security, contributes substantially to conditions that favors improved infrastructure facilities like education, hospitals, roads and other communications allowing better access. Economic progress permits rural households a greater purchasing power. This in turn shall lead to increased commercial and industrial activities in the region. Increased production has impacts at national level too. Besides adding to GNP of the nation, excess grains produced are then transported to deficient regions.

TABLE 11.1: SUMMARY OF IMPACT OF WATER INTAKE FOR APML

Sr. No	Impact	Remarks
	POSITIVE IMPACTS:	
1.	Impacts on Agricultural Activity	Due to storage of water at Dhapewada Barrage and Strengthening of intake well and other allied infrastructure, Irrigation facilities in entire command area has Strengthen leading to multiple crop as well as better crop yield.
2.	Impacts on Floral community	Due to storage of water at Dhapewada Barrage some other positive impacts are envisaged which are as follows: • The wetlands resulting from accumulation of water due to storage at Dhapewada Barrage can be used to grow some medicinal plants.

		• Some aquatic plants may serve the purpose of providing green manure and help in increasing yield of the area.
3.	Impact on Hydrogeology	Due to storage of water at Dhapewada Barrage The ground water table has increased from its previous position, which benefits the nearby users as water availability gets improved in that area which finally leads to an increase in the crop yield.
NEGATIVE IMPACTS:		
4.	Impact on ecology due to the withdrawal of water for the Tiroda Thermal Power Plant	There will be no major negative impacts on the ecology as only 70 MCM water have been allocated for the Tiroda Thermal Power Plants. Moreover, in post project phase of Intake well condition, the untapped catchment area will have significant discharge, which will be available for the survival of existing aquatic life- fishes, arthropods, reptiles and seasonal amphibians in the river after withdrawal of water for the TTPP and other downstream users.
5.	Impact on drinking water supply at down stream towns/villages due to the withdrawal of water for the Tiroda Thermal Power Plant	There will be no significant impacts on the drinking water supply at down stream towns/villages viz Tiroda, Tumsar, Belati, Mandavi, etc as adequate water is being released from Dhapewada barrage even during lean season to meet the drinking water requirements.
6.	Impact on Industrial water requirement at down stream due to the withdrawal of water for the Tiroda Thermal Power Plant	There will be no significant impacts on meeting the industrial water requirements viz Elora Paper Mill, Manas Sugar Mill, etc at down stream as adequate water is being released from Dhapewada barrage even during lean season to meet the water requirements of these downstream industries.

11.2 CONCLUSIONS

The Tiroda Thermal Power Plant is located at Tiroda in Gondia District of state Maharashtra, India. The study has been carried out in order to identify the likely impacts on downstream users due to withdrawal of water from Dhapewada Barrage at River Wainganga for the Tiroda Thermal Power Plant. All the impacts associated with the Project likely to have an effect on the water availability and downstream users.

There are numbers of barrage & weirs already constructed on River Wainganga, which may play an important role to sustain the biological life of river body.

Considering the scenario of likely impacts, there are some impacts on the ecological environment of the River Wainganga which shall be mitigated naturally with due course of time as ecological cycle has a self-sustaining capacity. Moreover, there are insignificant impacts on the downstream users due to the water withdrawal for the Tiroda TPP. Further, the project proponent i.e. APML also undertakes CSR activities which shall have beneficial impacts on the socio-economic environment.

Looking to the overall project scenario, it has been noticed that the project in totality may be considered environmentally safe.

Final Report

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Annexure - XIV

adani

ADANI POWER MAHARASHTRA LIMITED

SOCIAL IMPACT EVALUATION & SOCIAL AUDIT FOR TIRODA TPP

Executed By

INDIAN INSTITUTE OF SOCIAL WELFARE & BUSINESS MANAGEMENT, KOLKATA

Final Report

SOCIAL IMPACT EVALUATION & SOCIAL AUDIT FOR TIRODA THERMAL POWER PLANT

adani

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FOREWORD

*The Adani Group has made foray into high growth sector like Power, Infrastructure, Global Trading, Logistics, and Energy. **Adani Power Maharashtra Limited (APML)**, a wholly owned subsidiary of Adani Power Limited, has set up 3300 MW (5 x 660 MW) Coal-based Super Critical Thermal Power Plant at Tiroda, District Gondia in Maharastra State.*

*The setting up and operation of Tiroda TPP may result in changes of socio-economic status and lifestyle of the local people. In order to fulfill the social obligation, APML is executing various measures for social mitigation and development in the plant area. Accordingly, they engaged **Indian Institute of Social Welfare and Business Management (IISWBM), Kolkata** to undertake detailed **Social Impact Evaluation and Social Audit for CSR activities undertaken by Adani Foundation, APML**. The present study would help to meet the requirement of MoEF's EC compliance besides meeting its mission of being socially responsible corporate entity with thrust on community development around its Tiroda Thermal Power Plant.*

The prime aims of the present study were to evaluate the social impact of setting up and operation of Tiroda TPP as well as CSR activities undertaken in and around the vicinity of the project area for upliftment of quality of life of local people of the neighbouring villages.

IISWBM was required to conduct field survey including public consultation, collect primary and secondary data on the basis of structured questionnaires for villages within the 10 km radius of TTPP and evaluate the social impact. This report presents the social changes in the region due to setting up and operation of Tiroda TPP. This study also provides an insight into the assessment of magnitude of social impact of various CSR activities undertaken by AF-APML during the period 2016-17 to 2018-19.

The cooperation and guidance received from Shri C P Sahoo, Sr. VP & Station Head, Shri A P Singh, AGM & Head, Environment Cell; Shri Nitin Shiralkar, Unit CSR Head, Adani Foundation, APML, Tiroda and other executives & officers of APML in conducting this study is highly acknowledged.

This study would have not been possible without the constant support and guidance of Executives of Adani Power Limited. We are grateful to acknowledge the constant guidance and support extended by Shri Santosh Singh, Sr. VP, Corporate Environment Group and Shri R. N. Shukla, AGM, Corporate Environment Group, Adani Power Limited as well as their officers and staff.

We are also thankful to Sarpanch, Upsarpanch and Panchayet members of villages within the study area for their cooperation and active support for conducting public consultation and socio-economic survey in their villages/Gram Panchayet.

Kolkata
March 18, 2019

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LIST OF ABBREVIATIONS

ABBREVIATION	DESCRIPTION
AH	: Animal Husbandry
AP	: Action Plan
APL	: Adani Power Limited
APML	: Adani Power Maharashtra Limited
BDO	: Block Development Officer
BHQ	: Block Head Quarter
BPL	: Below Poverty Line
CHC	: Community Health Centre
CPRs	: Common Property Resources
CRSP	: Centrally Sponsored Rural Sanitation Programme
CSR	: Corporate Social Responsibility
DDP	: District Development Plan
DHQ	: District Head Quarter
DRDA	: District Rural Development Agency
EHS	: Environment, Health & Safety
FGDs	: Focus Group Discussions
FMCG	: Fast Moving Consumer Goods
GDCF	: Gross Domestic Capital Formation
GDP	: Gross Domestic Product
GP	: Gram Panchayet
HSC	: Health Sub-Centre
ICDS	: Integrated child development services
ITI	: Industrial Training Institute
Ha	: Hectare
HH	: Household
IAY	: Indira Awas Yojana
IISWBM	: Indian Institute of Social Welfare & Business Management
IMR	: Infant Mortality Rate
IRDP	: Integrated Rural Development Program
ISIA	: Initial Social Impact Assessment
IRA	: Impoverishment Risk Analysis
JRY/JGSY	: Jawahar Rozgar Yojna/Jawahar Gram Samridhi Yojna
MoEF	: Ministry of Environment and Forests
MS	: Microsoft
MES	: Modular Employable Skills

ABBREVIATION	DESCRIPTION
MMR	: Maternal Mortality Rate
MNP	: Minimum Needs Programme
MSL	: Mean Sea Level
MTPA	: Metric Tonne per Annum
MW	: Megawatt
NFHS	: National Family Health Survey
NGOs	: Non-Governmental Organizations
NODP	: National Oilseed Development Programme
NREP	: National Rural Employment Program
O&M	: Operation & Maintenance
OBC	: Other Backward Class
OP	: Operational Policy
ORS	: Oral Rehydration Salts
PAPs	: Project Affected Persons
PAR	: Participatory Action Research
PAV	: Project Affected Village
PB	: Panchayat Bhavan
PC	: Public Consultation
PCBs	: Polychlorinated Biphenyls
PDS	: Public Distribution System
PGCIL	: Power Grid Coal India Limited
PHC	: Primary Health Centre
PHP	: Public Hand Pumps
PMGY-RWSP	: Pradhan Mantri Gramodaya Yojana - Rural Water Supply Programme
PPP	: Private-Public Partnership
PPPPs	: policies, plans, programmes and projects
PRIs	: Panchayati Raj Institutions
PRA	: Participatory Rural Appraisal
PWSS	: Piped Water Supply Schemes
QoL	: Quality of Life
QoC	: Cumulative Quality of Life
R&R	: Resettlement & Rehabilitation
RAP	: Resettlement Action Plan
RRA	: Rapid Rural Appraisal
SA	: Social Audit
SAP	: Special Action Plan
SC	: Scheduled Caste
SDIS	: Skill Development Initiative Scheme
SES	: Socio-Economic Survey

ABBREVIATION	DESCRIPTION
SEZ	: Special Ecological Zone
SH	: State Highway
SHG	: Self Help Group
SIA	: Social Impact Assessment
SIE	: Social Impact Evaluation
SPCB	: State Pollution Control Board
ST	: Scheduled Tribe
TFR	: Total Fertility Rate
TPP	: Thermal Power Plant
TSC	: Total Sanitation Campaign
TSP	: Tribal Sub Plan
TTPP	: Tiroda Thermal Power Plant
ULBs	: Urban Local Bodies
VDAC	: Village Development Advisory Committee
VFCs	: Value Function Curves
ZP	: Zila Parishad

CHAPTER I

INTRODUCTION

CHAPTER 1
INTRODUCTION

1.1 PROLOGUE

The Adani Group (1988) has grown from being a trading house to a diversified business group with interests from infrastructural development to FMCGs. The Adani Group has made foray into high growth sector like Power, Infrastructure, Global Trading, Logistics and Energy.

Adani Power Limited (APL), a member of the Adani Group, has taken up implementation of large Thermal Power Projects at various locations in India in view of the growing needs of power requirements in the country. APL is also actively planning to implement Thermal Power Stations at various locations in India, totaling to about 20,000 MW in the coming years.

Adani Power Maharashtra Ltd (APML), a wholly owned company of Adani Power Limited, has set up Tiroda Thermal Power Plant of 3300 MW (5x660) capacity near Tiroda Village, District Gondia in Maharashtra.

With reference to the Ministry of Environment, Forest & Climate Change (MoEF&CC), Government of India (GoI), Environmental Clearance (EC) for Tiroda TPP conditions no. (xliv) Social Audit for the CSR Scheme shall be carried out periodically as per the CSR guidelines of Government of India and Details to be submitted to MoEF&CC besides putting it on company's website.

Accordingly, in compliance to the conditions of MoEF&CC's EC for Tiroda TPP, Social Audit & Social Impact Evaluation Study for the Tiroda TPP need to be carried out.

The present study would enable Adani Power Maharashtra Limited to meet the requirement of MoEF&CC's EC compliance besides meeting its mission of being socially responsible corporate entity with thrust on community development around its Tiroda Thermal Power Plant.

1.2 PROJECT DETAIL

A 3300 MW (5 × 660 MW) coal based super critical thermal power plant has been set up. The location of Tiroda TPP is presented in Figure 1.1. The brief description of the plant is presented in Table 1.1. In addition to coal, LDO and HFO are used as an auxiliary liquid fuel. Light Diesel Oil (LDO) is used for cold start up and HFO is used for flame stabilization at lower load. The main plant is arranged within the three interconnected structures, the boiler, turbine building & integrated control and electrical building.

TABLE 1.1: SALIENT FEATURES OF TTPP

Item	Particulars
Location of the Plant	Town: Tiroda, District: Gondia, State: Maharashtra
Net capacity	3300 MW
No. of Units and configuration	Phase I – 2 x 660 MW Phase II – 3 x 660 MW
Date of Commercial Operation (COD)	Phase I – Unit 1: September 23, 2012 Unit 2: March 30, 2013 Phase II – Unit 3: June 14, 2013 Unit 4: March 31, 2014 Unit 5: October 11, 2014
Technology	
Steam Generator	Super critical Pressure 255 kg /cm^2 Temperature 571°C
Turbo Generator	Turbine -246 kg/cm^2 (a), 563°C, 3000 rpm Generator - 660 MW (Each unit) Generator Transformer - 776 MVA
Major Auxiliary System	• Boiler & Turbine Auxiliaries • Pretreatment Plant • Compressed Air System • Coal and Ash Handling System • CW System and Raw Water System • Fire fighting System • Air conditioning System • Ventilation System
Stack Details	
No. of Stack	2
Stack Height (meter)	275 each
No. of flue	Five
Additional equipment	Electrostatic Precipitator
Coal	Indigenous Coal – 15.0 MTPA (6.3 MTPA for Phase I & 8.7 MTPA for Phase II) Transportation: Railways
Land	
MIDC Land Forest land	402.00 ha [210 ha for Phase I & 192 ha for Phase II] 163.84 ha
Water	
Cooling Technology	Induced draft cooling system is proposed
Total Water Requirement	90 MCM (36 MCM for Phase I & 54 MCM for Phase II) (withdraw 20 MCM)
Total Discharge	'Zero Discharge Norm' is being followed
General Information	
Manpower Requirement (Total)	Approx 700
Project Cost	Rs 17,772crores for both phases

Advantages of Supercritical Thermal Cycle:

- The 660 MW units have super critical steam parameters to achieve higher efficiency and hence, lower cost of generation. The prime advantages of the Super-critical technology are:
    - ➢ Improvement in power plant efficiency is more than 2%.
    - ➢ Reduction in coal consumption.
    - ➢ Reduction in emission of Green house gases.
    - ➢ Overall reduction in auxiliary Power Consumption,
    - ➢ Reduction in requirement of ash dyke land and consumptive water.
    - ➢ Sliding pressure operation due to once through system.
    - ➢ Uniform distribution of heat due to spiral wall arrangement leading to less Boiler tube failure, thereby improving system continuity and availability of the station.
    - ➢ Low thermal stress in turbine.
    - ➢ Less start up time of the boiler.
    - ➢ Reduction in water requirement.
- The thermodynamic cycle for 660 MW units considers super-critical steam parameters. The unit comprises of boiler, steam turbine generator, condenser, condensate extraction and boiler feed system along with all other necessary equipment for single/double reheat-regenerative cycle. For purpose of the study, the MP/IP cylinders may be of single/double casing design as per manufacturers' standard. The exhaust from HP-IP turbine will further expand in the double flow LP Turbine.

Steam Generator:	Super critical Pressure 255 kg /cm^2 Temperature 571°C
Turbo Generator:	Turbine - 246 kg/cm^2 (a), 563°C, 3000 rpm Generator - 660 MW (Each unit) Generator Transformer - 776 MVA

- A tri-flue chimney with common windshield for the unit 1, 2 & 3 has been installed. The total height of reinforced concrete chimney is 275 m having 7.4 m exit diameter.

- A bi-flue chimney with common windshield for the unit 4 & 5 has been installed. The total height of reinforced concrete chimney is 275 m having 7.4 m exit diameter.

- For air pollution control system, each steam-generating unit has been provided with electrostatic precipitators. Each precipitator has two parallel gas paths, any of which can be isolated for maintenance when required, keeping the other path in operation.

These units utilize main and hot reheat steam at a temperature of 566^0C at the turbine inlet. The main steam inlet pressure is about 254 Ata and the reheat steam pressures are in the order of 40 bar.

The energy flow in the process of thermal power generation is in four stages - firstly, the chemical energy of the coal is transformed into heat energy, which is then converted into mechanical energy and finally into electric energy through generator. The main raw materials required for thermal power generation are coal, water and air.

In the first stage, the coal moves from the coal handling plant to the coal bunker, from where it is fed into the pulverizing mills. This mill stacks, reclaims and crushes the coal into fine powder, which is then mixed with air and blow down into the boiler by a fan. In the boiler, the mixture of coal dust and air burns like a gas and produces high temperature. The boiler walls are lined with tubes containing high quality de-mineralized water, better known as boiler water. The heat released by the burning coal is absorbed by the boiler which in turn transfers the water into steam. The steam is then channelized through nozzles onto the turbines blades, where it makes the turbine rotate. A generator is attached to the turbine, which produce electricity once the turbine starts to move. The electricity is then passed through a step-up transfer which increase the voltage so that it can be transmitted efficiently over the power line of the grid.

The ash is generated due to combustion of coal as residue. Ash is collected at the bottom of the furnace as bottom ash, Economizer hoppers as Eco ash, Air-preheater hoppers as APH ash, electrostatic precipitator (ESP) hoppers as Fly ash and stack hoppers as Stack ash. The quantum of ash generation would depend on the plant load factor and the quality of coal being fed.

This ash, known as bottom ash is water quenched, and then conveyed for disposal. The rest is fly-ash, which is in form of fine powders and is taken out of the furnace to the Electrostatic Precipitators. The fly-ash trapped by the ESP is collected pneumatically operated dry ash storage silos for cement manufacturing.

As already mentioned earlier, the plant is using super-critical technology. The thermal efficiency of the power plant can be improved by using the steam at super critical condition. The improvement in overall efficiency of the plant compared to sub critical parameters is usually at least 2% if the super critical parameters are implemented. The importance of thermal efficiency of the thermodynamic cycle and the methods to improve the thermal efficiency of the cycle are also analyzed. The indirect costs such as reduction in maintenance cost, auxiliary power consumption, ash dyke land and environmental benefits such as reduction in green house gases; water requirements, etc. are additional to the above increase in efficiency.

Importance of Efficiency:

Since the time thermal power stations have been engineered, there is a quest for efficiency improvement. One such effort in that direction is supercritical parameters (i.e.) the pressure above 225 kg/cm^2 and temperature above 374.15ºC. The supercritical parameters for Tiroda 660 MW boiler are: 259 kg/cm^2 of pressure and 571ºC of temperature.

Methods of Increasing Ranking Cycle Efficiency:

The steam power cycle efficiency can be improved by the following methods:

<u>Raising supply temperature by super heating</u>: Increasing the turbine inlet temperature of steam will raise the heat supply to the boiler more than the heat rejection.

- <u>Raising inlet pressure of steam:</u> Increasing the pressure will mean increase in saturation temperature at which steam evaporates thus increasing the average inlet temperature (T_1).

- Efficiency can be improved by dropping the final pressure (or temperature) at which heat is rejected.

- <u>Regenerative heating</u>: Heating the feed water pumped to the boiler by bleeding steam from turbine.

- <u>Reheat cycle</u>: Reheating of steam in boiler after it has already expanded in high pressure (HP) turbine will avoid moisture formation in low pressure (LP) Turbine. Also more heat content of steam before LP turbine will improve efficiency.

At most elevated condition the steam is supercritical. Thus, if water is at a supercritical pressure and is heated the temperature will increase continuously. At a particular value the water will flash instantaneously into steam and super heating will commence. There is no change of specific volume from the liquid to the dry steam state.

Supercritical Boiler:

A Boiler operating at a pressure above critical point is called Supercritical Boiler. Supercritical Boiler has no drum and heat-absorbing surface being, in effect, one continuous tube hence called ‘Once Through Supercritical Pressure Boilers’. Boiler Feed Pump pressurizes the water in boiler, sensible heat is added in feed heaters, economizer and furnace tubes, until water attains saturation temperature and flashes instantaneously to dry saturated steam and super heating commences.

Steam Generator Set:

The steam generator for super-critical unit consists of a number of parallel circuits connected by inlet & outlet headers. Pressurized water enters the circuit at one end and leaves as supercritical steam at other end. Thus boiler is of "Once-through type". Once-through boiler may be designed in both two-pass & tower type design. Since flow is once-through furnace wall tube. Temperature tends to increase at low load. Assisted circulation mode is super imposed to overcome this problem. The volume of the evaporator system is much smaller compared to a Natural circulation boiler. Due to smaller inventory of stored water & steam, theoretical rate of response is much faster than drum unit at base load. Super heater section has been divided in convection and radiant zones and designed so as to maintain rated steam temperature of 571^0C at the outlet. The units have been completed with coal preparations and firing system, fuel oil firing system, draft plants comprising FD, ID and PA fans, electrostatic precipitators with required number of fields in series and a multi-flue 275 m high chimney.

Light Diesel Oil (Calorific value around 10,300 K Cal/Kg) is being used as start-up and stabilization fuel. As per GOI norms, space provision for FGD unit has been incorporated in the plant layout.

Due to elevated pressure and temperature, cycle efficiency improves which results in reduction of fuel consumption per unit of electricity generated, which in turn reduces CO_2, NO_X & SO_2 emission. To limit the dust load at the inlet to the chimney to a value of 50 mg/Nm^3, as per the norms prescribed by the Ministry of Environment and Forest, Govt. of India, adequately sized electrostatic-precipitators have been provided.

Turbine Generator Set:

The steam turbine set is with standard multi-stage, 3000 rpm, tandem compound, single/double reheat, regenerative, condensing, multi-cylinder unit with eight (8)/nine (9) uncontrolled extractions for regenerative feed water heating. The turbine has one single flow HP cylinder, one double flow IP turbine and two double flow LP casings. The LP turbine exhausts against a condenser pressure of 76 mm Hg (abs) and maximum cooling water temperature of 33^{o}C. The unit has horizontally split double flow LP cylinder with the LP turbine exhausting steam directly into spring mounted surface type, two-pass condenser having divided water box. The turbo-generator sets are designed for a maximum throttle steam flow at turbine valve wide open (VWO) condition of 105% of turbine MCR flow. A quick acting "HP and LP Turbine Bypass Station" has been provided as a part of turbine package. The unit is equipped with all auxiliaries as per good engineering practice. The steam turbine is directly coupled to the horizontally mounted, three phases, two-pole, cylindrical rotor type electric generator terminal after meeting power requirement for excitation system. The generator is of 0.85 – plant load factor and thus the MVA rating works out to be about 776 MVA. The generators deliver power at the standard voltage of the manufacturer between 20-24 KV, 3 Phase, 50 Hz. The steam turbine is equipped with hydraulic/motorized turning gear for uniform heating/ cooling of the rotor during start up/shut down. Highly sensitive electronic-hydraulic governing system is provided with suitable hardware to ensure fast speed to operation & safety. The units are complete with twin flow, double-pass, horizontal, surface type, water cooled condensers, 2 x 100% vacuum pumps (1W + 1S), vertical/ horizontal shell and tube type high pressure feed water heaters with group bypass arrangement, 4-stage horizontal U-tube low pressure heaters, drain cooler, gland steam condenser, horizontal spray or spray-cum-tray type deaerator with integral vent condenser etc. The units are equipped with two (2) nos. 50% capacity turbine driven and one (1) 30% capacity motor driven centrifugal, horizontal, boiler feed pumps of barrel casing construction.

1.3 OBJECTIVES OF STUDY

The aims of the proposed social audit were to evaluate social impact of CSR activities undertaken in and around the vicinity of the Tiroda TPP area for upliftment of quality of life of local people of the neighbouring villages. The prime objectives of the study include:

- To assess the baseline status of key social parameters around the Tiroda TPP site;
- To evaluate the social impact of the project based on the available secondary data and information generated during the study/survey;
- To present all potential significant social impacts and local employable youth for training in skills, relevant to the project;
- To undertake detailed social audit of CSR Activities undertaken by APML in last three years (i.e. 2016-17 to 2018-19).

1.4 SCOPE OF THE STUDY

The scope of the study includes the undertaking of a reconnaissance Social Audit & Social Impact Evaluation of CSR activities undertaken by APML. On the basis of the survey, a framework for assessing social development in all the villages coming within 10 km radius of the project site have been evolved. The study has been executed in line with National Legislation and in compliance with EC Conditions of MoEF&CC .

The scope of work includes:

1) Social Audit & Social Impact Evaluation Survey/study.
2) Action plan for identification of local employable youth for training in skills, relevant to the project.
3) Socio-economic profile of the villages and economic development profile of the villages.

4) Public consultation in all Panchayat/villages to ascertain the public views on various social and local issues.

5) Community engagement and social development plan.

6) Social Audit of 10 km radius and action plan for implementation.

7) Gap analysis and comparison of last three years for local development as well as social upliftment of local society.

8) Advantages of conducting Social Audit /Social Impact Evaluation.

1.5 DETAIL OF CSR VILLAGES

The location map along with villages falling within the 10 km radius of Tiroda TPP is presented in Figure 1.2. The detail of villages falling within the core zone, buffer zone-I (i.e. within 5 km radius of TTPP) and buffer zone-II (i.e. within 5-10 km radius of TTPP) is presented in Table 1.2. The Tiroda and Gondia block maps are presented in Annexure 1.1.

TABLE 1.2: LIST OF VILLAGES FALLING WITHIN THE 10 KM RADIUS OF TTPP

S. No.	Village	Location Code	Block	Direction Wrt TTPP	Aerial Distance Wrt TTPP (in km)	Zone
1	Gumadhawada	537553	Tiroda	N	1.09	Core Zone
2	Khairbodi	537551	Tiroda	W	2.18	Core Zone
3	Mendipur	537555	Tiroda	SE	1.64	Core Zone
4	Kachewani	537543	Tiroda	NE	3.28	Core Zone
5	Garda	537557	Tiroda	SW	3.55	Core Zone
6	Barbaspura	537554	Tiroda	NE	3.55	Buffer Zone-I
7	Wadhona	537562	Tiroda	E	3.82	Buffer Zone-I
8	Nimgaon	537563	Tiroda	E	4.91	Buffer Zone-I
9	Indora kh	537561	Tiroda	SE	4.64	Buffer Zone-I
10	Bhiwapur	537560	Tiroda	SE	2.46	Buffer Zone-I
11	Chikhali	537559	Tiroda	S	2.18	Buffer Zone-I
12	Khamari	537617	Tiroda	SE	3.55	Buffer Zone-I
13	Dongargaon	537616	Tiroda	SE	4.91	Buffer Zone-I
14	Thanegaon	537615	Tiroda	S	5.00	Buffer Zone-I
15	Churadi	537556	Tiroda	SW	3.28	Buffer Zone-I
16	Tiroda	802715	Tiroda	W	5.00	Buffer Zone-I
17	Nandnagar	537552	Tiroda	NW	2.73	Buffer Zone-I
18	Chirekhani	537550	Tiroda	NW	4.37	Buffer Zone-I

19	Bhuratola	537540	Tiroda	NW	3.82	Buffer Zone-I
20	Paldongari	537539	Tiroda	NW	4.64	Buffer Zone-I
21	Jamuniya	537541	Tiroda	N	3.55	Buffer Zone-I
22	Bendipur	537542	Tiroda	NE	4.91	Buffer Zone-I
23	Dabbetola	537536	Tiroda	N	7.10	Buffer Zone-II
24	Bora	537531	Tiroda	N	9.00	Buffer Zone-II
25	Sonegaon	537532	Tiroda	N	7.92	Buffer Zone-II
26	Bagholi	537530	Tiroda	N	10.00	Buffer Zone-II
27	Nahartola	537535	Tiroda	NE	8.46	Buffer Zone-II
28	Sejagaon	537534	Tiroda	NE	9.55	Buffer Zone-II
29	Dhadhari	537564	Tiroda	SE	6.28	Buffer Zone-II
30	Isapur	537585	Tiroda	SE	6.82	Buffer Zone-II
31	Govindtola	537566	Tiroda	SE	10.00	Buffer Zone-II
32	Bodalkasa	537619	Tiroda	SE	6.55	Buffer Zone-II
33	Khadaki	537618	Tiroda	SE	5.73	Buffer Zone-II
34	Sukadi	537621	Tiroda	S	6.28	Buffer Zone-II
35	Pindkepar	537620	Tiroda	S	7.10	Buffer Zone-II
36	Balapur	537622	Tiroda	S	8.46	Buffer Zone-II
37	Koweshwar	537623	Tiroda	S	7.64	Buffer Zone-II
38	Alezari	537624	Tiroda	S	9.28	Buffer Zone-II
39	Berdipur	537625	Tiroda	S	8.19	Buffer Zone-II
40	Khursipur	537626	Tiroda	S	9.28	Buffer Zone-II
41	Mendha	537614	Tiroda	S	6.82	Buffer Zone-II
42	Satona	537627	Tiroda	S	10.00	Buffer Zone-II
43	Malpuri	537558	Tiroda	SW	5.46	Buffer Zone-II
44	Birsi	537611	Tiroda	SW	7.64	Buffer Zone-II
45	Lakhegaon	537613	Tiroda	SW	7.92	Buffer Zone-II
46	Bopesar	537612	Tiroda	SW	8.74	Buffer Zone-II
47	Khodgaon	537586	Tiroda	SW	9.28	Buffer Zone-II
48	Vihirgaon	537574	Tiroda	SW	8.20	Buffer Zone-II
49	Sarandi	537575	Tiroda	SW	10.00	Buffer Zone-II
50	Umari	537573	Tiroda	SW	9.00	Buffer Zone-II
51	Dhadhari	537572	Tiroda	W	9.00	Buffer Zone-II
52	Belati bk.	537547	Tiroda	W	7.37	Buffer Zone-II
53	Mundipur	537548	Tiroda	W	8.74	Buffer Zone-II
54	Mandawi	537549	Tiroda	W	10.00	Buffer Zone-II
55	Kawalewada	537546	Tiroda	W	7.92	Buffer Zone-II
56	Pujaritola	537545	Tiroda	NW	6.28	Buffer Zone-II
57	Marartola	537544	Tiroda	NW	7.64	Buffer Zone-II
58	Karti Kh.	537538	Tiroda	NW	8.46	Buffer Zone-II
59	Karti Bk.	537537	Tiroda	N	6.55	Buffer Zone-II

60	Indora Br.	537529	Tiroda	N	8.19	Buffer Zone-II
61	Bihiriya	537528	Tiroda	N	9.28	Buffer Zone-II
62	Junewani	537886	Gondia	E	8.91	Buffer Zone-II
63	Sangrampur	537885	Gondia	E	7.82	Buffer Zone-II
64	Dhamnewada	537877	Gondia	E	5.90	Buffer Zone-II
65	Gangazari	537884	Gondia	E	10.0	Buffer Zone-II
66	Dandegaon	537878	Gondia	NE	8.36	Buffer Zone-II
67	Ekodi	537875	Gondia	NE	7.27	Buffer Zone-II
68	Rampuri	537876	Gondia	NE	6.72	Buffer Zone-II
69	Sahespur	537874	Gondia	NE	8.91	Buffer Zone-II

CHAPTER II

PRINCIPLES & GUIDELINES FOR SIE & SA

CHAPTER 2
PRINCIPLES & GUIDELINES FOR SIE & SA

2.1 CORPORATE SOCAL RESPONSIBILITY (CSR)

2.1.1 Concept of CSR

Corporate Social Responsibility (CSR) also called corporate responsibility, corporate citizenship, responsible business and corporate social opportunity is a concept whereby organizations consider the interests of society by taking responsibility for the impact of their activities on customers, suppliers, employees, shareholders, communities and other stakeholders, as well as the environment. This obligation is seen to extend beyond the statutory obligation to comply with legislation and sees organizations voluntarily taking further steps to improve the quality of life for employees and their families as well as for the local community and society at large. The practice of CSR is subject to much debate and criticism. Proponents argue that there is a strong business case for CSR, in that corporations benefit in multiple ways by operating with a perspective broader and longer than their own immediate, short-term profits. Critics argue that CSR distracts from the fundamental economic role of businesses; others argue that it is nothing more than superficial window-dressing; still others argue that it is an attempt to preempt the role of governments as a watchdog over powerful multinational corporations.

CSR in Global Context:

While there may be no single universally accepted definition of CSR, each definition that currently exists underpins the impact that businesses have on society at large and the societal expectations of them. Although the roots of CSR lie in philanthropic activities (such as donations, charity, relief work, etc.) of corporations, globally, the concept of CSR has evolved and now encompasses all related concepts such as triple bottom line, corporate citizenship, philanthropy, strategic philanthropy, shared value, corporate sustainability and business responsibility. This is evident in some of the definitions presented below:

The European Commission defines CSR as “the responsibility of enterprises for their impacts on society”. To completely meet their social responsibility, enterprises “should have in place a process to integrate social, environmental, ethical human rights and consumer concerns into their business operations and core strategy in close collaboration with their stakeholders”.

The World Business Council for Sustainable Development (WBCSD) defines CSR as “the continuing commitment by business to contribute to economic development while improving the quality of life of the workforce and their families as well as of the community and society at large.”

According to the United Nations International Development Organization (UNIDO), "Corporate social responsibility is a management concept whereby companies integrate social and environmental concerns in their business operations and interactions with their stakeholders. CSR is generally understood as being the way through which a company achieves a balance of economic, environmental and social imperatives (Triple-Bottom-Line Approach), while at the same time addressing the expectations of shareholders and stakeholders. In this sense it is important to draw a distinction between CSR, which can be a strategic business management concept, and charity, sponsorships or philanthropy. Even though the latter can also make a valuable contribution to poverty reduction, will directly enhance the reputation of a company and strengthen its brand, the concept of CSR clearly goes beyond that."

From the above definitions, it is clear that:

- The CSR approach is holistic and integrated with the core business strategy for addressing social and environmental impacts of businesses.

- CSR needs to address the well-being of all stakeholders and not just the company's shareholders.

- Philanthropic activities are only a part of CSR, which otherwise constitutes a much larger set of activities entailing strategic business benefits.

CSR in Indian Context:

CSR in India has traditionally been seen as a philanthropic activity. And in keeping with the Indian tradition, it was an activity that was performed but not deliberated. As a result, there is limited documentation on specific activities related to this concept. However, what was clearly evident that much of this had a national character encapsulated within it, whether it was endowing institutions to actively participating in India's freedom movement, and embedded in the idea of trusteeship.

As some observers have pointed out, the practice of CSR in India still remains within the philanthropic space, but has moved from institutional building (educational, research and cultural) to community development through various projects. Also, with global influences and with communities becoming more active and demanding, there appears to be a discernible trend, that while CSR remains largely restricted to community development, it is getting more strategic in nature (that is, getting linked with business) than philanthropic, and a large number of companies are reporting the activities they are undertaking in this space in their official websites, annual reports, sustainability reports and even publishing CSR reports.

The Companies Act, 2013 has introduced the idea of CSR to the forefront and through its disclose-or-explain mandate, is promoting greater transparency and disclosure. Schedule VII of the Act, which lists out the CSR activities, suggests communities to be the focal point. On the other hand, by discussing a company's relationship to its stakeholders and integrating CSR into its core operations, the draft rules suggest that CSR needs to go beyond communities and beyond the concept of philanthropy. It will be interesting to observe the ways in which this will translate into action at the ground level, and how the understanding of CSR is set to undergo a change.

2.1.2 CSR and Sustainability

Sustainability (corporate sustainability) is derived from the concept of sustainable development which is defined by the Brundtland Commission as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. Corporate sustainability essentially refers to the role that companies can play in meeting the agenda of sustainable development and entails a balanced approach to economic progress, social progress and environmental stewardship.
CSR in India tends to focus on what is done with profits after they are made. On the other hand, sustainability is about factoring the social and environmental impacts of conducting business, that is, how profits are made. Hence, much of the Indian practice of CSR is an important component of sustainability or responsible business, which is a larger idea, a fact that is evident from various sustainability frameworks. An interesting case in point is the NVGs for social, environmental and economic responsibilities of business issued by the Ministry of Corporate Affairs in June 2011. Principle eight relating to inclusive development encompasses most of the aspects covered by the CSR clause of the Companies Act, 2013. However, the remaining eight principles relate to other aspects of the business. The UN Global Compact, a widely used sustainability framework has 10 principles covering social, environmental, human rights and governance issues, and what is described as CSR is implicit rather than explicit in these principles.

Globally, the notion of CSR and sustainability seems to be converging, as is evident from the various definitions of CSR put forth by global organisations. The genesis of this convergence can be observed from the preamble to the recently released draft rules relating to the CSR clause within the Companies Act, 2013 which talks about stakeholders and integrating it with the social, environmental and economic objectives, all of which constitute the idea of a triple bottom line approach. It is also acknowledged in the Guidelines on Corporate Social Responsibility and Sustainability for Central Public Sector Enterprises issued by the Department of Public Enterprises (DPE), Ministry of Heavy Industries & Public Enterprises in April 2013. The new guidelines, which have replaced two existing separate guidelines on CSR and sustainable development, issued in 2010 and 2011 respectively, mentions the following:

“Since corporate social responsibility and sustainability are so closely entwined, it can be said that corporate social responsibility and sustainability is a company’s commitment to its stakeholders to conduct business in an economically, socially and environmentally sustainable manner that is transparent and ethical.”

2.1.3 Functional Elements of CSR

Milton Friedman, Nobel Laureate in Economics and author of several books wrote in 1970 in the New York Times Magazine that "the social responsibility of business is to increase its profits" and "the business of business is business". This represented an extreme view that the only social responsibility a law-abiding business has is to maximize profits for the shareholders, which were considered the only stakeholders for the company. However, time has given the term 'stakeholder' wider connotations. Edward Freeman defines, 'a stakeholder in an organization is any group or individual who can affect or is affected by the achievement of the organization's objectives.' Thus, the term stakeholder includes (apart from shareholders), but not limited to, customers, employees, suppliers, community, environment and society at large.

These and a host of other such ideas have given rise to the concept of Corporate Social Responsibility (CSR). The concept of CSR goes beyond charity or philanthropy and requires the company to act beyond its legal obligations and to integrate social, environmental and ethical concerns into its business process. Business for Social Responsibility defines CSR as "achieving commercial success in ways that honor ethical values and respect people, communities, and the environment. It means addressing the legal, ethical, commercial and other expectations that society has for business and making decisions that fairly balance the claims of all key stakeholders. In its simplest terms it is: "what you do, how you do it, and when and what you say." A widely quoted definition by the World Business Council for Sustainable Development states that "Corporate social responsibility is the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large".

Though, there is no universal definition of CSR but the common understanding amongst most of these definitions concern with how the profits are made and how they are used, keeping in mind the interests of all stakeholders. The concept of Corporate Social Responsibility is constantly evolving. The emerging concept of CSR goes beyond charity and requires the company to act beyond its legal obligations and to integrate social, environmental and ethical concerns into company's business process. What is generally understood by CSR is that the business has a responsibility - towards its stakeholders and society at large - that extends beyond its legal and enforceable obligations. The triple bottom line approach to CSR emphasizes a company's commitment to operating in an economically, socially and environmentally sustainable manner. The emerging concept of CSR advocates moving away from a 'shareholder alone' focus to a 'multi-stakeholder' focus. This would include investors, employees, business partners, customers, regulators, supply chain, local communities, the environment and society at large. The key components of CSR would therefore include the following:

Corporate Governance: Within the ambit of corporate governance, major issues are the accountability, transparency and conduct in conformity with the laws. Good corporate governance policy would enable the company to realize its corporate objectives, protect shareholder rights, meet legal requirements and create transparency for all stakeholders.

Business Ethics: relates to value-based and ethical business practices. 'Business ethics defines how a company integrates core values - such as honesty, trust, respect, and fairness – into its policies, practices, and decision making. Business ethics also involves a company's compliance with legal standards and adherence to internal rules and regulations.

Workplace & Labour Relations: Human resources are most important and critical to a company. Good CSR practices relating to workplace and labour relations can help in improving the workplace in terms of health and safety, employee relations as well as result in a healthy balance between work and non-work aspects of employees' life. It can also make it easier to recruit employees and make them stay longer, thereby reducing the costs and disruption of recruitment and retraining.

Affirmative Action/Good Practices: Equal opportunity employer, diversity of workforce that includes people with disability, people from the local community etc., gender policy, code of conduct/guidelines on prevention of sexual harassment at workplace, prevention of HIV/AIDS at workplace, employee volunteering etc. are some of the good practices which reflect CSR practices of the company.

Supply Chain: The business process of the company is not just limited to the operations internal to the company but to the entire supply chain involved in goods and services. If anyone from the supply chain neglects social, environmental, human rights or other aspects, it may reflect badly on the company and may ultimately affect business heavily. Thus, company should use its strategic position to influence the entire supply chain to positively impact the stakeholders.

Customers: The products and services of a company are ultimately aimed at the customers. The cost and quality of products may be of greatest concern to the customers but these are not the only aspects that the customers are concerned with. With increased awareness and means of communication, customer satisfaction and loyalty would depend on how the company has produced the goods and services, considering the social, environmental, supply-chain and other such aspects.

Environment: Merely meeting legal requirements in itself does not comprise CSR but it requires company to engage in such a way that goes beyond mandatory requirements and delivers environmental benefits. It would include, but not limited to, finding sustainable solutions for natural resources, reducing adverse impacts on environment, reducing environment-risky pollutants/emissions as well as producing environment-friendly goods.

Community: A major stakeholder to the business is the community in which the company operates. The involvement of a company with the community would depend upon its direct interaction with the community and assessment of issues/risks faced by those living in the company surrounding areas. This helps in delivering a community-focused CSR strategy - making positive changes to the lives of the people and improving the brand-image of the company. Involvement with the community could be both direct

& indirect - through funding and other support for community projects implemented by local agencies.

2.1.4 Benefits of a CSR Programme

As the business environment gets increasingly complex and stakeholders become vocal about their expectations, good CSR practices can only bring in greater benefits, some of which are as follows:

- **Communities provide the licence to operate:** Apart from internal drivers such as values and ethos, some of the key stakeholders that influence corporate behaviour include governments (through laws and regulations), investors and customers. In India, a fourth and increasingly important stakeholder is the community, and many companies have started realizing that the 'licence to operate' is no longer given by governments alone, but communities that are impacted by a company's business operations. Thus, a robust CSR programme that meets the aspirations of these communities not only provides them with the licence to operate, but also to maintain the licence, thereby precluding the 'trust deficit'.

- **Attracting and retaining employees:** Several human resource studies have linked a company's ability to attract, retain and motivate employees with their CSR commitments. Interventions that encourage and enable employees to participate are shown to increase employee morale and a sense of belonging to the company.

- **Communities as suppliers:** There are certain innovative CSR initiatives emerging, wherein companies have invested in enhancing community livelihood by incorporating them into their supply chain. This has benefitted communities and increased their income levels, while providing these companies with an additional and secure supply chain.

- **Enhancing corporate reputation:** The traditional benefit of generating goodwill, creating a positive image and branding benefits continue to exist for companies that operate effective CSR programmes. This allows companies to position themselves as responsible corporate citizens.

2.1.5 Principles and Guidelines of CSR

National Voluntary Guidelines on Social, Environmental and Economic Responsibilities of Business rolled-out by the Ministry of Corporate Affairs in India, were developed through an extensive consultative process with the objective of providing a distinctive India-centric approach for Indian businesses to understand the nuances of responsible business, applicable to large and small businesses alike. They are easy to comprehend and implement, and encourage businesses to adopt the triple bottom line approach. These guidelines consist of nine principles which relate to ethics and transparency, product life cycle sustainability, employee well-being, stakeholder engagement, human rights, environmental stewardship, responsible policy advocacy, inclusive development and consumer well-being. Each principle consists of core elements that further articulate the purpose and sense of each principle. It also provides an approach for adopting these guidelines.

In India, the concept of CSR is governed by Section 135 of the Companies Act, 2013, which was passed by both Houses of the Parliament, and had received the assent of the President of India on 29 August 2013. The CSR provisions within the Act is applicable to companies with an annual turnover of 1,000 crore INR and more, or a net worth of 500 crore INR and more, or a net profit of five crore INR and more. The new rules, which are applicable from the fiscal year 2014-15 onwards, also require companies to set-up a CSR Committee consisting of their board members, including at least one independent director.

The Act encourages companies to spend at least 2% of their average net profit in the previous three years on CSR activities. The ministry's rules, that have been put up for public comment, define net profit as the profit before tax as per the books of accounts, excluding profits arising from branches outside India.

The Act lists out a set of activities eligible under CSR (Figure 2.1). Companies may implement these activities taking into account the local conditions after seeking board's approval. The indicative activities which can be undertaken by a company under CSR have been specified under Schedule VII of the Act.

The Companies (Corporate Social Responsibility Policy) Rules, 2014 provide a number of clarifications, some the highlights are as follows:

- Surplus arising out of CSR activities will have to be reinvested into CSR initiatives, and this will be over and above the 2% figure.

- The company can implement its CSR activities through the following methods:

  - Directly on its own

  - Through its own non-profit foundation set- up so as to facilitate this initiative

  - Through independently registered non-profit organisations that have a record of at least three years in similar such related activities

  - Collaborating or pooling their resources with other companies

FIGURE 2.1: LIST OF CSR ACTIVITIES
(AS PER COMPANIES ACT, 2013 SCHEDULE VII)

- Only CSR activities undertaken in India will be taken into consideration.
- Activities meant exclusively for employees and their families will not qualify.
- A format for the board report on CSR has been provided which includes amongst others, activity-wise, reasons for spends under 2% of the average net profits of the previous three years and a responsibility statement that the CSR policy, implementation and monitoring process is in compliance with the CSR objectives, in letter and in spirit. This has to be signed by either the CEO, or the MD or a director of the company.

2.1.6 CSR Policy of APL

Adani Power Limited (APL) has always been committed to the cause of social service and has repeatedly channelized a part of its resources and activities, such that it positively affects the society socially, ethically and also environmentally. The company has taken up various CSR initiatives and enhanced values in the society.

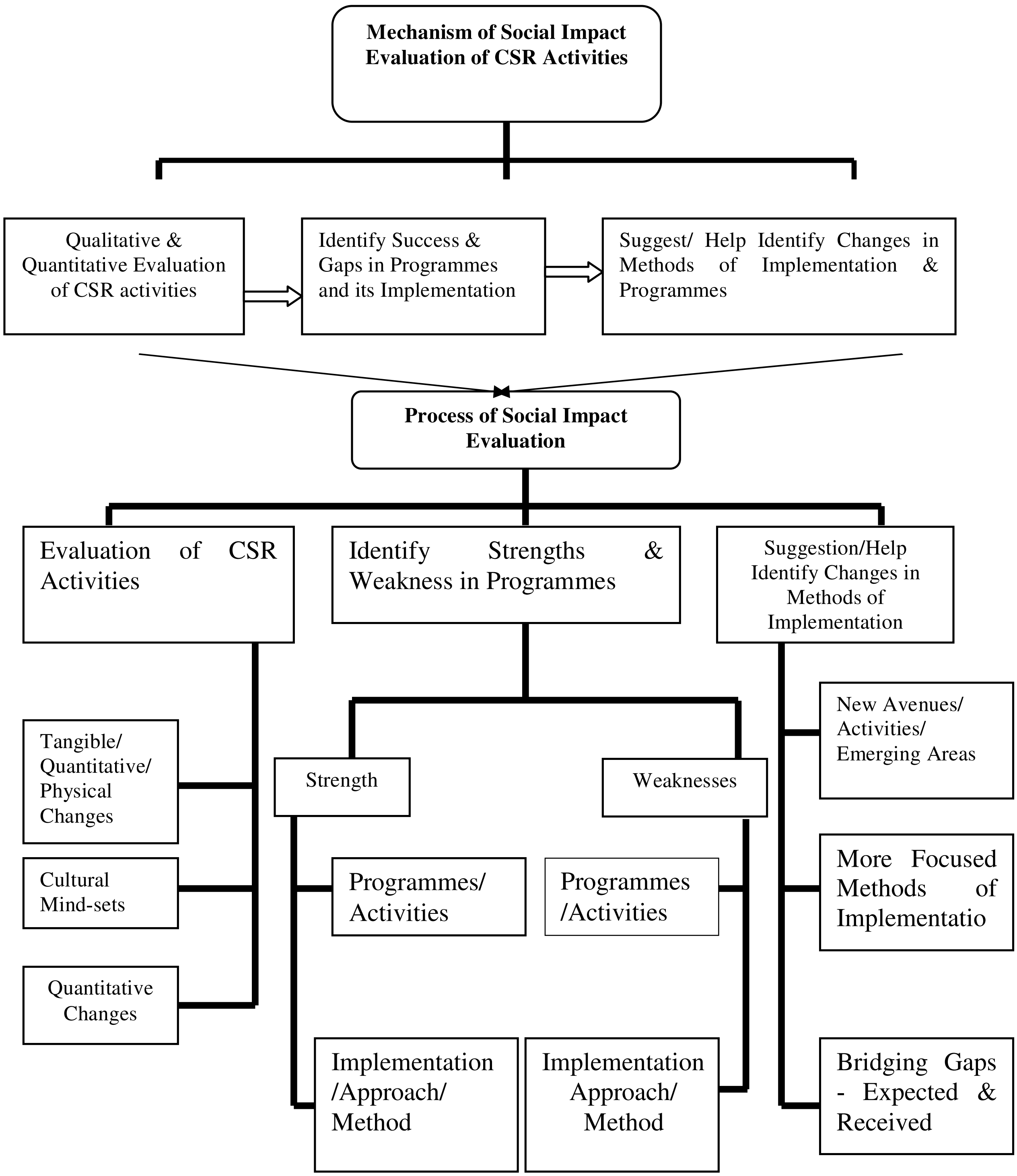
With the advent of the Companies Act, 2013 constitution of a Corporate Social Responsibility Committee of the Board and formulation of a CSR policy became a mandatory requirement. Accordingly, the company has formulated a robust CSR policy which encompasses its philosophy and guides its sustained efforts for undertaking and supporting socially useful programmes for the welfare and sustainable development of the society. The CSR policy of APL was approved by the Board of Directors on 6th August, 2014. The detail of CSR Policy of APL, August, 2014 is presented in Annexure 2.1.

2.2 SOCIAL IMPACT EVALUATION (SIE)

APML believes in growth with a human face, and pursuing people-centered development. APML is a socially committed organization and a socially responsible corporate citizen. It attaches great importance to discharging its overall social responsibilities to the community and the society at large. In accordance with its mission of being socially responsible corporate entity with thrust on Community Development, APML aims to focus on implementing all community development (CD) programmes in the affected/ neighbouring villages around its Tiroda TPP based on the specific needs of the community assessed through the Need Assessment Survey. APML has undertaken CSR activities as per the APL's CSR policy in approximately 50 villages under Baran District of Maharashtra on the basis of NAS. To understand the effectiveness and utility of the CSR activities carried out, it is imperative to conduct an evaluation study to measure the social, economic & cultural impacts of the programs/activities on the community. The whole exercise aims to set long-term CD priority, which could be achieved within the specified time frame. The evaluation process would also help APML to create positive brand image and contribute to sustainable development. Very briefly, social impact evaluation is a way of assessing the impact of CSR activities on groups/community members. The results for evaluation then guide future actions.

Social Impact Evaluation basically means the evaluation of qualitative and quantitative impact of the Community Development Programme carried out by the organization on the community. The evaluation includes assessment of the physical changes that have taken place during an identified span of time because of the activities undertaken as well as the awareness and perception of the people for whom the activities were aimed. The impact could be short term or / and long term. It could be on the economic aspect or the socio-cultural aspect or on both the aspects. This impact would vary depending upon the efficiency and effectiveness of the CD activities carried out and the social/physical infrastructure provided to the Community. The mechanism of SIE of CSR activities is presented in Figure 2.2

FIGURE 2.2: MECHANISM OF SOCIAL IMPACT EVALUATION OF CSR ACTIVITIES



Social impact evaluation would help to determine the extent to which the community people have got benefited from the CSR activities implemented for them and whether CSR activities have been able to bring desired changes in the educational/ health / economic status of the communities, thereby providing an understanding of the effectiveness of the existing programs/ activities. SIE also proposes the changes that need to be undertaken in future implementation of CSR activities. SIE helps to understand the following aspects of community:

- The short term and long term social/ cultural / economic impacts of the CSR activities on the community people.
- The effectiveness of the existing programs / activities with respect to the needs of the community.
- The contribution of CSR activities in raising the living standard of people.
- The changing needs of the community people.

2.3 SOCIAL AUDIT (SA)

Social auditing is a process that enables an organisation to assess and demonstrate its social, economic, and environmental benefits and limitations. It is a way of measuring the extent to which an organisation lives up to the shared values and objectives it has committed itself to. Social auditing also provides an assessment of the impact of an organisation's non-financial objectives through systematically and regularly monitoring its performance and the views of its stakeholders. Social auditing requires the involvement of stakeholders. This may include employees, clients, volunteers, funders, contractors, suppliers and local residents interested in the organisation. Stakeholders are defined as those persons or organisations who have an interest in, or who have invested resources in, the organisation.

In other words, a social audit is a way of measuring, understanding, reporting and ultimately improving an organization’s social and ethical performance. A social audit helps to narrow gaps between vision/goal and reality, between efficiency and effectiveness. It is a technique to understand, measure, verify, report on and to improve the social performance of the organization. Social auditing creates an impact upon governance. It values the voice of stakeholders, including marginalized/poor groups whose voices are rarely heard.

The key difference between development and social audit is that a social audit focuses on the neglected issue of social impacts, while a development audit has a broader focus including environment and economic issues, such as the efficiency of a project or programme.

2.3.1 Objectives of Social Audit

The prime objectives of social audit include:

- Increasing efficacy and effectiveness of community development programmes.
- Assessing the physical and financial gaps between needs and resources available for community development.
- Scrutiny of various policy decisions, keeping in view stakeholder interests and priorities, particularly of vulnerable & poor people.
- Creating awareness among beneficiaries and providers of local social and productive services.
- Estimation of the opportunity cost for stakeholders of not getting timely access to common property resources.

2.3.2 Advantages of Social Audit

A social audit can complement an organisation's annual financial audit by providing clear information on performance against social objectives. The results can be fed into the organisation's strategic review and planning processes to improve overall performance and social impact. It has been shown to increase accountability of the organisation to its stakeholders and to enhance democratic practice. In addition to serving as a management tool, social audits can be used for marketing, promotion and advocacy purposes. The prime advantages of social audit include:

- ➢ Encourages local democracy.
- ➢ Trains the community on participatory local planning.
- ➢ Encourages community participation.
- ➢ Benefits disadvantaged groups.
- ➢ Promotes collective decision making and sharing responsibilities.
- ➢ Develops human resources and social capital.

2.3.3 Process of Social Audit

CSR Audit is a formal strategic process that helps to measure company's actual social performance against the social objectives it has set for itself, and how decision making, mission statement, guiding principles, and business conduct are aligned with social responsibilities. The audit helps in discovering the interests and objectives of employees and stakeholders.

Recent research has indicated that integrating business strategy and corporate social responsibility contributes to:

- Improved community relations
- Reduced operating costs
- Increased employee satisfaction
- Corporate accountability
- Positive brand awareness

There are six key steps of Social Audit which are as follows:

1. Participatory activities:

- Understanding key principle of social audit.
- List core values of the programmes
- List down social objectives of the programme
- Match activities with objectives
- List current practices and delivery system
- Fix the responsibility for doing social audit
- Budget for social audit

2. Defining audit boundaries and identifying stakeholders

- Elaborate key issues for social auditing based on the social objectives
- Prepare a statement of purpose, objectives, key issue and activities for social auditing.
- Identify key stakeholders for consultation (Government and civil society)
- Forge consensus on audit boundaries to identify stakeholders and formalize commitments.

3. Social accounting & bookkeeping

- Select performance indicator for social accounting
- Identify what additional with existing records can be used.
- Identify what additional data to be collected, who would collect this data and how
- When stakeholders would be consulted and about what?
- Prepare a social accounting plan timeline
- Plan for monitoring social accounting activities

4. Preparing and using accounts

- Prepare social accounts using existing information, data collection and views of stakeholders
- Identify key issues for action
- Take stock of objective, activities and core values
- Set targets for future

5. Social audit & dissemination

- Presenting social accounts to social auditors
- Social auditors verify data and comment on the quality of social accounting and reporting
- Social auditor has to collect information from the stakeholders regarding programme implementation and benefits accrued to them
- Disseminate social auditors consolidate report to the decision making committee
- Disseminate report to civil society
- Begin next cycle of social accounting

6. Feedback & institutionalization of social audit

- Feedback for fine tuning of policy legislation, administrative functioning and programming towards social objectives
- Follow up action
- Reviewing support to civil society for the participation
- Institutionalization of process

Following are key factors for successful Social Audit:

- Level of information shared with and involvement of stakeholders, particularly of the rural poor, women, and other marginalized sections.

- Commitment, seriousness and clear responsibilities for follow-up actions.

- Involvement of key facilitators in the process.

CHAPTER III

SIE & SA METHODS & TOOLS

CHAPTER 3
SIE & SA METHODS & TOOLS

The Social Impact Evaluation (SIE) and Social Audit (SA) has been conducted using primary data as well as secondary data available with the Districts & Blocks as well as APL and APML. Interview with the local people and discussions with community, Government officials, community based organizations of the area were an important component of the study.

Conducting SIE & SA involve the use of a broad array of data collection methods, quantitative and qualitative, common in social science research. Often, a combination of tools may be required to do SIE and SA. In addition to substantive analytical tools, SIE & SA use participatory methods that contribute to a better understanding of the social as well as cultural issues.

3.1 DATA COLLECTION PROCEDURE

There are several methods of collecting data for purposes of conducting SIE and SA. The methods generally in use include:

Quantitative Methods

- Sample survey
- Other administrative records

Qualitative Methods

- Key beneficiaries/informant interviews
- Focus Group Discussions (FGDs)
- Rapid Rural Appraisal (RRA)/Participatory Rural Appraisal (PRA)
- Public consultation

The sample villages were selected representing whole CSR region of the Tiroda TPP for the present study. We have used both primary and secondary data for the study. The secondary data have been collected from the various source, namely, Census of India, Health Department, Education department, office of ICDS, Statistical department of the concerned district. The primary data have been collected from the beneficiaries of different programmes, Local community, Representatives of Gram Panchayets etc. from selected villages. The overall impact of CSR activities has been assessed for the last three years i.e. 2016-2017 to 2018-2019. The data collection work has been executed in two phases; under Phase-I, we developed rapport with different local communities, representatives of Gram Panchayat and some key persons of the selected villages and also approached different government officers of the concerned Blocks and District. Under Phase-II, we collected all relevant data from different sources. We recorded qualitative observations from Focus Group Discussion (FGDs), interviews with beneficiaries and

Gram Panchayat members during our field survey. The field survey was initiated in January, 2019 and completed in February, 2019. All the collected data were coded for computerization and subsequent analysis. All the data were then fed into the software of Statistical Package for Social Sciences (SPSS) and rechecked before analysis. The study tools, sample size for different targeted activities and methodology are given bellow:

3.2 SAMPLING & ANALYTICAL TOOLS

3.2.1 Sampling Tools, Sample Size and Coverage

Depending on the nature of information required, we developed six types of schedules/questionnaires for different target groups, namely, Beneficiaries under different programme, Village schedule for Gram Panchayats, schedule for Focus Group Discussions (FGDs) of communities, profiling of the CSR activities through local people, questionnaires for concerned government officials and thematic points for field observations. The tools and coverage by respondents have been given in Table 3.1.

TABLE 3.1: SAMPLING TOOLS, SAMPLE SIZE AND COVERAGE

Sampling Tools	Respondent	Sample Size	Scope
Part-A: Individual Beneficiary-Oriented Activities			
Beneficiary Schedule	Beneficiaries of Different programmes	At least 5 beneficiaries from each programme in each village (if <5, then all)	Obtain information on socio-economic, educational and demographic features of the households, type of benefits and its impact and need of the household
Part-B: Community Beneficiary-Oriented Activities			
Schedule for profiling the CSR activities	A group comprised of representatives of local body, Prominent Local People and Local communities	One Schedule administered in each village	Profiling of all the activities executed under CSR in the village
Schedule for Focus Group Discussions (FGDs)	Representatives of Local body, Prominent people, Representatives of weaker sections and project affected persons, if any	One FGD organized in each village and discussion initiated with 8-10 members of the specified areas ensuring gender representation	Community needs, quality of work/services & impact of executed activities like Infrastructural, Socio-cultural, Awareness, Livestock and Programmes for changing the traditional agricultural

			production system or any other CSR activities.
Village Schedule	Representatives of Gram Panchayat & Prominent people	One Schedule administered in each village	Availability of basic amenities, Demographic, Socio-economic and educational characteristics etc.
Qualitative Information	Self Observation	All team members	Impact on socio-economic -cultural – political aspects and any specific fact beyond the purview of structured schedule.
Part-C: Collection of Secondary Data			
Questionnaires /Data Format for Education Department	BSA/Coordinator from concerned Block Resource Centre	One from each Block	Population of the school going (6-14 years) children, enrolment, dropout, never enrolled children by gender and caste, retention etc.
Questionnaires/Data Format for Health Department	CMO/Medical Officer from PHC/CHC	One from each Block	Health status of the people regarding no. of cases of Measles, TB, Polio, Malaria and birth & death rate of the concern areas.
Questionnaires/Data Format for ICDS Department	DPO/CDPO of concerned Block	One from each Block	Immunization, information regarding mother and child care, IMR, MMR, U5MR

The sample copy of the questionnaires/formats developed for social impact evaluation of setting up of Tiroda TPP along with social audit of CSR activities is presented in Annexure 3.1.

3.2.2 Method for Sampling and Administration of Tools

The method adopted for survey and selection of sample was simple random sampling and purposive sampling. The simple random method has been used for the selection of different types of beneficiaries and purposive method was used for the selection of persons for FGDs and profiling the executed activities in the villages. The details are given in Table 3.2.

TABLE 3.2: METHODS OF SAMPLING AND ADMINISTRATION OF TOOL

Particulars	Sample method	Method for Administration of Tools
For collection of basic information of the village	The member of the team approached the concerned representatives of Gram Panchayats and prominent people of the village.	Individual interviews were conducted with the representatives of gram Panchayat and prominent people of the village avoiding the crowd.
Profiling the Executed Activities	For this purpose, we purposively selected groups, consisting of representatives of local body, prominent local people and local communities in each CSR village.	Identified the target persons with the help of facilitators. Due care for ensuring gender representation was taken. The date, time and venue for profiling of activities were fixed with the prior consent of identified persons. A two-member team in which one was monitor and other was writer started the profiling in a pre-decided venue.
Beneficiary from Different Programmes	We have arranged the list of beneficiary in alphabetical orders and then randomly selected the desired number. The additional sample has been taken to compensate the sample loss.	Trained members of the team approached the selected beneficiary with the help of facilitator and established rapport building. The individual interview was conducted in the house of the respondent avoiding the crowd.
Focus Group Discussions (FGDs)	For this exercise, we have purposively selected a group consisting of the representatives of local body, prominent people, representatives of weaker section and project affected person, if any, in each CSR village.	Identified the targeted persons with the help of facilitators ensuring gender representation. The date, time and venue for FGD fixed with the consent of the identified group. The two member of the team, in which one was monitor and the other was writer, started the FGD on pre-fixed venue. The monitor raised questions/issues and encouraged the members to discuss and explore the facts. The writer recorded the entire discussion in structured schedule and a voice recorder was also used for recording the matter of discussion.
Qualitative Information	In the above process each team member recorded his own observation on selected issues. The significant observation helped to understand the complicacy of the data.	
Information from Secondary sources	The team members requested the District Magistrate, Gondia, to provide his support and cooperation for collection of necessary data from different departments and for this purpose, the DM issued a letter to all concerned departments. The team members approached the concerned office and requested officers to provide the information on questionnaires. The concerned departments provided the available data.	

3.3 FIELD SURVEY

3.3.1 Reconnaissance Survey

A kick-off meeting was organised on 11th and 12th January, 2019 at Tiroda Thermal Power Plant site to discuss the modalities for initiating the social audit and social impact evaluation study and logistic support required for the same under the guidance of Shri A. P. Singh, Head (Environment) and Shri Nilkanth Prajapati, Manager (Environment), Tiroda TPP of APML after the preliminary discussion with IISWBM team members for the purpose.

During the introductory meeting with Shri C P Sahoo, Station Head, Tiroda TPP along with Shri A P Singh, Head (Environment) & Shri Nilkanth Prajapati, Manager (Environment), Tiroda TPP and IISWBM team members at Station Head Chamber, following issues were discussed & resolved to initiate the social audit & social impact evaluation study for Tiroda TPP:

1. Initially Shri C P Sahoo, Station Head, Tiroda TPP and Shri A P Singh, Head (Environment), Tiroda TPP explained the various CSR activities undertaken during last three years i.e. 2016-17 to 2018-19 and emphasised the recent CSR interventions of APML and their salient features viz. setting up of Adani Skill Development Center, Water Conservation & Rain Water Harvesting, Strengthening of Health and Sanitation facilities, Live Stock Development (Kamdhenu Project), etc as well as various IG activities for women empowerment like Mushroom Cultivation, Lac Bangle Making, Agarbatti Making, Bio-manure, bio-pesticide, etc. Subsequently Mr Singh highlighted the prime objectives and coverage of proposed study to be undertaken by IISWBM and mentioned that the study should consider all the major social issues in line with the regulatory agency’s requirement as well as needs of local people while assesing the impact of CSR activities on local community in particular and on region as a whole. Accordingly, various parameters included in the draft questionnaire submitted by IISWBM for social audit & social impact evaluation study have been discussed. Shri Prajapati mentioned that the proposed questionnaire may be used for pilot survey and on the basis of pilot survey certain parameters to address the local people need may be included, if required. Accordingly, it was resolved that the suggestions made during discussion as well as the observation recorded during the pilot survey would be incorporated in the proposed questionnaire and the same would be subsequently used for the field survey.

2. The detail meeting was held on 11th to 13th February, 2019 with Shri Nitin Shiralkar, Unit CSR Head, Adani Foundation, APML, Tiroda with IISWBM team members to understand the CSR activities of APML, Tiroda being undertaken by Adani Foundation, Tiroda. Shri Shiralkar highlighted the new intervention initiated for skill development and income generation besides the other SLD, Education, Health and Infrastructure Development activities. The following

information and documents were provided by CSR Cell of Adani Foundation, Tiroda:

a. List of priority villages along with name of Gram Panchayet and contact perso;

b. Copy of Annual Report of CSR for 2016-17 and 2017-18.

3. Initial field visit was undertaken under the guidance of Shri Shiralkar, along with Mr Nimesh, Ms Dipa and Mr Rahul, Project Officers, AF, APML, Tiroda on 13th January, 2019 to Berdipar, Khairbodi and Chikhali Villages to see the recent innovative interventions being undertaken in various CSR villages. During the visit the IISWBM team member interacted with benificiaries of Mushroom Cultivation, Agarbatti Making and Lac Bangle Making, etc and it was observed that these recent income generation intervention are highly motivating to the local people and effective in terms of ensuring sustainable livelihood as well as women empowerment. However, to scale up these interventions markting channel would be required to be developed more formal and robust on priority basis.

   The IISWBM team also interacted with some of the benificiaries of SRI, Vermi Composting, Biogas, Improved Chula, Kamdhenu schemes, swachhagrah, etc. and results of these interventions are also highly encouraging. The community beneficiary oriented intervention like smart card based RO water treatment system, e-learning kits, water conservation measures trough deepening of existing village ponds and creating rain water harvesting structure are also highly successful and social impact of these interventions are highly positive.

4. The setting up of state-of-the-art skill development center for SC/ST and other back ward people of the region under GoI Kausal Vikash Youjana at APML is one of the unique initiative of APML. The center is not only providing skill on latest welding techniques through digital simulator but also providing soft-skill training to increase employbility of trainees.

5. Dr. Agrawal requested to Shri Shiralkar to kindly provide village wise detail of CSR activities undertaken along with cost incurred for last three years i.e. 2016-2017 to 2018-2019. Shri Shiralkar ensured to provide all the information related to CSR activities of APML, Tiroda required for the present study. Accordingly, Dr. Agrawal submitted list of detailed information required in connection with CSR activities of APML to Shri Shiralkar.

6. It was resolved that the formal letter to sarpanch of selected GPs may be given in advance (at least 1-2 days) mentioning the objectives and modus operandi of social audit and social impact evaluation study. The format for the same as well as social impact of various CSR activities undertaken and suggestions for improvement was evolved under the guidance of Shri R N Shukla, Shri A P Singh and Shri Nilkanth Prajapati.

7. The time schedule for initiating the field survey was discussed in view of technical as well as logistic support required for the same. Shri A P Singh and Shri Nilkanth Prajapati Shri Nilkanth Prajapati suggested to depute the field survey team as early as possible to commence the field survey from 3rd week of January, 2019 and the same was agreed by IISWBM project team.

8. It was decided that initially 2-3 members team led by Dr. K. M. Agrawal would be deputed to sensitize the community in and around project area and start the field survey. Other team members including the local people after the proper training would be joining them subsequently as and when required.

9. Accordingly, the field survey was commenced from 14th January, 2019 at villages Tiroda and Chikhali & Kachewani under Tiroda Tehsil.

3.3.2 Field Survey

As discussed in earlier section, the field survey was commenced from 14th January, 2019 The series of public consultation meeting conducted involving Sarpanch/ Upsarpanch/ member of Gram Panchayet along with the local people to evaluate the social impact of setting up and operation of Tiroda TPP along with the evaluation of social impact of CSR activities undertaken by AF-APML during the last three years i.e. 2016-17 to 2018-19 as well as their suggestions for improving the quality of life of local people in all the core as well as buffer zone villages falling within the 10 km radius of the Tiroda Thermal Power Plant. The sample copy of FGD- public consultation intimation letter issued to Sarpanch/ Upsarpanch with request to organize public consultation on pre-decided date and time involving local people for the purpose along with endorsement regarding their presence during public consultation and the social issues identified along with their suggestions for the same is presented in Annexure 3.1.

Assessment of the existing basic amenities and infrastructural facilities along with the changes due to setting up and operation of Tiroda TPP as well as need for strengthening the same in the concerned villages was also undertaken. The detail of sample surveyed villages is presented in Table 3.3.

TABLE 3.3: DETAIL OF SAMPLE VILLAGES SURVEYED FOR SIE AND SA FOR TIRODA TPP

Sl. No.	Name of Village	Gram Panchayet	Block/Tehsil	Date of Survey	Zone
1	Garda	Garda	Tirora	19.01.2019	Core Zone
2	Gumadhwara	Gumadhwara	Tirora	21.01.2019	Core Zone
3	Kachewani	Kachewani	Tirora	15.01.2019	Core Zone
4	Khairbodi	Khairbodi	Tirora	17.01.2019	Core Zone
5	Mendipur	Mendipur	Tirora	23.01.2019	Core Zone
6	Barbaspura	Barbaspura	Tirora	18.01.2019	Buffer Zone - I
7	Berdipar	Kachewani	Tirora	17.01.2019	Buffer Zone - I
8	Bhiwapur	Bhiwapur	Tirora	22.01.2019	Buffer Zone - I
9	Chikhli	Chikhli	Tirora	15.01.2019	Buffer Zone - I
10	Chirekhani	Chirekhani	Tirora	19.01.2019	Buffer Zone - I
11	Churadi	Churadi	Tiroda	16.01.2019	Buffer Zone - I
12	Dhamnewada	Dhamnewada	Gondia	23.01.2019	Buffer Zone - I
13	Jamuniya	Jamuniya	Tirora	23.01.2019	Buffer Zone - I
14	Khamari	Khamari	Tirora	20.01.2019	Buffer Zone - I
15	Malpuri	Malpuri	Tirora	22.01.2019	Buffer Zone - I
16	Thanegaon	Thanegaon	Tirora	19.01.2019	Buffer Zone - I
17	Tirora	Tirora Municipality	Tirora	22.01.2019	Buffer Zone - I
18	Alejari	Alejari	Tirora	16.01.2019	Buffer Zone - II
19	Dandegaon	Dandegaon	Gondia	21.01.2019	Buffer Zone - II
20	Kawalewada	Kawalewada	Tirora	20.01.2019	Buffer Zone - II

The CSR activities undertaken by APML at villages around Tiroda TPP and its impact/feedback were also undertaken during the field survey. The priorities of local people were also identified for undertaking CSR activities.

The field survey and data collection have been completed on February 24, 2019 as per schedule.

3.3.3 Focus Group Discussions

An exhaustive guideline for conducting public consultation through Focus Group Discussions (FGD) was also developed. For discussion with male groups, various thematic areas were selected which included village history and its natural resources, access to public services, employment, housing, farm and non-farm livelihood, landholding and poverty, access to intuitional credit and transportation facilities. The thematic areas selected for discussion with women groups included PDS, Anganwadi, Primary Education, Women employment, drudgery and health issues.

The following Participatory Rural Appraisal (PLA) techniques were applied in the assessment process:

- Resource mapping
- Social mapping
- Input – Output tree
- Time line analysis
- Health chart
- Institution mapping

As discussed in earlier section, the field survey was commenced from 14th January, 2019. The series of public consultation meeting conducted involving Sarpanch/ Upsarpanch/ member of Gram Panchayet along with the local people to identify the likely social issues as well as their suggestions for tackling the same in all the core as well as buffer zone villages falling within the 10 km radius of the Tiroda TPP.

The public consultation intimation letters were issued to Sarpanch/ Upsarpanch with request to organize public consultation on pre-decided date and time involving local people. The local people participated in the public consultation were enlisted and their endorsement regarding their presence during public consultation were taken. During the public consultation, various social issues were identified along with their suggestions for mitigating the same were documented. Assessment of the existing basic amenities and infrastructural facilities along with the need for strengthening the same in the concerned villages was also undertaken.

CHAPTER IV

DETAIL OF CSR ACTIVITIES UNDERTAKEN

CHAPTER 4
DETAIL OF CSR ACTIVITIES UNDERTAKEN

4.1 THRUST AREA FOR CSR ACTIVITIES

Adani Foundation (AF) was established in 1996 and is situated in Ahmedabad. It was set up to enhance the socio-economic condition of backward rural community under Corporate Social Responsibility (CSR) near the vicinity of the plant premises. It is a part of the prestigious Adani Group and looks after the CSR related activities of the group, which has now become synonymous with creating wealth for the people. Foundation was established with the vision to "accomplish passionate commitment to the social obligations towards communities, fostering sustainable and integrated development, thus improving quality of life". Currently AF is working in Gujarat, Himachal Pradesh, Madhya Pradesh, Maharashtra and Rajasthan, etc.

As per the APL CSR policy AF-APML has undertaken various activities for providing sustainable livelihood and strengthening basic amenities & infrastructural facilities at villages of CSR zone Tiroda of APML. The CSR activities were initiated since inception of the Tiroda TPP.

The major emphasis are being given in sustainable livelihood development and strengthening the educational facilities in terms of providing infrastructural supports at primary as well as the secondary schools of Tiroda CSR zone. Besides improving the infrastructural facilities at educational institutions, the study materials, scholarships, etc. were also provided. For undertaking the CSR activities at CSR zones the emphasis were also given in improving road network, drinking water and health & sanitation facilities, etc. for villages of CSR zone.

As mentioned earlier, AF-APML has already initiated the various social mitigation and development activities in core as well as buffer zone villages within the 10 km radius of the Tiroda TPP. Initially, AF-APML has identified 18 villages divided into 3 clusters for undertaking CSR activities in the vicinity of Tiroda TPP. Subsequently, all the villages falling within 10 km radius of Tiroda TPP i.e. 64 have been classified into 4 clusters for undertaking CSR activities. The cluster wise detail of villages along with their demographic profile is presented in Annexure 4.1. The Adani Foundation is primarily focusing in four major thrust areas for socio-economic development in the vicinity of Tiroda TPP under Gondia District:

1. Education Facilities,
2. Community Health,
3. Sustainable Livelihood Development, and
4. Rural Infrastructure Development.

The need based annual action plan for undertaking CSR activities in the vicinity of Tiroda TPP area is being formulated. The social process being followed for formulation of annual action plan is mentioned in subsequent section.

At village level first AF-APML representatives attend Gram Panchayat meeting and introduce AF-APML and its objectives and societal commitment. Social development process requires basic information of village which is being collected through baseline survey and PRA which is the best practice for the purpose and the same is being followed. The baseline survey includes all information about village demographic profile, natural resources, geographical knowledge, etc. Some key information and primary social issues are captured through PRA like social mapping, resource mapping, matrix ranking, etc.

Matrix Ranking is very important tool to find out problems and solutions by village community. As per need, AF-APML prepares project with guideline like project planning, concept note, implementation strategy and outcome. This is in house process, then proposed developmental project is taken through Government Administration / Gram panchyat / Education Dept. / Health Dept. / Agriculture Dept. as per requirement of project nature and type before implementation of the same.

At village level, Village Development Committee (VDC) is being formed with the approval of Gram Panchyat. VDC members are selected by village community and give them rights and power for planning and decision making regarding social development of the village. They help in project implementation and look after which project(s) going in right direction or not and monitor and evaluation of CSR activities. VDC’s role is very effective in undertaking need based CSR Activities in the vicinity of Tiroda TPP.

The major CSR activities undertaken by AF-APML includes:

Education Facilities-

- Navodaya coaching for 5th std students at ZP Upper Primary School
- E-Learning package distribution programme to Government schools.
- E-learning kit with Education Software provided to Anganwadis and primary School.
- Workshop for Anganwadi Sevika on using the software provided for E-learning kit.
- Aamchishala- Adarshshala Competition initiated and implemented in Z.P Schools.
- UDAAN Programme- Educational exposure visit to Adani Power Plant Tirora.
- “Swachhagrah with School” programme.
- Champion Square English &Maths coaching classes for ZP Upper Primary Schools.
- Goal setting workshop for High school students
- Software module development training programme for Anganwadi
- Road Traffic safety Awareness Programme in Schools.
- Sports Material Distribution to youth group

- Workshop for Teachers on Maths through Origami
- Employee volunteering under education enhancement Programme
- Fire safety week Celebration with Schools
- Environment Day Celebration

Medical Facilities-

- MHCU Helpage India
- General Medical Health camp in CSR villages
- Upgradation of Government Hospitals
- Suposan
- Prayas
- Poor Patient Assistance Programme
- Swachhagraha
- Magic pit
- Homeopathic Medical Treatment Camp
- Pulse polio vaccination camp support to SDH Tiroda
- Street play on De-addiction awareness programme
- TSC (Total Sanitation Campaign) material support to CSR villages

Sustainable Livelihood Development-

- Sewing training center in CSR villages
- SRI cultivation in Kharif and Rabi season
- Vanmahotsav
- Cow based livelihood training programme
- Fly ash utilization training programme
- Mushroom cultivation training programme
- Training programme on formation of Farmers Producer Company
- Seminar on opportunities in abroad for ITI Job aspirants
- Felicitation of women for promoting de-addiction in village
- Self-help group meeting in villages
- Agarbatti making training programme
- Workshop on cashless transaction at APML
- SAKSHAM- Adani skill development center
- Workshop on lac bangle making for SHG women
- Catering services training programme for sustainable development
- Livestock development Centre (BAIF)
- Kitchen Garden Seeds distribution programme
- Installation of Pre-Fabricated Bio-gas systems
- Improved Chulha programme.
- Water conservation

Rural Infrastructure Development-

- Sabha Mandap construction in CSR village
- Establishment of RO Unit in CSR villages
- Jalyukta Shivar Campaign (Pond Deepening and Stream Cleaning Work)
- Construction of low cost house.
- Provide drinking water facility in CSR villages
- Installation of seating benches at CSR villages
- Construction of farm pond at CSR villages
- Construction of classroom in CSR villages Schools
- Construction of sharaddhanjali shed

4.2 DETAIL OF CSR ACTIVITIES UNDERTAKEN

4.2.1 Education Programme

The prime focus of education programme includes:

a) Providing/ Ensuring quality education for the Zilla Parishad school students

b) Building environment which supports Zilla Parishad school students in their study

c) Creating environment in the Zilla Parishad School for students through different co-curricular activities which engage students in their integrated development.

d) Making Efforts for 100% enrollment & retention of eligible children in Government Primary Schools.

e) Providing conducive & healthy environment in the Government Schools.

Under this Programme AF conducted various educational support programmes in working villages the detail list is as follows.

- Navodaya coaching for 5th std students at ZP Upper Primary School Gumadhawada and Gulabtola.
- E-Learning package distribution programme to Government schools.
- E-learning kit with Education Software provided to Anganwadis and primary School.
- Workshop for Anganwadi Sevika on using the software provided for E-learning kit.
- Aamchishala- Adarshshala Competition initiated and implemented in Z.P Schools.
- Adani Foundationis a State level partner with Education Department for capacity building of staff of Education department in quality education initiative of Government officers Maharashtra
- UDAAN Programme- Educational exposure visit to Adani Power Plant Tirora.

- Swachhagrah with School" programme
- Champion Square English &Maths coaching classes for ZP Upper Primary Schools.
- Goal setting workshop for High school students
- Software module development training programme for Anganwadi
- Road Traffic safety Awareness Programme in Schools.
- Sports Material Distribution to youth group
- Workshop for Teachers on Maths through Origami
- Employee volunteering under education enhancement Programme
- Fire safety week celebration with Schools
- Environment Day Celebration

Competitive Coaching Classes for Navodaya Entrance Exam

The Navodaya Vidyalaya is a unique experiment in the annals of School education in India and elsewhere. Its significance lies in the selection of talented rural children as the target group and the attempt to provide them with quality education comparable to the best in a residential school system.

Adani Foundation Tiroda inaugurated coaching classes on 29th June 2016. School Management committee, Gram Panchayat members, Parents, Teachers and students from class 5th were present during inauguration programme on 13th July 2016. 20 students attended classes on regular basis. 2 Teachers were hired for running classes before school and after school on regular basis. Monthly exam and monthly parents meeting were going on monthly basis. APML Station Head also gave their active participation in parents meeting. Station Head Sh C P Sahoo motivate students to do hard work in studies. Prizes were distributed among 3 topper students. Final exam was conducted on 8th January 2017.

Adani Foundation Tirora received request letter from Gram Panchayat Mendipur village for running coaching classes for Maths & English for 5th std to 7th std students. Inauguration Programme was conducted on 1st of August 2016.

Total of 41 students attended classes on regular basis with 3 special teachers hired for running classes smoothly without any interruption (Table 4.1). Monthly exam followed by parents meeting are conducted to ensure the progress and quality of programme. Unit CSR Head Sh Nitin Shiralkar motivated students to work hard and succeed in this competitive exam. The final exam which will be held on 21st April 2018.

TABLE 4.1: CENTRE WISE DISTRIBUTION OF STUDENTS

Name of Centres	No. of Students
Gulabtola	25
Gumadhavda	16
Total	**41**

Champion Square English and Maths Coaching Centers

Education now being one of the focus areas in rural area with Government spending approximately 25% of their budget should be followed up with required process in order to utilize all the funding and efforts taken up by Government. Though many facilities are provided to the schools, many of which are underutilized and the benefits are not reaching the students. The result of it is poor performance of students in academics especially in subjects like Mathematics and English, which are of great importance citing the future education. To ensure improvement not only in the quality of education for these subject but also in understanding the basic concepts, Adani Foundation started Champion Square classes at coaching centers at Mendipur, Chikhali, Pindkepar and Kachewani. The classes have helped student improve in these subjects with substantial improvement in their scores which is evident from their annual results. Village volunteers actively take up teaching some topic which they are comfortable teaching helping students gain. Table 4.2 presents enrolment status in Champion Square English and Maths Coaching Centres.

TABLE 4.2: STATUS OF ENROLMENT IN CHAMPION SQUARE ENGLISH AND MATHS COACHING CENTERS

S. No.	Name of the School	Village	Year	Boys	Girls	Total
1	ZP Upper Primary school	Chikhali	2016-2017	21	16	37
			2017-2018	31	29	60
2	ZP Upper Primary school	Mendipur	2016-2017	18	19	37
			2017-2018	19	13	32
3	ZP Upper Primary school	Pindkepar	2016-2017	20	15	35
4	ZP Upper Primary school	Kachewani	2017-2018	23	18	32
Grand Total				**132**	**110**	**242**

E-Learning Package Distribution Programme

The programme was organized in the premises of Adani Power Maharashtra Limited, Tirora, and APML Plant Head Sh Chaitanya Sahoo, District Education Officer Sh. Ulhas Narad, Women and Child Development Officer Sh J M Ambade, District Education Training Department Sh. Prashant Dawre, BEO Sunil Mandhare, CDPO Kale, and Adani Foundation's Unit CSR Head Sh Nitin Shiralkar were present to grace the occasion.

Honourable Sh Nandkumar Chief secretary, Education Department, asserted the need of technical progress in child education and development which will enhance the education standard at Anganwadi, primary and Higher secondary level. Added to this, department of education and child development will go hand-in-hand for this programme. He stressed on the need to upgrade the Education standard at Anganwadi level, which according to him will help the students to adjust with the higher level education.

He was all praise for Adani for becoming Government partner in the campaign. ShNandkumar also distributed E-Learning kits to 44schools of Tiroda Tehsil. Notably, Adani has become state level partner with the Education Department of Maharashtra Government for capacity building campaign for Education department employees in their endeavour transforming 100 Government schools into International standard schools, in first phase. The Government wants to bridge the gap of pre-primary and primary classes between Government schools and the private schools.

Adani Foundation has provided E-Learning kits and made arrangements for training session in their campus of Tiroda plant and till date around 100 employees from all over the state have been imparted with the training.

APML Plant Head, Sh Chaitanya Sahoo while reaffirming their commitment towards the society, shared about the social welfare activities carried out by Adani foundation at Tiroda. In this programme total 44 Government school's Principal and School management committee President were present. Anganwadi Supervisors and Teachers including Gram Panchayat Sarpanch and members were present. This programme evoked very good response. Total 6800 students benefitted from this activity.

Aamchi Shala- Adarsh Shala Competition (Best School Competition)

Education is one of the main focus areas of the AF-APML and working for enhancing the quality of education through various initiatives, community participation and support for making the schools clean and green are some of those initiatives. In connection with this AF-APML organized "Aamchishala" best school competition in nearby villages of APML on pilot basis.

In this Programme Deputy Education officer Sh Rajendra Gharde, Sh Balkrushna Bisen (District coordinator Sarva Shiksha Abhiyan) BEO Sh Sunil Mandhre and Sh Mubarak Saiyyad (Principal ZP Primary School Kharashi) were present. From villages Sarpanch, Students, Teachers and SMC members were present. Total 19 schools were participated in first phase.

Schools started there intervention looking towards parameters. SMC, Teachers, Gram panchayat Sarpanch and villagers actively participated in this activity. Adani Foundation team member's monitor the activity on regular basis.

Result declaration of Aamchishala – Adarshshala competition in year 2016-2017:

1. ZP Upper Primary school Gumadhawada secured 1st prize,
2. ZP Upper Primary school Thanegaon secured 2nd prize
3. ZP Upper Primary school Jamunia secured 3rd prize.

In 2017-2018 financial year 33 schools from 33 villages and 10 clusters have participated in the competition and so far it looks like it would be a tough one as everyone are giving their best. For encouraging community participation and to improve the school environment organize competition for the school from nearby villages of APML Tiroda seems viable option.

School actively participated in this activity. While evaluation period Sh Rajendra Gharde (Deputy EO) Sh Ramteke (ZP EdudepGondia) Sh A P Singh (Environment Department APML) Sh V V Ramakrishna (Sr Manager- Quality Department) were the evaluator.

Capacity Building Programme

Adani Foundation-APML is a State level partner with Education Department, Government of Maharashtra for capacity building of staff of Education department in quality education initiative of Government officers Maharashtra. Accordingly, various capacity building training programme were organized at APML Tiroda for senior officers from Maharashtra State (Table 4.3).

TABLE 4.3: STATUS OF CAPACITY BUILDING TRAINING PROGRAMME AT APML TIRODA

Year	No. of Tranning Programmes	No. of Participants
2016-17	6	274
2017-18	9	423

Maharashtra states Principal Secretary Education Sh Nandkumar attended the two training programmes for the planning of quality Education. District Education Officer Sh Ulhas Narad monitored the activity on regular basis. Total 1788 mandays covered under this training.

Udaan Programme - Educational Exposure Visit to Tiroda Thermal Power Plant

The objective of UDAAN is to share about industry and motivate students to think actively about their careers. Udaan Programme is being organized for students from 10th and 12thstd. It is one day field trip (Exposure visit) to Adani Power Maharashtra Limited, Tirora. Adani Foundation takes students to Tiroda TPP where students get technical knowledge about power generation and exposure of environment, rural development, safety management functions, various kinds of machine and its role in power generation. Operation Department Engineers, GETs and JETs (Graduate Engineer Trainees and Junior Engineer Trainees) orient students through PPT about "How to generate electricity from coal". After class room training students go to power plant visit. Students come to know all the safety measures about power plant this is the outcome of the UDAAN Programme.Visiting Tiroda TPP helps students to enhance concepts regarding practical aspects of operation in coal fired power production.

Table 4.4 shows that this Programme got overwhelming response in 2017-2018 compared to previous year. School Principals, Teachers and students suggested to run this UDAAN Programme on regular basis for upcoming students and hence target for 2018-19 was crossing 6500.

TABLE 4.4: STATUS OF EDUCATIONAL EXPOSURE VISIT TO TIRODA THERMAL POWER PLANT UNDER UDAAN PROGRAMME

Year	No. of Visits	No. of Students and Teachers
2016-17	41	2132
2017-18	99	5033

Swachhagrah with Schools' Programme

With an objective of encouraging students, towads cleanliness Adani Foundation has initiated "Swachhagraha". It is a concept derived from the word Satyagraha with the same fervor of unifying the whole community, whole country and making the clean India movement a war cry for all of us. The whole movement has been designed to make cleanliness a culture to be transpired to all, by the future generation of our country.

Adani Foundation Tirora launched Swachhagraha with schools on 10th Oct 2017. Total 37 School and their teachers participated in this programme. From APML Tiroda Sh Sanjay Rangnekar (AVP), Sh A P Singh (Environment Dept.) Unit CSR Head Sh Nitin Shiralkar were present.

Centre for Environment Education (CEE) Programme officers Sh Avinash Madhale and Ms Sanskruti Marathe were present as resource person. Mr Jignesh Vibhandik Coordinator Adani Foundation HO was also present.

Goal Setting Workshop for High School Students

In general high school students are focused on exams like SSC, HSC and very few able to set their goal and work in that, lack of such guidance and vision are major hurdles in their career path. Goal setting is having prime importance in any student's life. Motivation, goal setting and career counseling can transform their life. To motivate and support them for their goal setting and career counseling one day workshop was organized in 4 high schools.

1. SMART Work
2. Goal setting
3. How to set target etc.

One of the things that make goal setting successful is making an action plan. It's basically a list of things you need to do to achieve your goal. The reason why it is important to do this is because it will help you in giving you that push to action. To find out how to make an action plan for your set goals.

Session of Goal setting workshop was interactive. Principals from all the 4 High schools appreciated the intervention organized by Adani Foundation. With the help of games students become understood about the concept of goal setting. Students asked various questions and that questions resolved very nicely by Sh Sudhir More. Table 4.5 presents gender wise distribution of students participated in Goal setting workshop organised in all 4 High Schools.

TABLE 4.5: GENDER WISE DISTRIBUTION OF STUDENTS PARTICIPATED IN GOAL SETTING WORKSHOP

S. No.	Date	Name of the School	Name of the Village	No. of Students	
				Boys	Girls
1	13.12.2016	Manavta High school	Berdipar	122	168
2	14.12.2016	GovernmnetAshramschool	Majitpur	110	135
3	15.12.2016	Shahid Mishra High School	Tiroda	139	160
4	18.01.2017	Shree Ganesh High school	Gumadhawada	130	180
Total				501	643
Grand Total				**1144**	

Software Module Development Training Programme for Anganwadi

Audio visual learning is an effective tool for Anganwadi children as they love to see colors, pictures, cartoons and hear rhymes, Music. In connection with this we have discussed with Hon. Principal Secretary, Education Dept. Govt. MS for developing module of e-learning software for Anganwadi of Maharashtra. He has accepted our suggestion and given direction to the concern departments to support us in this initiative. In connection with this we have organize two days' workshop on developing e-learning software for Anganwadi in APML premises. In this workshop from Govt. DEO Shri, UllhasNarad, CDPO Tiroda, MrsKanaklata Kale, 7 subject matter specialists from Education Department and WCD Department, representative from Bachpan School and Meritorious Public School, Tiroda were participated in the three days' workshop. Mobile applications are being developed by this team and required materials have been compiled by the team. 25 Anganwadis from surrounding 10 villages of APML through community contribution money Rs. 5000/- from each Anganwadi will get benefit.

Road Traffic safety Awareness Programme with Schools

Adani Power Maharashtra Limited, Tiroda, celebrated 28th Road safety week with a slogan "Your safety, secures your family. Be cautious on roads". With an objective of spreading awareness about road safety within APML premises and its vicinity. Adani Security team lead by P Suryakiran (Head Security) in assistance of Adani Foundation team lead by Unit CSR Head conducted mass awareness rally in Tirora, the other city. Over 1000 students from Shahis Mishra High School Tirora, Nagar Parishad Gandhi VidyalayaTirora, ZP Kanya High school Tirora, ZP Uttarbuniyadi School Tirora, participated in the rally.

In the fiscal year 2017-2018 the slogan of 29th Road safety week was "Avoid over speeding- prevent accident". Over 1500 students from Nagar Parishad Gandhi VidyalayaTirora, ZP Kanya High school Tirora, ZP Uttarbuniyadi School Tirora, In addition on the spot road safety quiz was also organized and the winners were awarded.

School children performed motivational skit and also delivered speeches on road safety awareness. Earlier, the rally was kick started with the flag off by police Inspector Sh Sandeep Koli who motivated children's with his thoughts on road safety. The overall road safety awareness programme was conducted under the guidance of Sh C P Sahoo (Station Head) APML with an objective of bringing down the road accidents to zero.

Computer UPS support to Library

Adani Foundation Tirora received request letter from Pragati Ashramshala Sarandi village for support of 2 computer system. Total 202 students are enrolled in this school from which 120 students belongs to Nomadic tribe, SC and ST Community from rural area. All the facilities like fooding and lodging were provided by private agency. It was felt that children specially in 5th to 7th standard with special talent or aptitude should be provided opportunities to proceed at a faster pace by making technical education available to them, irrespective of their capacity to pay for it.

Workshop for Teachers on Maths through Origami

2days residential training programme observed at APML China colony for Maths Teachers of Gondia District. Renowned Resource person Mr. Shivshankar Shastry form Bangalore winner of Limca book of world record. Origami is the ancient art of paper folding believed to be of Chinese or Japanese origin. The reason origami models as an educational aid for touching maths can be a success in a century like India.

DEO Gondia Sh.Ulhas Narad witnesses the programme. From the dais, they said for the quality education of Gondia District various activities are ongoing. To make these activities successful Adani Foundation supporting which is appreciable. For the preprimary education and elementary Education development invaluable contribution given by Adani Foundation. BDO TirodaMrMankar, ABEO Mr Pradeep Samritwas also present.

APML Station Head Sh C P Sahoo urged Teachers to take benefit from this activity. Quality Education is the basic need of students for this Adani Foundation will always try to give their best efforts and actively participate in every programme implement by Education Department for the betterment of students. Residential workshop benefitted with 46 Teachers from Gondia District.

Employee Volunteering under Education Enhancement Programme

To enhance quality of education in nearby schools of APML, an initiative with the support of employee volunteers especially Executive Trainees have been taken (Table 4.6). These employee volunteers are sparing 2 hours every week for teaching Math's, English and science for students. The schedule has been made, Education Dept. is also requested us for our support.

Executive trainees felicitated with a small gift on 20.02.2017 for their active participation in this initiative by the august hands of Shri C P Sahoo, Shri Sameer Mitra and all HODs.

TABLE 4.6: EMPLOYEE VOLUNTEERING UNDER EDUCATION ENHANCEMENT PROGRAMME

Sr. No.	Date	Group	Name of School	Village	No. of Employee
1	28.12.2016	Group 3	ZP Upper Primary school	Khairbodi	2
2	30.12.2016	Group 2	ZP Upper Primary school	Berdipar	2
3	02.01.2017	Group 1	ZP Primary school	Kachewani	5
4	06.01.2017	Group 3	ZP Upper Primary school	khairbodi	3
5	13.01.2017	Group 4	Tribal Government school	Majitpur	3
6	18.01.2017	Group 2	ZP Upper Primary school	Berdipar	3
7	20.01.2017	Group 1	Manavta High school	Berdipar	2
8	23.01,2017	Group 4	Tribal Government school	Majitpur	4
9	27.01.2017	Group 2	ZP Upper Primary school	Berdipar	3
10	30.01.2017	Group 1	Manavta High school	Berdipar	3
11	10. 02.2017	Group 4	Tribal Government school	Majitpur	3
12	13.02.2017	Group 3	ZP Upper Primary school	Khairbodi	4
13	15.02.2017	Group 2	ZP Upper Primary school	Berdipar	4
14	17.02.2017	Group 1	Manavta High school	Berdipar	4
15	22.02.2017	Group 3	ZP Upper Primary school	Khairbodi	4

In the subsequent financial year i.e. 2017-2018, the progress of employee volunteering are listed in Table 4.7.

TABLE 4.7: PROGRESS OF EMPLOYEE VOLUNTEERING IN 2017-18

Sr. No.	Group No.	Group Head	Name of the School	Village
1	Group-1	Manoj Yadav	ZP Upper Primary School	Berdipar
			Manavta High school	Berdipar
2	Group-2	Nitin Jain	ZP Upper Primary School	Gumadhawada
			Ganesh High school	Gumadhawada
3	Group-3	Yashpal Sahu	ZP Upper Primary School	Khairbodi
4	Group-4	Vineet Garg	ZP Upper Primary School	Barbaspura
			Tribal school	Majitpur

GyanJyoti- Digitalization of Anganwadis

The GyanJyoti programme was initiated on 2017-2018 year under which we provided E-learning kits to all the Government schools in Tirora block. Looking at present scenario in which students are more tech-savvy and are comfortably to use technology, they are the one who actually operate the E-learning kit in a better way compared to their teachers, regardless of them coming from rural areas. The teachers have given positive feedback and improvement in student's grades have sealed the success for this programme.

While this programme was taking shape Adani Foundation had also started its intervention in Anganwadis through renovation done by Employee volunteers. While renovation it came to our notice that Anganwadis would benefit more by E-learning kits as children had no source of dynamic learning and to learn in a playful manner which is a big plus point of these E-learning kits. The solution for this came in from collaboration of Adani Foundation with Government of Maharashtra where the Govt. developed the software and we provided the hardware (E-learning kit). The software is plug_and_play consisting of education materials like Rhymes, Colours, Numbers, Alphabets and Short stories etc.

The aim of the Government was to bridge the gap of pre-primary and primary classes between Government schools and providing quality education at par with private schools. This year the programme has covered a total of 31 Anganwadis and 1 Government school which was left out. Anganwadi Supervisors and Teachers including Gram Panchayat Sarpanch and members are motivated rather than being sceptical about the method of this teaching. Education Dept. is also playing a vital role for the success of this programme by providing software update as and when required. This programme evoked very good response with total of 1900 students benefitting from this activity.

Recently, a one day workshop was organized for provided software related information and using of the same to Anganwadi Sevika. The software is provided by

Education Department, Government of Maharashtra. 28 Anganwadi Sevika from their respective Anganwadis were present for the workshop. Mr. Gautam Bante from Govt. Education department was the resource person. Later after the training the software was handed over to the Sevika's through pen drive. This is joint pilot project of Adani Foundation in association with Government of Maharashtra.

National Safety Awareness Progrmme with School

National safety week celebrated very enthusiastically by Adani Power Maharashtra Limited Tiroda. Various activities like awareness programme with poster competition organized in 5 schools (Table 4.8). Safety Department Mr. Suhas Wakodkar lead the programme.

TABLE 4.8: DISTRIBUTION OF PARTICIPANTS IN NATIONAL SAFETY WEEK 2017-18 POSTER COMPETITION

Sr. No	Date	Name of School	Village	Total Participants	Boys	Girls
1	26.02.18	ZP Upper Primary School	Khairbodi	43	28	15
2			Berdipar	60	23	37
3	27.02.18		Gumadhawada	52	23	29
4			Kachewani	39	18	21
5	28.02.18		Mendipur	41	24	17
Total				**235**	**116**	**119**

Fire Safety Week Celebration With Schools

Adani Power Maharashtra Limited Tiroda in collaboration with Adani Foundation celebrate 72nd National Fire safety week with 2 Government Schools. The National safety Day/week observed Nationwide under the guidance of Ministry of Home affairs, Govt of India on April 14th 1944, there was a major fire on board ship S.S. fort Stikine in Victoria Docks Mumbai. Poster competition was conducted in 2 Schools of peripheral villages (Table 4.9). Students took participation wholeheartedly in the activities. Prize distribution was observed at APML premises on 20.04.2016.

TABLE 4.9: PARTICIPATION STATUS IN NATIONAL FIRE SAFETY WEEK CELEBRATION WITH SCHOOLS IN 2016

Sr. No.	Date	Name of School	Village	Activity	Class	Total Participant
1	20.04.2016	ZP Upper Primary School	Malpuri	Poster competition	1st to 7th	34
2	20.04.2016	ZP Upper Primary School	Berdipar	Poster competition	1st to 7th	23
Total						57

Environment Day

Adani Power Maharashtra Limited celebrated World Environment Day with great enthusiasm from 5th June'16 to 11th June'16 to create awareness among the Employees, Family Members, Contract Man powers, Villagers and children's on Environmental Protection and conservation of Natural Resources. Theme for WED 2016 as decided by UNEP was: GO WILD FOR LIFE ZERO TOLERENCE FOR ILLEGAL WILDLIFE TRADE

From 5th June to 10th June 2017 Adani Power Maharashtra Limited celebrated World Environment Day. On this day of event, below mentioned programmes were observed in villages-

1. Poster and slogan competition in 6 villages for children.
2. Dust bin distribution in villages.
3. Awareness session for ITI students on waste management.

The weeklong celebration was concluded with a mega event. Chief Guest was Shri Popatrao Pawar, Sarpanch of well-known village Hiwre Bazar.

4.2.2 Community Health

People are usually not much aware about healthy sanitation practices in the rural areas. They generally do not use safe water, food & careless about cleanliness. Because of that a large part of their income goes as expenditure during illness. If people will make habit of using safe water, food & start cleaning the surroundings of their niche most of the diseases can be controlled very easily. Looking in to the severity of the issue in the villages realising the fact that villages are declared as Nirmal on paper, Adani Foundation started spreading awareness on Sanitation and Health.

The prime objectives of community health programme include:

- Making community aware on different diseases, general health and sanitation
- Motivating community for total sanitation
- Promoting free medical care services complete well being of community
- Assisting poor patients in secondary treatment.

Under this Programme AF-APML conducted various community health support programmes in working villages the detail list is as follows:

- MHCU Helpage India
- General Medical Health Camp at Bagholi, Churdi, Pathri and Berdipar village
- Adani Foundation Tiroda upgraded Government Hospital Tiroda
- Suposhan
- Prayas

- Poor Patient Assistance Programme
- Swachhagaha
- Swachhagrahi House Competition
- Magic Pit
- Homeopathic Medical Treatment Camp
- Pulse Polio Vaccination Camp Support to SDH Tiroda
- Street play on deaddiction awareness programme
- TSC (Total Sanitation Campaign) Material Support to Gumadhawada and Mendipur

Mobile Health Care Unit (MHCU)

Helpage India is a leading charity platform in India working with and for disadvantaged elderly and has become the representative voice for India's elderly. Dedicated improving the status for India's senior citizen. Adani Foundation-APML in collaboration with Help Age India providing referral services to 50 villages in Tirora Site, one more new Mobile Health Care Unit is inaugurated in March 2017 with existing unit we reached with 40613 patients which is presented in Table 4.10.

TABLE 4.10: PATIENTS' VISIT IN MOBILE HEALTH CARE UNIT IN 2016-17

S. No.	Month	Male	Female	Children	Total
1	Apr 16	982	1677	211	2870
2	May 16	1181	1825	179	3188
3	Jun 16	1201	2048	142	3391
4	Jul 16	1357	1680	157	3194
5	Aug 16	1692	2237	294	4223
6	Sep 16	1528	2097	209	3834
7	Oct 16	1371	1987	156	3514
8	Nov 16	1497	1962	144	3603
9	Dec 16	1574	2919	239	4732
10	Jan 17	1440	2702	249	4391
11	Feb 17	1281	2192	200	3673
Total		**15104**	**23326**	**2180**	**40613**

In 2017-18 AF-APML have 2 mobile units in collaboration with Help Age India. Each MHCU consists of MBBS Doctor, Pharmacist and Special Project Officer. MHCU caters to 50 villages with weekly visits to each village. Table 4.11 presents that there are many patients who have benefitted from this programme and want it to continue and expand its reach.

TABLE 4.11: PATIENTS' VISIT IN MOBILE HEALTH CARE UNITS OF AF-APML IN 2017-18

Sr. No.	Month	No. of Patients				Total
		MHCU 1		MHCU 2		
		Male	Female	Male	Female	
1	Apr-17	1344	2168	1321	2128	6961
2	May-17	1893	3624	1412	2518	9447
3	Jun-17	1653	3237	1250	2582	8722
4	Jul-17	1528	2264	1325	1960	7077
5	Aug-17	1424	1973	1494	2025	6916
6	Sep-17	1731	2368	1565	2036	7700
7	Oct-17	1377	2060	1177	1545	6159
8	Nov-17	1671	2172	1295	1654	6792
9	Dec-17	1471	2263	1077	1679	6490
10	Jan-18	1591	2473	1150	1669	6883
11	Feb-18	1325	1899	1446	2060	6730
12	Mar-18	2023	2838	1678	2311	8850
Total		**19031**	**29339**	**16190**	**24167**	**88727**

General Medical Health Camp

Adani Foundation - APML received request letter from Gram Panchayat at Bagholi, Churdi and Pathari village to conduct General Medical camp in nearby villages as looking necessity we conducted general medical camps in programme village, detail is presented in Table 4.12.

TABLE 4.12: GENERAL MEDICAL CAMP

Sr. No.	Village	Date	Male	Female	Total
1	Bagholi	09.04.2016	79	113	192
2	Churdi	10.02.2017	32	23	55
3	Pathari	26.02.2017	87	91	178
Total			119	114	233

Table 4.13 presents that in 2017-18 total 46 General Medical camps were conducted in 41 villages in which total 10402 patients visited.

TABLE 4.13: PATIENTS' VISIT IN GENERAL MEDICAL CAMPS IN 2017-18

No. of Camps	No. of Villages	No. of Beneficiaries		Total
		Male	Female	
46	41	8193	2209	10402

Specialist Medical Camps

Looking the condition of area especially in old age person they are facing Osteoarthritic problem and looking at their financial condition, the treatment for replacement of knees is not possible and is also a painstaking treatment. Adani Foundation conducted knee brace camps for old age people in collaboration with Helpage India as well as Dr. Vijay Nayak team through which we conducted specialist medical camps at APML premises. Table 4.14 presents distribution of beneficiaries in those camps.

TABLE 4.14: DISTRIBUTION OF BENEFICIARIES IN SPECIALIST MEDICAL CAMP

S. No	Date	Subject	Village	No. of Beneficiaries		Total
				Male	Female	
1	28-06-2017	Knee Brace Camp	APML	29	56	85
2	28-02-2018	Vasectomy	SDH-Tirora	51	0	51
Total				**80**	**56**	**136**

Awareness on Health and Sanitation in Villages

The awareness on health and sanitation is one of the necessary issues to be addressed for rural society; women and children faced many problems due to unhygienic condition in villages. Looking at the requirement Adani Foundation started awareness drive on various health issues, diseases like hyper tension, TB, water born disease and intervention in sanitation for healthy environment for all. Table 4.15 presents that total 49 awareness programmes on health issues, disease as well as sanitization for schools and villages were conducted in 36 villages and its message reached to approximately 2870 peoples through awareness programme.

TABLE 4.15: AWARENESS PROGRAMMES ON HEALTH AND SANITATION

No. of Camps	Village	No. of Participants		Total
		Male	Female	
49	36	1305	1565	2870

Upgradation of Government Hospital Tiroda

The Sub District Hospital Tirora is the only big hospital in Tehsil and large number of patients especially from the rural areas visits daily for medical treatment, hence the services here are free of cost.

The Gondia District Collector Dr Vijay Suryawanshi has requested Adani to support for Transformation of the hospital under "**Kayakalp" Yojana.** Under the guidance of

Station Head, Adani Foundation and APML team with supporting staff took pains for transforming and sincere efforts has brought laurel for the hospital.

In its constant efforts to work selflessly to the society, Adani Foundation added another feather to its cap. The Foundation has funded the project of renovation and adding the much needed facilities like modernization of ICU, Casualty wards, Pathology laboratory, OPD, etc. to the Government Regional Health Center of Tiroda. It was initiative of young dynamic District Collector last year after his joining that the need to upgrade the Government Hospital at Tiroda was identified and the proposal was given to the Adani Foundation, Tirora working under the supervision of Adani Power Tiroda. APML Station Head Sh C P Sahoo and team members of Technical Training Department, Horticulture Department, Civil Department supported this initiative while giving them training.

The union Government with an objective of improving the medical services and infrastructure of health center started “Kayakalp” scheme under which Tirora Subdistrict Hospital has been awarded first prize at the State level for the year 2015-16. The center was chosen on the parameters of 500 points. The parameters included cleanliness medical and waste management infection control, awareness towards cleanliness and availability of health services.

Adani Foundation has contributed in making available many services at Tiroda Sub District Hospital. According to Adani Foundation they have worked hard to uplift the standard of the hospital. Adani Foundation has made available the modern equipment’s beside doing the Civil, Horticulture Landscape Work, AF-APML have also given furniture etc, to the hospital as AF is committed in providing better medical facilities for the people of Tirora and nearby places.

Now, the visitor’s patients are admiring the changes say it is 10 times better than the expensive private hospital. Medical officer appreciated the contribution of Adani Foundation.

SuPoshan Programme

A child’s entire life is determined in large measured by the food given to him during his first five years. Because a childhood period is one of rapid growth and development nutrition in one of the influencing factors in this period. Malnutrition causes a great deal of physical and emotional suffering and it is a violation of child deaths, and increases the vulnerability to a variety of diseases in later life.

Children who are undernourished and underweighted are likely to be less clever than if they were fell fed. Health of children is of great importance as rapid growth occurs during this period. Good nutrition is a basic requirement for good health.

The inaugural Programme was conducted on 3rd August 2016. In this programme Dr S D Nimgade (District Health officer Gondia), WCD Officer Sh J M Ambade, ADHO GondiaDrChouhan, SDO TiroraShPravinMahire, TahsildarTirora, Sh H S Mankar(BDO Tirora) DrHimmatMeshram (MS SDH Tirora) were present. From

APML Station Head Sh C P Sahoo, Operations Head Sh Sameer Mitra, AGM Environment Dept Sh A P Singh and Dr Vijay Gandhewar (AGM Technical training dept) were present. From the dais Sh S D Nimgade said that Adani Foundation that Health department is always with you for technical training whatever you need. Our block level Doctors will also support on regular basis. SDO ShPravinMahire (Tirora) "Malnourishment is a sensitive issue in Gondia District. Adani Foundation in their surrounding village doing great job. We all are with Adani Foundation for such type of Programme for health improvement".

Sh C P Sahoo sir urged to the Sarpanch, deputy Sarpanch, Gram Panchayat members and Government Department members that we all need to come together and join hands for reduction of malnourishment. Adani Foundation will give their 100% contribution to malnourishment free Tirora block.

Ms. Sushma Oza explained in brief the concept of the SuPoSHANProgramme in which she has told that "Sanginis are the main spirit and backbone of the SuPoSHANProgramme" we can't reach our programmer's goal without sanginis effort, the SuPoSHAN Programme is not just the Programme for a children also we can connect with families as well as society in our village.

Capacity building training programme was conducted at APML Premises for Sanginis. In this programme Superintendent Sub district Hospital Tiroda Dr Himmat Meshram, TMO Tiroda, Dr Tembhurne, Nutrition specialist and dentist were present. During this Programme Station Head APML Tirodamotivatesanginis for doing great job to bring change in villages for curbing malnutrition amongst children's, adolescent girls and women. Following points were discussed during meeting:

1. MMR(Maternal mortality rate)
2. IMR (infant Mortality rate)
3. Sickle cell
4. Cause of Anaemia
5. Diet

In financial year 2017-18 we reached 60585 beneficiaries in our programme villages and provide awareness as well as services under SuPoshan programme, the detail highlights of the programme is as follows:

- Two New sanginis are recruited and started working in Tirora town.
- Total 7132 Focused Group Discussion done by Sanginis
- Total 19535 Family counseling completed by sanginis
- Total 395 community based survey done by sanginis
- Total 34 Reproductive age women groups made by sanginis
- Total 14 Adolescent girls new groups formed by sanginis
- Total 81 SAM children completed 14 days in CTC Tirora
- Total 276 SAM children benefited with RUTF
- Total 22676 reproductive age group women HB screening completed
- Total 8364 Adolescent girls HB screening completed.
- Total 1345 women get benefits of IFA tablets by our MHCU,

- 112 SAM children's converted to MAM and Normal group
- 547 MAM Children's converted to Normal
- 35 Sever anemic Adolescent girls get positive changes
- 39 sever anemic Reproductive age group women get positive changes.

Suposhan – Supporting Programme on Sustaining Health and Nutrition - SAM Children Referred

Around 10% Children under 0 to 6 year age group in programme village are found in SAM category as well as 30% are found MAM category under health status, to provide referral service for Severe Acute Malnourished children with treatment, Adani Foundation referred total 107 SAM children's to CTC Center in SDH Tirora. Where they get medical treatment including nutritious food and healthy environment for 15 days with mother.

Engagement of Sanginis

Adani Foundation Tiroda took initiative in 49 villages around with 23000 households and 115 Anganwadi. To implement SUPOSHAN programme in 49 villages 37 Sanginis are selected for this. Sanginis are the backbone of SUPOSHAN. Total 380 SAM Children's and 1164 MAM Children's we had found during the baseline survey.

Training and Capacity Building of Sangini

To give strengthening for SuPoshan Programme we conducted various subjective training programme and awareness session with sangini in every month under through this platform we given information to sangini about Nutrition, various health issues, various subject like IMR, MMR, Anaemia, home-made nutritional food and concepts for awareness.

Anaemia Screening (Hemoglobin Testing)

Adani Foundation under SuPoshan started Anaemia screening camps in programme villages. Village level testing programme have also been conducted in programme village through this phase, where it is found that there are 2% severe anaemic, 31% moderate anaemic and 50% mild anaemic women and adolescent girls in programme villages (Table 4.16). To curbing anaemia among adolescent girls as well as reproductive age women AF is creating awareness and nutritional session with them also referring to Mobile Medical Health Care unit for preventive health service.

TABLE 4.16: ANAEMIA SCREENING CAMPS BY AF

Name of Disease	Women and Adoledcent Girls Affected
Severe anaemia	2%
Moderate anaemia	31%
Mild anaemia	50%

Prayas Programme

At Adani Power Maharashtra Limited, in Tirora, Swachh Bharat is not only the way of life but also a mission to spread awareness about cleanliness and hygiene across various communities. In order to encourage village community to work towards cleanliness as a way of life, the Swachh Bharat Abhiyan was organised on 24/6/2016 under the banner of "PraYas" at four villages - Berdipar, Gumadhawada, Jamuniya and Kachewani (Table 4.17) by APML Team under the leadership of Sh C P Sahoo, Station Head, APML - Tirora.

TABLE 4.17: SWACHHAGRAHA IN 2016-17

S. No.	Date	Name of the Villages	APML Staff	No. of Participants	Total
1	24.06.2016	Berdipar	56	198	254
2	24.06.2016	Gumadhawada	58	174	232
3	24.06.2016	Jamunia	58	178	236
4	24.06.2016	Kachewani	58	214	272
5	18.9.2016	Gumadhawada	57	257	314
6	25.09.2016	Churdi	96	298	394
7	2.10.2016	Kahirbodi	79	176	255
8	13.11.2016	Berdipar	32	214	246
9	8.01.2017	Kaashighat, Garada	63	117	180
10	8.01.2017	Mendipur	58	189	247
11	2.01.2017	Gate No. 2	79		79
12	5.02.2017	Malpuri	60	155	215
13	26.02.2017	Gondia, Mokshdham	38	60	98
Total			**494**	**2015**	**3022**

PRAYAS led from the front by Station Head and all HODs. Four teams of 50 volunteers each carried out Swachh Bharat in four villages. Active involvement of villagers including women (Self Help Group) and children.Village cleanliness drive followed by tree plantation. Tree plantation also carried out in Tiroda ITI, KashiGhat, Shantigram Township and Shantiniketan. Focus on sustaining cleanliness and GO GREEN for environment preservation. After launched SWACHHAGRAH its started swachhagrah activity in villages with APML team, including respected HODs.

Swachhagrahi House Competition

Swachhagrahi house competition is in demand in project area villages of APML. Swachhagrahi house competition was initiated by AF Tirora for the first time. This concept is very simple and it boosts women pride for keeping her house neat and clean. The parameters had been set by the AF team with house makers. In Khairbodi village first batch of 40 house hold participated in the competition.

Adani Foundation started Swacchagrahi family competition with women in Programme, under this programme we conducted meeting with women in

Gumadhawada and Churdi village in this meeting total 96 families were participate and also started to make swacchagrahi family by own, for implementing we used Khairbodi village women as a resource person which are motivating for cognitive changes to make home clean and Hygienic.

These home makers are now our ambassadors/resource persons for other villages. We have formed 8 batches (5 members in each batch) these batches will motivate house makers from other villages. Received an overwhelming support from women and adolescent girls.

2nd phase SWACHHAGRAHI House competition observed in 7 villages with 588 household, Jamuniya, Gumadhawada, Khairbodi, Berdipar, Churdi, Garada and Mendipur.

In this financial year 2017-18 we spread awareness in 7 villages and out reached the Swachhagrahi massage to 1500 families, in which the 658 families have adopted Swachhagrah and started off by arranging their respective home systematically and getting it cleaned.

Poor Patient Assistance Programme

Long term illness or any health diseases made not only impact to physical health as well as mental condition of patients with family members but also financial condition of patients and family, the several diseases which affecting to human life like cancer, accident, gangrene, and other diseases where needed surgery to make treatment to heal the problem, in this type of health issues patients lost not only time but also mental and financial condition also affecting due to this problem, after or core stage on treatment patient become needed financial support from outside but in present situation no one came to heal that issue, looking that situation Adani foundation at Tirora started poor patient assistant programme in working villages and supported needy patients with financial and emotional support to motivate patient for making them self-reliable. Table 4.18 shows the number of beneficiaries from such programme. In 2016-17.

TABLE 4.18: STATUS OF POOR PATIENT ASSISTANCE PROGRAMME IN 2016-17

Year	No. of Patients Get Benefits
2016-17	8

Magic Pit

A Magic pit also known as a soak away or leach pit, is a covered, porous walled chamber that allows water too slowly to soak into the ground. Pre settled effluent from a collection is discharged to the underground chamber from which it infiltrates into the surrounding soil. Advantages to using magic pits are:

1. Drainage free village
2. Mosquito free village
3. Can be built and repaired with locally available materials
4. Technique simple to apply for all users and small land area is required with low capital costs, low operating costs and recharge ground water bodies.

Magic Pit workshop was organized for Gram panchayat members at APML. Table 4.19 presents the villages where magic pits have been built. We have invited the pioneer of this concept Sh Maroti Rekulwar from Lanji village in Nanded district as a resource person for this training programme. He has shared his experience of magic pit. The session was interactive many questions raised by the participants and Mr Rekulwarhas answered the questions brilliantly. Station Head, APML, BDO, Tiroda, Govt. Officers, APML HOD's were also present in the workshop. Sh C P Sahoo (Station Head-APML) in his motivational speech sensitized villagers to implement magic pit concept in every village.

TABLE 4.19: VILLAGE WISE DISTRIBUTION OF MAGIC PIT

No. of Magic Pit Built	Name of the Villages
1	Gumadhawada
1	Mendipur
1	Kachewani

Pulse Polio Vaccination Camp Support to SDH Tiroda

Pulse polio drive was organized on 29.01.2017 in Tiroda Town by SDH, Tiroda. We have supported them by providing food packets for the volunteers and SDH team actively participated in the drive. **100** NCC cadets, **50** students from nursing college and **100** employees in the team.

On 27-01-2018 and 11-03-2018 Maharashtra state had pulse polio drive in all over Maharashtra, for this we supported SDH-Tirora with the Sanginis for all booths and snacks for the volunteers. Also all sanginis participated as a volunteer for the drive and provided health services for 0 to 5 year age group children's in villages.

De-Addiction Campaign in Villages

Addiction is one of the burning problems in youth which is going to spread due to easily availability of addictive products in market and everywhere, due to addiction problem not only addicted person but also family members and society become suffered with lots of trouble because of addiction, numbers of families become destroyed and number of empires become ruined because of addiction problems at villages also addicted persons falling by health diseases and accepting slow died due to addiction, it is happened due to lack of awareness among youths about addiction and its impact on health and other aspects. For abolishing the problem in village it is conducted awareness drive with village leader and youth as well as women group through the awareness in 30 villages, by this villagers become took initiated to excommunicate sale and making leaker in village.

In the year 2017-2018 the road accidents also increased, especially bike accidents were increasing due to driving under influence of alcohol, drugs and also because of lack of awareness in youth about road rules. Looking at the condition of youth in villages Adani Foundation started awareness programme to create awareness on de-addiction and road safety awareness programme's CSR villages.

Mendipur village became alcohol free as Adani Foundation started intervention with women groups in village for their capacity building and create a village which is alcohol free. Table 4.20 preens that total 45 programmes with 45 villages conducted in financial year 2017-18,

TABLE 4.20: DE-ADDICTION CAMPAIGN IN 2017-18 BY AF

No. of Camps	No. of Village	Total
45	45	7483

Total Sanitation Material Support

Adani foundation supported families with pan set, door and ventilator to construct HH toilets and motivate others to construct same for make village become ideal and open defecation free, and under this programme we supported total 200 units to 200 families in 2 villages. 100 units to Gumadhawada and 100 units in Mendipur village.

To make village open defecation free, the villages in APML vicinity were provided total sanitation material support from Adani Foundation in collaboration with respective villages Gram Panchayat. We started with providing material support for construction of Individual Household toilets in programme villages. In this financial year Adani Foundation supported sanitary materials to needy families in Khairbodi, Berdipar, Mendipur, Chikhali and Garada villages with Rural Pan Set, Door, Ventilator and GI sheet for roof to needy family in proposed villages, total 695 families in 5 villages covered during the financial year 2017-18 (Table 4.21).

TABLE 4.21: TOTAL SANITATION MATERIAL SUPPORT IN 2017-18

S. No.	Village	Material Required			
		Roof	Pan Set	Door	Ventilator
1	Khairbodi	209	86	253	81
2	Berdipar	214	212	158	158
3	Mendipur	44	44	44	44
4	Chikhali	57	57	59	57
5	Garada	171	171	171	171
Total		695	570	685	511

Filaria Awareness Programme

Districts Filaria officers along with district health department requested us for provide awareness banners for Filaria in all over Gondia districts, looking at the requirement we provided them with banners for spreading awareness in all over district.

Renovations of Governemnt Primary Health Centre

PHC's are the village level health centers in rural area which basically provide primary health services by government through these centers to increase health quality services at remote areas. Adani Foundation has started PHC's renovation programme in our vicinity, during the Financial Year 2017-18, we focused on 5 PHC's in our area which are Mundikota, Indora, Wadegaon, Sukdi and Ekodi PHC's for renovation, under this programme we facilitated drinking water, electrification, and work place management and other required work implemented in given PHCs.

4.2.3 Sustainable Livelihood Development

The prime sustainable development interventions taken up by AF-APML includes-

- Sewing training center in Tiroda and Mendipur village
- SRI cultivation in Kharif and Rabi season
- Vanmahotsav
- Cow based livelihood training programme
- Fly ash utilization training programme
- Mushroom cultivation training programme
- Training programme on formation of Farmers producer company
- Seminar on opportunities in abroad for ITI Job aspirants
- Felicitation of women from Mendipur for promoting deaddiction in village
- Self-help group meeting in villages
- Agarbatti making training programme
- Workshop on cashless transaction at APML
- SAKSHAM- Adani skill development center
- Workshop on lac bangle making for SHG women
- Catering services training programme for sustainable development
- Livestock development Centre (BAIF)
- Kitchen Garden Seeds distribution programme
- Installation of Pre-Fabricated Bio-gas systems
- Improved Chulha programme .
- Water conservation

Sewing Training Center

Rural women in APML surrounding villages suffer from being both economically and socially invisible. Economic invisibility stems from the perception that women are not relevant to the wage and self-employment. But they have been performing very important and significant role. These women engaged in a variety of occupations small farm agriculture, livestock vending, tree growing and small trading and vending. Still there is continued vulnerability and inequality in all sectors economic, social, political, education and health care, nutrition and legal. There is need to empower these women to counter this menace while strengthening women economic security. It was found that the socio-economic condition of the rural female in Tirora block is very miserable. The rural female will be given proper income generating on Professional vocational training for cutting\tailoring course then they will be self-employed through their skill and the socio-economic conditions of their family will get a boost. By providing the said training to the unemployed rural female will serve a moral purpose. These Vocational Trainings would have no doubt to dispel frustration of the rural female as well as prove to be a boon for the locality in the Tirora area.

In collaboration with Jan sahyog Shikshan sansthan Gondia in Mendipur village and Tiroda town total 40 women in 2batches benefitted from this activity.

SRI Cultivation in Kharif and Rabi Season

In Tiroda block and surrounding villages, agriculture is a primary income source of the farmers and secondary is dairy. The agriculture and milk is low due to lack of exposure, knowledge, technique and new verities etc. Therefore, Adani Foundation is taking initiatives in demonstration, exposure and provides information about integrated cow based livelihood, improved agriculture, SRI through organic farming agriculture based small scale industry, horticulture, honey bee keeping etc.

In FY 2016-2017 Adani Foundation had conducted Organic farming in SRI method activity under sustainable livelihood development programme (Table 4.22). Farmers were made aware about the new technique in paddy cultivation which known as System of Rice Intensification.

TABLE 4.22: ORGANIC FARMING IN SRI METHOD ACTIVITY UNDER SUSTAINABLE LIVELIHOOD DEVELOPMENT PROGRAMME

Year	No. of Villages	No. of Farmers	Total Area
2016-17	42	2000	4000 acre
2017-18	35	1050	1050 acre

It was observed that production in SRI method is more than traditional method. Based on above statistical data we can say that the farmers who are taking paddy production in land/farms by used SRI method with organic farming had got more production with less expenditure compared traditional method farmers had gain near by 34.63% more production compared to traditional method and saved 45.05% expenditure in SRI through organic farming.

Plan for Implementation of the programme

1. Awareness meeting: - Awareness meeting organized in all the selected villages for this project and finalize beneficiary list from this meeting.

2. Beneficiaries' baseline data collection: - Baseline data will be select from all beneficiaries of village.
3. Farmers Group Formation: - Village level Farmers groups will be prepared after beneficiaries' selection.
4. Village Level Training: - Organize training for paddy seedling bed, transplantation, making of Amritpani, Dashparni ark, Jeewamrut and Vermi compost to the farmers.
5. Seeds Support to beneficiaries:- AF will be supported total 5 KG paddy seeds to farmers for an acre land rest other land will be managed by farmers himself,
6. Raise Bed Preparation:- include with below mentioned steps:
    - Farmers Meeting
    - Training
    - Demonstration
    - Preparations raise bed to each farmer.
7. Transplantation :- Transplantation will be strictly monitored in each farmers beneficiaries for the such steps will be followed by AF which are as follows:
    - Farmers Meeting
    - Training in hall
    - Demonstration to farmers field,
    - Replicating transplantation methods to each beneficiaries in working village
8. Technical guidance for organic method: - Technical guidance regarding organic methods provided by the Adani foundation. The regular farm and home visit will be organized to strictly implement organic methodology in farm.
9. Impact assessment: - Before closing programme we will be made impact assessment of programme.

SRI Transplantation completed in 2000 farmers and 4155 Acre (1662 Hector) Land from 42 different villages.Transplantation will be strictly monitoring in each farmer's beneficiaries. During this activity Sh. P VPotdhukhe (TalukaAgriculture officer Tirora) visited the site. While in training programme agriculture officers given their technical guidance support. Sh P. V. Potdhukhe appreciated activity of Adani Foundation and given technical guidance and motivates farmers. Station Head Mr. C.P. Sahoo sir also visited in Bihiriya village farmer field.

Rabi season SRI

SRI (System of rice intensification) Cultivation Rabi 2016-17 planned to do with minimum with 600 farmers on 1200 acres of land. Farmers training and Seed sowing demonstration are ongoing in villages. We are going to providing marking Rope to farmers Group.

We are going to introduce mechanised SRI (system of rice intensification) with providing mechanised weeder and marked ropes to farmers groups to cover more area under SRI. Within February 2017 nine mechanised weeder will be provided to nine farmers groups.

In FY 2017-2018 like previous years, Adani foundation has taken initiative in promotion of SRI through organic farming. It was observed through our findings of last 3 years report showing the increase in yield and subsequent reduction in input cost compared to that of traditional method. Based on this statistical data we can say that the farmers who are taking up paddy cultivation in farms by SRI method with the use of organic method of farming are getting more production with comparatively less expense.

This year Tirora block was declared as drought prone area by Government of Maharashtra. But only because of SRI technique which requires less water and low density of crop used in cultivation, the drought condition had minimum impact on paddy fields. There were also various water conservation activities which were carried out by Adani Foundation and were saving grace during this lean period when the crops cultivated are in grain formation stage. Along with the water present in ponds and streams, water level in the field wells had also increased providing extra source of water during this period which was totally utilised by farmers. To support organic farming in SRI we got support from our other two programs Cow based Livelihood Programme and Vermicompost. Both mentioned programmes are very effective and success rate is quite commendable. These programmes when interlinked together form a big picture of a complete sustainable method of farming reducing the capital burden on farmers and for production of quality output.

Table 4.23 resents that total 2066 farmers and 4381 acre land in 52 different villages was under SRI cultivation. To implement the project more effectively, technical support from State Government Agriculture department and Human resource department had extended their support through marketing and certification for organic rice. Hence farmers are getting more prices for their production. Earlier they used to get 40 Rs/Kg and now for organic rice they earn up to 60Rs/Kg.

TABLE 4.23: DETAIL OF SYSTEM OF RICE INTENSIFICATION (SRI)

Sr. No	Year	Total No. of Villages	Farmers	Land (Acre)	SRI Project Cost (Rs)	SRI Project Cost/Beneficiary (Rs)	Average / Acre Benefit to Farmers (Rs)
1	2017-18	52	2066	4381	16,22,000	786	8,254

Vanmahotsav

Planting trees is most essential to save our ecology. If a full grown tree covers 10 sqmt area, the canopy from 2 crore sapling over Maharashtra will substantially increase green cover, making it the first step to address climate change. Table 4.24 presents village wise details of plantation/distribution of trees in 2016-17.

Government of Maharashtra celebrates Vanmahotsav on 1st July. APML and Adani Foundation celebrate Vanmahotsav on 1st July, 2016 in Tirora block and peripheral villages and schools. Station Head Sh C P Sahoo (APML Tirora) given their handholding support for this activity.

TABLE 4.24: VILLAGE WISE DETAILS OF PLANTATION/DISTRIBUTION OF TREES IN 2016-17

S. No.	Date	Name of Village/Location	Total Plant	Total Amount
1	30.06.2016	Court Tiroda	150	7600
2	30.06.2016	Gram Panchayat Kachewani	200	7700
3	30.06.2016	Gram Panchayat Mendipur	200	7900
4	30.06.2016	Gram PanchayatEkodi	300	11800
5	30.06.2016	Gram PanchayatMundikota	100	4000
6	30.06.2016	Gram PanchayatGhogra	100	4000
7	30.06.2016	Gram PanchayatDabbetola	100	4100
8	30.06.2016	Z.P. School Gumadhawda	25	1150
9	30.06.2016	Gram Panchayat Chikhali	100	4400
10	30.06.2016	Gram PanchayatBihiriya	100	4000
11	30.06.2016	Gram PanchayatGumadhawda	100	4400
12	14.07.2016	Gram Panchayat Khairbodi	100	4300
13	14.07.2016	Gram PanchayatGumadhawda	100	4300
14	27.07.2016	Gram PanchayatDandegaon	200	12000
15	04.08.2016	Z.P. School Sarandi	100	6000
16	04.08.2016	Gram Panchayat Jamuniya	150	9000
17	12.08.2016	Z.P. School Vihirgaon	110	6300
18	12.08.2016	Z.P. School Gulabtola	110	6300
19	20.08.2016	Gram PanchayatEkodi	300	13400
20	09.09.2016	SatyaSaiSewaSamitee Tiroda	100	4000
TOTAL			2745	126650

Cow Based Livelihood Training Programme

3 Days residential training Programme was conducted at Go-VigyanAnusandhan Kendra Devalapar. Mr. Sunil Mansinghka and Suresh Dhawle emphasized cow based livelihood and organic farming. Table 4.25 presents gender wise distribution of participans in such programme in 2016-17. Following topics are covered in the training Programme:

1. Promoting organic farming
2. Side effects of chemical fertilizers
3. Generating material from cow dung and medicines
4. Production of vermin compost and compost fertilizer.
5. Pesticide from Gomutra.
6. Information about income generation from cow dung & cow urine.

TABLE 4.25: DETAIL OF COW BASED LIVELIHOOD TRAINING PROGRAMME IN 2016-17

Sr. No.	Total No. of Village	No. of Participant		
		Male	Female	Total
1	24	187	50	237

Same programme was organized in FY 2017-2018 and the results are presented in Table 4.26.

TABLE 4.26: DETAIL OF COW BASED LIVELIHOOD TRAINING PROGRAMME IN 2017-18

Sr. No.	Village Name	Total No. of Villages	Training Date		No. of Participants		
			From	To	Male	Female	Total
1	Mendipur, Bhiwapur	2	01.12.17	03.12.17	39	0	39
2	Chikhali, Churdi, Berdipar	3	03.12.17	05.12.17	0	49	49
3	Kachewani, Barbaspura	2	17.02.18	19.02.18	23	8	31
4	Gumadhawada, Khairbodi, Kawalewada	3	19.02.18	21.02.18	51	0	51
5	Chikhali, Bhiwapur, Mendipur	3	17.03.18	19.03.18	31	19	50
6	Malpuri, Khairbodi, Garada	3	19.03.18	21.03.18	18	0	18
Total		16			162	76	238

Vermicomposting

Vermicompost is the product of the composting process using various species of worms, to create a mixture of decomposing vegetable or food waste, bedding materials, and vermicast. The benefits yielded through this programme are higher compared to other programmes in such a short span of time. The capital investment is negligible considering the output you get once the compost is ready for use. The High Density Polyethylene (HDPE) bed is the highest cost material required to set up Vermicompost. The HDPE bed is provided by Adani Foundation to the beneficiaries. In FY 2017-2018 nearly 520 HDPE beds were provided to farmers who were leading in SRI cultivation in the vicinity of APML with a increase in target for next year. Some farmers who had taken complete training, having experimented and experienced the benefits of Vermicompost are planning on developing a business model based on Vermicompost.

Fly Ash Utilization Training Programme

Dr. Vijay Suryanvanshi (Collector Gondia) has suggested that cultivation of pulses (Udad&Mung*)* need to be undertaken in the coming rabi 2016-17 under "National Food Security Programme". He was also suggested to carry out long term study regarding the uptake of heavy metal due to application of fly ash in agriculture. He was directed to the APML, Tiroda and CSIR – AMPRI, Bhopal to supply the fly ash to the District Agriculture Department's demonstration site at "Amgaon&Karanja" for advertising and convincing the local farmers for application of fly ash in agriculture. Dr. Suryavanshi also appreciated the APML ongoing project and its outcomes actual seen in the APML demonstration site. Shri C. P. Sahoo put his remark on positive approach and success of ongoing project "Utilization of Fly Ash in Agriculture" during 2015 – 16 and efforts of environment department for handling the project in difficult situation. Farmers training Programme was conducted at china colony. Total 82 farmers were present in this training Programme.

Mushroom Cultivation

Mushroom farming business can be mean big profits in just a few weeks. Table 4.27 presents that mushroom cultivation training programme was organized on 6th to 8th October 2016 for women SHG's from Berdipar village 30 participants attended the training. Objectives of the training Programme includes-

1. Capacity building of women self-help group.
2. Economic development of Women self-help groups.

Resource person Sh Santosh Mishra (Orissa Bhubaneswar) provided 3 days training Programme. The resource person has given detail information about mushroom cultivation with practice.

The women SHG members are successfully cultivating mushroom and selling @Rs.200/kg .

Importance of mushroom cultivation is nutritional value. Protein content, 3-7% when fresh and 25-40% when dry, contain all essential amino acids, amides and lysine with medicinal value.

Consumption of mushroom slows down the spread and effect of cancer, Heart disease, HIV-AIDS. Another one platform is income generation and employment creation.

TABLE 4.27: DETAIL OF MUSHROOM CULTIVATION TRAINING PROGRAMME IN 2016-17

<table>
<tr><th>Sr. No.</th><th>Date</th><th>Name of Self-help group</th><th>Village</th><th>No. of participants</th></tr>
<tr><td>1</td><td rowspan="4">6-8/ 10.2016</td><td>Ramabai self-help group</td><td rowspan="4">Berdipar, Gumadhawada</td><td rowspan="4">30</td></tr>
<tr><td>2</td><td>Aadiwasi self-help help group</td></tr>
<tr><td>3</td><td>Pragati self-help group</td></tr>
<tr><td>4</td><td>Kalyani Self-help group</td></tr>
<tr><td>5</td><td rowspan="2">10-11/11/2016</td><td>Panchasheel self-help group</td><td rowspan="2">Berdipar, Gumadhawada</td><td rowspan="2">22</td></tr>
<tr><td>6</td><td>Gungun self-help group</td></tr>
</table>

In FY 2017-2018 Resource person Sh Santosh Mishra (Bhubaneswar, Orissa) provided 3 days training. Table 4.28 presents that total 48 women SHG members in Gumadhawada and Berdipar village attended training programme. 4 women even went to Orissa for further training in order to run the Mushroom spawn unit set up at APML premises. Before setting up of spawn centre we were dependent on getting mushroom seeds from Pune or Odisha and now we are able to provide seed to entire gondia district SHG.

Earlier family members of some mushroom cultivators were unsure of the income generation from it and did not support them but later after getting to know the benefits of mushroom cultivation they caved in and started helping all together.

Three types of mushroom are grown in this programme- Oyster mushroom, Paddy straw mushroom and Kalinga mushroom.

The women SHG members since then are successfully cultivating mushroom and selling @Rs.170/kg on average.

TABLE 4.28: DETAIL OF MUSHROOM CULTIVATION TRAINING PROGRAMME IN 2017-18

S. No.	Name of Activity	Name of Village	No. of Beneficiary	Daily Production	Daily Income in Rs.
1	Mushroom Cultivation	Berdipar	46	5 Kg - 10 kg	1000-2000
2		Gumadhawada	2		
Total			48		

Training Programme on Formation Of Farmers Producer Company

Two days training Programme for the formation of Farmers Producers Company was organized on 20th and 21st Oct. 2016 for 20 farmers group leaders, 9 village volunteer and AF Tiroda Staff. Trainers Mr. Vijay Avhad and Raman Gaikwad from Yuva Mitra Nashik. Objective of Farmers Producer Company includes:

1. To promote economically viable, democratic, and self-governing Farmer Producer Organizations (FPOs)
2. To provide support for the promotion of such FPOs by qualified and experienced Resource Institutions,
3. To provide the required assistance and resources – policy action, inputs, technical knowledge, financial resources, and infrastructure – to strengthen these FPOs.

Training Subject includes:

Agriculture scenario – global/ India/Local.
Need for promotion of FPOs
Formation and Registration of FPO/ Incorporation of PC.
Role & responsibilities and dos & don’ts for BOD
Organizational Management of Producer Company.
Challenges of Producer Company

Way Ahead and Discussion about business plan.
Exercise on business plan preparation and SWOT analysis
Question answer, Feed Back and Closing Session

In FY 2017-2018 Training Programme for the formation of Farmers Producers Company was organized on 26th& 27th Feb. 2018 and 12th& 13th Mar. 2018 for 104 BOD's, farmers' group leaders, village volunteers and AF Tiroda Staff.

Trainers Mr. Ashish Pal and Mr. Ahsan Malik from Catalyst Management Services Private LimitedBangalore. Registration process is ongoing.

Seminar on Opportunities in Abroad For IIT Job Aspirants

- The seminar was organized with the support of Resume services private Limited company, Nagpur in collaboration with Adani Power Maharashtra Limited and Adani Foundation on 19th October 2016.
- Dr Vijay Gandhewar (Technical training department- APML) had given introduction of the Programme.
- MsPhilomina has given detail information about the job opportunities in India and abroad for ITI technicians like fitter, welders, and electricians. Turners and other trades.
- More than 350 youth were present during Programme. Now we are working on further process of recruitment of these youths with the support of the Resume Services Pvt. Ltd.

Promoting De Addiction In Village

Mendipur village is situated beside the APML premises. It is highly appreciated that 40 women including youth group together achieved target of liquor addiction free village. All the females were worried about the future of their family because of liquor addiction of their husband. These women had decided to ban liquor in the village. For that they have made a team and patrol on regular basis to catch a person under influence of liquor. Every night till 3am to 4am they were doing patrolling in the village. This painstaking effort has brought laurels after 7 months of struggle. Now villagers are with them and the village declared as liquor free village. To give honor to them we have organized a small event for felicitation of the team.

APML Station Head Sh C P Sahoo sir highly appreciated the efforts taken by the women group. President of the group Ms SayabaiTekam has shared her and her team's struggle behind the success.

Self Help Group Meeting In Villages

Self-help groups are the main source for village development. Looking towards there development Adani Foundation organized various meeting in villages. Meetings were observed for Mushroom cultivation, agarbatti making, Kitchen garden training programme, Swachhagrahi house competition etc.

Agarbatti Making Training Programme

SHG (Self-help group) from Gumadhawada village shown interest for Agarbatti making with the help of machine. As an income generation activity.

Table 4.29 presents that in FY 2017-2018 Women SHG (Self-help group) from Gumadhawada and Ramatola village had shown keen interest for Agarbatti making due to presence of couple of big Agarbatti industry near Gondia district. Adani foundation was quick to pick on this activity as it is a great project for income generation thereby providing Agarbatti making machines followed by training on how to use it.

Last year total 11 women of self-help group visited Barbaspura village for training which was organized by the Sarpanch of Barbaspura Ms Mamta Tai Lichade and this year the training was attended by 10 women from Ghumadhawada and Ramatola village which was conducted by Agroha mills Gondia. They even provide the raw material to the SHG and buy finished products at 10 Rs/Kg. The production per day is around 60-70 Kg which is of industrial finish. The Human Resource Department has appreciated our work and are planning to help us in our further development of this programme.

TABLE 4.29: DETAIL OF AGARBATTI MAKING TRAINING PROGRAM IN 2017-18

S. No.	Name of Activity	Name of Village	No. of Beneficiary	Daily Production	Daily Income in Rs.
1	Agarbatti Making	Gumadhwda	12	180-210 Kg	1800-2100
2		Ramatola	6	120-140 Kg	1200-1400
Total			**18**		

Workshop on Cashless Transaction at APML

People are facing inconvenience post demonetization time. Taking cognizant of the Situation, Government has stressed to create a cashless society by promoting cashless transaction all over the country.

With an objective of making the people aware of the importance of cashless transaction and to give them the knowledge, a workshop was organized jointly by Adani Foundation and Sub Divisional office of Tiroda under the guidance of SDO. APML Plant Head Sh C P Sahoo assured to help to make Tirora cashless. Mr Nitin Shiralkar informed to arrange the POS machines for Tiroda Traders by help of all Banks. SDO Shri Suryawanshi, SBI Manager ShNandeshwar, and chief executive officer Shri Urkude told the benefits of cashless transaction. Cashless benefits were shared by Banks to Tirora businessmen.

Saksham - Adani Skill Development Center

SAKSHAM - Adani Skill Development center has been inaugurated by Sh C P Sahoo, Station Head, APML, and Tiroda. On this occasion all HODs were present, Pooja was performed by the Station Head. CEO APSEZ respected Karan Bhai visited Skill development center on 20th December & appreciated the AF & APTRI team for good initiative. APML team and AF team have taken lead for setting up the center. Most of the material used for this centeris arranged in-house.

NSDC (National skill Development Center Delhi) team has visited our ASDC (Adani Skill Development center) for granting registration number for the center.

Table 4.30 presents that in FY 2017- 2018 under the programme SAKSHAM the Adani foundation avails three months residential training on Welding Technician and Assistant Electrician, transforming the life of the village youths and especially tribal youths from remote areas. During the course of training, these participants are acquainted of computer literacy, basic knowledge of English speaking, personality development etc.

Under SAKSHAM programme we are selecting needy youths with particular focus on tribal students, so that after completing the training they can secure a job and provide support to their families. There were many students from remote villages of Salekasa and Deori tehsils from Naxalite area.

Three months training is all free of charge with foundation providing state of the art residential and food facilities for the participating youths. Importantly an advanced Welding Simulator machine had also been provided to facilitate virtual training for the participating youths, which help them in performing much more accurate welding. The machine is the only and one of its kinds in the entire state, which is provided at ASDC.

The students are very much benefitted from this programme as they develop an outgoing personality and there is increase in their confidence level as well. This programme comes under Unnati livelihood mission project of Government of India.

TABLE 4.30: TRAINING AND PLACEMENT DETAILS UNDER SAKSHAM PROGRAMME IN 2017-18

S. No.	Trade	Batch No.	Total Candidates Admission	Drop Out Candidates	Total Trained	Total Placement
1	Welding Technician	1st	30	0	30	30
2		2nd	25	0	25	25
3		3rd	36	0	36	30
4		4th	20	0	20	20
5		5th	14	2	12	12
Sub Total			**125**	**2**	**123**	**117**
6	Assistant Electrician	1st	30	3	27	27
7		2nd	24	0	24	24

8		3rd	34	1	33	17
9		4th	22	1	21	21
10		5th	6	0	6	6
Sub Total			**116**	**5**	**111**	**95**
Grand Total			**241**	**7**	**234**	**212**

Total 5 batches (Electrician and Welding) have been successfully trained consisting of 234 trainees out of whom 212 got placed in various companies all over Maharashtra. Accredited by National Skill Development Corporation. (Date- 31st January 2018). Our ASDC Centre got approved as "High Pressure Welding Testing Centre" by Govt. of Maharashtra (12th March 2018).

Workshop on Lac Bangle Making for SHG Women

Bangles and jewellery items made from lac are one of the oldest types and most brittle. Lac has been and is popular due to it being the oldest source of colour. Adani Foundation in collaboration with NABARD Organization workshop on lac bangle making for 10days for the skill development of SHG women from nearby villages of APML. Total 2 training programme organized.

In this skill training programme, the women participants will acquire the practical knowledge on making bangles and various jewellery items of attractive designs from the lac. Apart from it, they will also get skill of packaging and marketing of these lac bangles and jewellery items to earn handsome income for their livelihood support. Total 60 candidates attended the training programme in 2batches.

In FY 2017-2018 Adani Foundation had organized special skill training programme on lac bangle making for 12 days by DhulanDevi Sanstha who are also our buy back contractor.

90 women SHG members from nearby villages namely Khairbodi, Ramatola, Churdi, Garada, Chikhli, Kachewani, Mangezari, Kodebarra have been trained and are engaged by DhulanDevi Sansthafor working on sustainable business module with buy back guarantee for these SHG members. The NGO is providing raw material to them and purchasing lac bangles from the SHG members. Earlier they received 5 Rs per pair as the finishing of product was not great and later as they kept getting better the amount increased to 7-10 Rs per pair based on the quality of output. We had arranged bangle exhibition cum sale on the eve of Ganesh festival celebration at Shantigram Township, Tirora. Also this year we have started lac cultivation programme to support for raw material and give complete production charge to the women SHG.

Catering Services Training Programme

Adani Foundation Tirora organized workshop on catering Training at Wardha. Main objective of this activity was to support women SHG from Garada. Total 11participants attended the training programme for 5 days.

In FY 2017-2018 A meeting was organized with the women of the village on March 10th, 2017. The focus of this meeting was on making the participants aware about the self-employment and supporting family, the advantages of Self Help Groups (SHGs), credit linkages as well as other government schemes. Other local concerns of the women were also discussed. The discussion helped in motivating the women to set up an SHG.

"Suruchi" SHG was formed by 9 women and 2 men. After the formation of the SHG, the members started Food Canteen. They started off by making food for the 60 students who were staying in the premises for the Skill Development Programme started by Adani Foundation at Adani Skill Development Centre (ASDC).They also serve food to the students who come to visit the plant under the UDAAN programme which crossed a mark of 5000 nos. this year which benefitted the SHG. Starting Suruchi helped in both ways, providing homemade food for the skill development students and empowering women through SHG. We helped them by setting up a well equipped kitchen and 10 days training regarding food recipes, importance of hygiene while cooking and serving, usage of new equipment's and managing finances. Working together has resulted in an improved economic status of the members.

Livestock Development Centre (Kamdhenu Project)

In nearby villages of APML many farmers are doing dairy business on small scale successfully. To support them for keeping good quality of indigenous livestock bread, fodder development, proper health care facility for livestock and to improve milk production we set up of livestock development Centre with the support of BIAF-MITTRA.

The objective of the centre is to develop dairy farming as an additional source of livelihood for the farmers by improving productivity of local cattle and buffaloes. To improve quality of livestock Adani foundation Tiroda with the support of BIAF-MITTRA started Livestock Development Centre for 13 villages in the vicinity of APML in August 2017. Table 4.31 presents the target and progress details of such centre. By providing artificial insemination services, fodder demo, health camps, trainings etc. at farmer's doorstep and for developing good quality of indigenous milching breeds like Gir, Sahiwal, Tharparkar and Murrha. The Centre is getting very positive response from farmers.

TABLE 4.31: STATUS OF LIVESTOCK DEVELOPMENT CENTRE (AUG. 2017 TO MAR 2018)

S. No.	Activity	1st Year Target	Cumulative Progress
1	AI (Artificial insemination)	360	329
2	PD Pregnancy Diagnosis	162	123
3	Fodder seeds	100	140
4	Meeting	13	15
5	Training	8	9
6	Cattle Health Check-up Camps	5	5

Kitchen Garden Seeds Distribution Programme

In our area many households are having open backyard space; hence Adani Foundation came up with an idea for developing kitchen gardens. In tribal villages every household now has a kitchen garden. Table 4.32 presents the status of kitchen garden seeds distribution programme. In our Anemia reduction project we have distributed vegetable seed packets to anemic women for developing kitchen garden at their households. The result and response was positive. Later we expanded the projects in normal households as in our area many households are having open space for developing kitchen gardens. In tribal villages every household has a kitchen garden. Due to kitchen garden family can get fresh vegetables with no extra cost which is helpful for increasing nutritive values of daily intake food which help prevent Anaemia in women and malnourishment in children which was on rise.

We provided 3000 seed packets of vegetables like Spinach, Lady Finger, Bottle Gourd, Carrot, Carrot, Tomato, Corn, Chili, Bitter Gourd, Lal Bhaji, etc. to promote kitchen gardens in households in our nearby villages.

The activity will support our SuPoShAn project as well as organic farming initiative and Swachgrahi house. Our village level volunteer did co-ordinate the project at village level. Total 2500 families were covered under this initiative.

TABLE 4.32: STATUS OF KITCHEN GARDEN SEEDS DISTRIBUTION PROGRAMME

S. No.	No. of Village	Total No. of Beneficiary
1	46	9000

Installation of Pre-Fabricated Bio-Gas Systems

The core livelihood of the rural community in the vicinity of APML is agriculture. They cultivate their land and rear cattle. Apart from milk production, farmers do not have a better plan to utilize the byproducts of cattle such as cattle dung, urine and other panchgavya products. Most of the farmers at least have 3-4 cattle in their houses. Adani foundation observed that women have to toil in the village for fetching fuel wood. This consumes a lot of time and energy also being harmful to health. Installation of Biogas in the rural household provides an alternate solution for cooking where time and toil is substantially reduced. It is eco friendly, non-polluting and also easy to operate by providing basic training. Table 4.33 presents the status of pre-fabricated bio-gas systems installed in 2017-18.

Objectives:-

1. To make clean energy available to the rural households for cooking.
2. To achieve smokeless kitchen for women to work in while alsopreserving forests and to maintain balance of environment.
3. To save time along with having clean and hygienic kitchen.
4. Monetary savings.

TABLE 4.33: STATUS OF INSTALLATION OF PRE-FABRICATED BIO-GAS SYSTEMS

Year	No. of Construction of Pre-Fabricated Bio-gas	No. of Benefitted Household
2017-18	22	22

It is expected to save about 5 tons of fire wood in each household every year. Moreover it will also reduce the respiratory problems faced by women who make use of blowpipes to operate tradition chulhas. The cost of one unit is Rs. 31500/- with 2 cum capacity. The community also contributed Rs. 5000/- per household as their share in the project and have a sense of responsibility and ownership.

Improved Chulha Programme

Adani Foundation brought Improved Chulha technique which is based on scientific method i.e. providing more oxygen for burning the fuel by placing cast iron mesh (11”x11”) at the base of Chulha and below the iron mesh a trench of 33”x9”x9” is provided for air flow (Figure 4.1). Fire wood is kept on the cast iron mesh, which will be placed at 11” from both sides of the trench. Total 2044 cast iron meshes has given to family in 50 villages.

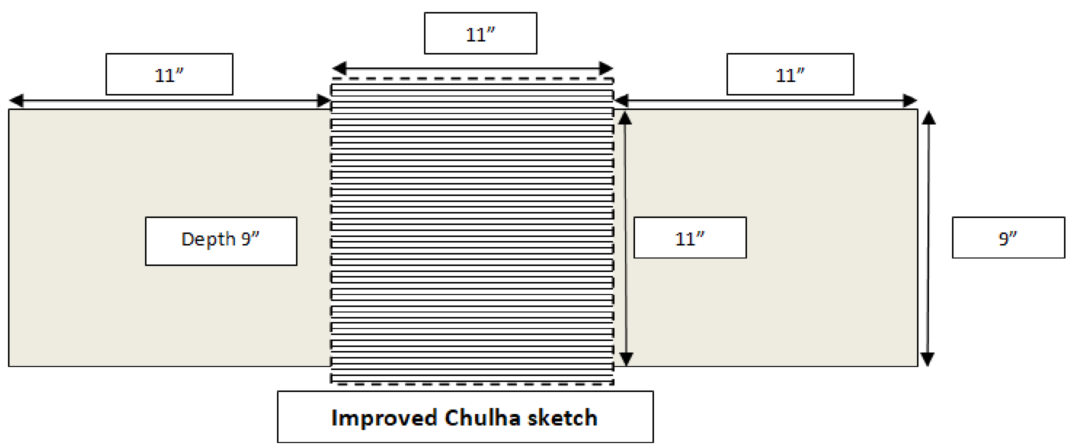


FIGURE 4.1: CONCEPTUAL DESIGN OF IMPROVED CHULLAH

The impact of Improved Chulha is as follows:

- At least 90% emission reductions (if proper quantity of firewood is used) and nearly 50% firewood savings.
- Cheap and very easy to use.
- More smiles and no tears due to 90% reduction in the smoke from improved chulha.
- No need to use blow pipes which reduces risk of Asthma, Lung cancer, TB, low birth weight and blindness.
- Eco friendly, no adverse effects on the environment.

Water Conservation Programme:

Rain water harvesting and waste water management is one of the essential issues to address in order to sustain in future. Gondia district though known as city of lakes, the city still faced water scarcity problem. According to water management board, near about 70% rain water is spilling down to river or other source due to which water storage in ponds and streams level is severely affected. The other reason being the silting problems in water bodies which again in turn affect the water storage resulting in reduction of storage capacity. These problems coupled together caused scarcity of water during the lean period as well as reduction in level of ground water table. The meteorological department had already warned of less rainfall and to tackle the water scarcity situation which would arise Adani Foundation started the Water Conservation programme.

There was no water conservation facility before which meant more efforts and swift action for the programme. Though there was ample amount of rainfall (around 1000-1200 mm annually) in previous years but there always arises shortage of water just before the grain formation stage which would cause huge damage to the crop. Hence it was decided to completely carry out these activities before the onset of monsoon based on topography of existing water shed areas.

The activities under water conservation programme were as follows:

1. Cleaning, Deepening and De-silting of ponds.
2. Cleaning, Deepening and De-silting of streams.
3. Construction of Natural bunds on streams.
4. Construction of check dams.
5. Developing earthen water storage tanks in ponds.

Farmers were not able to grow crops during this lean period and it was hampering the production and multi crop activity which could not be carried out due to inadequate supply of water facility in farm. Table 4.34 presents that with all the water conservation activities carried out in 24 villages Magic pit concept was also introduced which helps in water conservation by recharging ground water level and also solves the sanitation problem. Also while carrying out deepening and de-silting of pond and streams we left 6m patch running perpendicular to the pond or stream which would act as an earthen bund. The farmers would use their pumps in order to extract water the stream or pond.

These activities linked together are providing relief to farmers as it enables them to save their crops and not suffer any monetary loss which would again burden them in future. Villagers are also facilitated by drinking water as their dug wells have increased water levels and faced severe shortage of drinking water during summer season.

TABLE 4.34: DETAIL OF WATER CONSERVATION PROGRAMME IN 2017-18

Particulars	Value
No. of Cover Blocks	2
No. of Cover Village	24
Cover No. of Pond	21
Cover No. of Stream	19
Total Qty in Cum	272795
Well Benefited	307
Borwell Benefited	148
Farmers Benefited	962
Land Benefited In Acre	2886
Soil Utilization in Agriculture land in Acre	124
Project Cost Rs. [Lackh]	83.72

4.2.4 Rural Infrastructure Development

The prime objectives of rural infrastructure development in the plant area include:

- Bridging the gap of the villager's demand and Schemes of Government.
- Providing basic facilities to the community like drinking water, quality education.
- Providing basic facilities to the people related to their rituals and *Astha*.

Under this sector AF conducted various rural infrastructure development programmes in working villages the detail list is as follows:

- Sabha Mandap construction at Pathri village
- RO Unit at Kachewani, Khairbodi and Gumadhawada
- Jalyukta shivar campaign (Pond deepening and stream cleaning work)
- Construction of low cost house at Garada village
- Provide drinking water facility in villages
- Installation of seating benches at surrounding villages
- Construction of farm pond at surrounding villages
- Construction/Repairing of classrooms in Schools
- Construction of sharaddhanjali shed

Sabha Mandap Construction at Villages

Addressing the request of the Gram Panchayat Pathari members for construction of sabhamandap. There were lack of facility in village for seating together in a group and discuss about the general issues for village development. Adani Foundation took initiative for the construction of Sabhamandap. Total 550 people from village benefited from this activity and all took facility by this Sabhamandap in the year of 2016-2017.

Request from Garada, Mendipur and Tiroda Gram Panchayat of constructing Sabhamandap was received at the start of the financial year of 2017-2018. Total 1500 people from 3 different villages benefited (Table 4.35).

TABLE 4.35: STATUS OF SABHA MANDAP CONSTRUCTION

Year	No. of People Benefitted
2016-2017	550
2017-2018	1500

Magic Pit

Magic Pit concept has proved not only a boon for drought prone area of Maharashtra but is also creating magic for sanitation in villages. Magic Pit is a device that manages waste water control at source and allows percolation of it in soil where soil itself acts as a filter for purification of the waste water.

Adani foundation took the lead in installation work in Ramatola and Tikaramtola village at each house hold and in other villages community water resources are being covered.

The projects have also increased the awareness among villagers, which was one of the aims of the project. Hopefully, the successful execution of the project in these two villages will help to spread the message to other nearby villages and eventually, we can help other villages in the region get rid of their wastewater safely

RO Unit Installation

Pure drinking water is a basic requirement of everyone but at many places people are forced to consume unsafe water. Most importantly disease caused by consumption of impure water is on a rise. Rescue van handover programme and RO Plant inauguration programme was organized at kachewani village. Chief guest of the programme was District collctor Sh Abhimanyu Kale, DCCF Dr Jitendra Amgaonkar(Deputy conservator of forest) Sh C P Sahoo Staion Head APML Tiroda, Nitin Shiralkar (Unit CSR Head Adani Foundation Tiroda) Mohan Pande(GM Corporate Affairs). Sarpanch Kachewani and other GP members were also present. Earlier a fully equipped rescue van was donated by Adani donated to the forest department. DCF Dr Jitendra Ramgaonkar accepted the keys of the multi utility vehicle. Expressing gratitude for Adani's the officer lauded the gesture. Sh C P Sahoo (Station Head APML) assured of continuing the similar activities under the guidance of our beloved chairman.

In Gumadhawada and Khairbodi village RO building construction work is completed. One can get 20 liters of water for a mere sum of 5 Rs which one can avail through ATM facility. Adani foundation has also provided bubble taps to store the water by depositing 150 Rs. The response to the project has been appreciated by village people, Government agencies and District Collector as well.

Water Conservation -Pond Depeening and Stream Cleaning Work

Rain water harvesting and waste water management is one of the essential issue to make sustain of future, according to water management board near about 70% rain water become spilling down to river or other source due to this water storage in water pond become down, also due to silting in pond water storage also going down, hence water storage in pond also be decreased, Due to low water storage in pond the village ground water level become down and mostly in summer season villagers don't have water to drink for themselves, also farmers are not able to make more production and multi crop due to water irrigation facility in farm.

Looking this situation in Adani foundation working topography it is very much needed to increase water storage capacity in pond and make sustain situation for future, for this Adani Foundation started pond deepening and stream cleaning work in various village in Gondia Districts.

During 2016-17, 39 pond deepening work, 21 Stream and 21 Farm pond de-silting work in Adani foundation working village have been undertaken (Table 4.36).

Gondia district falls in the arid zone of Vidarbha in Maharashtra. It receives its annual precipitation (average 1160 mm) from the south west monsoon from (June to end of September) with July- August being the wettest months of the year. Although Annual rainfall is good the erratic nature of monsoon is the cause of concern. The area experiences long dry spells. Sufficient water for support irrigation in Kharif season is not available for the standing crop in the field while water for irrigation for Rabi and summer is a big question mark.

Addressing water issues requires improving the supply through enhancing the potential of the resources and efficient management of available resources. With a vision to raise the quality of life of people in the surrounding villages Adani foundation, a CSR wing of Adani Power Maharashtra Ltd. has been implementing water resource development programme and water harvesting is one such core area in which Adani foundation works. Since ages deepening and de-siltation of the existing Government were not done and Adani Foundation realized this need of the people. People exclaimed that ponds deepening will increase ground water table, availability of water in the well and bore well and thus water will be available for the critical irrigation during the month of October. Table 4.37 presents the benefits accrued due to water conservation programme in 2016-17.

TABLE 4.36: DETAIL OF WATER CONSERVATION PROGRAMME IN 2016-17

No. of Constructions	Extra Storage Capacity
39 ponds deepened	151330 cum
21 streams deepened	83924 cum
21 Farm ponds	9660 cum

TABLE 4.37: BENEFITS ACRRUED DUE TO WATER CONSERVATION PROGRAMME IN 2016-17

Area of land	3012 acres
No. of wells	924
No. of Bore wells	387
No. of famrers	1224
No. of covered villages	24

This year 2016-17, Government of Maharashtra has also initiated water conservation scheme under the banner "Jal Yukt Shivar Abhiyan". Adani Foundation was the biggest contributor in the district which was well appreciated by Dr. Vijay Suryawanshi, IAS, and District Collector Gondia. People of the villages also observed that water table in the well and bore well has increased.

The prime positive impact of Water Conservation activity is as follows:

1	Total excavated quantity water conservation programme for water storage from four year is 244914 Cu.M and 244914000 Letter
2	Total well benefited 924 from 43 villages in water conservation programme
3	Total 387 bore wells benefited from this activity
4	Total 1224 farmers from 43 villages had benefited from this activity
5	Total 3012 acre land irrigated from this programme
6	Because of rise in water table total 24% farmers get Rabbi Crop from this programme
7	From water conservation programme number of farmers had got opportunity to get more production from agriculture through using water for agriculture irrigation purpose, hence nearby Rs. 2000 for an acre

Adani Foundation had organized exposure visit for progressive farmers in surrounding village hence farmers and village leaders become aware about water conservation and they become demanded for water harvesting programme in all village.

Looking overall impact of water conservation programme we can say that water conservation is very useful to increased water storage capacity in village, also it give various opportunity for farmers to increasing income source.

Under Jalyukta shivar campaign Adani Foundation planning to deepen the pond and clean the stream for the water conservation practices. Considering drought like situation occurring frequently in the state Jalyukta shivar campaign is being taken up under "water for all- drought free Maharashtra 2019".

Objectives of the campaign includes:

1. Increasing area under irrigation in the state – increasing assured water for family and efficiency of water usage
2. Creating decentralized water storages

3. Initiating new projects to create water storage capacity
4. Reinstating/ increasing to create water storage capacity of existing and dysfunctional water sources (small dams/ village tanks/percolation tanks/cement dams)
5. Extracting sludge from existing water sources through public participation and increasing water storage of water sources

Adani Foundation doing this works in 6 blocks of Gondia District. Pond deepening work with more than 40 no. of pond and stream cleaning work with more than 25 no's of stream.

Drinking Water Facility in Villages

Drinking water in rural area is one of the conspicuous issue for village, it is hard to make avail potable drinking water for HH, to reduce that problem and giving relief in women Adani Foundation took initiative and installed 12 no's of hand pumps by drilling bore wells. The installed hand pumps in the villages will help to get portable water at shorter distance.

Installation of Seating Benches

Adani Foundation observed that villagers need seating benches at common places such as near temple, park, bus stand, Gram Panchayat etc. looking in to need of the seating benches Adani Foundation provided benches. The benches were placed at such a place where it is being used by the senior citizen and women. Table 4.38 presents the distribution of seating benches in 2016-17 and 2017-18.

TABLE 4.38: INSTALLATION OF SEATING BENCHES BY AF-APML

Year	No. of villages	No. of benches
2016-17	43	200
2017-18	45	250

Construction of Farm Pond

Farm Pond is one of the best systems for conserving and harvesting rain water especially for support irrigation in dry spell and distress period. Rain Water harvesting through excavation of Farm Pond is not a new but just to utilize an indigenous knowledge of farmers on scientific manner to harvest surface run off of the agricultural land. The water management interventions has the potential to evolve as a catalyst to enhancing the water use efficiency and thereby increasing agriculture economy of the water stressed villages in the Tirora block of Gondia district. Adani Foundation has constructed Farm ponds of size 15 x 15 x 3 m of capacity to store 445 cum of water.

Site selection in farm pond will be done in consultation with farmers. Factors such as rainfall, quality of slope of land, soil type and soil texture are considered before selecting the sites and deciding the size of the farm pond. Most of the farm pond sites are planned to be constructed on wasteland. So that precious cultivable land was not lost. The size 15*15*3 M with average storage capacity of 460cubic meters is accepted by farmers of the surrounding villages. Farmers have contributed Rs. 3000/- farm pond.

Construction of Classroom in Z.P Schools

School buildings, classrooms, playgrounds and libraries are the most important aspect of school infrastructure. Spacious and refurbished buildings and well-ventilated classrooms are a must in schools for effective teaching and learning. Many schools in Tirora block are old construction buildings which are not fit to use. There was couple of life threatening incidents of collapsing of school buildings. To tackle this situation on request of villages, Adani Foundation helped in construction of classrooms for such schools (Table 4.39).

TABLE 4.39: STATUS OF CLASSROOM CONSTRUCTION IN SCHOOLS

Sr. No.	Name of the village	Year	No. of beneficiary	No. of classroom	Boys	Girls	Total
1	Berdipar	2016-17	229	1 Room	114	115	229
2	Chirekhani	2016-17	214	1 Room	51	47	98
3	Churdi	2016-17	98	1 Room	51	47	98
4	Kachewani	2017-18	32	1 Room	14	18	32
5	Kawalewada	2017-18	265	1 Room	128	137	265
6	Belati Bu	2017-18	109	1 Room	55	54	109

ZP Kanya High school Tiroda collapsed on 30th August 2016. School requested Adani Foundation for the construction of 3rooms. Station Head APML Sh C P Sahoo visited the school along with BEO (Block Education Officer Tiroda). Considering the importance of school & education for local children, three rooms are being constructed. Total **326 students** benefitted from this activity.

ZP Upper Primary school Chikhali get collapsed during rainy season in July 2016. Sarpanch and School Principal along with SMC Members requested Adani Foundation to support classroom construction for students. Station Head Sh C P Sahoo along with APML team and AF Team visited school and decided to support 2classroom and one hall construction. From this activity total **165 students** took benefit.

Construction of Toilets in School

School sanitation and hygiene is an essential component of the total sanitation campaign which government is so focused on. This includes provision of proper toilet infrastructure and also recognizes the role of children who are the best agents to bring about change in habits. There are many schools where toilets were not maintained properly and were in unusable state. The major problem of such unusable toilets was faced by the girls. Adani foundation intervened and constructed good quality toilets only on the condition that the school will provide water facility for same. We also repaired many toilets which were in bad state and made them usable once again. This has provided relief to all students especially girls and school management committee understood the importance of sanitation.

Children also help in popularizing new ideas and concepts of sanitation not only in their school but in their families, as well as neighbourhood. Taking this campaign forward, Adani Foundation had constructed 3 toilet units in 3 schools (Tirora, Belati Bu. and Marartola).

Construction of Washing Ghat

Women in village use stream water for washing and cleaning work. It is dangerous at times to use stream water for such activities. To reduce that risk Gram Panchayat requested Adani Foundation to construct washing Ghat at pond and village stream. Addressing this request Adani Foundation constructed washing Ghat at CHURDI – 2 No., GARADA – 1 No., and KAWALEWADA – 1 No., total 600 villagers benefited by this activity.

Construction of Road

Addressing the request of the Gram Panchayat, Adani Foundation took initiative in the construction of cement concrete road and constructed road at Churdi village. The road 320m in length and is approach to the crematorium. Through this Adani Foundation facilitate for easy convenience of villagers who can now perform last rites without any transport hindrance.

Construction of Shraddhanjali Shed

Addressing the request of the gram Panchayat, Adani Foundation took initiative in the construction of the Shrandhali Shed in Kachewani village. This structure will help people in the last rites.

Miscallaneous Civil Works

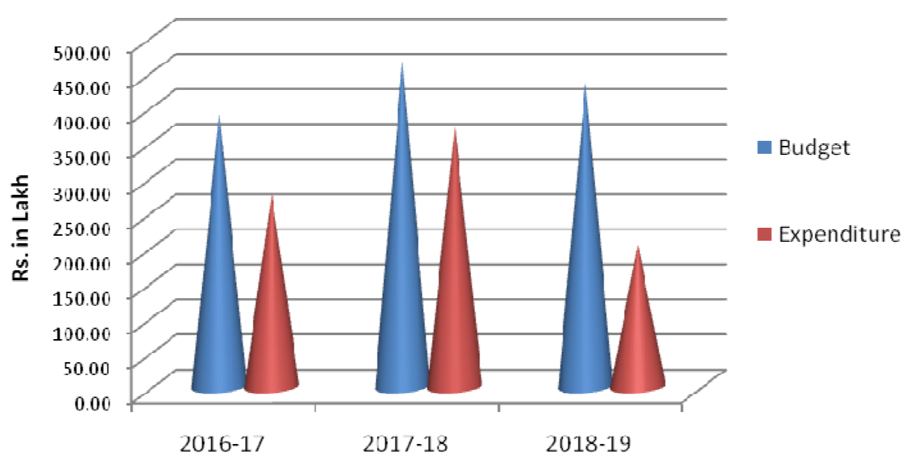
- Beatification of Village Public Place/Garden at Gondia – Mokshdham & Garada – Kashighat.
- Developing garden, play ground , repairing of community centre, Fencing and Stage Work at Ramatola & Tikaramtola.
- Flooring at Community Hall at Chikhali village and Govt. ITI Tiroda.
- Pre Cast Slab Drain Cover at Kawalewada village.

4.3 BUDGET & EXPENDITURE DETAIL

The budget and expenditure incurred for CSR activities at CSR zone Tiroda for the last 3 years i.e. from 2016-2017 to 2018-19 is presented in Figure 4.2. The total expenditure on various CSR activities at Tiroda zone has increased to Rs. 434.60 lakh during 2018-2019 against Rs. 388.46 lakh during 2016-17.

The sector wise budget and expenditure incurred for CSR activities at CSR zone Tiroda during the last 3 years i.e. from 2016-2017 to 2018-19 is presented in Figure 4.3 to 4.5. The analysis reveals that the maximum fund is being allocated for strengthening rural infrastructural development followed by sustainable livelihood development and improving community health facilities. Out of total CSR fund, 42.50% of total fund have been spend in improving rural infrastructure followed by 18.61% for improving the community health in selected CSR villages (Figure 4.6) during 2016-17. Whereas out of total CSR fund, 50.04% of total fund have been spend in improving rural infrastructure followed by about 16% each for improving the community health and sustainable livelihood development in selected CSR villages (Figure 4.7) during 2017-18. It may be pertinent to mention here that during 2018-19 the emphasis on sustainable livelihood development has been increased significantly (Figure 4.8).

Figure 4.2: Year Wise Budget & Expenditure for CSR Activities



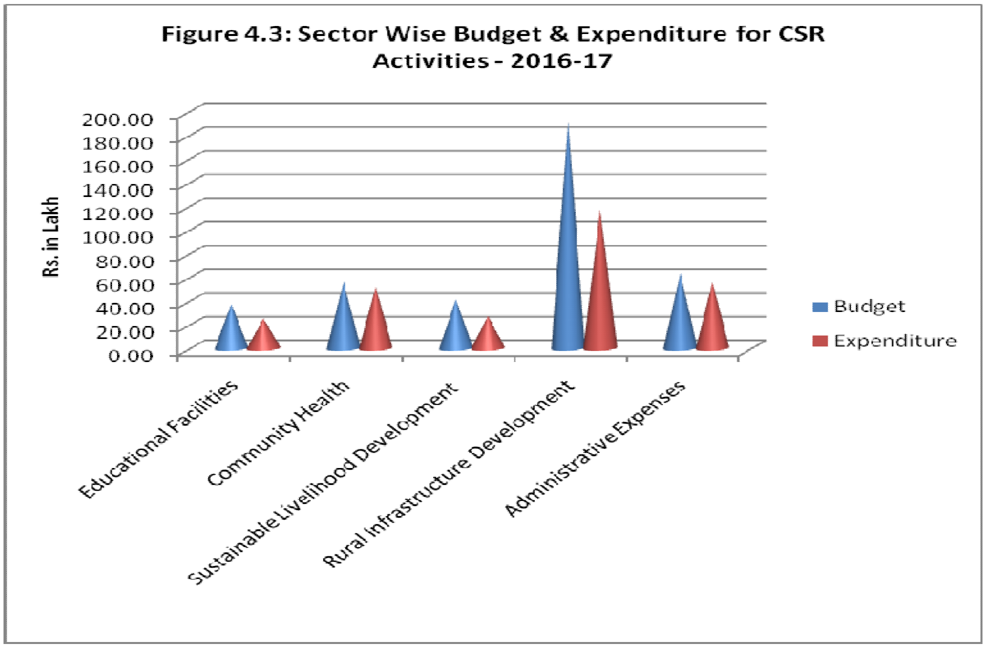


Figure 4.3: Sector Wise Budget & Expenditure for CSR Activities - 2016-17
Rs. in Lakh
200.00
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Educational Facilities
Community Health
Sustainable Livelihood Development
Rural Infrastructure Development
Administrative Expenses
Budget
Expenditure

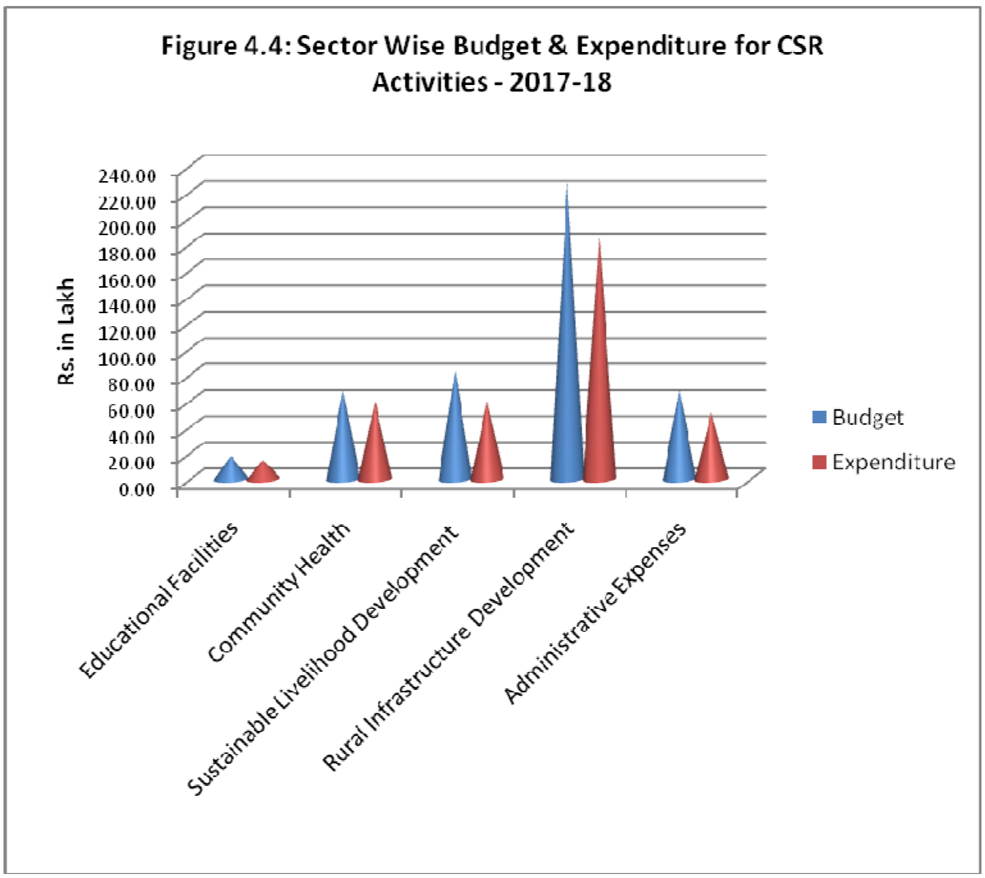


Figure 4.4: Sector Wise Budget & Expenditure for CSR Activities - 2017-18
Rs. in Lakh
240.00
220.00
200.00
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Educational Facilities
Community Health
Sustainable Livelihood Development
Rural Infrastructure Development
Administrative Expenses
Budget
Expenditure

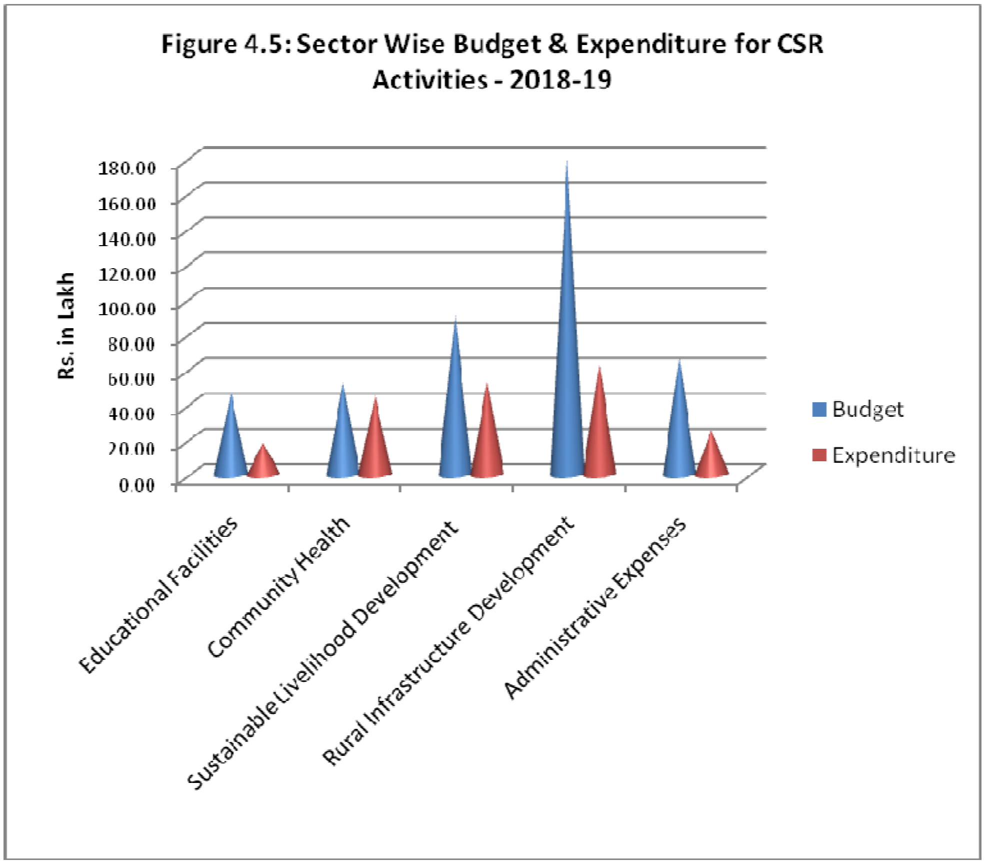


Figure 4.5: Sector Wise Budget & Expenditure for CSR Activities - 2018-19
Rs. in Lakh
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Educational Facilities
Community Health
Sustainable Livelihood Development
Rural Infrastructure Development
Administrative Expenses
Budget
Expenditure

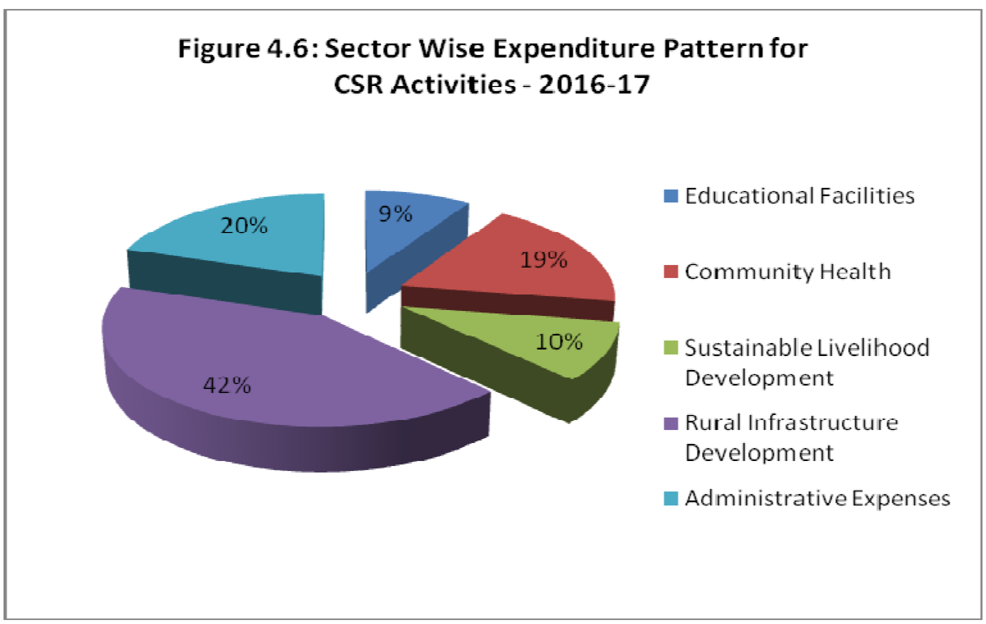
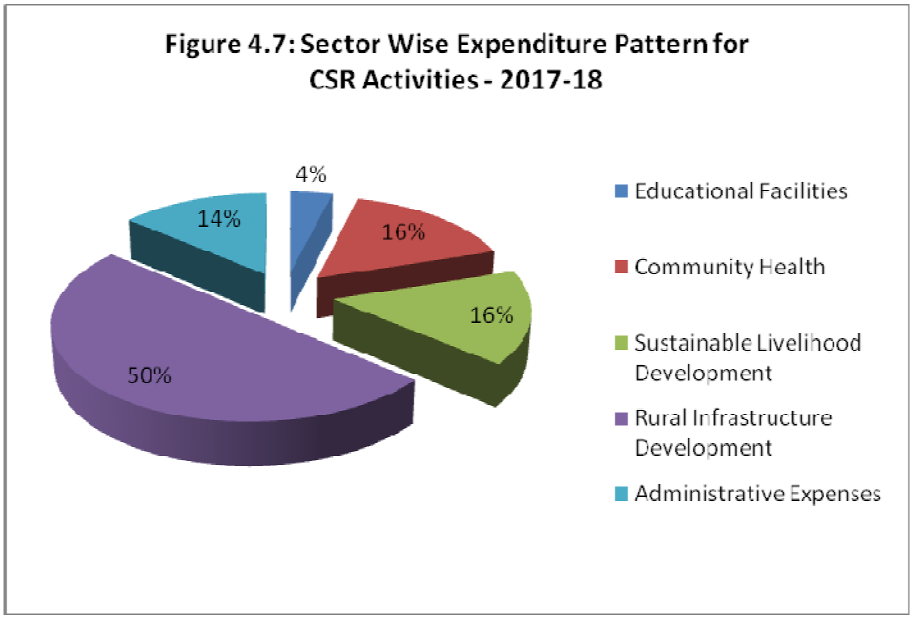
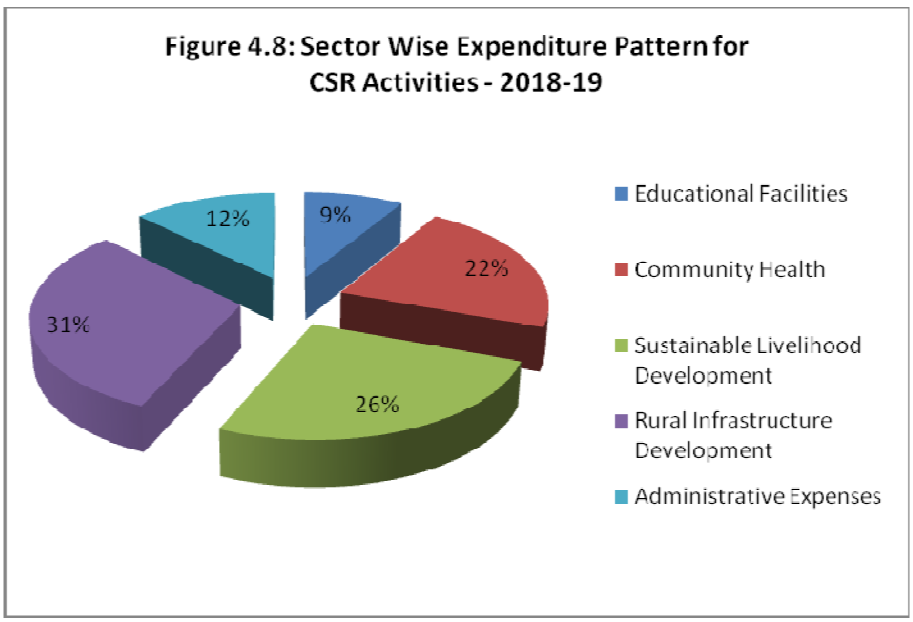


Figure 4.6: Sector Wise Expenditure Pattern for CSR Activities - 2016-17
9%
19%
10%
42%
20%
Educational Facilities
Community Health
Sustainable Livelihood Development
Rural Infrastructure Development
Administrative Expenses





The activity wise detail of budget and expenditure incurred for CSR activities during the last 3 years i.e. from 2016-17 to 2018-19 is presented in Annexure 4.2.

CHAPTER V

SOCIAL IMPACT EVALUATION

CHAPTER 5
SOCIAL IMPACT EVALUATION

Acknowledging the responsibility towards the society, in addition to power generation, the APML is discharging its responsibility by contributing its effort towards Corporate Social Responsibility in the process of all round development of its surrounding villages. Various community development works are being undertaken in this process. In accordance its mission of being socially responsible corporate entity with thrust on community development, APML aims to focus on implementing all community development programme in the affected and other neighbouring villages around its Tiroda TPP based on the specific needs of the community. To understand the efficacy and utility of various CSR activities carried out, it is imperative to conduct an social impact evaluation study to measure the social, economic and cultural impact of the programmes/activities on society. This study would facilitate to set long term community development priorities which could be achieved within the specified time frame. The evaluation process would also help APML to create positive brand image and contribute to sustainable development. The results of social impact evaluation exercise would also prove instrumental in providing guidance and direction for future action.

The setting up and operation of Tiroda TPP might result in two types of impacts on the local people and their livelihood pattern. The impacts are: a) Positive, b) Negative. The gravity of impact can be direct or indirect or cumulative.

Positive impacts are hardly highlighted. The positive impacts of setting up and operation of Thermal Power Plant are long-term and applicable to both affected and non-affected population. Positive impacts are the visible indicators of economic development. The positive impacts are visible from the infrastructural development itself and different income generating activities during the project period and after the completion of the project.

Negative impacts of setting up and operation of Thermal Power Plant are highlighted for necessary resettlement and rehabilitation work. In the projects, the negative impacts are always short-term and applicable to limited number of population who are directly or indirectly involved. Accordingly .the Tiroda TPP may have both positive and negative social impacts. Some of the prime positive and negative social impacts have been discussed in subsequent sections.

The prime positive impacts of Tiroda TPP include:

a) Development of road, transport and communication facilities.

b) Development of educational institutions such as schools, colleges, skill development l institutions, etc.

c) Generation of direct and indirect employment which was not available throughout the year at the pre-project days.

d) Development of ancillary industries to meet the requirement of the project.

e) Availability of electricity in the surrounding villages.

f) Availability of recreation and sports facilities.

g) Opening of banks, post offices, hospitals, community welfare centres, etc.

h) Increased Market activities and increased purchasing power of the population.

i) Initiation of other developmental projects by the State Government.

j) The overall impact resulted in better quality of life of the local people.

The other benefits that the Tiroda TPP include:

- Providing closer interaction and understanding between people from different regions, culture, social traits etc.
- Improvement in the general living standards and knowledge sharing bringing modern outlook and vision for growth and economic prosperity.
- Benefit to State and Central governments by way of royalty, sales tax, duties etc. from this project. This in turn will help in development activities by Government in the area.

As discussed in earlier chapter, the comprehensive profile of all CSR activities illustrate the two types of programmes and target groups namely, i) Activities targeted to individual persons like students, physically challenged persons, women, unemployed youth, etc. and ii) Activities targeted on whole community, namely, infrastructure works, support provided to resource-poor institution (school, colleges, Panchayets, etc.), entertainment, health and sanitation etc. Thus, the activities were bifurcated into two major parts, namely, individual beneficiary oriented activities and community-beneficiary oriented activities. Further, the individual beneficiary oriented activities and community-beneficiary oriented activities were divided into various sectors.

Evaluation of changes during last three years i.e. from to 2018-19 in basic amenities and infrastructure facilities viz., village approach road, condition of internal village road, availability of drinking water sources as well as tap water supply of drinking water with treatment facilities if required, educational facilities, health services, drainage facilities, toilet & sanitation, vocational training facilities, irrigation facilities, veterinary services, sports & cultural facilities, etc. in CSR villages i.e. villages falling within the core zone, buffer zone-I (i.e. within 5 km radius of TTPP) and buffer zone-II (i.e. within 5-10 km radius of TTPP) were undertaken on the basis of information collected during the field survey. This would facilitate to assess the social as well as economic impact of the setting up and operation of Tiroda TPP in particular CSR villages and in general overall region. The status of changes in the infrastructure facilities in CSR villages are presented in subsequent section.

5.1 EVALUATION OF IMPACT OF COMMUNITY ORIENTED ACTIVITIES

5.1.1 Evaluation of Impact on Educational Facilities

Evaluation of impact on educational facilities in villages falling within the core zone, buffer zone-I (i.e. within 5 km radius of TTPP) and buffer zone-II (i.e. within 5-10 km radius of TTPP) during last three years i.e. from to 2018-19 is presented in Table 5.1. The analysis reveals that all the 5 villages of core zone, 11 villages of buffer zone-I and 51 villages of buffer zone-II have primary schools within the village itself.

As mentioned in the earlier Chapter, various activities have been undertaken in Primary, Middle and Secondary schools of core and buffer zone villages for strengthening of educational facilities as a part of CSR activities. The intervention made to improve quality of education and enrollment as well as retention in the school including strengthening of better infrastructure facilities has resulted significant improvement in the enrollment in the primary school of core zone as well as buffer zone villages (Figure 5.1). The analysis reveals that there is a nearly 20% increase in enrollment in Primary school of core zone villages, whereas in buffer zone villages, the enrollment has increased ranging from 6-32%. There is significant improvement in retention of students in core as well as buffer zone villages due to counseling of parents being undertaken for the purpose by AF as a part of CSR activities.

The analysis reveals that out of 5 villages of core zone, 80% villages and out of 11 villages of buffer zone-I, 63.64% villages have Jr. High/Middle schools within the village itself. Whereas out of 51 villages of buffer zone-II, about 70% villages have Jr. High/Middle schools within the village itself during the academic session 2018-19. The intervention made to improve quality of education and enrollment as well as retention in the school including strengthening of better infrastructure facilities has resulted significant improvement in the enrollment in the Jr. High/Middle school of core zone as well as buffer zone villages (Figure 5.2). The analysis reveals that there is a nearly 43.04% increase in enrollment in Jr. High/Middle school of core zone villages, whereas in buffer zone villages, the enrollment has increased ranging from 9-20%.

The analysis reveals that out of 5 villages of core zone, 20% villages and out of 11 villages of buffer zone-I, 27.27% villages have High schools within the village itself. Whereas out of 51 villages of buffer zone-II, 30.77% villages have High schools within the village itself during the academic session 2018-19. The intervention made to improve quality of education and enrollment as well as retention in the school including strengthening of better infrastructure facilities has resulted significant improvement in the enrollment in the high school of core zone as well as buffer zone villages (Figure 5.3). The analysis reveals that there is a nearly 25% increase in enrollment in High school of core zone villages, whereas in buffer zone villages, the enrollment has increased ranging from 8-11%.

The analysis reveals that out of 5 villages of core zone, only 20% villages have Higher Secondary schools within the village itself. Whereas out of 11 villages of buffer zone-I, only 18.18% villages have this facility. Out of 51 villages of buffer zone-II, only 10.26% villages have Higher Secondary schools within the village itself during the academic session 2018-19. The intervention made to improve quality of education and enrollment as well as retention in the school including strengthening of better infrastructure facilities has resulted significant improvement in the enrollment in the higher secondary school of core zone as well as buffer zone villages. The analysis reveals that there is a nearly 20% increase in enrollment in Higher Secondary school of core zone villages, whereas in buffer zone villages, the enrollment has increased ranging from 11-19%.

TABLE 5.1: EVAULATION OF CHANGES IN EDUCATIONAL FACILITIES IN CSR VILLAGES

Particulars	Core Zone		Buffer Zone-I		Buffer Zone-II	
	2016-17	2018-19	2016-17	2018-19	2016-17	2018-19
Primary School:						
% of Villages having Pr. School	100.00	100.00	100.00	100.00	100.00	100.00
Total No. of School	7	7	11	11	51	51
Total No. of Students	530	645 (+21.70%)	725	961 (+32.55%)	3608	3839 (+6.40%)
No. of Students /School	76	92 (+21.05%)	66	87 (+31.82%)	71	75 (+5.63%)
No. of Teachers	20	21	33	36	132	137
Student-Teacher Ratio	27	31	22	27	27	28
Jr. High/Middle School:						
% of Villages having Jr. High/Middle School	60.00	80.00	60.00	63.64	69.23	69.23
Total No. of School	3	4	6	7	27	27
Total No. of Students	381	545 (+43.04%)	567	684 (+20.63%)	2900	3165 (+9.14%)
No. of Students /School	127	136 (+7.09%)	95	98 (+3.16%)	107	117 (+9.35%)
No. of Teachers	10	13	24	26	120	128
Student-Teacher Ratio	38	42	24	26	24	25
High School:						
% of Villages having High School	20.00	20.00	20.00	27.27	30.77	30.77
Total No. of School	1	1	2	3	12	12
Total No. of Students	200	250 (+25.00%)	350	380 (+8.57%)	2594	2884 (+11.18%)
No. of Students /School	200	250 (+25.00%)	175	127 (-27.43%)	216	240 (+11.11%)
No. of Teachers	4	5	9	14	87	90
Student-Teacher Ratio	50	50	39	27	30	32
Higher Secondary School:						
% of Villages having HS School	20.00	20.00	10.00	18.18	10.26	10.26
Total No. of School	1	1	1	2	4	4
Total No. of Students	125	150 (+20.00%)	160	178 (+11.25%)	828	990 (+19.57%)
No. of Students /School	125	150 (+20.00%)	160	89 (-44.38%)	207	248 (+19.81%)
No. of Teachers	4	4	6	10	26	28
Student-Teacher Ratio	31	38	27	18	32	35
Degree College:						
% of Villages having Degree College	Nil	Nil	Nil	Nil	Nil	Nil
Anganwadi Centre:						
% of Villages having Anganwadi Centre	100.00	100.00	100.00	100.00	97.44	97.44
Total No. of Anganwadi Centre	12	12	19	21	74	74
Total No. of Students	364	389	576	627	2493	2558
No. of Students /Anganwadi Centre	30	32	30	30`	34	35

The analysis reveals that all 5 villages of core zone and 11 villages of Buffer zone-I have Anganwadi centres within the village itself. Whereas out of 51 villages of buffer zone-II, 97.44% villages have Anganwadi centres within the village itself during the academic session 2018-19. The intervention made to improve infrastructural facilities including drinking water, sanitation as well as playing facilities etc. has resulted significant improvement in the enrollment in the Anganwadi centre of core zone as well as buffer zone villages. The retention of students has also significantly improved due to better caring facilities evolved in the Anganwadi centre with the intervention of various CSR activities.

5.1.2 Evaluation of Impact on Village Road Network

Evaluation of changes in village road network of villages falling within the core zone, buffer zone-I (i.e. within 5 km radius of TTPP) and buffer zone-II (i.e. within 5-10 km radius of TTPP) during last three years i.e. from 2016-17 to 2018-19 is presented in Table 5.2.

The analysis reveals that all 5 villages of core zone are connected by metalled road during 2018-19. Out of 11 villages of buffer zone-I, 9 (81.82%) villages are connected by metalled road during 2018-19. Out of 51 villages of buffer zone-II, 32 (62.75%) villages are connected by metalled road during 2018-19. The improvement in the road network system in the vicinity of Tiroda TPP has occurred due to the additional revenue which is being generated due to taxes being collected from APML by respective panchayet as well as Central and State Government schemes besides CSR activities for strengthening infrastructural facilities. The intervention made to improve road communication network in the region has resulted significant changes in the quality of life in the core as well as buffer zone villages.

The analysis further reveals that there is 22.41% reduction in inter-village kutcha road in core zone in 2014-2015 (Figure 5.4), whereas 25% increase in morrum road (Figure 5.5), 183.33% increase in concrete road (Figure 5.6) and 53.85% increase in metalled road as compared to 2016-17 (Figure 5.7). The improvement in inter-village road in 2018-19 clearly shows that the fund flow under CSR activities as well as taxes being collected from APML by respective panchayet and Central & State Government schemes has resulted strengthening of inter-village communication road network, for which length of metalled, concrete and morrum road has increased, whereas length of kutcha road has decreased. Similarly, there is 16.11% reduction in inter-village kutcha road in buffer zone-I in 2014-2015, whereas 43.69% increase in morrum road, 137.27% increase in concrete road and 13.85% increase in metalled road as compared to 2016-17. Likewise, there is 22.24% reduction in inter-village kutcha road in buffer zone-II in 2014-2015, whereas 22.83% increase in morrum road, 75.58% increase in concrete road and 10.34% increase in metalled road as compared to 2016-17. Thus the financial investment under CSR activities for improving road communication network has heightened the quality of life of core zone and buffer zone villages.

TABLE 5.2: EVAULATION OF CHANGES IN ROAD COMMUNICATION NETWORK IN CSR VILLAGES

Particulars	Core Zone		Buffer Zone-I		Buffer Zone-II	
	2016-17	2018-19	2016-17	2018-19	2016-17	2018-19
Status of Intra Village Road:						
No. of Village Connected With Metalled Road	5	5	9	9	32	32
% of Village Connected With Metalled Road	100.00	100.00	81.82	81.82	62.75	62.75
Status of Inter Village Road:						
Length of Inter-Village Kutcha Road (m)	5800	4500 (-22.41%)	14900	12500 (-16.11%)	48870	38000 (-22.24%)
Length of Inter-Village Morrum Road (m)	2200	2750 (+25.00%)	5150	7400 (+43.69%)	32200	39550 (+22.83%)
Length of Inter-Village Brick Road (m)	-	-	-	1050	-	-
Length of Inter-Village Concrete Road (m)	3000	8500 (+183.33%)	11000	26100 (+137.27%)	18670	32780 (+75.58%)
Length of Inter-Village Metalled Road (m)	1300	2000 (+53.85%)	6500	7400 (+13.85%)	29000	32000 (+10.34%)

5.1.3 Evaluation of Impact 0n Drinking Water Facilities

Evaluation of changes in drinking water facilities of villages falling within the core zone, buffer zone-I (i.e. within 5 km radius of TTPP) and buffer zone-II (i.e. within 5-10 km radius of TTPP) during last three years i.e. from 2016-17 to 2018-19 is presented in Table 5.3.

The analysis reveals that all the villages of core zone are dependent on groundwater, whereas 90.91% villages of buffer zone-I and 52.94% villages of Buffer zone-II are dependent on groundwater. The analysis further shows that all the villages of core zone have handpump, though about 90% villages of buffer zone-I and more than 50% villages of buffer zone-II have the facility of handpump. The analysis further presents that in CSR villages there is increase of number of handpump ranging from 23-33% in 2018-19 as compared to 2016-17 (Figure 5.8), though 88-95% handpumps are functional in 2018-19, whereas in 2016-17, 83-94% handpumps were functional (Figure 5.9), which shows that financial investment as a part of CSR activities besides the gram panchayet interventions resulted in more operationalization of handpumps in 2018-19, that has minimized drinking water problem of the CSR villages.

The analysis further reveals that 80% villages in core zone, more than 60% villages in buffer zone-I and about 30% villages in buffer zone-II are having good drinking water in 2018-19. However, the tap water supply is not adequate, as only 9.09% villages in buffer zone-I and 37.25% villages in buffer zone-II are having tap water supply in 2018-19. The analysis shows that there is 10.29% increase in number of households having tap water connection as compared to 2016-17 in buffer zone-I villages, whereas there is 186.01% increase in number of households having tap water connection as compared to 2016-17 in buffer zone-II villages respectively (Figure 5.10). This improvement occurred due to investment as a part of CSR activities for strengthening drinking water facilities. The intervention made to improve drinking water facilities has resulted significant improvement in the quality of life in the core and buffer zone villages.

The analysis presents that all of the 11 villages of buffer zone-I, 80% villages in core zone and about 55% villages in buffer zone-II are having pond. In 2018-19, all of the villages of buffer zone-I have pond, whereas in 2016-17, 63.64% villages had pond. This happened due to 25% increase of seasonal ponds in buffer zone-I villages in 2018-19 as compared to 2016-17.

TABLE 5.3: EVAULATION OF CHANGES IN DRINKING WATER FACILITIES IN CSR VILLAGES

Particulars	Core Zone		Buffer Zone-I		Buffer Zone-II	
	2016-17	2018-19	2016-17	2018-19	2016-17	2018-19
Main Source of Drinking Water:						
No. of Village Dependent on Groundwater	5	5	8	10	27	27
% of Village Dependent on Groundwater	100.00	100.00	80.00	90.91	69.23	69.23
Status of Handpumps:						
No. of Villages having HPs	5	5	8	10	27	27
Total No. of HPs	69	85 (+23.19%)	89	118 (+32.58%)	394	526 (+33.50%)
No. of Functional HPs	65	75 (+15.38%)	83	105 (+26.51%)	327	501 (+53.21%)
Quality of Drinking Water:						
No. of Villages having Good DW Quality	4	4	7	7	15	15
% of Villages having Good DW Quality	80.00	80.00	63.64	63.64	29.41	29.41
Status of Tap Water Supply:						
No. of Villages Having Tap Water Supply	-	-	1	1	15	19
% of Villages Having Tap Water Supply	-	-	9.09	9.09	29.41	37.25
No. of Households Having Tap Water Connection	-	-	68	75 (+10.29%)	1508	4313 (+186.01%)
Status of Ponds:						
No. of Villages Having Ponds	4	4	7	11	28	28
% of Villages Having Ponds	80.00	80.00	63.64	100.00	54.90	54.90
No. of Seasonal Ponds	10	14	16	20 (+25.00%)	45	54 (+20.00%)
No. of Perennial Ponds	1	1	2	2	7	7
Total No. of Ponds	11	15	18	22	52	61

5.1.4 Evaluation of Impact on Health Facilities

Evaluation of changes in health facilities of villages falling within the core zone, buffer zone-I (i.e. within 5 km radius of TTPP) and buffer zone-II (i.e. within 5-10 km radius of TTPP) during last three years i.e. from 2016-17 to 2018-19 is presented in Table 5.4.

The analysis reveals that out of 5 villages in core zone, only one village, namely Kachewani village under Kachewani GP has sub-Primary Health Centre. Out of 11 villages in buffer zone-I, only 5 villages have sub-Primary Health Centre. Out of 51 villages in buffer zone-II, only 12 villages have sub-Primary Health Centre.

Out of 5 villages in core zone, Primary Health Centre is available at only one village, likewise out of 11 villages in buffer zone-I, only 2 villages and out of 51 villages in buffer zone-II, only 4 villages have Primary Health Centre. Similarly only 2 village in core zone and 15 villages of buffer zone-II have dispensary.

Major diseases that are prevalent in CSR villages are malaria, tuberculosis, cancer, etc. The analysis reveals that in 2018-19 there is 31.25% reduction of malaria patients (Figure 5.11), 26.47% reduction in polio (Figure 5.12) and 18.18% reduction in tuberculosis patients in core zone as compared to 2016-17, whereas 26.32% reduction of malaria patients in buffer zone-I and 26.32% reduction of malaria patients in buffer zone-II as compared to 2016-17. It clearly shows that this improvement occurred due to regular Mobile Health Care Unit (MHCU) service to 18 CSR villages and regular health check up camp for strengthening health facilities. The intervention made to improve health facilities has resulted significant improvement in the quality of life in the core and buffer zone villages.

TABLE 5.4: EVALUATION OF CHANGES IN HEALTH FACILITIES IN CSR VILLAGES

Particulars	Core Zone		Buffer Zone-I		Buffer Zone-II	
	2016-17	2018-19	2016-17	2018-19	2016-17	2018-19
Status of Medical Facilities:						
No. of Sub-Primary Health Centre	1	1	5	5	12	12
No. of Primary Health Centre/Community Hospital	1	1	2	2	4	4
No. of Dispensaries	1	2	-	-	15	15
No. of Private Medical Practitioner – Allopathic	4	5	-	1	14	18
No. of Private Medical Practitioner – Ayurvedic/Homeopathic	3	4	-	-	4	6
No. of Veterinary Hospital/Dispensary	-	-	2	2	7	7
No. of Medicine Shops	2	3	2	4	15	22
No. of Pathological Centres	-	-	-	-	-	-
Prevalence of Major Diseases:						
Malaria	32	22 (-31.25%)	38	28 (-26.32%)	114	84 (-26.32%)
Measles	-	-	-	-	-	-
Tuberculosis	11	9 (-18.18%)	18	15 (-16.67%)	93	80 (-13.97%)
Cancer	-	-	5	3	12	9
Physically Challenged Persons:						
Deaf & Dumb	8	6 (-25.00%)	16	14 (12.50%)	46	39 (-15.22%)
Blind	2	2	2	3	22	18 (-18.18%)
Polio	34	25 (-26.47%)	21	18 (-14.29%)	106	98 (-7.55%)
Mentally Retarded	1	1	10	9 (-10.00%)	39	37 (-5.13%)

5.1.5 Evaluation of Impact on Skill Development Training & Livelihood

Before the setting of Tiroda TPP the socio-economic conditions of the local people in the study area was not good mainly due to low agricultural productivity. It was found that it is difficult for the people to sustain their livelihood on agriculture and was looking for other means of livelihood. Accordingly the setting up and operation of Tiroda TPP have resulted in a positive impact on the socio-economic conditions of the people by providing direct and indirect employment in the plant. It may be pertinent to mention here that any capital intensive power project like Tiroda TPP using state-of-the-art technology though has restricted direct job opportunities per se but generates a lot of downstream employment facilitating boom in the local economy. For every one direct job opportunity there is on an average at least 5 jobs created downstream which can facilitate socio-economic development of the area. Also the project has enhanced economic growth of the area in general. Cost of land and other properties in the area has been increased.

The positive impact has been the increase of employment opportunities for un-skilled and semi-skilled workers also. Growth/expansion of shops, dhabas, small hotels and other allied services have also opened up avenues for employment. The subsequent improvement in the status of the people also helped in increasing the health and education status of the people.

Table 5.5 and 5.6 present the manpower detail of Tiroda TPP having Maharashtra domicile during construction and post construction period respectively. The analysis indicates that during the construction period about 5,500 people of Maharashtra directly as well as contract labour were got employment opportunity. However, during O&M phase around 2500 people of Maharashtra got employment opportunity. It is also envisaged that the setting up and operation of Tiroda TPP has increased the enormous indirect employment opportunity for the local people.

TABLE 5.5: STATUS OF EMPLOYMENT OPPORTUNITY PROVIDED TO LOCAL PEOPLE OF MAHARASHTRA IN TIRODA TPP - DURING CONSTRUCTION PHASE

<table>
<tr><th>Particulars</th><th>Through Contractor</th><th>APML Employee</th><th>Total</th></tr>
<tr><td>Tiroda Tehsil</td><td>3392
(20.09%)</td><td rowspan="4">190
(29.14%)</td><td rowspan="4">5521</td></tr>
<tr><td>Gondia Tehsil</td><td>1076
(6.37%)</td></tr>
<tr><td>Bhandara Tehsil</td><td>407
(2.41%)</td></tr>
<tr><td>Rest of Maharashtra
(Nagpur, Amravati, etc.)</td><td>456
(2.70%)</td></tr>
<tr><td>Other than Maharashtra</td><td>11552
(68.43%)</td><td>462
(70.86%)</td><td>12014</td></tr>
<tr><td>Total</td><td>16883</td><td>652</td><td>17535</td></tr>
</table>

Source: GM (HR), APML, Tiroda (As on January, 2015).

TABLE 5.6: STATUS OF EMPLOYMENT OPPORTUNITY PROVIDED TO LOCAL PEOPLE OF MAHARASHTRA IN TIRODA TPP – POST CONSTRUCTION PHASE (OPERATION PHASE)

Particulars	Through Contractor	APML Employee	Total
Tiroda Tehsil	1506 (41.36%)	190 (29.14%)	2615
Gondia Tehsil	602 (16.53%)		
Bhandara Tehsil			
Rest of Maharashtra (Nagpur, Amravati, etc.)	317 (8.71%)		
Other than Maharashtra	1216 (33.40%)	462 (70.86%)	1678
Total	**3641**	**652**	**4293**

Source: GM (HR), APML, Tiroda (As on January, 2015).

In addition to the employment opportunity being provided to the local people of Maharashtra directly or through contract at Tiroda TPP, approx. 1200 vendours of Maharashtra have been enlisted with APML for supplying/providing various goods and services to Tiroda TPP. These vendours are being entrusted for supplying various material and equipments along with providing various services on regular basis. It is envisaged that the expansion of Tiroda TPP will further increase the opportunity for the local vendours.

Evaluation of changes in vocational training and livelihood of villages falling within the core zone, buffer zone-I (i.e. within 5 km radius of TTPP) and buffer zone-II (i.e. within 5-10 km radius of TTPP) during last three years i.e. from 2016-17 to 2018-19 is presented in Table 5.7.

The analysis reveals that there is 34.05% increase in persons received vocational training from ITI and other Training Institutes (ITI, Tiroda, Gondia, etc.) in core zone in 2018-19 as compared to 2016-17 (Figure 5.13). Whereas in buffer zone-I and buffer zone-II, there are increase of 23.64% and 18.14% persons respectively in vocational training in 2018-19 as compared to 2016-17. The analysis further reveals that more employment-oriented training i.e. fitter, nursing and computer, etc. are focused in core zone in 2018-19 besides various conventional training on welding, electrical, mechanical and carpentry that was selected in 2016-17. In Buffer zone-I and II, socially relevant training on fire & safety besides other conventional training is also imparted in 2018-19 to make more effective so that unemployed youth could get involved in various high risk establishments, industry, etc. after receiving vocational training. The result shows that in 2018-19, there is increase of 136.21% persons who get employment/self-employed after receiving vocational training as compared to 2016-17 in core zone. In buffer zone-I and II, there is increase of 84.62% and 61.07% respectively who get employment/self-employed after receiving vocational training as compared to 2016-

17 (Figure 5.14). This improvement occurred due to the better employment opportunity generated after setting up of Tiroda TPP.

TABLE 5.7: EVAULATION OF CHANGES IN MEANS OF SUSTAINABLE LIVELIHOOD IN CSR VILLAGES

Particulars	Core Zone		Buffer Zone-I		Buffer Zone-II	
	2016-17	2018-19	2016-17	2018-19	2016-17	2018-19
Status of Skilled Personnel:						
No. of Persons with Vocational Training from ITI and Other Training Institutes (ITI, Tiroda, Gondia, etc.)	185	248 (+34.05%)	55	68 (+23.64%)	1268	1498 (+18.14%)
Type of Vocational Training Undertaken by Local People in Project Area	Welder Electrical Mechanical Carpenter	Welder Electrical Mechanical Carpenter Fitter Nursing Computer	Welder Electrical Mechanical Carpenter Fitter Nursing	Welder Electrical Mechanical Carpenter Fitter Nursing Fire & Safety	Welder Electrical Mechanical Carpenter Fitter Nursing Computer	Welder Electrical Mechanical Carpenter Fitter Nursing Computer Fire & Safety
No. of Persons got Employment/Self-Employed after Receiving Vocational Training	58	137 (+136.21%)	26	48 (+84.62%)	298	480 (+61.07%)

5.1.6 Evaluation of Impact on Agricultural Facilities

Evaluation of changes in agricultural facilities of villages falling within the core zone, buffer zone-I (i.e. within 5 km radius of TTPP) and buffer zone-II (i.e. within 5-10 km radius of TTPP) during last three years i.e. from 2016-17 to 2018-19 is presented in Table 5.8.

The analysis reveals that there is 14.29% reduction in number of big farmers in core zone in 2018-19 as compared to 2016-17. Similarly in buffer zone-I and buffer zone-II, there are reduction of 12% and 3.39% big farmers in 2018-19 as compared to 2016-17 (Figure 5.15). The reason is due to getting encouraged in more non-agricultural activities as a result of setting up of Tiroda TPP, presently number of big farmers are getting reduced as compared to 2016-17. As a result, there is 12.50% reduction in agricultural labourers in core zone in 2018-19 as compared to 2016-17. Similarly reduction in agricultural labourers in buffer zone villages in 2018-19 ranges between 6-11% as compared to 2016-17 (Figure 5.16). Whereas due to the setting up of Tiroda TPP, currently there is 16.13% increase in non-agricultural activities in core zone. Similarly, in 2018-19 increase in non-agricultural activities ranges between 6-32% in buffer zone villages as compared to 2016-17 (Figure 5.17).

The analysis further reveals that there is inclination of usage of more modern agricultural implements in CSR villages in 2018-19 besides various conventional implements that was used in 2016-17. There is 16.67% increase of use of tractor in core zone in 2018-19 as compared to 2016-17 (Figure 5.18). More than 45% increase of use of pump set is visualized in core zone villages in 2018-19 as compared to 2016-17 (Figure 5.19). Use of sprayers/puddlers, thresher, etc. is prominently increased in CSR villages in 2018-19 as compared to 2016-17. Overall, about 23.81% increase of modern agricultural implements is visible in core zone villages in 2018-19 as compared to 2016-17. This improvement occurred due to more fund flow in the region due to setting up of Tiroda TPP. The intervention made to use modern agricultural facilities has resulted significant improvement in the crop yield in the core and buffer zone villages.

TABLE 5.8: ZONE WISE EVALUATION OF CHANGES IN AGRICULTURAL FACILITIES IN CSR VILLAGES

Particulars	Core Zone		Buffer Zone-I		Buffer Zone-II	
	2016-17	2018-19	2016-17	2018-19	2016-17	2018-19
Status of Cultivators:						
Big Farmers	14	12 (-14.29%)	25	22 (-12.00%)	236	228 (-3.39%)
Small Farmers	100	105 (+5.00%)	148	150 (+1.35%)	228	235 (+3.07%)
Marginal Farmers	55	65 (+18.18%)	90	100 (+11.11%)	190	206 (+8.42%)
Total	169	182 (-7.69%)	263	272 (+3.42%)	654	669 (+2.29%)
Status of Labourers:						
Agricultral Labourers	160	140 (-12.50%)	215	190 (-11.63%)	2235	2100 (-6.04%)
Non-Agricultural Labourers	155	180 (+16.13%)	140	185 (+32.14%)	1850	1960 (+5.95%)
Total	315	320 (+1.59%)	355	375 (+5.63%)	4085	4060 (-0.61%)
Major Crop Yield Pattern:						
Wheat (Qt/acre)	14.0-18.0	13.5-16.0	15.0-18.0	14.5-17.5	15.0-18.0	14.5-17.8
Paddy (Qt/Acre)	6.0-10.0	5.5-9.5	6.5-10.5	6.0-9.5	6.5-10.5	6.0-10.0
Mustard Oil (Qt/Acre)	5.2-8.8	4.2-7.5	6.0-9.5	5.5-8.5	6.0-9.5	5.5-9.0
Cotton (Qt/Acre)	8.0-10.0	7.5-9.0	8.0-10.5	8.0-9.5	8.0-10.5	8.0-10.0
Soyabean (Qt/Acre)	3.5-4.5	3.5-4.2	3.5-4.6	3.5-4.5	3.5-4.6	3.5-4.5
Use of Modern Agricultural Implements:						
Tractor	18	21 (+16.67%)	110	131 (+19.09%)	92	109 (+18.48%)
Power Tiller	-	-	-	-	-	-
Pumps Set	15	22 (+46.67%)	68	82 (+20.59%)	30	37 (+23.33%)
Sprayer/Puddlers	28	32 (+14.29%)	260	300 (+15.38%)	90	101 (+12.22%)
Thresher	2	3 (+50.00%)	15	16 (+6.67%)	32	39 (+21.88%)
Total	63	78 (+23.81%)	453	529 (+16.78%)	244	286 (+17.21%)

5.1.7 Evaluation of Impact on Livestock Development

Evaluation of changes in status of livestock of villages falling within the core zone, buffer zone-I (i.e. within 5 km radius of TTPP) and buffer zone-II (i.e. within 5-10 km radius of TTPP) during last three years i.e. from 2016-17 to 2018-19 is presented in Table 5.9.

The analysis reveals that there is about 6.67% reduction in various livestocks viz., drought animal, milch animal, young stocks, pigs, poultry birds, etc. in core zone in 2018-19 as compared to 2016-17 (Figure 5.20). The reason is due to getting encouraged in more non-agricultural activities, opportunities being created directly as well as indirectly due to setting up/operation of Tiroda TPP, currently number of livestocks have slightly reduced as compared to 2016-17.

TABLE 5.9: ZONE WISE EVALUATION OF CHANGES IN LIVESTOCK IN CSR VILLAGES

Particulars	Core Zone		Buffer Zone-I		Buffer Zone-II	
	2016-17	2018-19	2016-17	2018-19	2016-17	2018-19
Drought Animal	280	250 (-10.71%)	1130	1220 (+7.96%)	1110	1160 (+4.50%)
Milch Animal	698	672 (-3.72%)	2130	2250 (+5.63%)	1840	1955 (+6.25%)
Young Stocks	480	445 (-7.29%)	1075	1160 (+7.91%)	1140	1250 (+9.65%)
Sheep/Goats	1480	1230 (-16.89%)	4650	4700 (+1.08%)	3555	3650 (+2.67%)
Pigs	-	-	-	-	-	-
Poultry Birds	380	500 (+31.58%)	2850	3385 (+18.77%)	1565	1745 (+11.50%)
Total	3318	3097 (-6.67%)	11835	12715 (+7.44%)	9210	9760 (+5.97%)

5.1.8 Evaluation of Impact on Electricity Facilities

Evaluation of changes in electricity facilities of villages falling within the core zone, buffer zone-I (i.e. within 5 km radius of TTPP) and buffer zone-II (i.e. within 5-10 km radius of TTPP) during last three years i.e. from 2016-17 to 2018-19 is presented in Table 5.10.

The analysis reveals that all the villages in core zone and buffer zone-I have electricity facility. Out of 51 villages in buffer zone-II, 37 villages have electricity facility.

The analysis further reveals that there is about 6.33% increase in households having domestic light & fan in core zone villages in 2018-19 as compared to 2016-17. Similarly increase in households having domestic light & fan in buffer zone-I and II villages in 2018-19 as compared to 2016-17 ranges between 4-9%.

Street light is available in 60% in core zone villages in 2018-19, though in 2016-17, the same was available in only 40% villages. Similarly 81.82% villages in buffer zone-I are having street light in 2018-19, whereas the same was available in case of only 45.45% villages in 2016-17. Significant increase in households having electricity for irrigation purposes is seen in 2018-19. There is 5% increase in households having electricity for irrigation purposes is observed in core zone villages in 2018-19 as compared to 2016-17. Same picture is revealed in case of households having electricity for commercial purposes in 2018-19, when 75% increase in households having electricity for commercial purposes is visualized in case of core zone villages. Out of 11 villages, 10 villages in buffer zone-I are using solar/wind/biomass energy in 2018-19, whereas the figure was only 7 in 2016-17. This improvement occurred due to intervention made as a part of CSR activities along with the availability of better avenues and growth due to setting up of Tiroda TPP. The improved electricity facilities has resulted significant changes in the quality of life and sustainability in the core and buffer zone villages.

TABLE 5.10: ZONE WISE EVALUATION OF CHANGES IN ELECTRICITY FACILITIES IN CSR VILLAGES

Particulars	Core Zone		Buffer Zone-I		Buffer Zone-II	
	2016-17	2018-19	2016-17	2018-19	2016-17	2018-19
No. of Villages Having Electricity	5 (100.00%)	5 (100.00%)	11 (100.00%)	11 (100.00%)	37 (72.55%)	37 (72.55%)
No. of Households Having Domestic Light & Fan	1721	1830 (+6.33%)	2951	3080 (+4.37%)	11232	12350
No. of Villages Having Street Lighting	2 (40%)	3 (60%)	5 (45.45%)	9 (81.82%)	27 (52.94%)	27 (52.94%)
No. of Households Having Electricity for Irrigation Purposes	20	21 (+5.00%)	71	78 (+9.86%)	74	81 (+9.46%)
No. of Households Having Electricity for Commercial Purposes	4	7 (+75.00%)	15	31 (106.67%)	47	54 (+14.89%)
No. of Villages using solar/wind/biomass energy	2	5	7	10	13	13

5.1.9 OVERALL SOCIAL IMPACT EVALUATION

To evaluate the overall social impact of setting up and operation of Tiroda TPP, ranking of changes in the basic amenities and infrastructural facilities were undertaken in consultation with local people and village representatives during the FGDs conducted in CSR. The evaluation of changes in basic amenities and infrastructural facilities during last three years i.e. 2016-17 to 2018-19 was rated in the scale 1 to 5, i.e. 1: Deteriorated, 2: Same, 3: Slightly improved, 4: Moderately improved and 5: Highly improved.

Table 5.11 presents the status of changes due to setting up and operation of Tiroda TPP in the rural infrastructure, education facilities, health facilities including level of awareness regarding health, hygiene and various social issues, agricultural pattern, vocational training opportunities, socio-cultural improvement.

The analysis of opinion gathered during FGDs conducted in selected CSR villages shows that in 60% villages, availability of road network has been slightly improved and in 13.33% villages, it is highly improved (Figure 5.21).

The analysis shows that in 20% villages, availability of community building has moderately improved during last three years (Figure 5.21). Availability of safe drinking water has been highly improved during last three years in about 20% villages, though 60% villages show slight to moderate improvement of the same. About 75% villages have slight to moderate improvement in sanitation facilities.

The analysis further reveals that availability of classroom in school has been getting improved to great extent during last three years, as in 60% villages availability of classroom has been moderately improved and in more than 25% of the villages, high improvement has taken place in this respect (Figure 5.21). More than 65% of villages have moderate to high improvement in availability of safe drinking water in school. Same picture is revealed in case of sanitation facilities in school. Status of improvement of sanitation facilities in school during last three years shows that more than 45% of villages have moderate to high improvement. Improvement status of availability of table, desk, etc. in school during last three years shows that more than 65% villages have moderate to high improvement. Status of improvement of playground in school during last three years shows that 80% of villages have slight to moderate improvement. Improvement has taken place to a great extent in educational facilities and ambience during last three years. Analysis states that more than 75% villages have slight to moderate improvement and 7.69% villages have high improvement in this regard.

Similarly, remarkable improvement has taken place in health facilities and ambience during last three years. Analysis states that more than 90% villages have slight to moderate improvement. There is significant improvement in level of awareness towards hygiene and sanitation. In 60% villages there is slight improvement and about 15% villages have moderate improvement (Figure 5.21).

Status of improvement in level of awareness towards social issues shows that in more than 65% villages there is slight improvement.

Status of improvement in the area of mortality rate of livestock shows that more than 85% villages have slight to moderate reduction in mortality rate of livestocks. Similarly, status of improvement in the area of health status of livestock shows that 70% villages have moderate improvement and rest of the villages have slight improvement.

Improvement takes place to a great extent in agricultural pattern during last three years. Analysis states that 80% villages have slight to moderate improvement.

Status of improvement in the area of vocational training opportunities during last three years shows that more than 30% villages have slight improvement.

Status of improvement of level of participation of people including children in sports and cultural activities during last three years shows that 80% of villages have slight to moderate improvement.

Status of improvement in socio-cultural pattern of communities due to project interventions in different fields during last three years shows that more than 90% of the villages have slight to moderate improvement.

Table 5.12 presents the overall social impact of setting up and operation of Tiroda TPP. Status of inter-village road and intra-village road network has been improved during last three years i.e. from 2012-2013 to 2014-2015. The analysis of opinion gathered during FGDs conducted in CSR villages shows that in more than 85% CSR villages, village access road has been moderately improved. Similarly, in 80% CSR villages, internal village road has been moderately improved and in 5% villages, it is highly improved (Figure 5.22).

Status of drinking water in terms of availability and quality has been moderately improved during last three years in about 70% villages (Figure 5.22).

Status of educational facilities has been improved during last three years, as in 75% villages educational facilities have been moderately improved and in rest (25%) of the villages, it is slightly improved.

Health facilities are getting improved during last three years, as in 56.25% villages, health facilities have been improved slightly and rest of the villages envisage moderate to high improvement in this respect.

Some improvements have taken place in drainage facilities during last three years, as in more than 50% villages there is slight improvement in drainage facilities and in about 30% villages it is moderately improved. Same picture is revealed in sanitation facilities. About 65% villages have slight improvement in terms of availability of toilets.

Vocational training opportunities have been improved to some extent during last three years. In more than 70% villages such facilities have been slightly improved, though in more than 10% villages, moderate improvement has been envisaged (Figure 5.22).

Same picture is reflected in case of irrigation facilities and modern equipments (tractor, harvester, etc.) for agricultural activities. The analysis presents that in about 65% villages, this facility have been slightly improved. Moderately improved status is found in 17.65% villages.

Improvement of veterinary services/facilities is found to be average during last three years, as in 50% villages, it has been moderately improved and in rest of the villages, slight improvement has taken place.

Improvement of sports facilities takes place satisfactorily during last three years. In more than 90% villages, it has been improved slightly, though in rest of the villages it has been moderately improved.

5.2 EVALUATION OF IMPACT OF INDIVIDUAL BENEFICIARIES CSR ACTIVITIES

To evaluate the social impact of the CSR activities targeted towards community oriented benefit as well as individual/family benefits undertaken by AF-APML, following nine parameters were considered:

- Willingness to obtain the benefit
- Changes in living condition after receving the benefits
- Level of direct benefit received from the programme
- Level of indirect benefit received from the programme
- Impact of benefits on individual
- Impact of benefits on whole family
- Levels of profits received from the benefits
- Economic changes after receiving the benefits
- Social changes after receiving the benefits

The above parameters were assessed in the scale 1 to 5, i.e. 1: no, 2: low, 3: moderate, 4: high and 5: very high. The evaluation of impact of individua beneficiaries CSR activities undertaken during year 2016-17 to 2018-19 is presented in subsequent section.

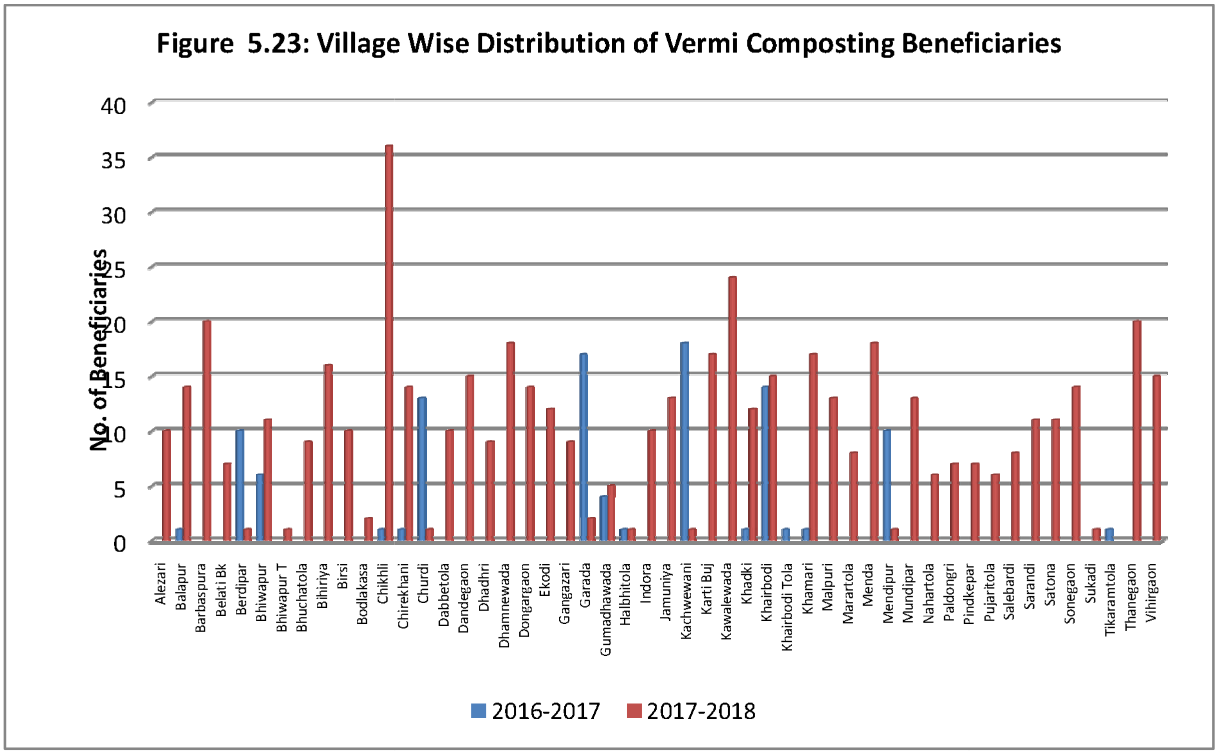
5.2.1 Vermicomposting Unit

Vermicomposting is a type of composting in which certain species of earthworms are used to enhance the process of organic waste conversion and produce a better end-product. Earthworms feeds the organic waste materials and passes it through their digestive system and gives out in a granular form (cocoons) which is known as vermicompost.Vermicompost is earthworm excrement, called castings, which can improve biological, chemical, and physical properties of the soil.

The worm castings contain higher percentage of both macro and micronutrients than the garden compost. Apart from other nutrients, a fine worm cast is rich in NPK, which are in readily available form and are released within a month of application. Vermicompost enhances plant growth, suppresses disease in plants, increases porosity and microbial activity in soil, and improves water retention and aeration.

Vermicompost also benefits the environment by reducing the need for chemical fertilizers and decreasing the amount of waste going to landfills. Vermicompost production is trending up worldwide and it is finding increasing use especially in Western countries, Asia-Pacific and Southeast Asia.

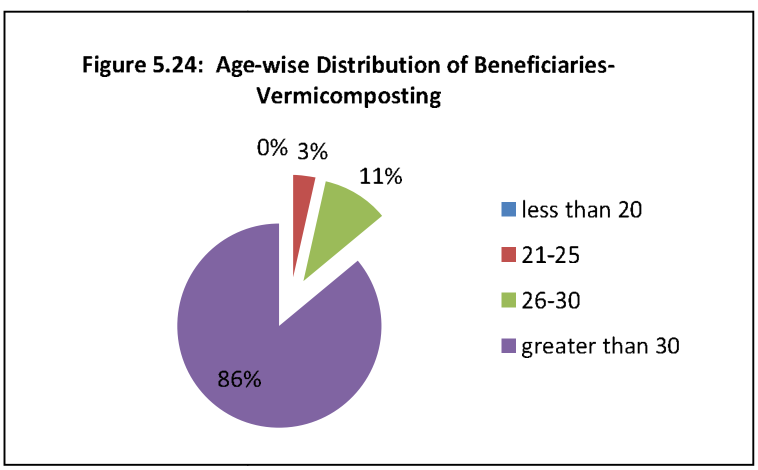
Adani foundation has taken the initiatives of implementing vermicomposting in the villages i.e, Dandagaon, Malapuri, Dhamenepada, Mendipur, Jamuniya, Bivapur, Khamari, Chirekhani, Thanagoan, Khairbodi, Beraipar, Churdi, kachhewani in Triroda (Figure 5.23). The benefits yielded through this programme are higher in such a short span of time. The capital investment is negligible considering the output you get once the compost is ready for use. The High Density Polyethylene (HDPE) bed is the highest cost material required to set up Vermicompost. In FY 2017-2018 nearly 520 HDPE beds were provided to farmers. Some farmers who had taken complete training, having experimented and experienced the benefits of Vermicompost are planning to develop a business model based on Vermicompost.



Socio-Economic Profile of Beneficiaries

The socio-economic profile of beneficiaries of vermi composting with respect to age, sex, education qualifications, etc. is presented in subsequent section.

- **Age:** The age wise distribution of the beneficiaries those who benefited by the vermicomposting process are given in Figure 5.24.



From the above-mentioned Figure it is clear that near 86% of the benefited people are greater than 30 years, 10.5% of people are in 26-30 years, and 3.5% people are in 21-25 years.

- **Sex**: Sex wise distribution of the beneficiaries are shown in Figure 5.25.

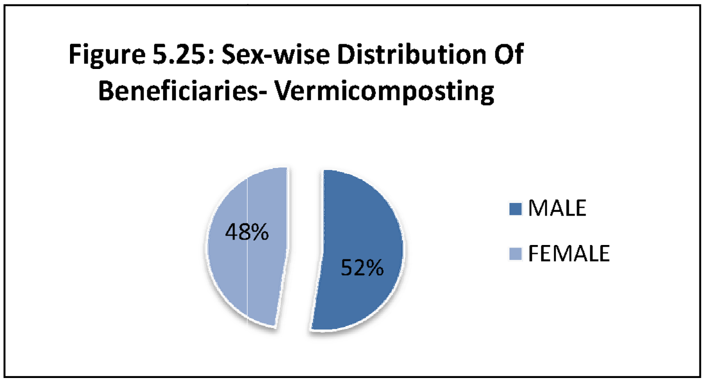


Figure 5.25: Sex-wise Distribution Of Beneficiaries- Vermicomposting

From the Figure 5.25 we can get sex distribution where the percencentage of male beneficiaries is 52% and female beneficiaries is 48%.

Educational Qualification: The education qualification of the beneficiaries are given in Figure 5.26.

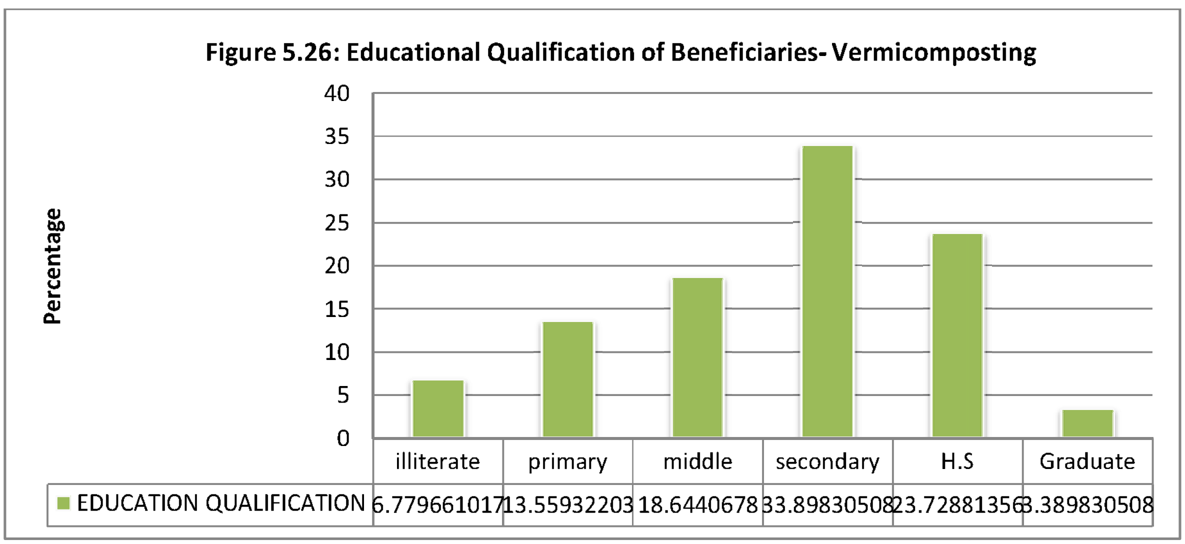


Figure 5.26: Educational Qualification of Beneficiaries- Vermicomposting

From the above mentioned figure it is shown that the education qualification of the benefited people are divided in categories i.e, illiterate 6.7%, primary 13.5%, middle 18.6%, secondary 33.8%, H.S 23.7% and graduate 3.4%.

Changes in Occupation & Income Level of Beneficiaries

The status of occupation before receiving the benefits and after receiving the benefits are given as follows:

From the analysis it is clear that there is very little changes take place within the beneficiaries. Before receiving the benefit, almost 98% of the beneficiaries were farmers and nearly 2% was involed in service. After receiving the benefits, the same percentage was maintained in case of farmers and the remaining percentage of service holders have also been in farmimg thereafter.

The status of changes in income level before & after receiving the benefits is given as follows:

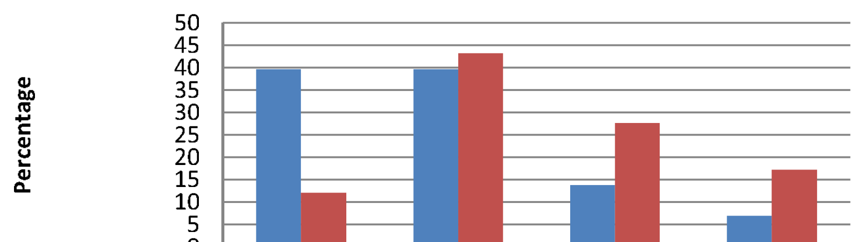
From the above data we can get a clear picture about the income changes after receiving the benefits. For the category less than or equal to 40000, the percentage of people before receiving the benefits was 39%, whereas after receiving the benefits, the percentage reduced into 12%. It means 27% of people shifted to higher income group.

In the next category, i.e., 41000-80000the before benefit percentage was again 39%, and in after benefit case, the percentage showed a little improvement to 43%, having a small growth of 8%.

For the subsequent class, i.e., 81000-150000, there was a massive improve showing 13% of the people at before benefits stage and 27% in after benefit stage, showing almost 100% significant growth.

The final income group, i.e., greater than 150000, also showed a massive improvement. Starting with nearly 7% of people in before benefit stage and ultimately increased in to 17%, showing a growth of almost 150%. The graphical presentataions of the data is shown in Figure 5.27.

Figure 5.27: Changes In Income Level of Beneficiaries-Vermicomposting

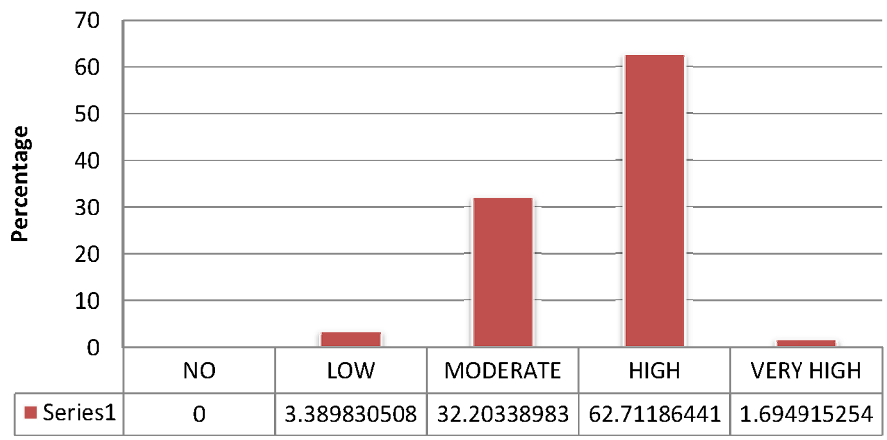


	less than equal to 40000	41000-80000	81000-150000	greater than 150000
BEFORE BENEFIT	39.65517241	39.65517241	13.79310345	6.896551724
AFTER BENEFIT	12.06896552	43.10344828	27.5862069	17.24137931

Evaluation of Impact of Vermicomposting

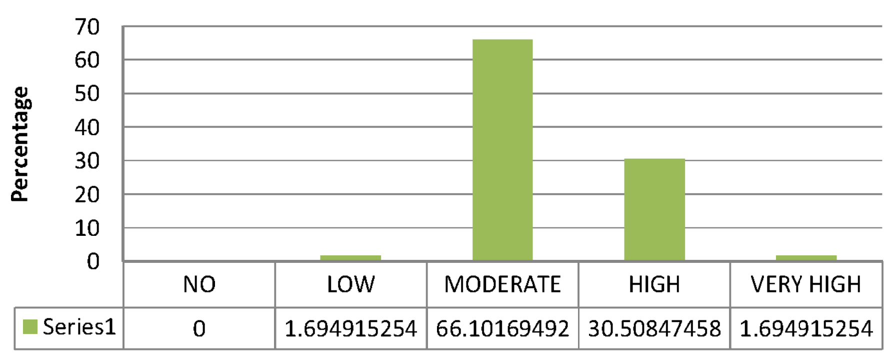
Willingness to obtain the benefit: The willingness of the participants were taken into consideration and it is clear that more that 60% of people highly benefitted and satisfaction level near about 1.5% were very high and 32% people benefitted moderately. This status of willingness was described graphically in Figure 5.28.

Figure 5.28: Status Of Willingness Of Beneficiaries To Obtain The Benefit-Vermicomposting

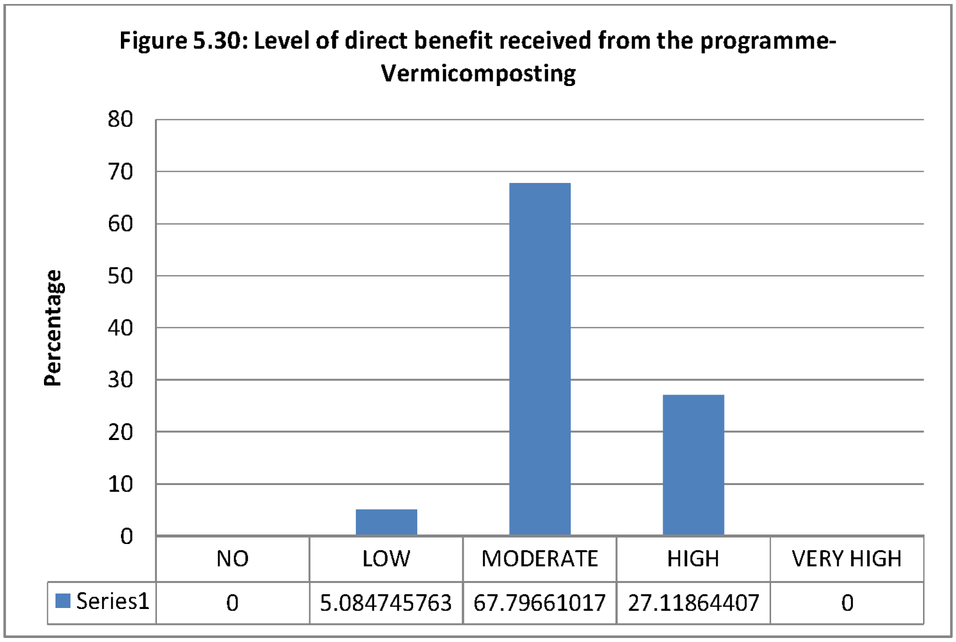


Changes in living condition after receiving the benefits: The changes in living condition of the beneficiaries after receiving the benefits were taken into consideration and it is shown that near 30% of people were highly benefitted and more than 1.5% people gave their status as very high. This changes in living conditions was described graphically in Figure 5.29.

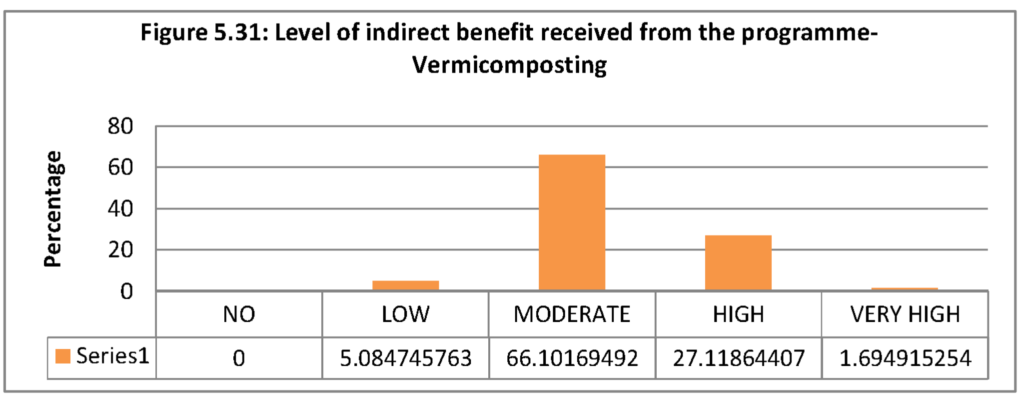
Figure 5.29: Status Of Changes In Living Condition After Receiving The Benefits- Vermicomposting



Level of direct benefit received from the programme: the extent of benefits, which was directly obtained by the beneficiaries, was taken into consideration. More than 65 % of people were moderately and near 27% of people were highly benefitted. This status of direct benefits was described graphically in Figure 5.30.



Level of indirect benefit received from the programme: In this significant extent of benefits, which was clearly obtained by the beneficiaries, was taken into consideration. 66% were moderately benefitted, nearly 27% were highly benefitted and nearly 2% participants were very highly benefitted. This status of indirect benefits was described graphically in Figure 5.31.



Impact of benefits on individual: In this parameter, the extent of benefits, on individual beneficiaries, was taken into consideration. 56% shown moderate impact of benefit, 35% responded for high impact of benefit and nearly 2% paticipants showed very high impact of benefit. This status of indirect benefits was described graphically in Figure 5.32.

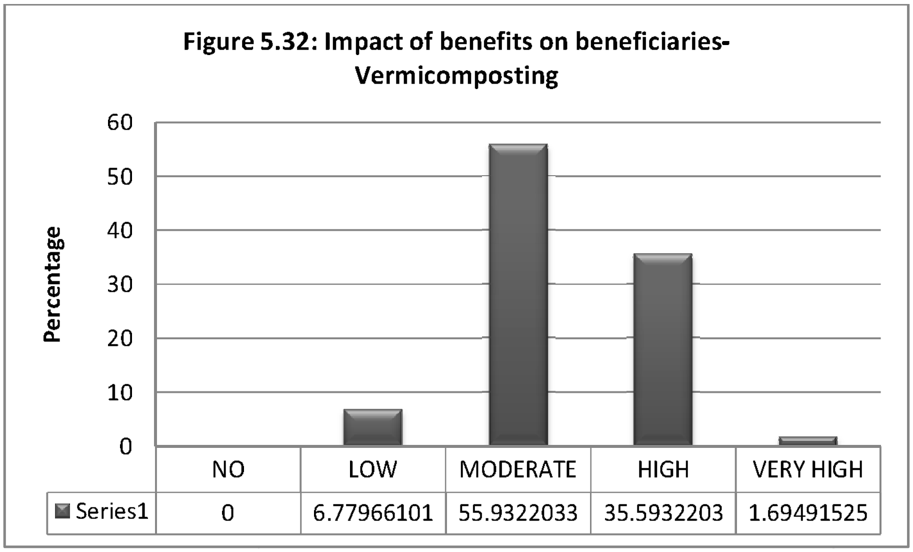


Figure 5.32: Impact of benefits on beneficiaries-Vermicomposting

Impact of benefits on whole family : In this parameter, the extent of benefits, on family basis, was taken into consideration. 59% shown moderate impact of benefit, 37% responded for high impact of benefit. This status of indirect benefits was described graphically in Figure 5.33.

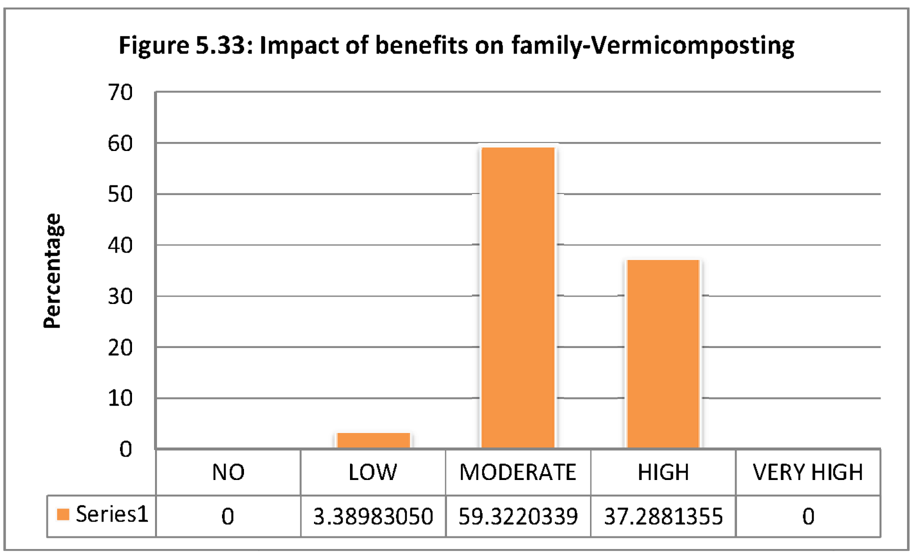
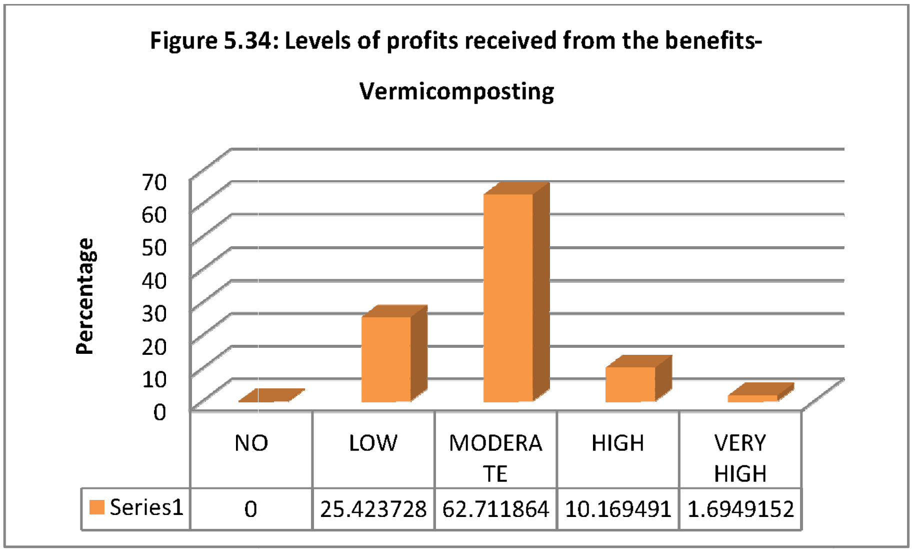
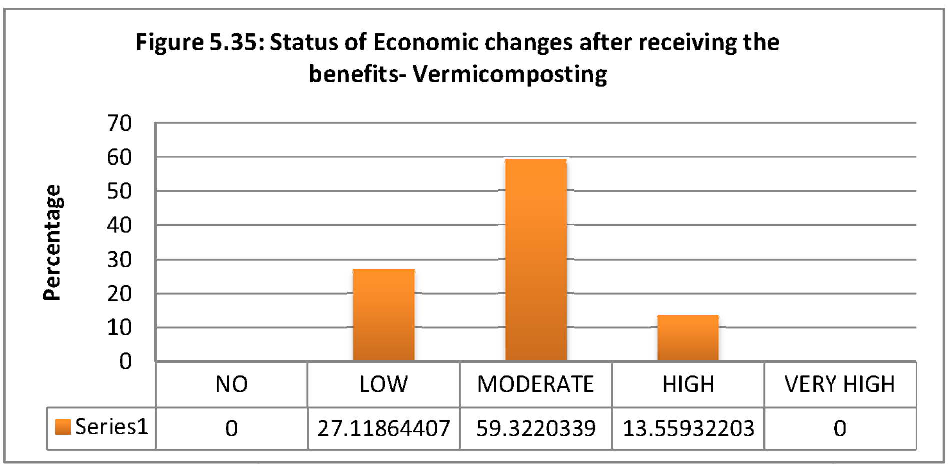


Figure 5.33: Impact of benefits on family-Vermicomposting

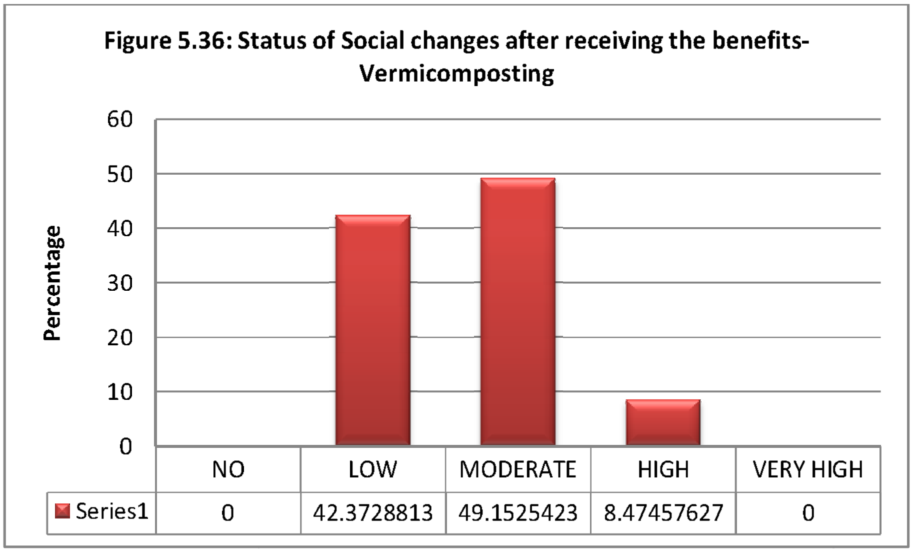
Levels of profits received from the benefits: In this parameter, the extent of profits earned from the benefits to the beneficiaries, was taken into consideration. nearly 63% shown moderate profit earned from benefit, 10% responded for high profit earned from benefit and nearly 2% showed very high level of profit earned from benefit. This status of indirect benefits was described graphically in Figure 5.34.



Economic changes after receiving the benefits: In this parameter, the economic changes after receiving the benefits to the beneficiaries, was taken into consideration. 59% showed moderate economic changes from benefit, 13% responded for high economic changes from benefit. This status of indirect benefits was described graphically in Figure 5.35.



Social changes after receiving the benefits: In this parameter, the social changes after receiving the benefits to the beneficiaries, was taken into consideration. 49% showed moderate social changes from benefit, 8% responded for high social changes from benefit. This status of indirect benefits was described graphically in Figure 5.36.



5.2.2 SRI Programme

The System of Rice Intensification (SRI) is a methodology aimed at increasing the yield of rice produced in farming. It is a low water, labor-intensive, method that uses younger seedlings singly spaced and typically hand weeded with special tools. SRI methodology is based on four main principles that interact with each other:

- Early, quick and healthy plant establishment
- Reduced plant density
- Improved soil conditions through enrichment with organic matter
- Reduced and controlled water application

Adani Foundation is taking initiatives in demonstration, exposure and provides information about integrated cow based livelihood, improved agriculture, SRI through organic farming agriculture based small scale industry, Horticulture, honey bee keeping etc.

It was observed that production in SRI method is more than traditional method. Based on above statistical data we can say that the farmers who are taking paddy production in land/farms by used SRI method with organic farming had got more production with less expenditure compared traditional method farmers had gain near by 34.63% more production compared to traditional method and saved 45.05 % expenditure in SRI through organic farming.

Socio-Economic Profile of Beneficiaries

There are some data of the beneficiaries, which are analyzed respectively to their age, sex, education qualifications, and change in income before and after the benefits, evaluation of individual beneficiary activities;

AGE: the age wise distribution and percentage of the beneficiaries those who benefited by the vermicomposting process are given in Figure 5.37.

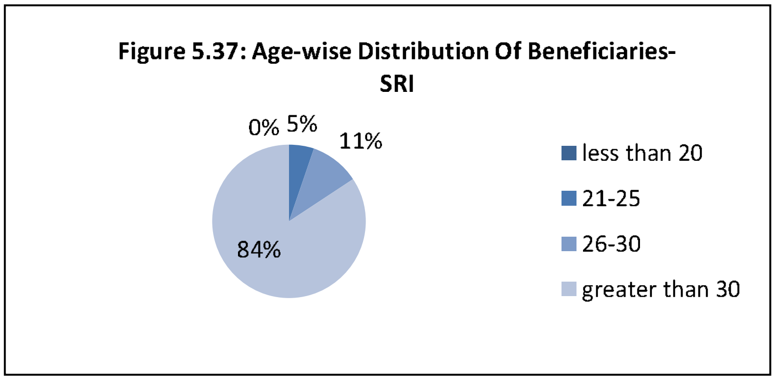


Figure 5.37: Age-wise Distribution Of Beneficiaries-SRI

From the above-mentioned figure it is clear that near 48% of the benefited people are greater than 30 years, 6% of people are in 26-30 years, and 3% people are in 21-25 years.

- **Sex**: sex wise distribution of the beneficiaries are shown in Figure 5.38.

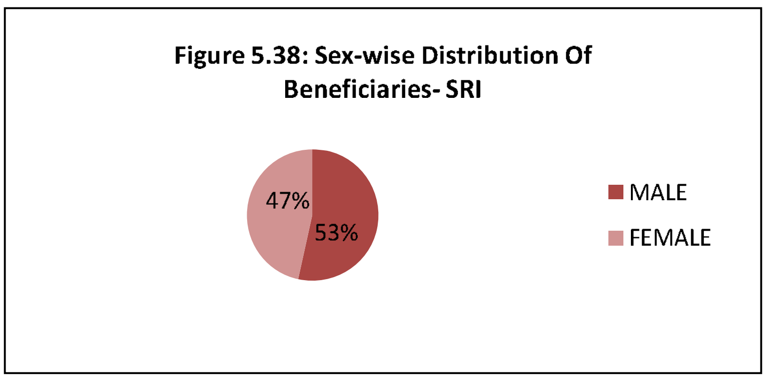


Figure 5.38: Sex-wise Distribution Of Beneficiaries- SRI

From the Figure 5.38 we can get sex distribution where the percentage of male beneficiaries is 53% and female beneficiaries is 47%.

EDUCATION QUALIFICATION: the education qualification of the beneficiaries are given in Figure 5.39.

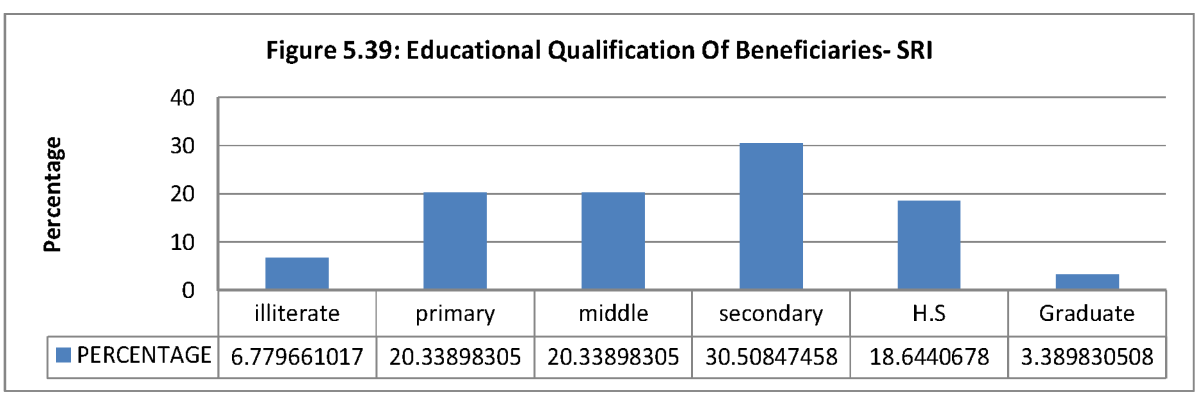


Figure 5.39: Educational Qualification Of Beneficiaries- SRI

	illiterate	primary	middle	secondary	H.S	Graduate
PERCENTAGE	6.779661017	20.33898305	20.33898305	30.50847458	18.6440678	3.389830508

From the above mentioned Figure it is shown that the education qualification of the benefited people are divided in categories i.e, illiterate 6.7%, primary 20%, middle 20%, secondary 30.5%, H.S 19% and graduate 3.3%.

Changes in Occupation & Income Level of Beneficiaries

The status of occupation before receiving the benefits and after receiving the benefits are given as follows:

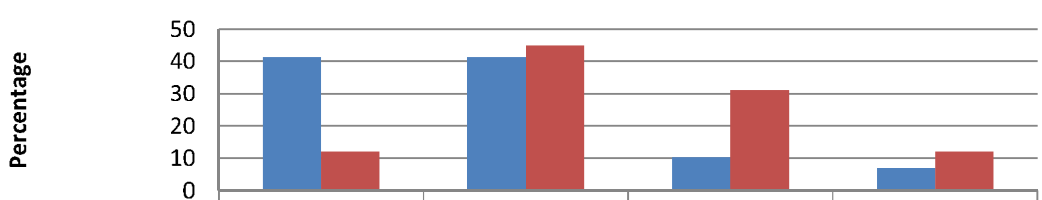
From the analysis it is clear that there is very little changes take place within the beneficiaries. Before receiving the benefit, almost 97% of the beneficiaries were farmers and nearly 1.5% was involved in service and 1.5% were student. After receiving the benefits, the same percentage was maintained in case of farmers and the remaining percentage of service holders have also been in farming thereafter.

The status of changes in income level before & after receiving the benefits is given as follows:

- From the above data we can get a clear picture about the income changes after receiving the benefits. For the category less than or equal to 40000, the percentage of people before receiving the benefits was 41%, whereas after receiving the benefits, only 12% people left in this group of income.
- In the next category, i.e., 41000-80000the before benefit percentage was again 41%, and in after benefit case, the percentage showed a little improvement to 44%.
- For the subsequent class, i.e., 81000-150000, there was a massive improve showing 10% of the people at before benefits stage and 31% in after benefit stage, showing almost 200% significant growth.
- The final income group, i.e., greater than 150000, also showed a massive improvement. Starting with nearly 6% of people in before benefit stage and ultimately increased in to 12%, showing a growth of almost 75%.

The graphical representations of the data are given in Figure 5.40.

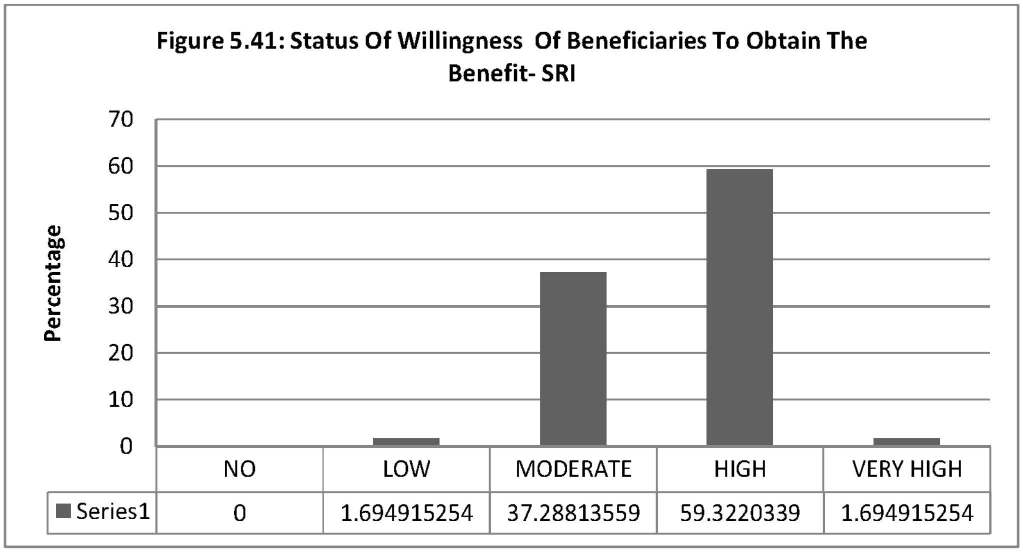
Figure 5.40: Changes In Income Level Of Beneficiaries- SRI



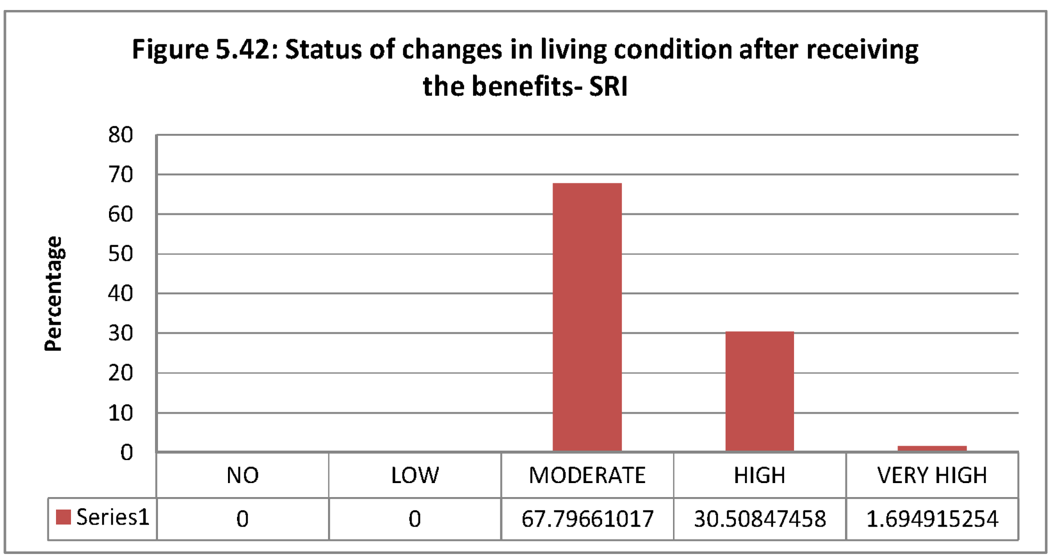
	less than equal to 40000	41000-80000	81000-150000	greater than 150000
BEFORE BENEFIT	41.37931034	41.37931034	10.34482759	6.896551724
AFTER BENEFIT	12.06896552	44.82758621	31.03448276	12.06896552

Evaluation of Impact of SRI Programme

Willingness to obtain the benefit: In this parameter, the willingness of the participants were taken into consideration. Where 37% were moderately willing, nearly 59% where highly willing and nearly 2% were very highly willing to obtain the benefit. This status of willingness was described graphically in Figure 5.41.



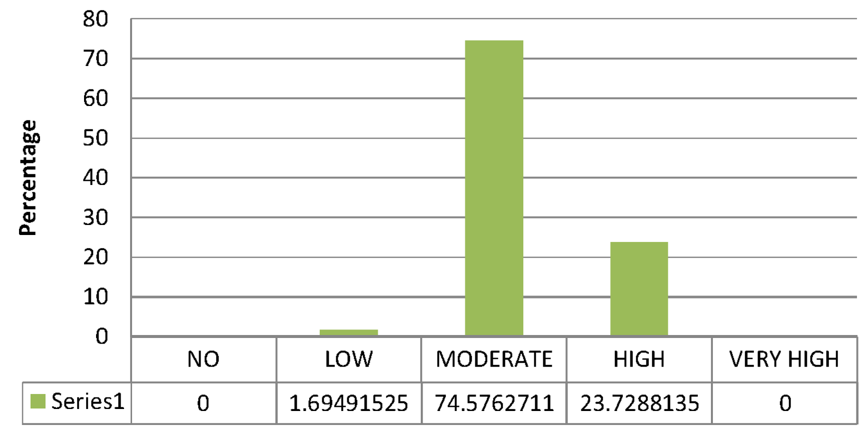
Changes in living condition after receiving the benefits: In this parameter, the changes in living condition of the beneficiaries after receiving the benefits were taken into consideration. 68% were moderately in changed condition, nearly 30% were highly changed and nearly 2% were very highly changed after receiving the benefit. This status of changes in living conditions was described graphically in Figure 5.42.



Level of direct benefit received from the programme: In this parameter, the extent of benefits, which was directly obtained by the beneficiaries, was taken into consideration. 74%

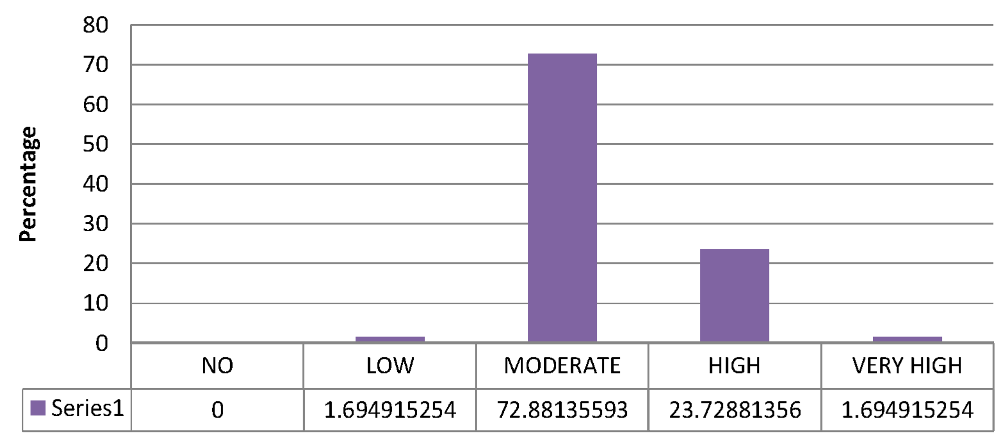
were moderately benefitted, nearly 24% were highly benefitted. This status of direct benefits was described graphically in Figure 5.43.

Figure 5.43: Level Of Direct Benefit Received From The Programme- SRI

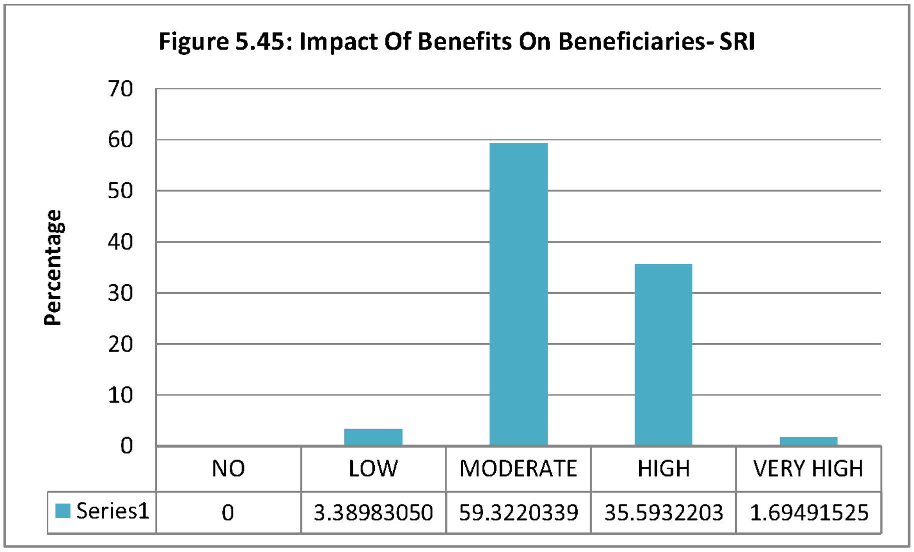


Level of indirect benefit received from the programme: In this parameter, the extent of benefits, which was indirectly obtained by the beneficiaries, was taken into consideration. 73% were moderately benefitted, nearly 24% were highly benefitted and nearly 1.6% participants were very highly benefited. This status of indirect benefits was described graphically in Figure 5.44.

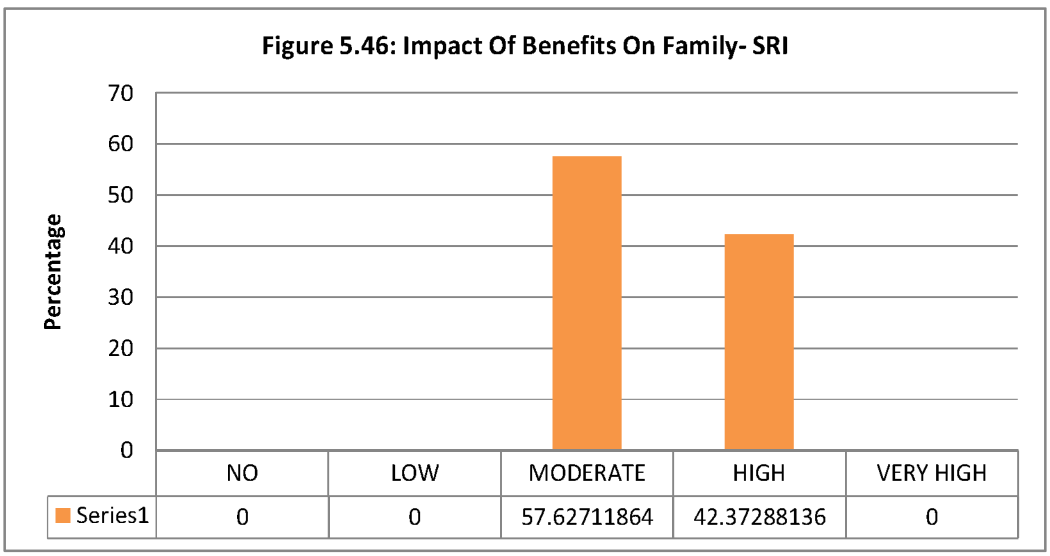
Figure 5.44: Level Of Indirect Benefit Received From The Programme- SRI



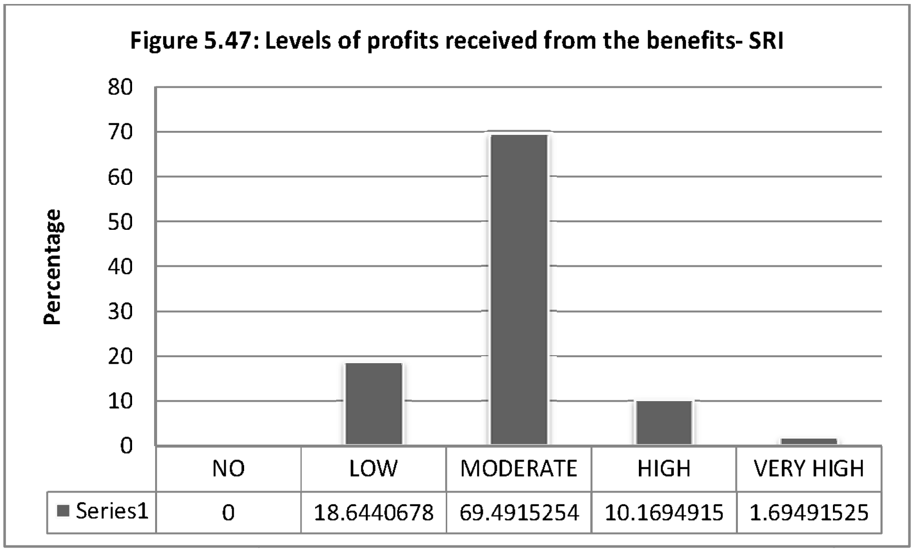
Impact of benefits on individual: In this parameter, the extent of benefits, on individual beneficiaries, was taken into consideration. 59% shown moderate impact of benefit, 36% responded for high impact of benefit and nearly 2% participants showed very high impact of benefit. This status of indirect benefits was described graphically in Figure 5.45.



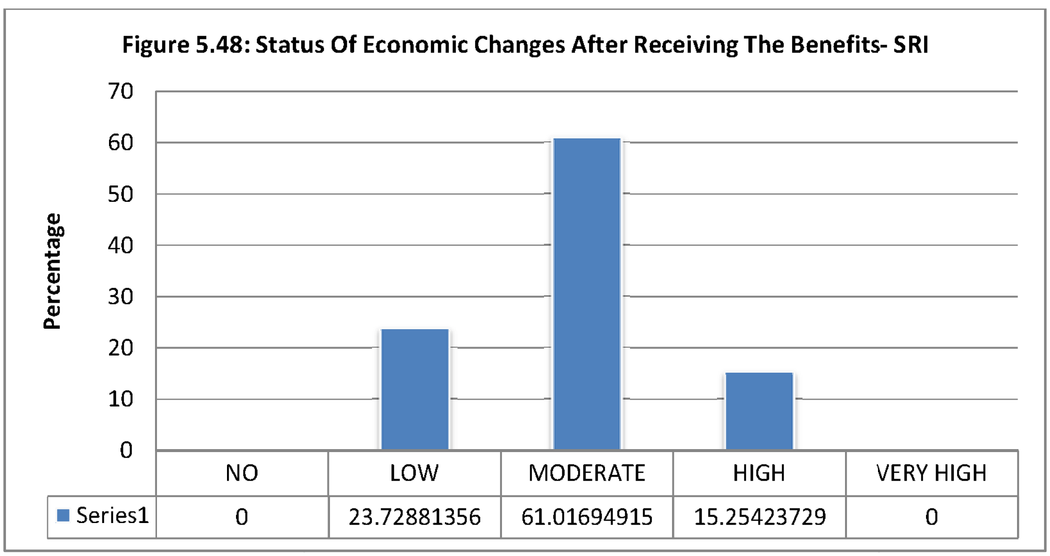
Impact of benefits on whole family: In this parameter, the extent of benefits, on family basis, was taken into consideration. 58% shown moderate impact of benefit, 42% responded for high impact of benefit. This status of indirect benefits was described graphically in Figure 5.46.



Levels of profits received from the benefits: In this parameter, the extent of profits earned from the benefits to the beneficiaries, was taken into consideration. Nearly 69% shown moderate profit earned from benefit, 10% responded for high profit earned from benefit and nearly 2% showed very high level of profit earned from benefit. This status of indirect benefits was described graphically in Figure 5.47.

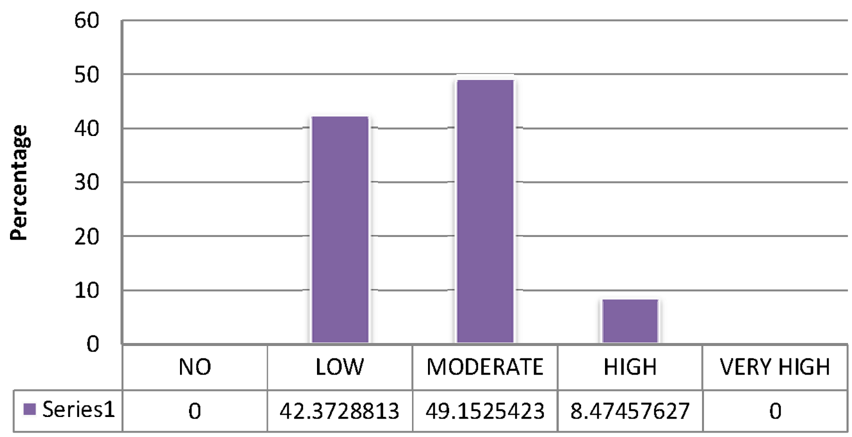


Economic changes after receiving the benefits: In this parameter, the economic changes after receiving the benefits to the beneficiaries, was taken into consideration. 61% showed moderate economic changes from benefit, 15% responded for high economic changes from benefit. This status of indirect benefits was described graphically in Figure 5.48.



Social changes after receiving the benefits: In this parameter, the social changes after receiving the benefits to the beneficiaries, was taken into consideration. 49% showed moderate social changes from benefit, 8% responded for high social changes from benefit. This status of indirect benefits was described graphically in Figure 5.49.

Figure 5.49: Status Of Social Changes After Receiving The Benefits- SRI



5.2.3 Kitchen Garden

The traditional kitchen garden, also known as a potager (in French, *jardin potager*) or in Scotland a kailyaird ,is a space separate from the rest of the residential garden – the ornamental plants and lawn areas. Most vegetable gardens are still miniature versions of old family farm plots, but the kitchen garden is different not only in its history, but also its design.

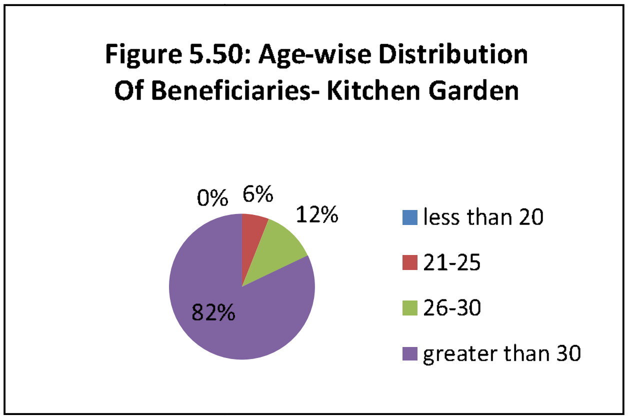
The kitchen garden may serve as the central feature of an ornamental, all-season landscape, or it may be little more than a humble vegetable plot. It is a source of herbs, vegetables and fruits, but it is often also a structured garden space with a design based on repetitive geometric patterns.

The kitchen garden has year-round visual appeal and can incorporate permanent perennials or woody shrub plantings around (or among) the annuals.

Adani Foundation came up with an idea for developing kitchen gardens. In tribal villages every household now has a kitchen garden. The result and response was positive. Later we expanded the projects in normal households as in our area many households are having open space for developing kitchen gardens. Due to kitchen garden family can get fresh vegetables with no extra cost which is helpful for increasing nutritive values of daily intake food which help prevent Anaemia in women and malnourishment in children which was on rise.Adani Foundation provided 3000 seed packets of vegetables like Spinach, Lady Finger, Bottle Gourd, Carrot, Carrot, Tomato, Corn, Chili, Bitter Gourd, Lal Bhaji, etc. to promote kitchen gardens in households in our nearby villages.

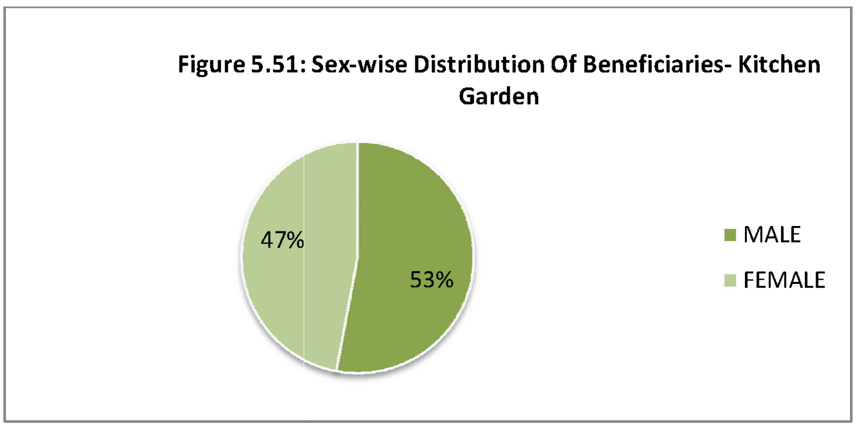
Socio-Economic Profile of Beneficiaries

AGE:the age wise distribution and percentage of the beneficiaries those who benefited by the vermicomposting process are given in Figure 5.50.



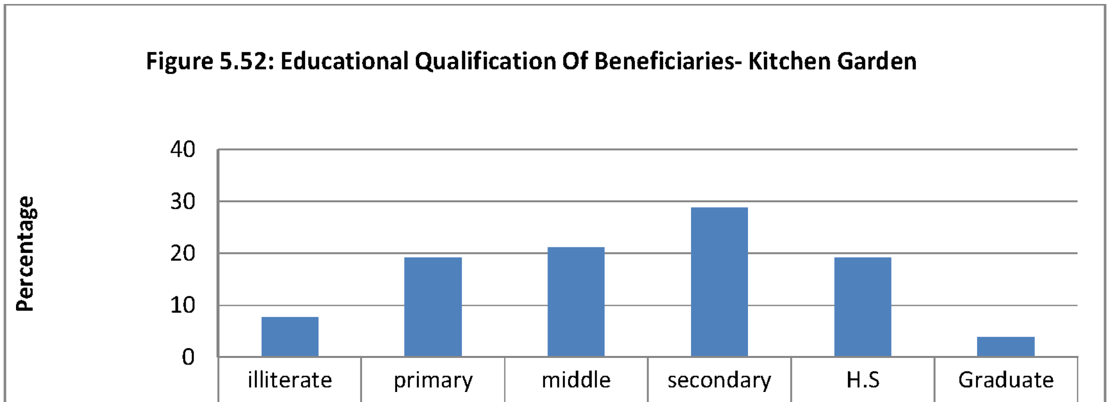
From the above-mentioned figure it is clear that near 82% of the benefited people are greater than 30 years, 12% of people are in 26-30 years, and 6% people are in 21-25 years.

SEX: sex wise distribution of the beneficiaries are shown in Figure 5.51.



From the Figure 5.51 we can get sex distribution where the percentage of male beneficiaries is 53% and female beneficiaries is 47%.

EDUCATION QUALIFICATION: the education qualification of the beneficiaries are given in Figure 5.52.



	illiterate	primary	middle	secondary	H.S	Graduate
PERCENTAGE	7.692307692	19.23076923	21.15384615	28.84615385	19.23076923	3.846153846

From the above mentioned figure it is shown that the education qualification of the benefited people are divided in categories i.e, illiterate 8%, primary 19%, middle 21%, secondary 29%, H.S 19% and graduate 4%.

Changes in Occupation & Income Level of Beneficiaries

The status of occupation before receiving the benefits and after receiving the benefits are given in Figure 5.53.

From the analysis, it is clear that there is very little changes take place within the beneficiaries. Before receiving the benefit, clear 100% of the beneficiaries were farmers. After receiving the benefits, the same percentage was maintained in case of farmers and the remaining percentage of service holders have also been in farming thereafter.

- From the above data we can get a clear picture about the income changes after receiving the benefits. For the category less than or equal to 40000, the percentage of people before receiving the benefits was 41%, whereas after receiving the benefits, only 11% were remained in this income group.

- In the next category, i.e., 41000-80000 before benefit percentage was again 41%, and in after benefit case, the percentage showed a little improvement to 47%.

- For the subsequent class, i.e., 81000-150000, there was a massive improve showing 9% of the people at before benefits stage and 27% in after benefit stage, showing almost 180% significant growth.

- The final income group, i.e., greater than 150000, also showed a massive improvement. Starting with nearly 7% of people in before benefit stage and ultimately increased in to 13%, showing a growth of almost 75%.

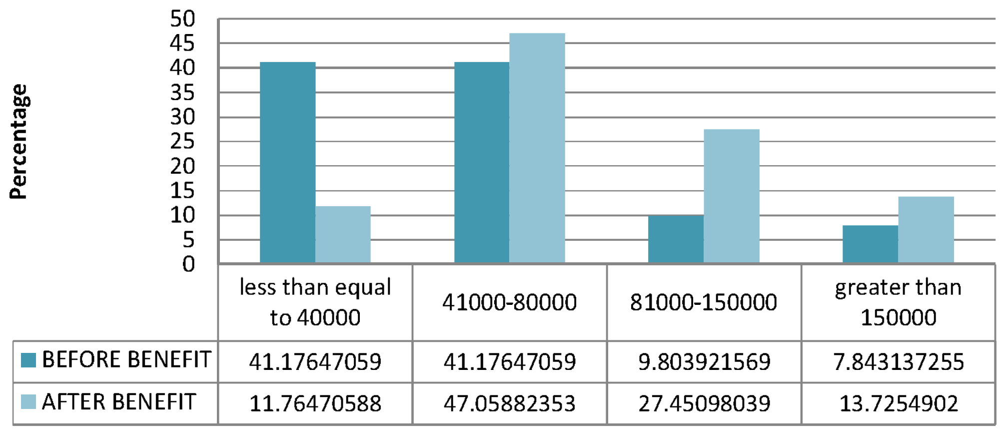


Figure 5.53: Changes In Income Level Of Beneficiaries- Kitchen Garden

	less than equal to 40000	41000-80000	81000-150000	greater than 150000
BEFORE BENEFIT	41.17647059	41.17647059	9.803921569	7.843137255
AFTER BENEFIT	11.76470588	47.05882353	27.45098039	13.7254902

Evaluation of Impact of Kitchen Graden Development Programme

Willingness to obtain the benefit: In this parameter, the willingness of the participants were taken into consideration. 34% were moderately willing, nearly 61% where highly willing and nearly 2% were very highly willing to obtain the benefit. This status of willingness was described graphically in Figure 5.54.

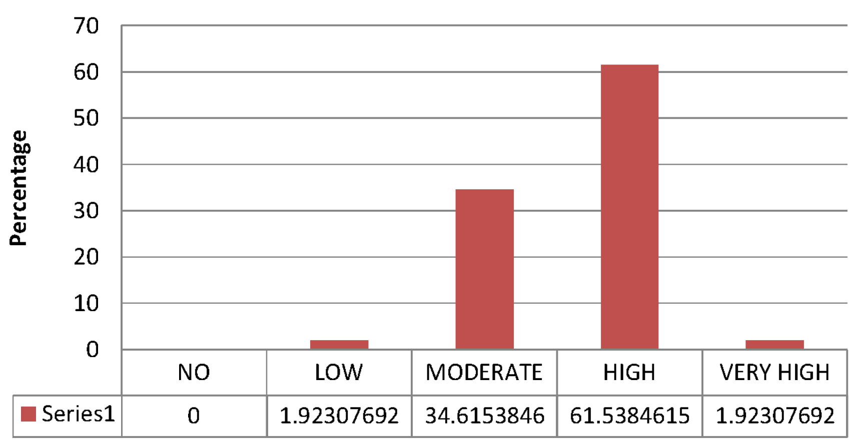
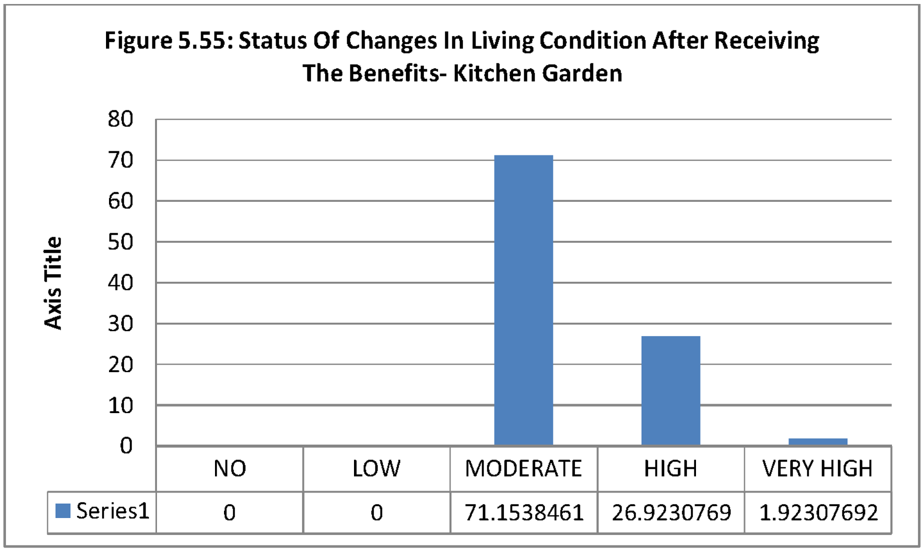


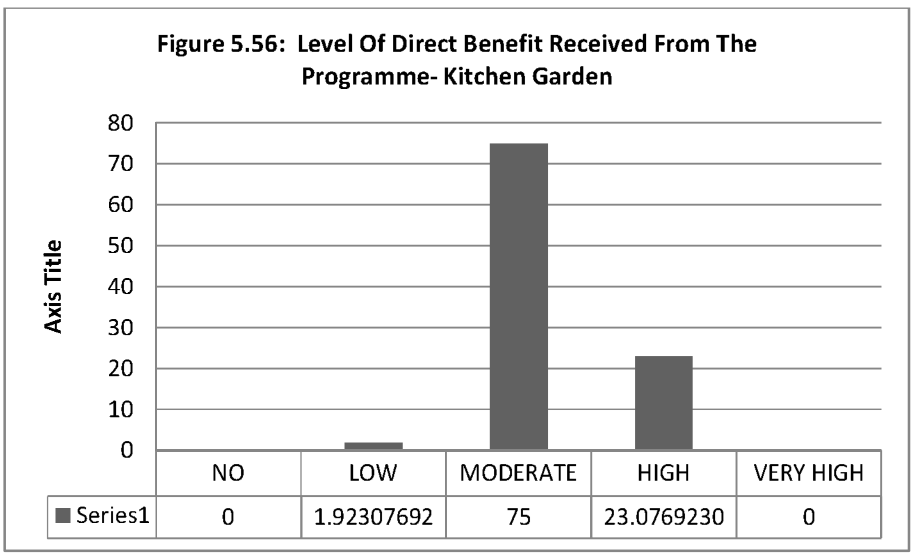
Figure 5.54: Status of Willingness of beneficiaries to obtain the benefit- Kitchen Garden

	NO	LOW	MODERATE	HIGH	VERY HIGH
Series1	0	1.92307692	34.6153846	61.5384615	1.92307692

Changes in living condition after receiving the benefits: In this parameter, the changes in living condition of the beneficiaries after receiving the benefits were taken into consideration. 71% were moderately in changed condition, nearly 27% were highly changed and nearly 2% were very highly changed after receiving the benefit. This status of changes in living conditions was described graphically in Figure 5.55.

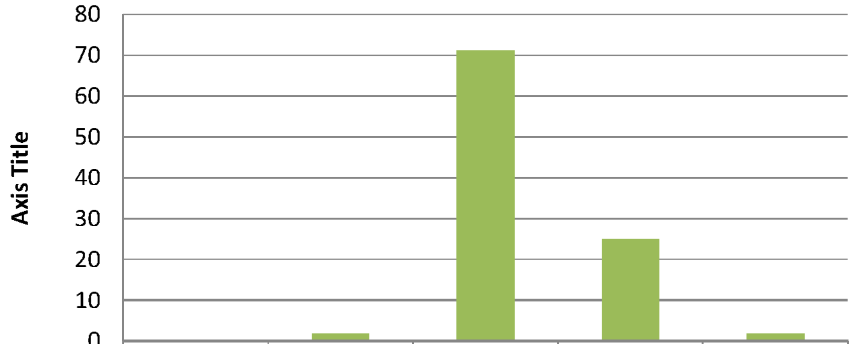


Level of direct benefit received from the programme: In this parameter, the extent of benefits, which was directly obtained by the beneficiaries, was taken into consideration. 75% were moderately benefitted, nearly 23% were highly benefitted. This status of direct benefits was described graphically in Figure 5.56.



Level of indirect benefit received from the programme: In this parameter, the extent of benefits, which was indirectly obtained by the beneficiaries, was taken into consideration. 71% were moderately benefitted, nearly 25% were highly benefitted and nearly 2% participants were very highly benefited. This status of indirect benefits was described graphically in Figure 5.57.

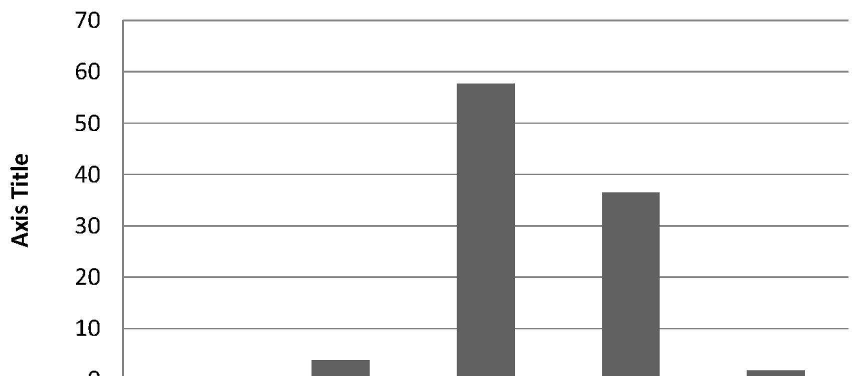
Figure 5.57: Level of indirect benefit received from the programme- Kitchen Garden



	NO	LOW	MODERATE	HIGH	VERY HIGH
Series1	0	1.92307692	71.1538461	25	1.92307692

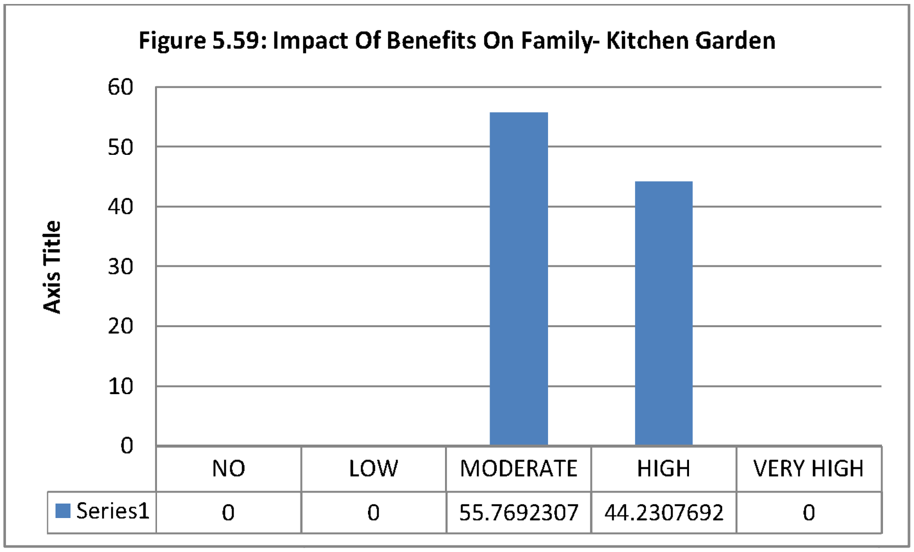
Impact of benefits on individual: In this parameter, the extent of benefits, on individual beneficiaries, was taken into consideration. 58% shown moderate impact of benefit, 36% responded for high impact of benefit and nearly 2% participants showed very high impact of benefit. This status of indirect benefits was described graphically in Figure 5.58.

Figure 5.58: Impact Of Benefits On Beneficiaries- Kitchen Garden

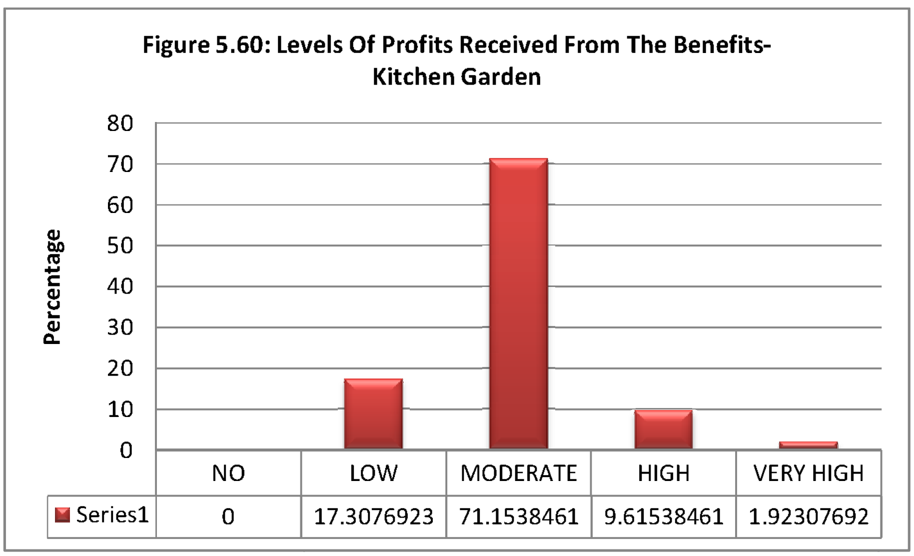


	NO	LOW	MODERATE	HIGH	VERY HIGH
Series1	0	3.84615384	57.6923076	36.5384615	1.92307692

Impact of benefits on whole family: In this parameter, the extent of benefits, on family basis, was taken into consideration. 56% shown moderate impact of benefit, 44% responded for high impact of benefit. This status of indirect benefits was described graphically in Figure 5.59.



Levels of profits received from the benefits: In this parameter, the extent of profits earned from the benefits to the beneficiaries, was taken into consideration. Nearly 71% shown moderate profit earned from benefit, 10% responded for high profit earned from benefit and nearly 2% showed very high level of profit earned from benefit. This status of indirect benefits was described graphically in Figure 5.60.



Economic changes after receiving the benefits: In this parameter, the economic changes after receiving the benefits to the beneficiaries, was taken into consideration. 62% showed moderate economic changes from benefit, 15% responded for high economic changes from benefit. This status of indirect benefits was described graphically in Figure 5.61.

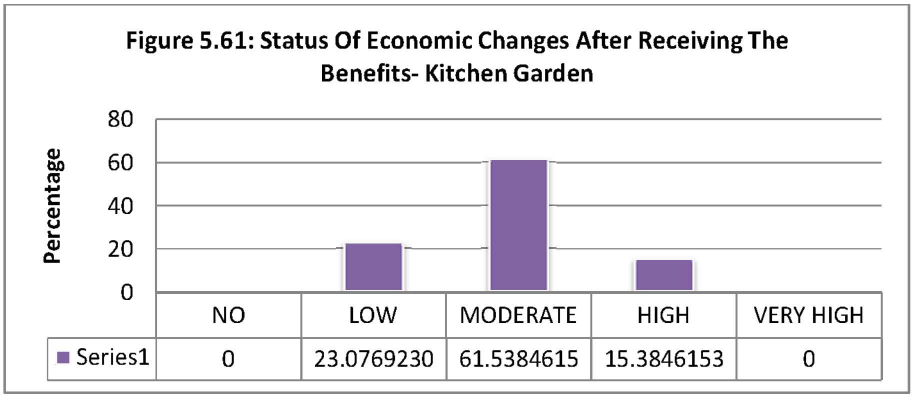


Figure 5.61: Status Of Economic Changes After Receiving The Benefits- Kitchen Garden

Social changes after receiving the benefits: In this parameter, the social changes after receiving the benefits to the beneficiaries, was taken into consideration. 46% showed moderate social changes from benefit, 10% responded for high social changes from benefit. This status of indirect benefits was described graphically in Figure 5.62.

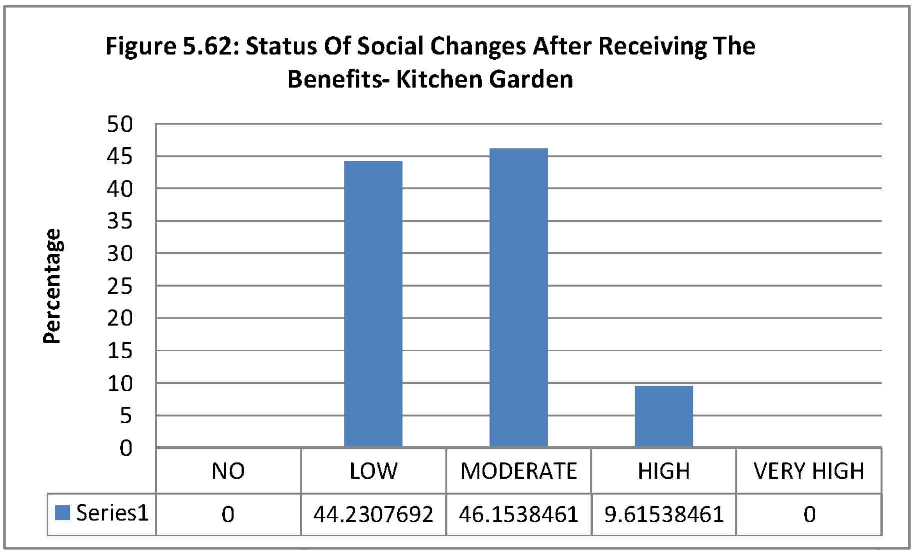


Figure 5.62: Status Of Social Changes After Receiving The Benefits- Kitchen Garden

5.2.4 Horticulure Programme

Horticulture has been defined as the culture of plants for food, comfort and beauty. A more precise definition can be given as "The cultivation, processing, and sale of fruits, nuts, vegetables, ornamental plants, and flowers as well as many additional services". It also includes plant conservation, landscape restoration, soil management, landscape and garden design, construction, and maintenance, and arboriculture. In contrast to agriculture, horticulture does not include large-scale crop production or animal husbandry.

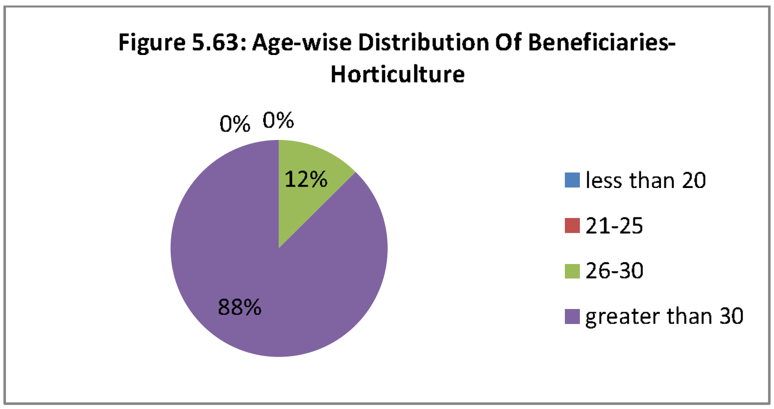
Horticulturists apply their knowledge, skills, and technologies used to grow intensively produced plants for human food and non-food uses and for personal or social needs. Their work involves plant propagation and cultivation with the aim of improving plant growth, yields, quality, nutritional value, and resistance to insects, diseases, and environmental stresses. They work as gardeners, growers, therapists, designers, and technical advisors in the food and non-food sectors of horticulture. Horticulture even refers to the growing of plants in a field or garden.

Adani Foundation takes the initiative to make people aware about the benefits of horticulture and how to apply the knowledge of horticulture which will help to make the quality of life of people of local area. Adani Foundation helps to make the people more skilled for implementing the process**.**

Socio-Economic Profile of Beneficiaries

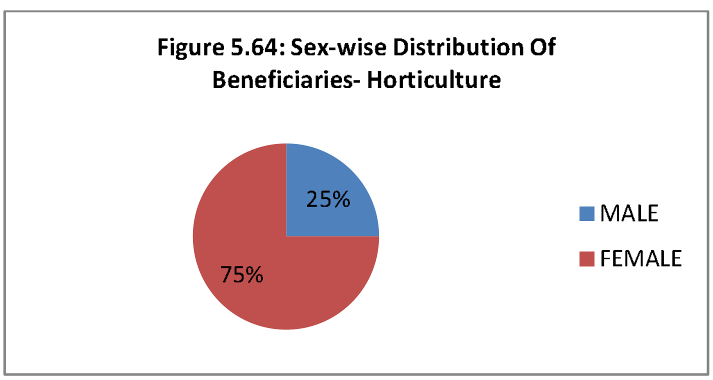
There are some data of the beneficiaries, which are analyzed respectively to their age, sex, education qualifications, and change in income before and after the benefits, evaluation of individual beneficiary activities;

AGE: the age wise distribution and percentage of the beneficiaries those who benefited by the vermicomposting process are given in Figure 5.63.



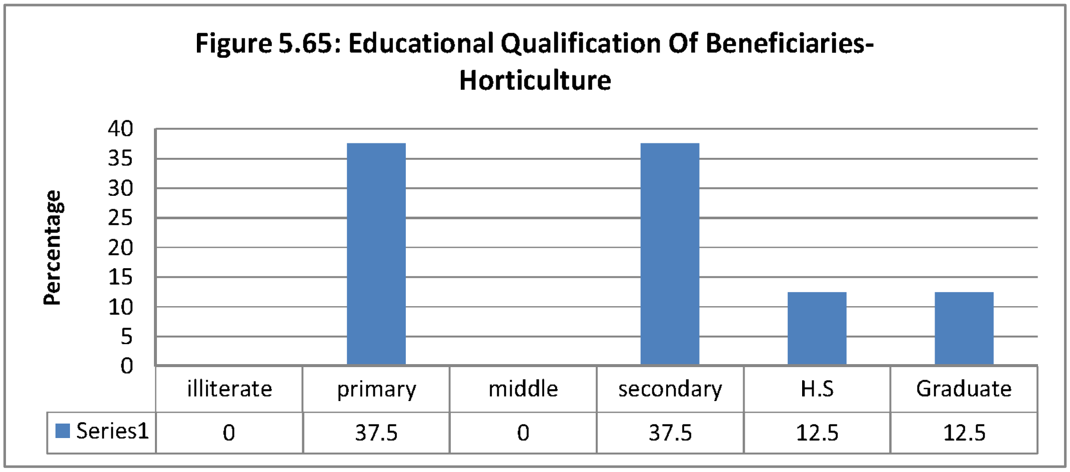
From the above-mentioned figure it is clear that near 88% of the benefited people are greater than 30 years, 12% of people are in 26-30 years, and 12% people are in 21-25 years.

SEX: sex wise distribution of the beneficiaries are shown in Figure 5.64.



From the Figure 5.64 we can get sex distribution where the percentage of male beneficiaries is 25% and female beneficiaries is 75%.

EDUCATION QUALIFICATION: the education qualification of the beneficiaries are given in Figure 5.65.



From the above mentioned figure it is shown that the education qualification of the benefited people are divided in categories i.e, primary 37.5%, secondary 37.5%, H.S 12.5% and graduate 12.5%.

Changes in Occupation & Income Level of Beneficiaries

The status of occupation before receiving the benefits and after receiving the benefits are given as follows:

From the Figure 5.66. it is clear that there is very little changes take place within the beneficiaries. Before receiving the benefit, clear 100% of the beneficiaries were farmers. After receiving the benefits, the same percentage was maintained in case of farmers and the remaining percentage of service holders have also been in farming thereafter.

The status of changes in income level before & after receiving the benefits is given as follows:

- From the above data we can get a clear picture about the income changes after receiving the benefits. For the category less than or equal to 40000, the percentage of people before receiving the benefits was 25%, whereas after receiving the benefits, the percentage of income increases and it was shifted to the higher income group.
- In the next category, i.e., 41000-80000the before benefit percentage was again 50%, and in after benefit case, the income increased and shifted to higher income group.
- For the subsequent class, i.e., 81000-150000, there was a massive improve showing 12.5% of the people at before benefits stage and 37.5% in after benefit stage, showing almost 200% significant growth.
- The final income group, i.e., greater than 150000, also showed a massive improvement. Starting with nearly 12.5% of people in before benefit stage and ultimately increased in to 37.5%, showing a growth of almost 100%.

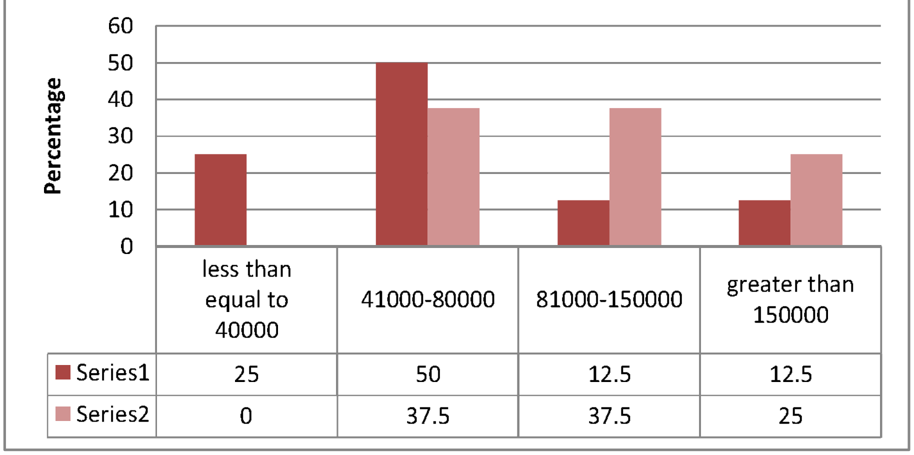


Figure 5.66: Changes In Income Level Of Beneficiaries- Horticulture

Evaluation of Impact of Horticulture Programme

Willingness to obtain the benefit: In this parameter, the willingness of the participants were taken into consideration. 37% were moderately willing, nearly 63% where highly willing. This status of willingness was described graphically in Figure 5.67.

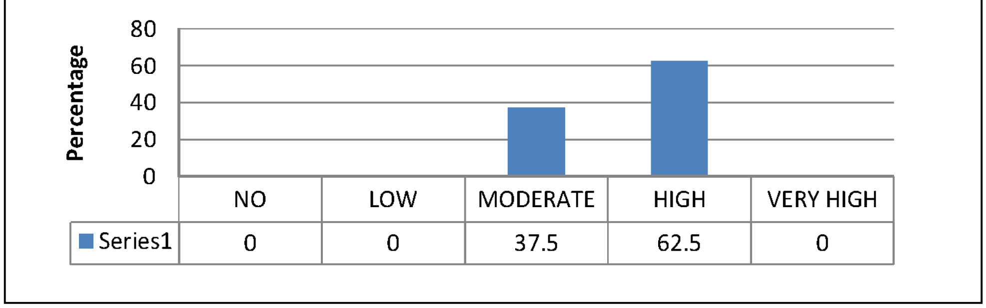
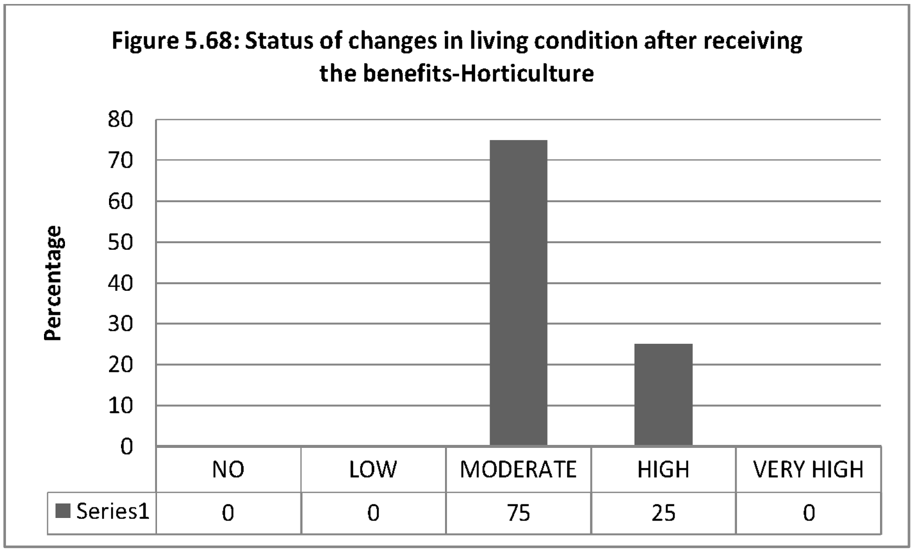


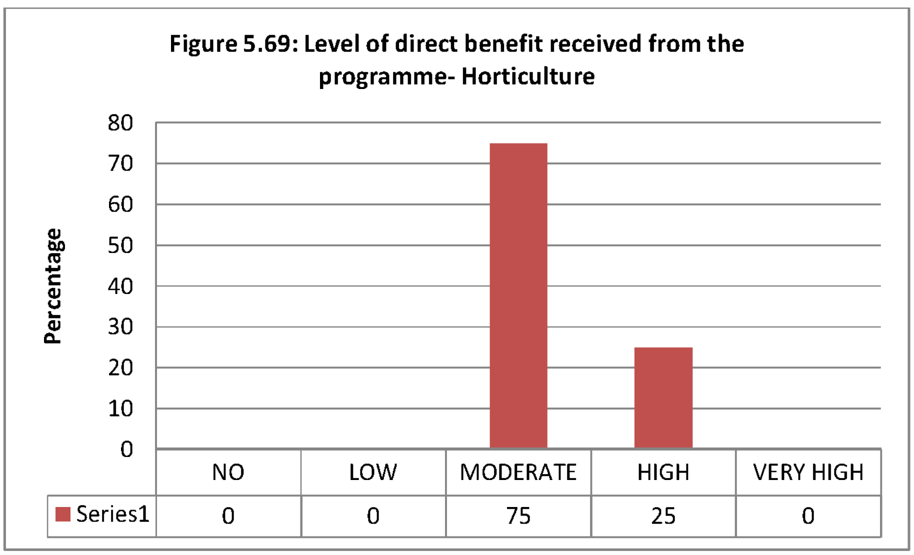
Figure 5.67: Status Of Willingness Of Beneficiaries To Obtain The Benefit- Horticulture

Changes in living condition after receiving the benefits: In this parameter, the changes in living condition of the beneficiaries after receiving the

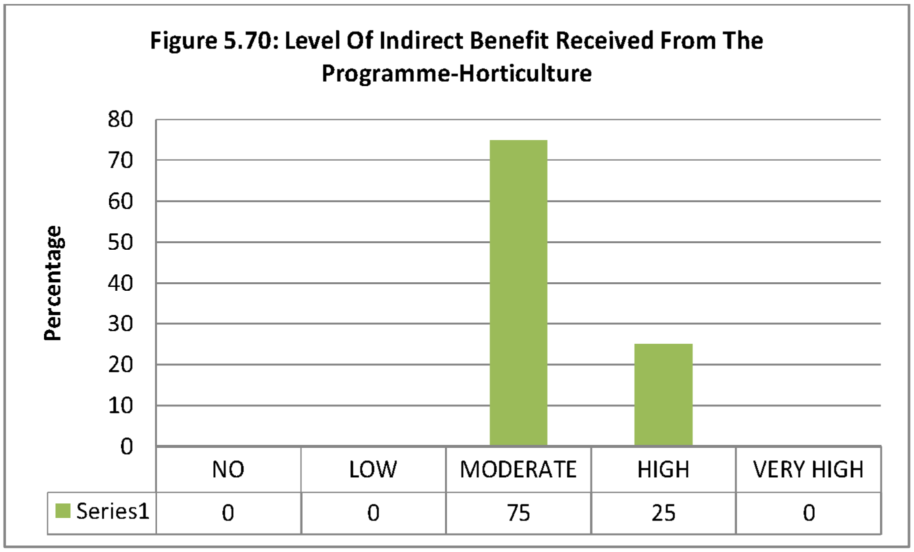
benefits were taken into consideration. 75% were moderately in changed condition, nearly 25% were highly changed. This status of changes in living conditions was described graphically in Figure 5.68.



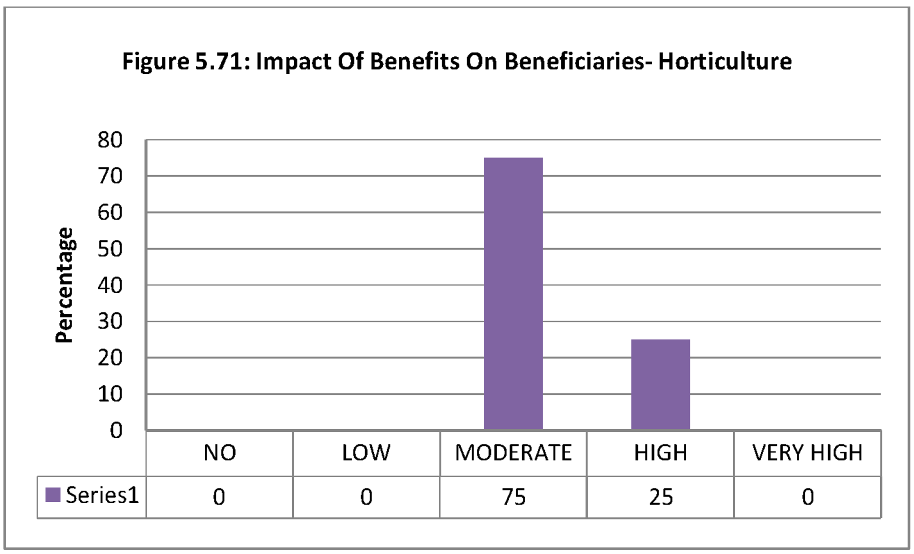
Level of indirect benefit received from the programme: In this parameter, the extent of benefits, which was indirectly obtained by the beneficiaries, was taken into consideration. 75% were moderately benefitted, nearly 25% were highly benefitted. This status of indirect benefits was described graphically in Figure 5.69.



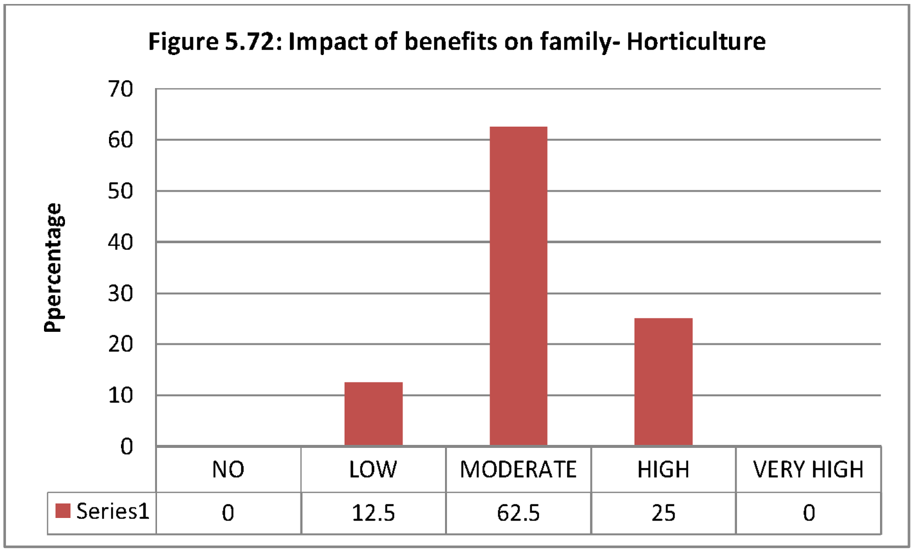
Level of indirect benefit received from the programme: In this parameter, the extent of benefits, which was indirectly obtained by the beneficiaries, was taken into consideration. More than 70% were moderately benefitted, nearly 25% were highly benefitted. This status of indirect benefits was described graphically in Figure 5.70.



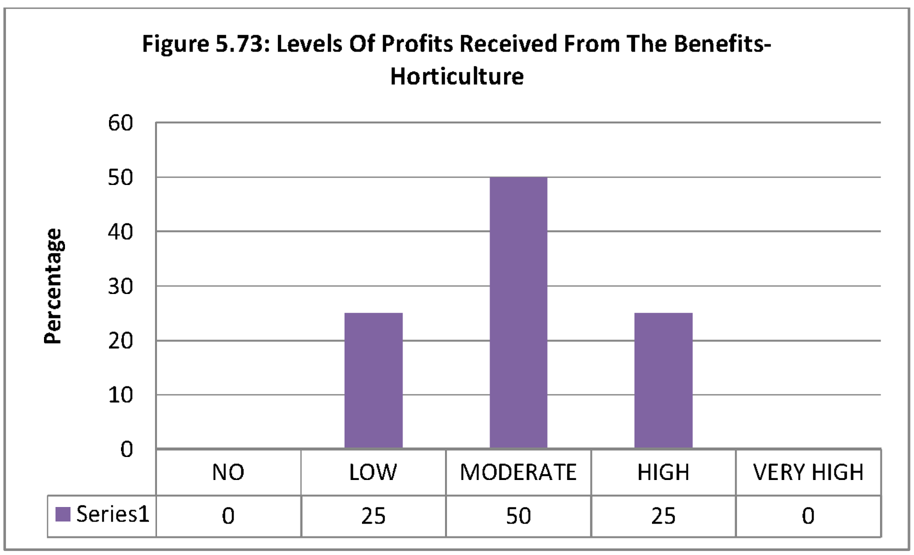
Impact of benefits on individual: In this parameter, the extent of benefits, on individual beneficiaries, was taken into consideration. 75% were moderately benefitted, nearly 25% were highly benefitted. This status of indirect benefits was described graphically in Figure 5.71.



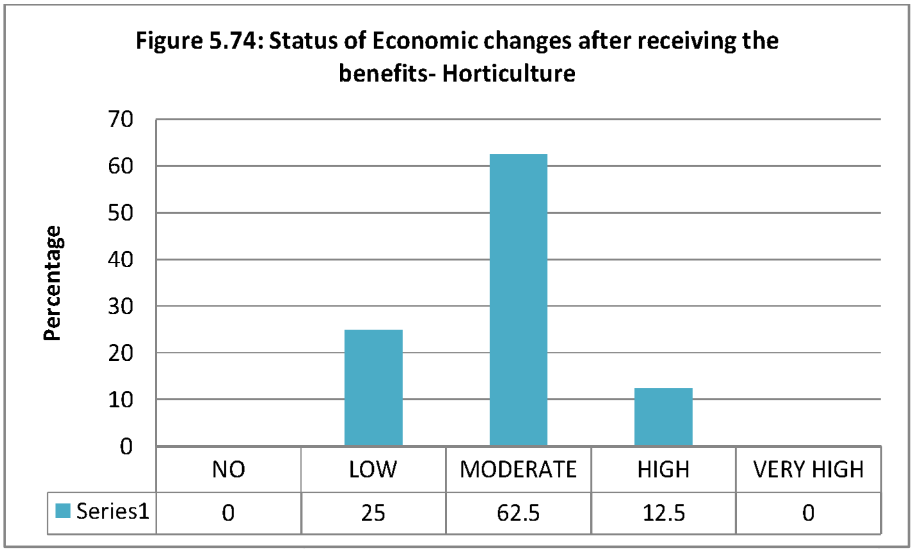
Impact of benefits on whole family: In this parameter, the extent of benefits, on family basis, was taken into consideration. 62.5% shown moderate impact of benefit, 25% responded for high impact of benefit. This status of indirect benefits was described graphically in Figure 5.72.



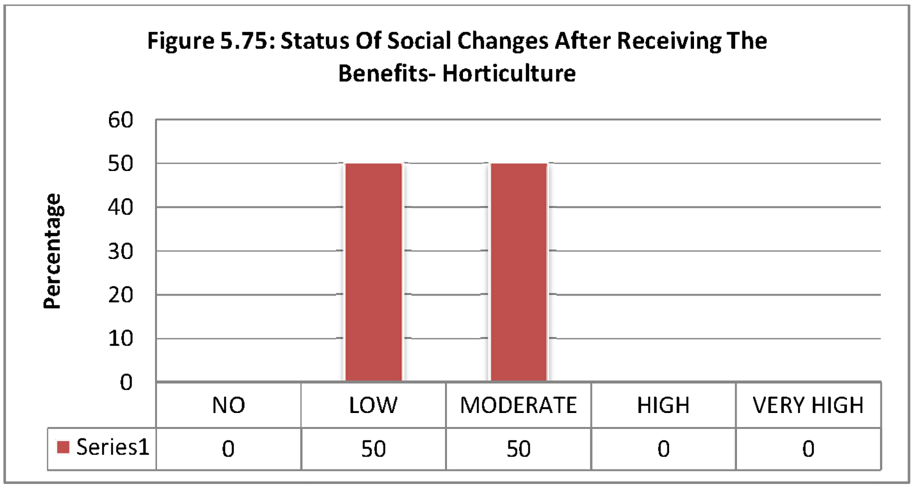
Levels of profits received from the benefits: In this parameter, the extent of profits earned from the benefits to the beneficiaries, was taken into consideration. Nearly 50% shown moderate profit earned from benefit, 25% responded for high profit earned from benefit. This status of indirect benefits was described graphically in Figure 5.73.



Economic changes after receiving the benefits: In this parameter, the economic changes after receiving the benefits to the beneficiaries, was taken into consideration. 62.5% showed moderate economic changes from benefit, 12.5% responded for high economic changes from benefit. This status of indirect benefits was described graphically in Figure 5.74.



Social changes after receiving the benefits: In this parameter, the social changes after receiving the benefits to the beneficiaries, was taken into consideration. 50% showed moderate social changes from benefit. This status of indirect benefits was described graphically in Figure 5.75.



5.2.5 Bio-Gas Plant

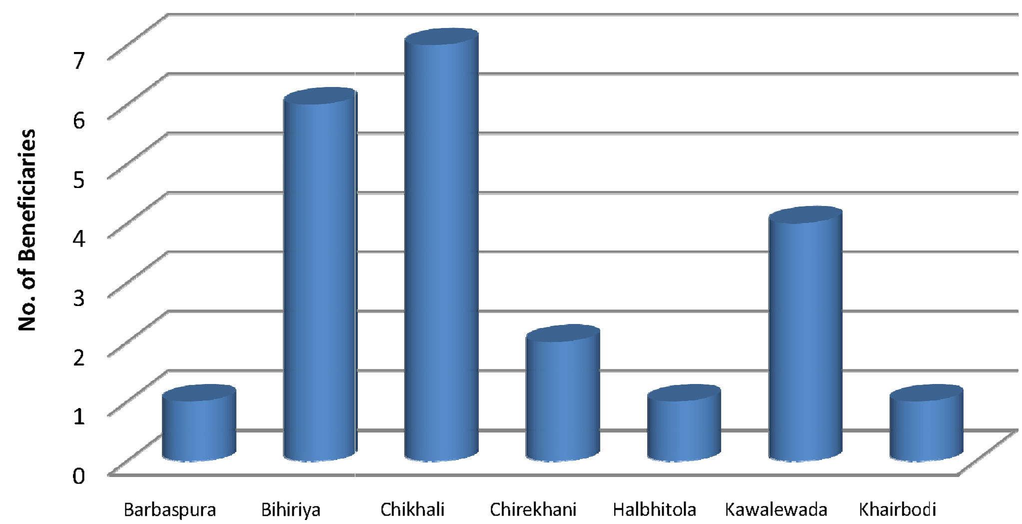
Introduction:Biogas refers to a mixture of different gases produced by the breakdown of organic matter in the absence of oxygen. Biogas can be produced from raw materials such as agricultural waste, manure, municipal waste, plant material, sewage, green waste or food waste. Biogas is a renewable energy source.

Biogas is produced by anaerobic digestion with methanogen or anaerobic organisms, which digest material inside a closed system, or fermentation of biodegradable materials. This closed system is called an anaerobic digester, bio digester or a bioreactor.

Organic matter such as manure (human or animal) is used to feed the plant. The process of anaerobic fermentation will then take place here, to generate biological gas (biogas). It will also produce a substrate rich in nutrients which can be used as organic fertilizer or fish feed.

Application: Adani Foundation gives a major effort to concern the local people about the benefits of bio-gas and its use. They provide them proper training, knowledge about bio-gas production and usage. It helps the people to implement bio-gas plant and take the benefits from it. Village wise distribution of bio-gas beneficiaries is presented in Figure 5.76.

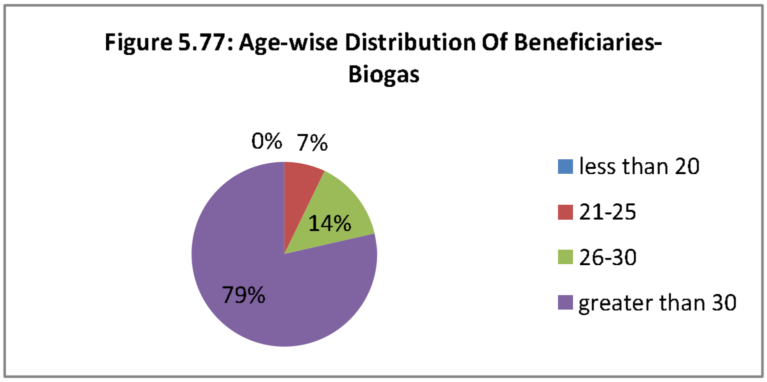
Figure 5.76: Village Wise Distribution of Bio Gas Beneficiaries



Socio-Economic Profile of Beneficiaries

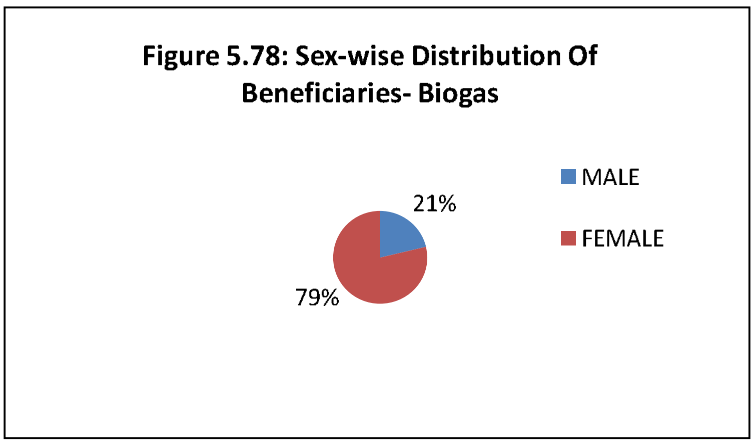
There are some data of the beneficiaries, which are analyzed respectively to their age, sex, education qualifications, and change in income before and after the benefits, evaluation of individual beneficiary activities.

AGE:the age wise distribution and percentage of the beneficiaries those who benefited by the vermicomposting process are given in Figure 5.77.



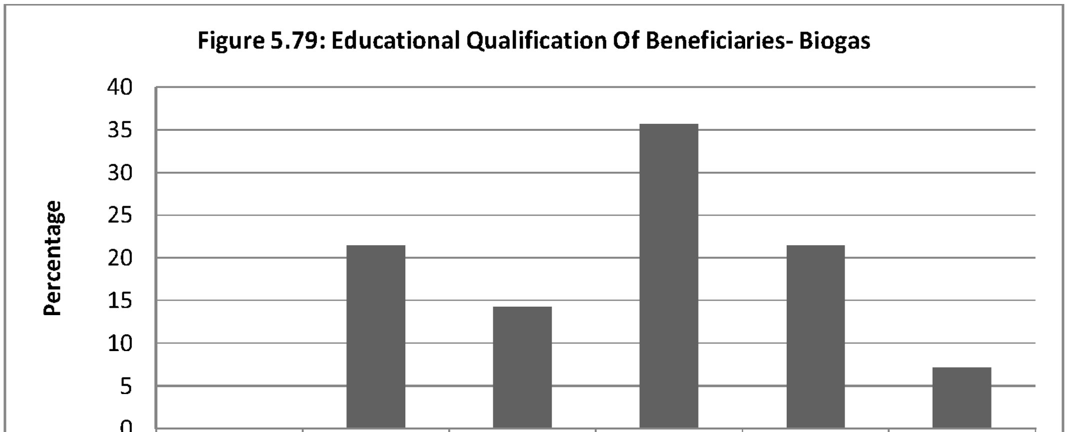
From the above-mentioned Figure it is clear that near 78% of the benefited people are greater than 30 years, 14% of people are in 26-30 years, and 7% people are in 21-25 years.

SEX: sex wise distribution of the beneficiaries are shown in Figure 5.78.



From the fFigure 5.78 we can get sex distribution where the percentage of male beneficiaries is 21% and female beneficiaries is 79%.

Educational Qualification: the education qualification of the beneficiaries are given in Figure 5.79.



	illiterate	primary	middle	secondary	H.S	Graduate
Series1	0	21.4285714	14.2857142	35.7142857	21.4285714	7.14285714

From the above mentioned figure it is shown that the education qualification of the benefited people are divided in categories i.e, primary 21%, middle 14%, secondary 36%, H.S 21% and graduate 7%.

Changes in Occupation & Income Level of Beneficiaries

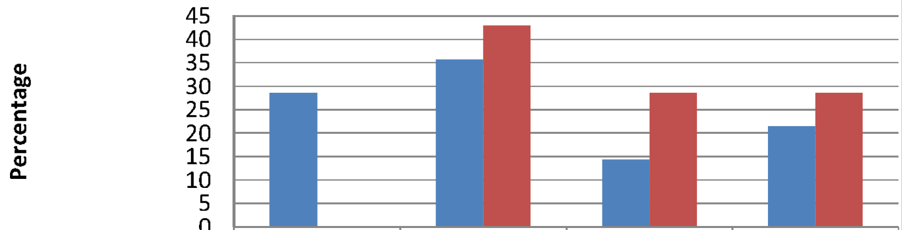
The status of occupation before receiving the benefits and after receiving the benefits are given as follows:

From Figure 5.80 it is clear that before receiving the benefit, clear 100% of the beneficiaries were farmers. After receiving the benefits, the same percentage was maintained in case of farmers and the remaining percentage of service holders have also been in farming thereafter.

The status of changes in income level before & after receiving the benefits is given as follows:

- From the above data we can get a clear picture about the income changes after receiving the benefits. For the category less than or equal to 40000, the percentage of people before receiving the benefits was 28%, whereas after receiving the benefits, the percentage of income increases and they shifted to the higher income group.
- In the next category, i.e., 41000-80000the before benefit percentage was 35%, and in after benefit case, the income increased at 42% and showing almost 20% significant growth.
- For the subsequent class, i.e., 81000-150000, there was a massive improve showing 14% of the people at before benefits stage and 28% in after benefit stage, showing almost 100% significant growth.
- The final income group, i.e., greater than 150000, also showed a massive improvement. Starting with nearly 21% of people in before benefit stage and ultimately increased in to 28%, showing a growth of almost 33.33%.

Figure 5.80: Changes In Income Level Of Beneficiaries- Biogas

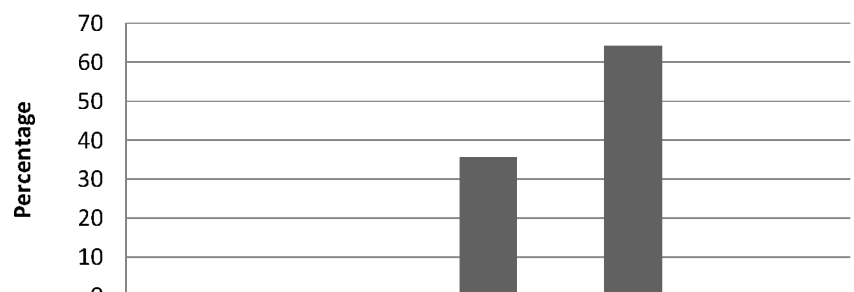


	less than equal to 40000	41000-80000	81000-150000	greater than 150000
BEFORE BENEFIT	28.57142857	35.71428571	14.28571429	21.42857143
AFTER BENEFIT	0	42.85714286	28.57142857	28.57142857

Evaluation of Impact of Bio-Gas Plant Installation

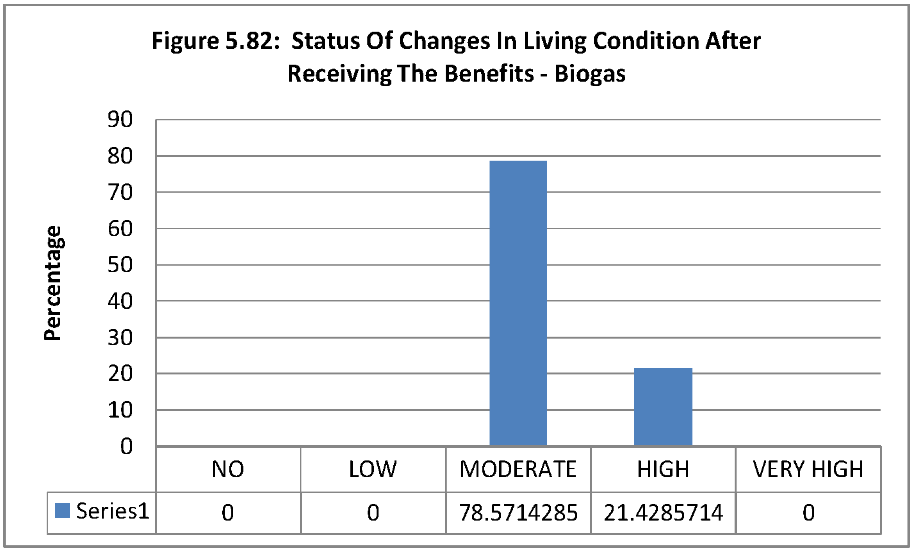
Willingness to obtain the benefit: In this parameter, the willingness of the participants were taken into consideration. Near 35% were moderately willing, nearly 64% where highly willing to obtain the benefit. This status of willingness was described graphically in Figure 5.81.

Figure 5.81: Status Of Willingness Of Beneficiaries To Obtain The Benefit- Biogas

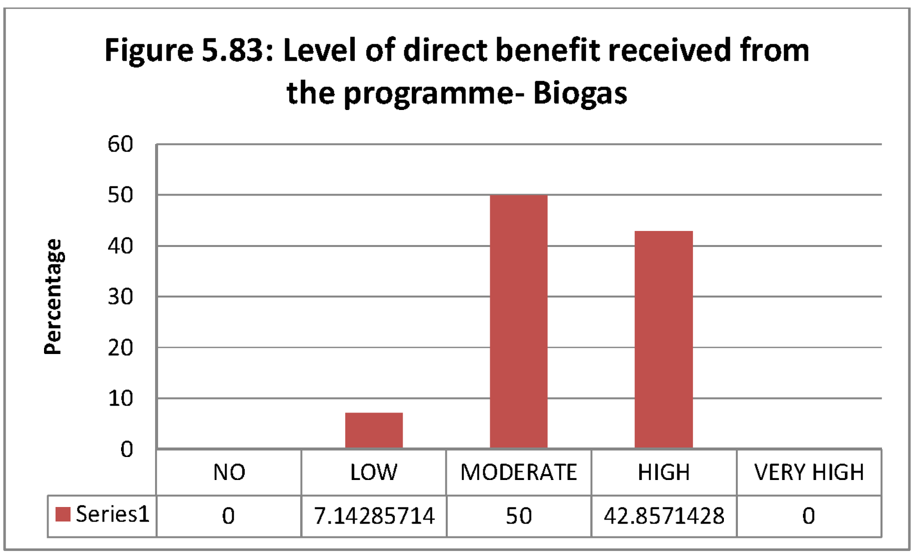


	NO	LOW	MODERATE	HIGH	VERY HIGH
Series1	0	0	35.7142857	64.2857142	0

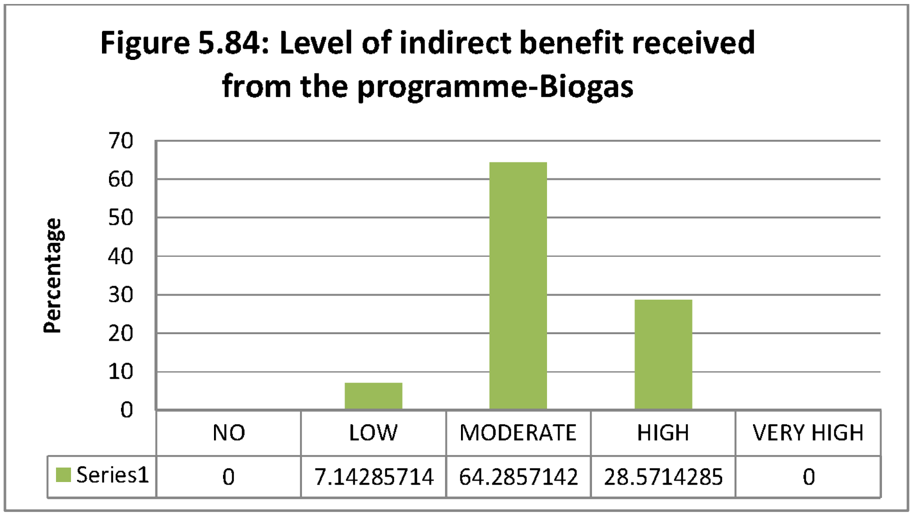
Changes in living condition after receiving the benefits: In this parameter, the changes in living condition of the beneficiaries after receiving the benefits were taken into consideration. More than 75% were moderately in changed condition, nearly 21% were highly changed. This status of changes in living conditions was described graphically in Figure 5.82.



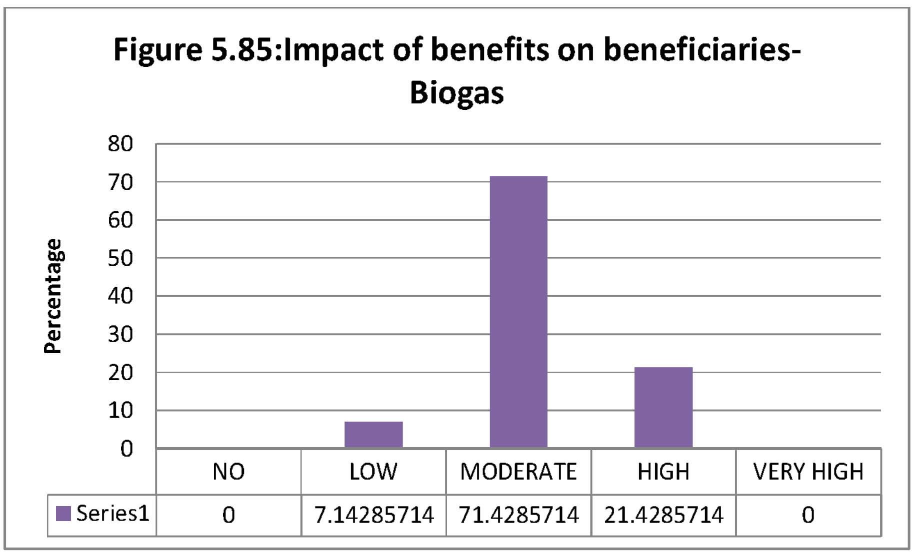
Level of indirect benefit received from the programme: In this parameter, the extent of benefits, which was indirectly obtained by the beneficiaries, was taken into consideration. 50% were moderately benefitted, nearly 43% were highly benefitted. This status of indirect benefits was described graphically in Figure 5.83.



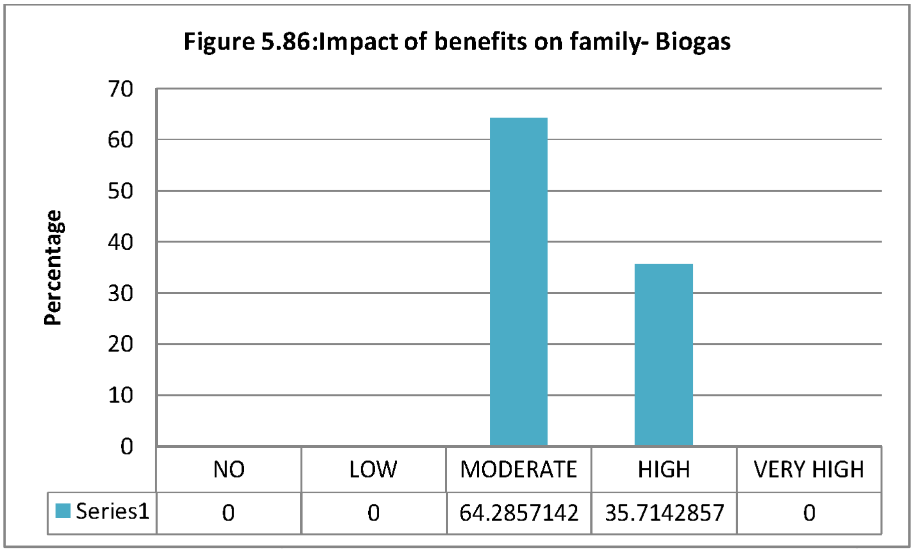
Level of indirect benefit received from the programme: In this parameter, the extent of benefits, which was indirectly obtained by the beneficiaries, was taken into consideration. 64% were moderately benefitted, nearly 29% were highly benefitted. This status of indirect benefits was described graphically in Figure 5.84.



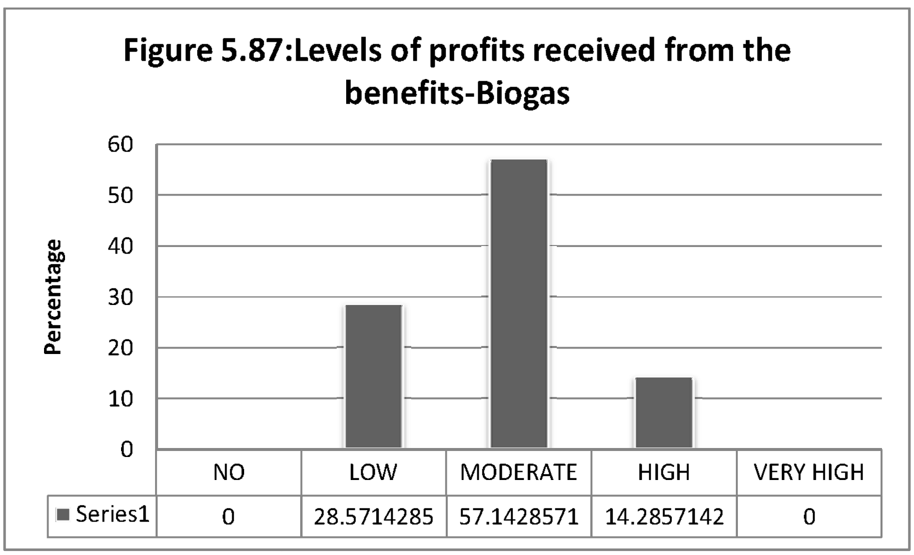
Impact of benefits on individual: In this parameter, the extent of benefits, on individual beneficiaries, was taken into consideration. 71% were moderately benefitted, nearly 21% were highly benefitted. This status of indirect benefits was described graphically in Figure 5.85.



Impact of benefits on whole family: In this parameter, the extent of benefits, on family basis, was taken into consideration. 64% shown moderate impact of benefit, 36% responded for high impact of benefit. This status of indirect benefits was described graphically in Figure 5.86.



Levels of profits received from the benefits: In this parameter, the extent of profits earned from the benefits to the beneficiaries, was taken into consideration. Nearly 57% shown moderate profit earned from benefit, 14% responded for high profit earned from benefit. This status of indirect benefits was described graphically in Figure 5.87.



Economic changes after receiving the benefits: In this parameter, the economic changes after receiving the benefits to the beneficiaries, was taken into consideration. 50% showed moderate economic changes from benefit, 14% responded for high economic changes from benefit. This status of indirect benefits was described graphically in Figure 5.88.

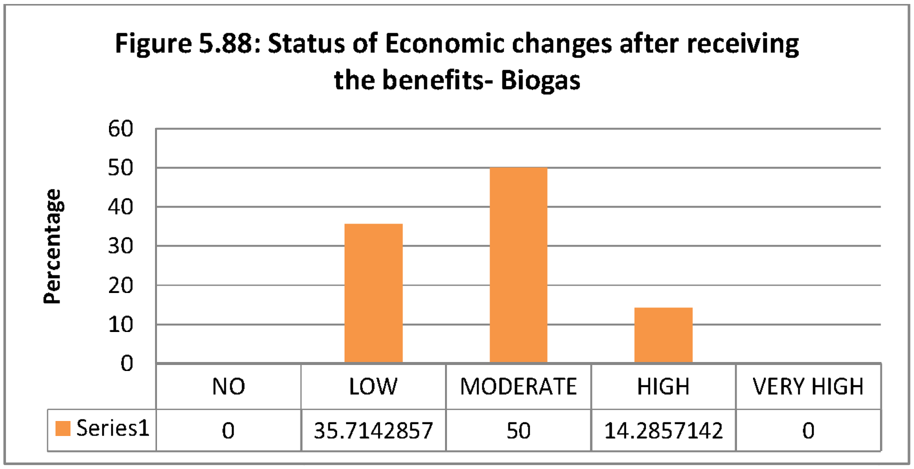


Figure 5.88: Status of Economic changes after receiving the benefits- Biogas

Social changes after receiving the benefits: In this parameter, the social changes after receiving the benefits to the beneficiaries, was taken into consideration. 50% showed moderate social changes from benefit, 7% beneficiaries showed high. This status of indirect benefits was described graphically in Figure 5.89.

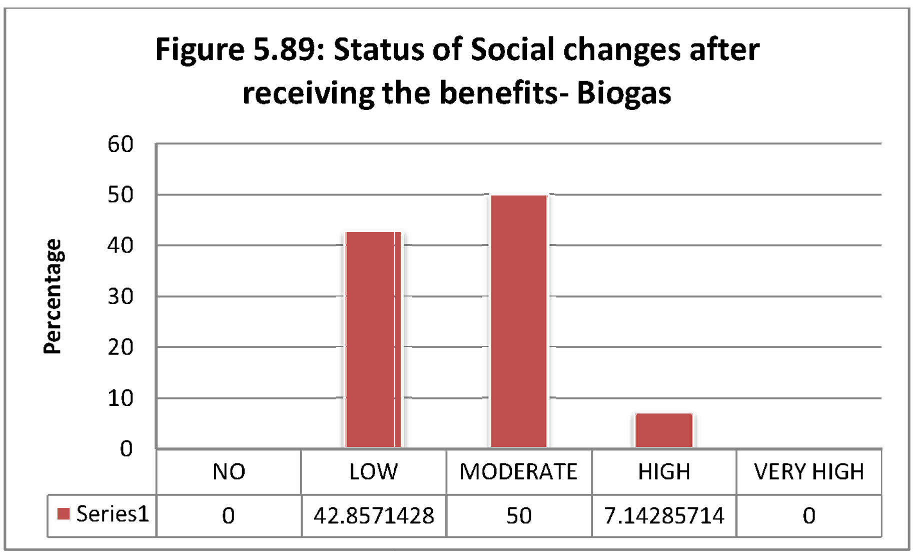


Figure 5.89: Status of Social changes after receiving the benefits- Biogas

5.2.6 Improved Chullah

Introduction: Smokeless Chulhas are commonly used in houses, canteens, hotels etc. for cooking purpose. These are gaining more popularity in rural and semi-urban areas where firewood is generally used as the fuel. Coconut husks, leaves, firewood, coconut shell, etc., which are easily available in rural and semi-urban areas can be economically used in houses, hotels etc., for cooking purposes.

The main advantage of installing smokeless chulha is that it does not emit smokein the kitchen and make the area smokeless unlike the conventional type country oven.The construction of theoven is such that the entire smoke generated while burning thefuel is taken through a pipe anddischarged into the atmosphere at a higher level. Thusan air draft is created and it helps smooth burning of the fuel. The ovens are sodesigned that flames are not directed outside and thus more heat is absorbed by thevessel giving more fuel economy.

Application: Adani Foundation brought Improved Chulha technique which is based on scientific method i.e. providing more oxygen for burning the fuel by placing cast iron mesh (11”x11”) at the base of Chulha and below the iron mesh a trench of 33”x9”x9” is provided for air flow. Fire wood is kept on the cast iron mesh, which will be placed at 11” from both sides of the trench. Total 2044 cast iron meshes has given to family in 50 villages.

The impact of Improved Chulha is as follows:

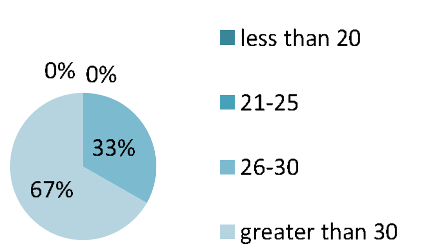
- At least 90% emission reductions (if proper quantity of firewood is used) and nearly 50% firewood savings.
- Cheap and very easy to use.
- Less indoor air pollution resulting into less eye irritation and other diseases due to 90% reduction in the smoke from improved chulha.
- No need to use blow pipes which reduces risk of Asthma, Lung cancer, TB, low birth weight and blindness.
- Eco friendly, no adverse effects on the environment.

Socio-Economic Profile of Beneficiaries

There are some data of the beneficiaries, which are analyzed respectively to their age, sex, education qualifications, and change in income before and after the benefits, evaluation of individual beneficiary activities;

AGE:the age wise distribution and percentage of the beneficiaries those who benefited by the vermicomposting process are given in Figure 5.90.

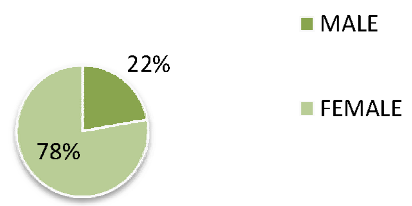
Figure 5.90: Age-wise Distribution Of Beneficiaries-Improved Chullha



From the above-mentioned figure it is clear that near 67% of the benefited people are greater than 30 years, 33% of people are in 26-30 years.

SEX: sex wise distribution of the beneficiaries are shown in Figure 5.91.

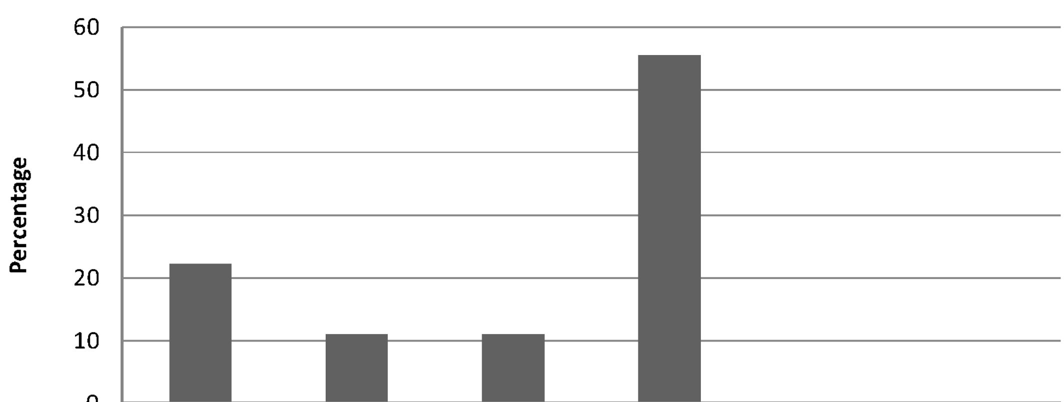
Figure 5.91: Sex-wise Distribution Of Beneficiaries- Improved Chullah



From the Figure 5.91 we can get sex distribution where the percentage of male beneficiaries is 22% and female beneficiaries is 78%.

EDUCATION QUALIFICATION: the education qualification of the beneficiaries are given in Figure 5.92.

Figure 5.92: Educational Qualification Of Beneficiaries- Improved Chullah



	illiterate	primary	middle	secondary	H.S	Graduate
Series1	22.22222222	11.11111111	11.11111111	55.55555556	0	0

From the above mentioned figure it is shown that the education qualification of the benefited people are divided in categories i.e, illiterate 22%, primary 11%, middle 11%, secondary 55%.

Changes in Occupation & Income Level of Beneficiaries

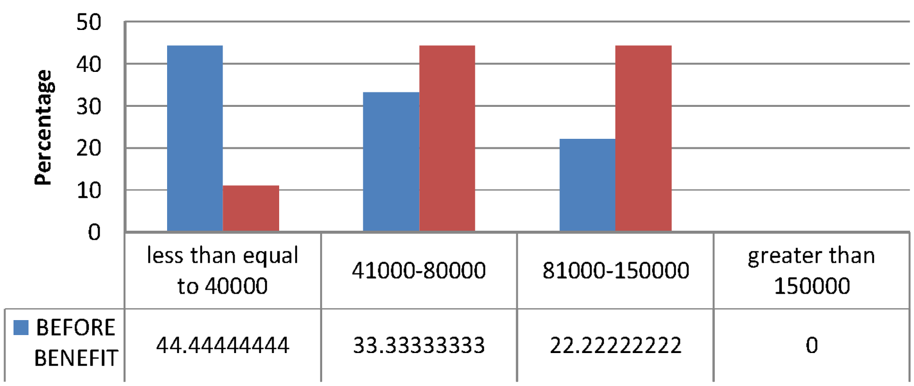
The status of occupation before receiving the benefits and after receiving the benefits are given as follows:

From the Figure 5.93 it is clear that before receiving the benefit, clear 100% of the beneficiaries were farmers. After receiving the benefits, the same percentage was maintained in case of farmers and the remaining percentage of service holders have also been in farming thereafter.

The status of changes in income level before & after receiving the benefits is given as follows:

- From the above data we can get a clear picture about the income changes after receiving the benefits. For the category less than or equal to 40000, the percentage of people before receiving the benefits was 44%, whereas after receiving the benefits, they shifted to the higher income group.
- In the next category, i.e., 41000-80000the before benefit percentage was 33%, and in after benefit case, the income increased at 44% and showing almost 33% significant growth.
- For the subsequent class, i.e., 81000-150000, there was a massive improve showing 22% of the people at before benefits stage and 44% in after benefit stage, showing almost 100% significant growth.

Figure 5.93: Changes In Income Level Of Beneficiaries- Improved Chullah



Evaluation of Impact of Providing Improved Chullah

Willingness to obtain the benefit: In this parameter, the willingness of the participants were taken into consideration. 44% were moderately willing, nearly 56% where highly willing. This status of willingness was described graphically in Figure 5.94.

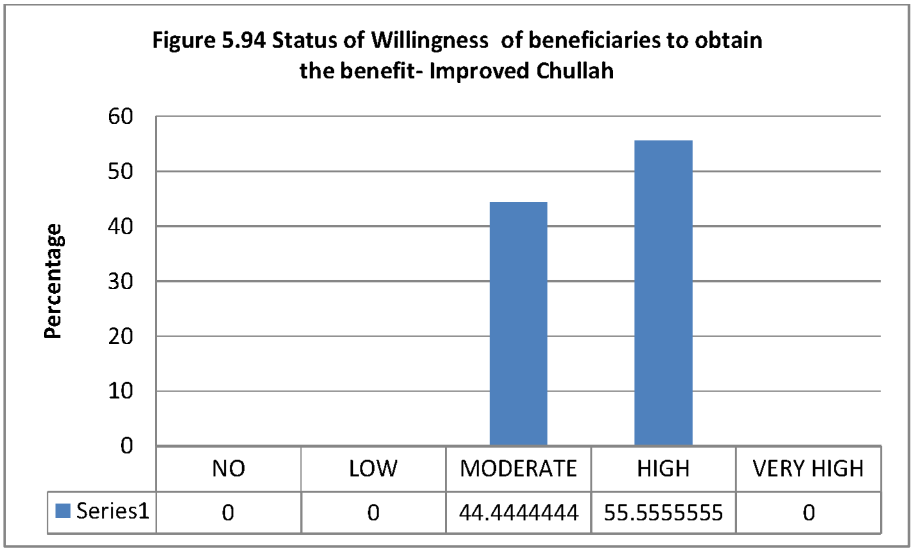


Figure 5.94 Status of Willingness of beneficiaries to obtain the benefit- Improved Chullah

Changes in living condition after receiving the benefits: In this parameter, the changes in living condition of the beneficiaries after receiving the benefits were taken into consideration. 78% were moderately in changed condition, nearly 22% were highly changed. This status of changes in living conditions was described graphically in Figure 5.95.

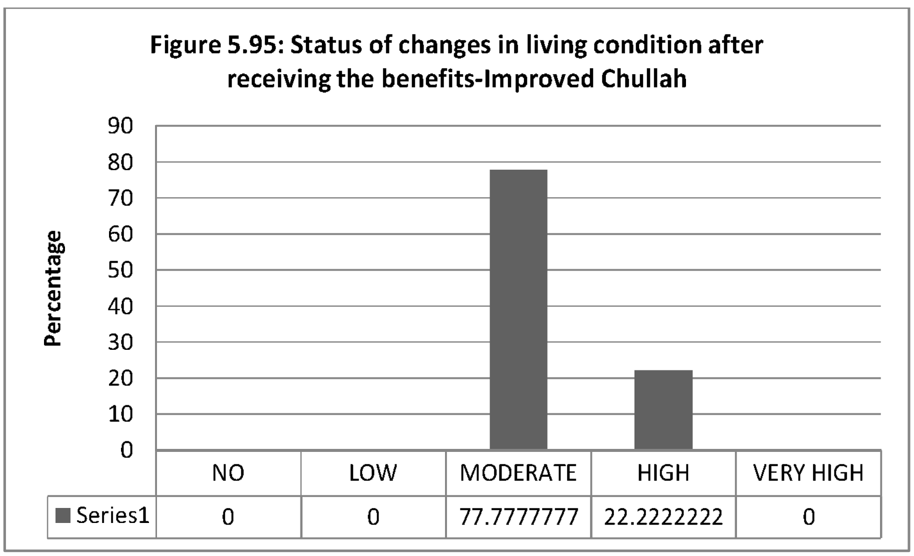
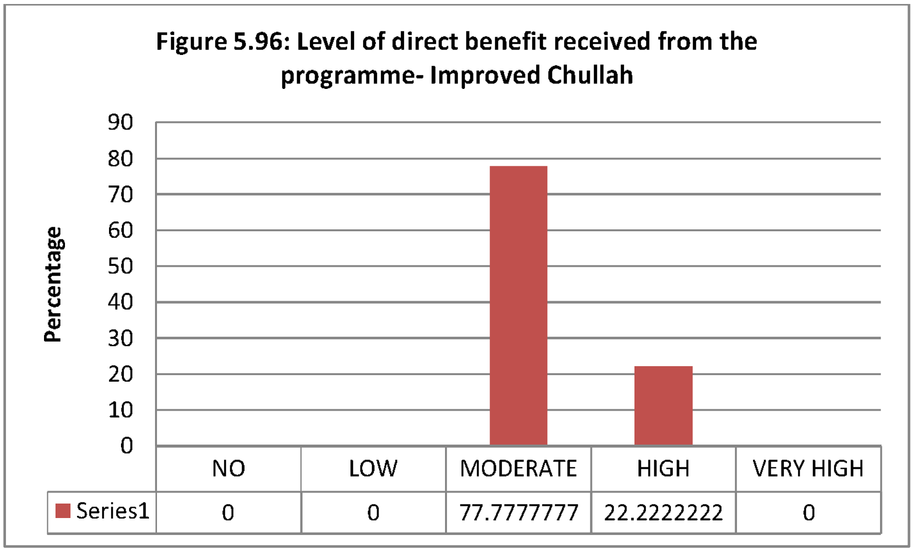
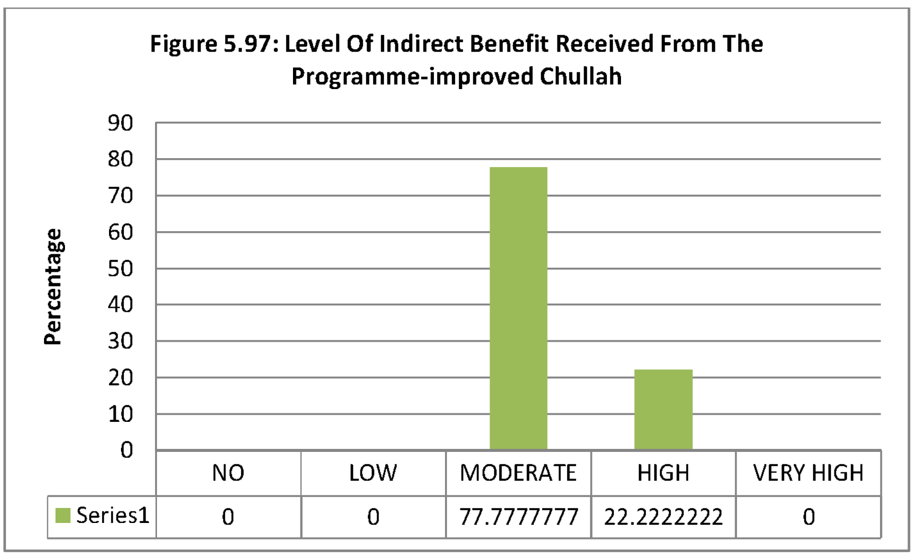


Figure 5.95: Status of changes in living condition after receiving the benefits-Improved Chullah

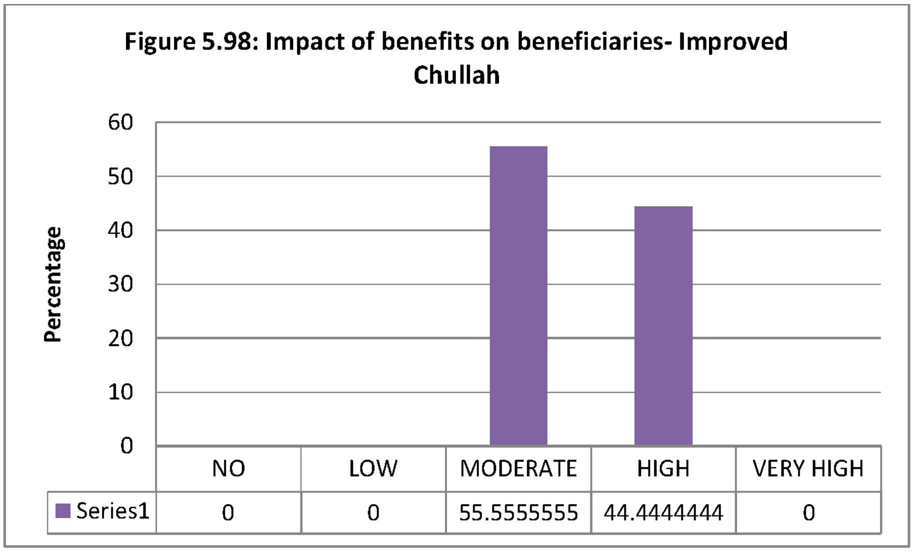
Level of indirect benefit received from the programme: In this parameter, the extent of benefits, which was indirectly obtained by the beneficiaries, was taken into consideration. 78% were moderately benefitted, nearly 22% were highly benefitted and no participant was very highly benefited. This status of indirect benefits was described graphically in Figure 5.96.



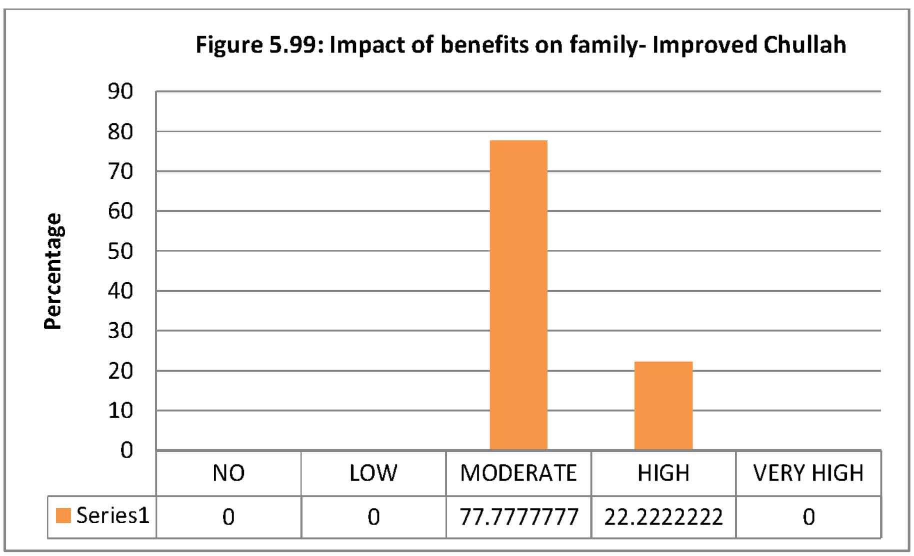
Level of indirect benefit received from the programme: In this parameter, the extent of benefits, which was indirectly obtained by the beneficiaries, was taken into consideration. 78% were moderately benefitted, nearly 22% were highly benefitted. This status of indirect benefits was described graphically in Figure 5.97.



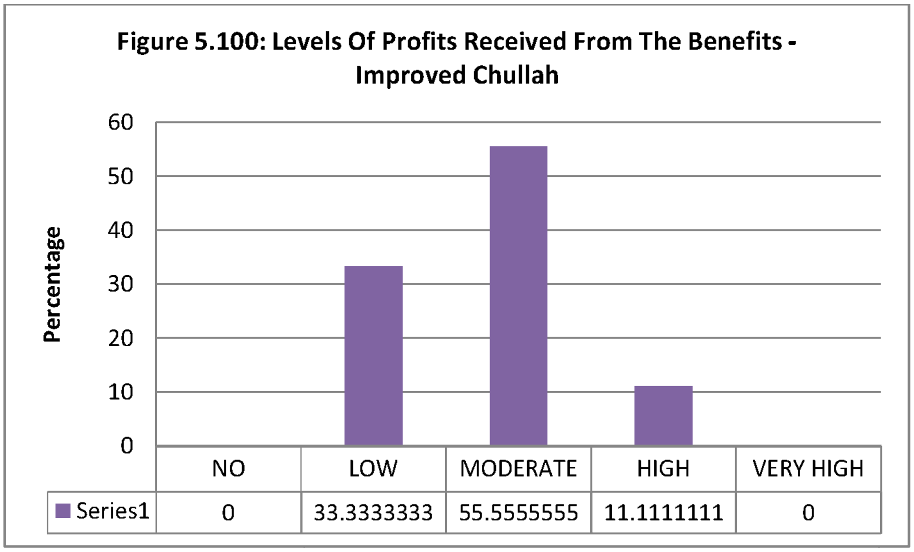
Impact of benefits on individual: In this parameter, the extent of benefits, on individual beneficiaries, was taken into consideration. 56% were moderately benefitted, nearly 44% were highly benefitted. This status of indirect benefits was described graphically in Figure 5.98.



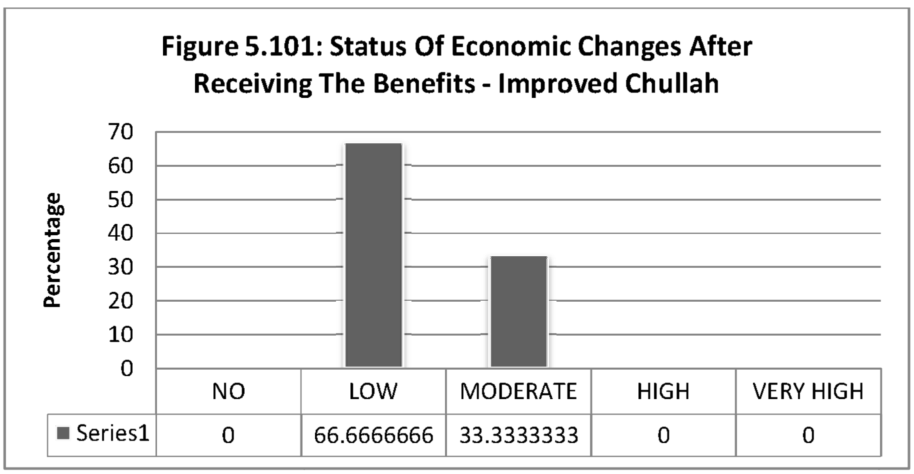
Impact of benefits on whole family: In this parameter, the extent of benefits, on family basis, was taken into consideration. 78% shown moderate impact of benefit, 22% responded for high impact of benefit. This status of indirect benefits was described graphically in Figure 5.99.



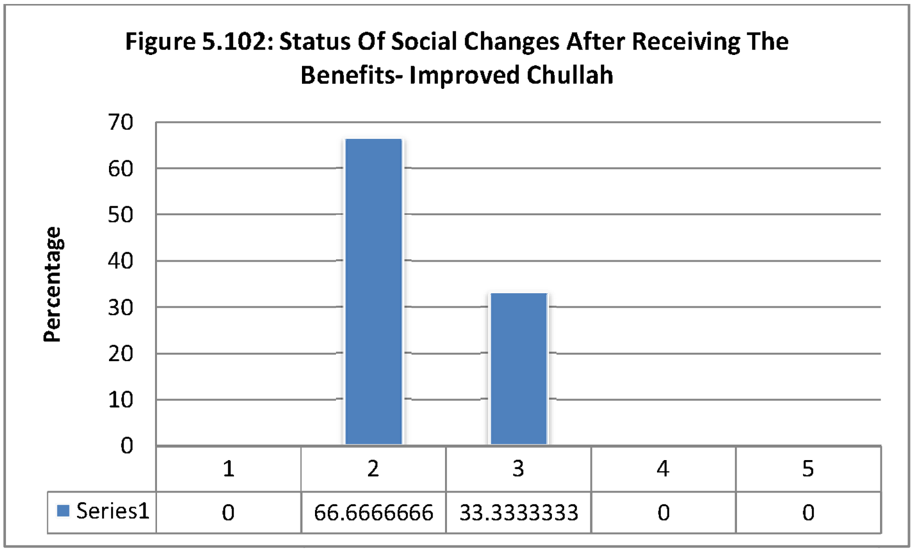
Levels of profits received from the benefits: In this parameter, the extent of profits earned from the benefits to the beneficiaries, was taken into consideration. Nearly 56% shown moderate profit earned from benefit, 11% responded for high profit earned from benefit. This status of indirect benefits was described graphically in Figure 5.100.



Economic changes after receiving the benefits: In this parameter, the economic changes after receiving the benefits to the beneficiaries, was taken into consideration. 33% showed moderate economic changes from benefit. This status of indirect benefits was described graphically in Figure 5.101.



Social changes after receiving the benefits: In this parameter, the social changes after receiving the benefits to the beneficiaries, was taken into consideration. 33% showed moderate social changes from benefit. This status of indirect benefits was described graphically in Figure 5.102.



5.2.7 Mushroom Cultivation

A mushroom is a kind of fungus with the Latin name of Agaricus bisporus. More specifically, Mushrooms are the fruiting bodies of a fungus. n the vegetable kingdom the mushroom is ranked with the heterotrophic organisms (lower plants). In contrast to the higher, green plants, these heterotrophs are not capable of photosynthesis. Fungi are the scavengers of nature. In mushroom cultivation, too, waste products, such as chicken manure, horse manure, straw, gypsum and waste water (from their own composting) are used to produce a high-quality substrate, from which the mushrooms will grow. Ammonia is removed by means of an ammonia washer from the process air before it is returned to nature. Even the ammonia from the air is used as a source of nitrogen in composting. The fungus, also called mycelium, uses the compost as a source of energy for its combustion, in which energy is released that is used for growth.

Mushrooms are good for your health. They contain few calories, but are rich in fibres, vitamins and minerals. In the Table below is found the nutritional value per 100 grams of mushrooms in comparison with vegetables.

	Mushrooms (uncooked)	Vegetables (uncooked)	Mushrooms fried	Vegetables cooked
Kcal	14	14	54	29
Protein (gr)	2.3	1	2.6	1.8
Fat (gr)	0	0	4	0.3
Fibre (gr)	1.5	1.3	2.5	2.7

Vitamin B2 (mg)	0.30	0.03	0.29	0.07
Vitamin B3 (mg)	4	0.4	3.8	0.6
Folic acid (ug)	32	20	8	36
Vitamin C (mg)	4	8	1	16
Potassium (mg)	400	230	410	247
Phosphorus (mg)	125	28	101	46
Magnesium (mg)	9	10	12	15
Iron (mg)	0.2	0.4	0.3	0.6
Copper (mg)	0.72	0.04	0.29	0.06

Nutritional value of mushrooms

Mushrooms contain an extra amount of vitamins B2 and B3. These vitamins take care of the metabolism and the release of energy from carbohydrates, proteins and fats. Vitamin B2 is also necessary for a healthy skin. Folic acid is necessary for growth and the production of blood. It is one of the few vitamins of which, on average, we take in too little from our food. Potassium is necessary for a healthy blood pressure and for muscle and nerve activity. Phosphorous takes care of healthy bones and teeth and also of energy metabolism. Copper is necessary for your immune system, nerves and for the synthesis of body cells. All these nutritional values occur in high concentrations in mushrooms.

The Importance of Mushroom Cultivation

- Nutritional value
- Protein content, 3-7% when fresh and 25-40% when dry. Contain all essential amino acids, amides and lysine.
- Medicinal value

- Consumption of mushrooms slows down the spread and effect of cancer, heart disease, HIV/AIDS (by boosting immune system).
- Income generation and
- Employment creation.

Advantages of Mushroom Growing

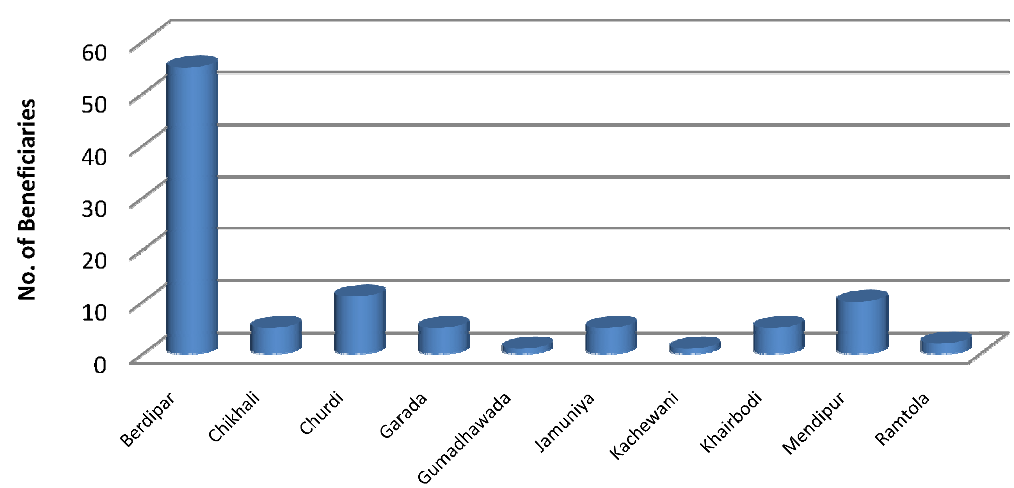
- Use of idle structures,
- Involvement of small initial capital,
- Possible production all the year round
- Use of Agricultural waste as substrate- mostly waste materials from farms, plantations or factories.
- Is a Bio degrader hence environmental con-server.

Challenges in Mushroom Growing

- Lack of skills on mushroom production
- Spawn is expensive and quality not guaranteed
- Lack of awareness of benefits of mushroom
- Traditional beliefs of some communities

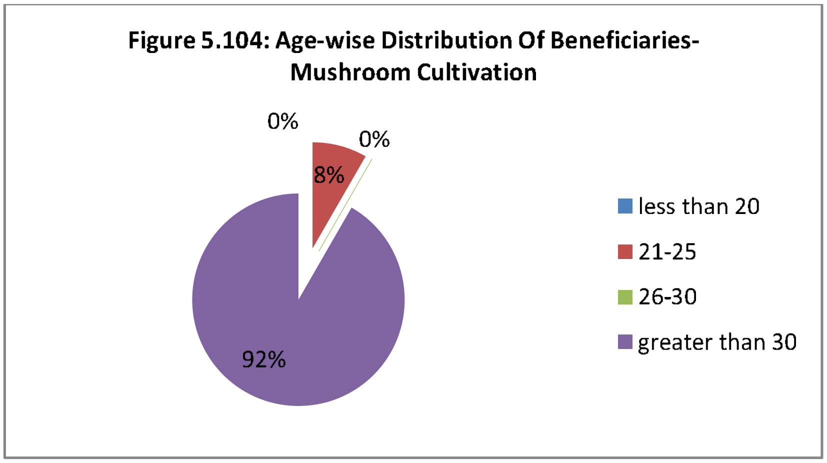
In FY 2018-2019, Adani foundation has introduced mushroom cultivation as their CSR project in Beraipar village of Tiroda to enhance the nutrition requirement of the villagers. The status of mushroom cultivation is given in Figure 5.103.

Figure 5.103: Village Wise Distribution of Mushroom Cultivation Beneficiaries



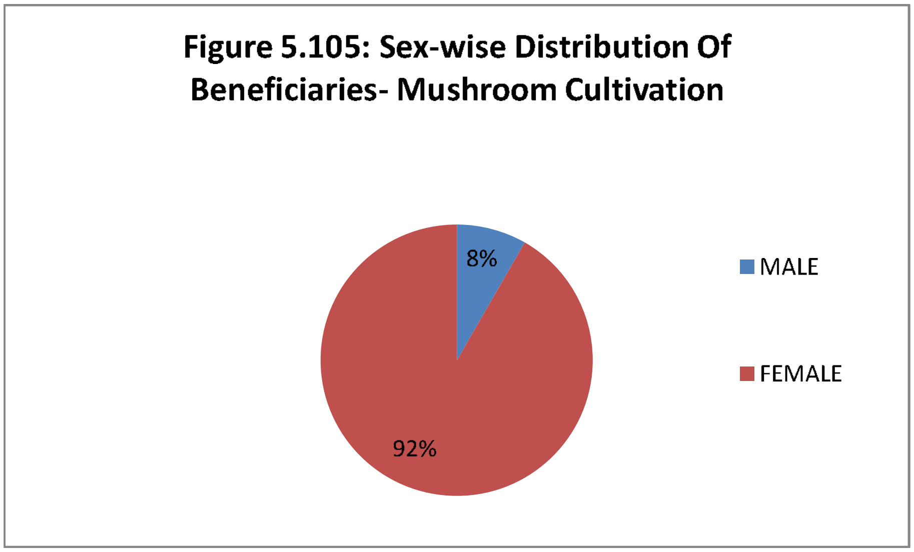
Socio-Economic Profile of Beneficiaries

- **Age:** the age wise distribution and percentage of the beneficiaries those who benefited by the mushroom cultivation process are given in Figure 5.104.



From the above-mentioned figure it is clear that near 92% of the benefited people are greater than 30 years, and 8% people are in 21-25 years.

- **SEX**: sex wise distribution of the beneficiaries are shown in Figure 5.105.



From the Figure 5.105 we can get sex distribution where the percencentage of male beneficiaries is 8% and female beneficiaries is 92%.

EDUCATIONAL QUALIFICATION: the educational qualifications of the beneficiaries are given in Figure 5.106.

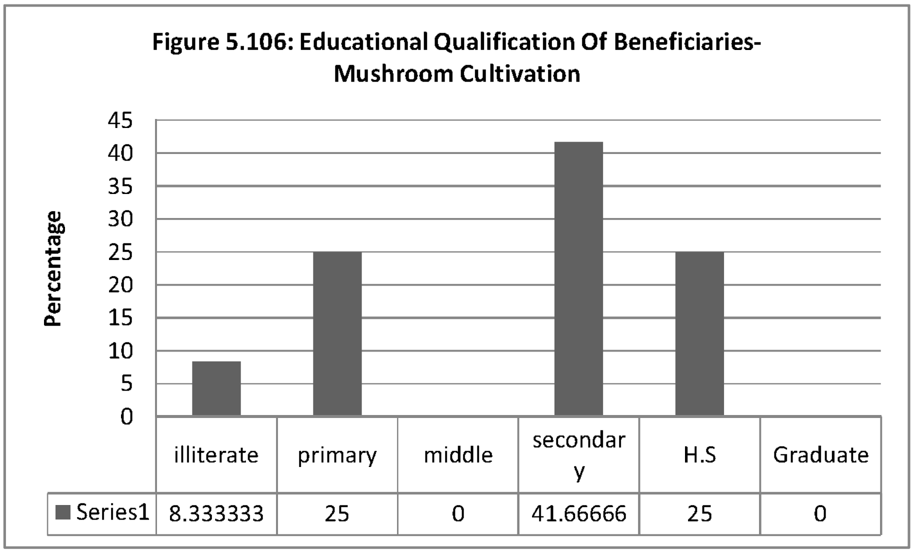


Figure 5.106: Educational Qualification Of Beneficiaries-Mushroom Cultivation

From the above mentioned figure it is shown that the education qualification of the benefited people are divided in categories i.e, illiterate 8.3%, primary 25%, secondary 41.6% and H.S 25%.

Changes in Occupation & Income Level of Beneficiaries

The status of occupation before receiving the benefits and after receiving the benefits are given as follows:

From Figure 5.107 it is clear that no changes have taken place within the beneficiaries. Before receiving the benefit, 100% of the beneficiaries were farmers after receiving the benefits, the same percentage was maintained in case of farmers as well.

The status of changes in income level before & after receiving the benefits is given as follows:

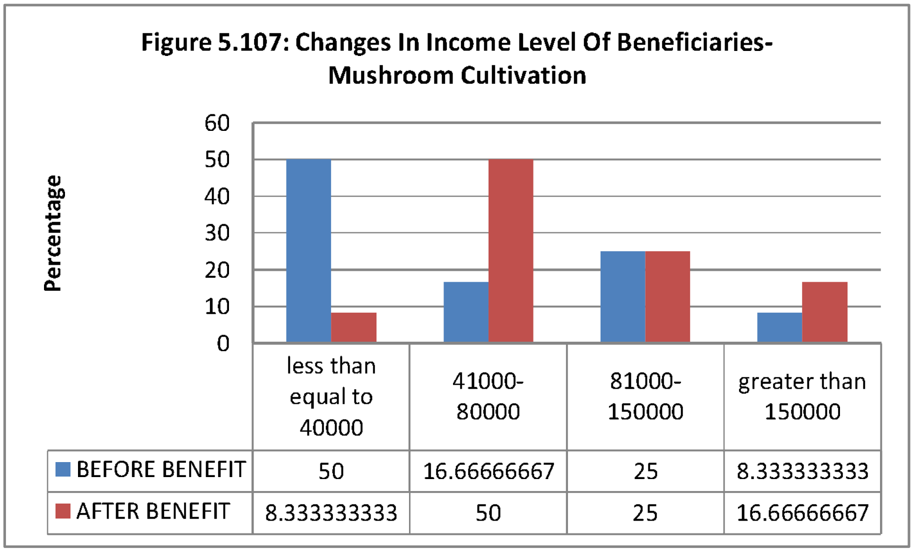
From the above data we can get a clear picture about the income changes after receiving the benefits. For the category less than or equal to 40000, the percentage of people before receiving the benefits was 50%, whereas after receiving the benefits, only 8% remained in this income group.

In the next category, i.e., 41000-80000the before benefit percentage was 25%, and in after benefit case, the percentage remained the same.

For the subsequent class, i.e., 81000-150000, there was a massive improve showing 13% of the people at before benefits stage and 27% in after benefit stage, showing almost 100% significant growth.

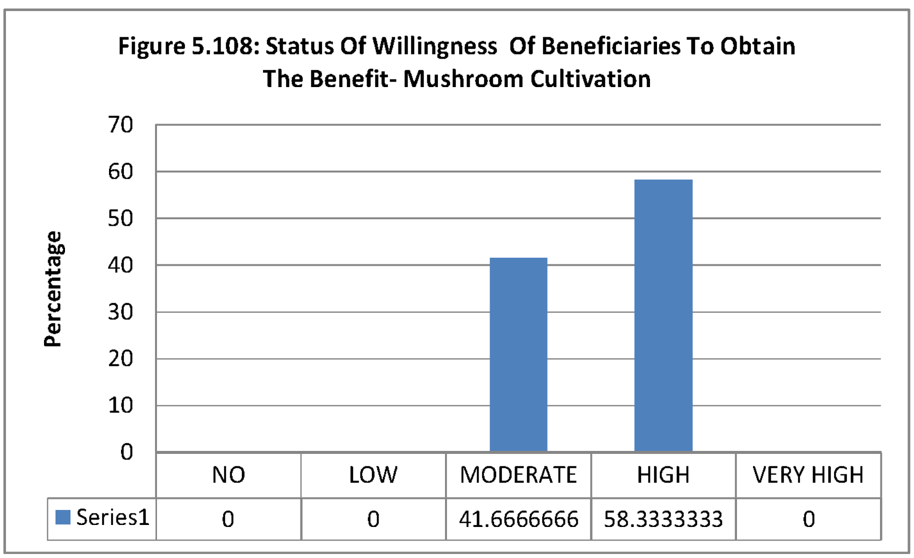
The final income group, i.e., greater than 150000, also showed a good trend of improvement. Starting with only 8% of people in before benefit stage and ultimately increased in to 16%, showing a growth of almost 100%.

The graphical representations of the data are given in Figure 5.107.



Evaluation of Impact of Mushroom Cultivation

Willingness to obtain the benefit: In this parameter, the willingness of the participants were taken into consideration. Nearly 42% were moderately willing, 58% were highly willing. This status of willingness was described graphically in Figure 5.108.



Changes in living condition after receiving the benefits: In this parameter, the changes in living condition of the beneficiaries after receiving the benefits were taken into consideration. Where nearly 92% were moderately in changed condition, nearly 8% were highly changed after receiving the benefit. This status of changes in living conditions was described graphically in Figure 5.109.

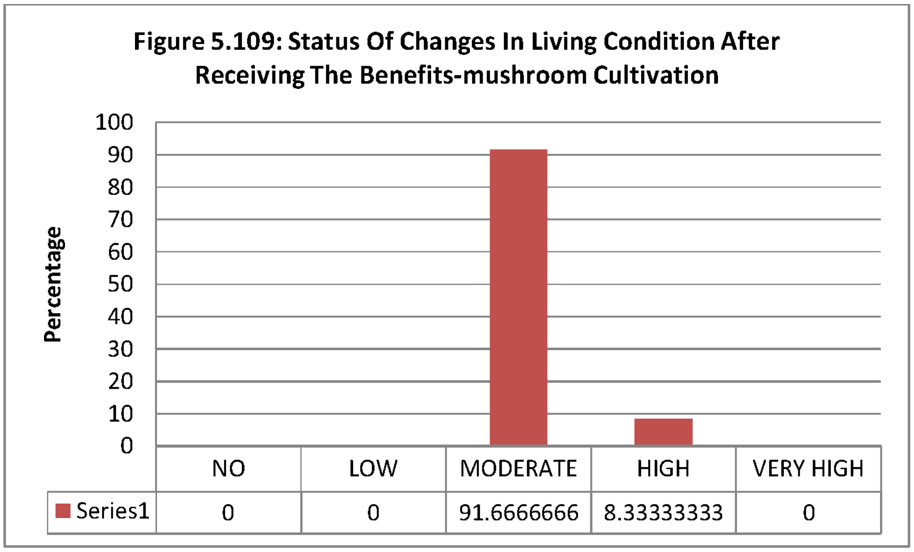


Figure 5.109: Status Of Changes In Living Condition After Receiving The Benefits-mushroom Cultivation

Level of direct benefit received from the programme: In this parameter, the extent of benefits, which was directly obtained by the beneficiaries, was taken into consideration. 75% were moderately benefitted, nearly 17% were highly benefitted. This status of direct benefits was described graphically in Figure 5.110.

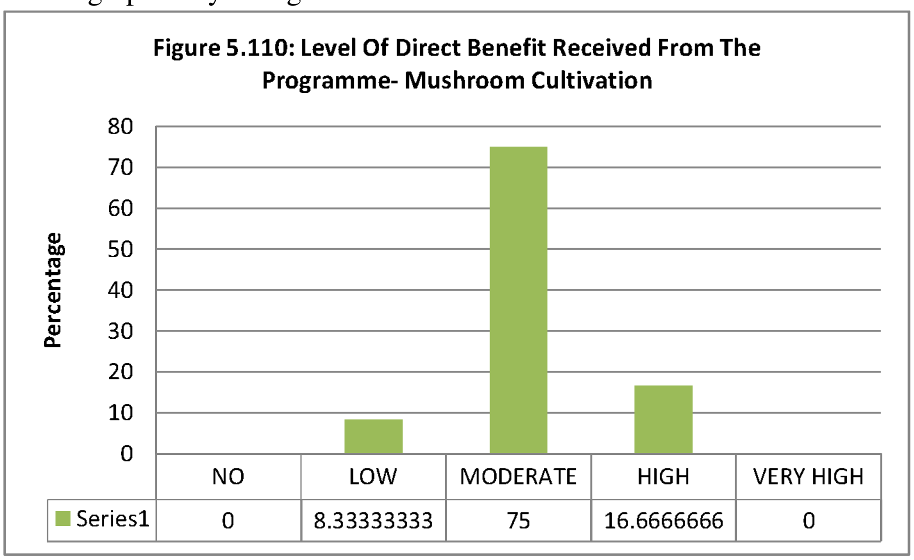
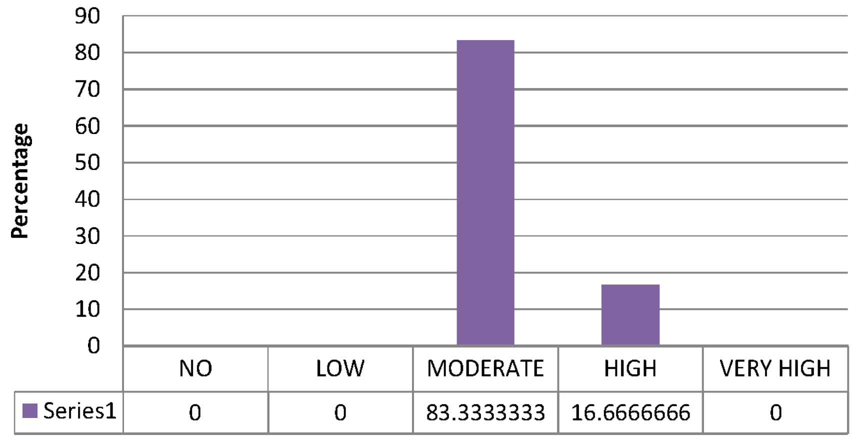


Figure 5.110: Level Of Direct Benefit Received From The Programme- Mushroom Cultivation

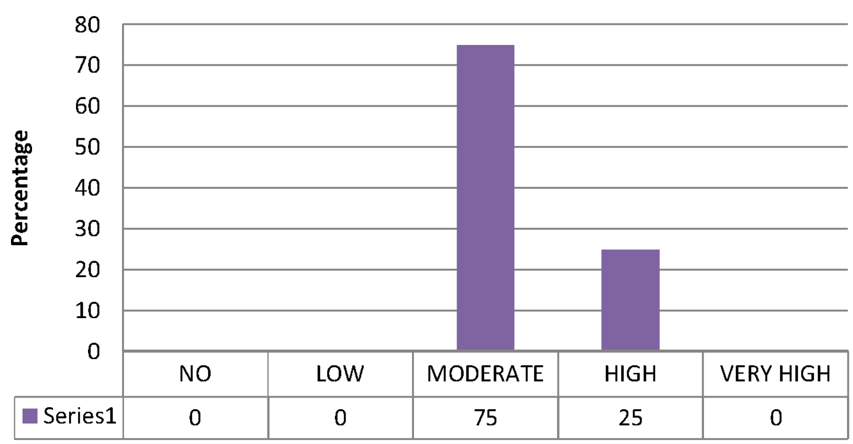
Level of indirect benefit received from the programme: In this parameter, the extent of benefits, which was indirectly obtained by the beneficiaries, was taken into consideration. 83% were moderately benefitted, nearly 17% were highly benefitted. This status of indirect benefits was described graphically in Figure 5.111.

Figure 5.111: Level Of Indirect Benefit Received From The Programme-mushroom Cultivation

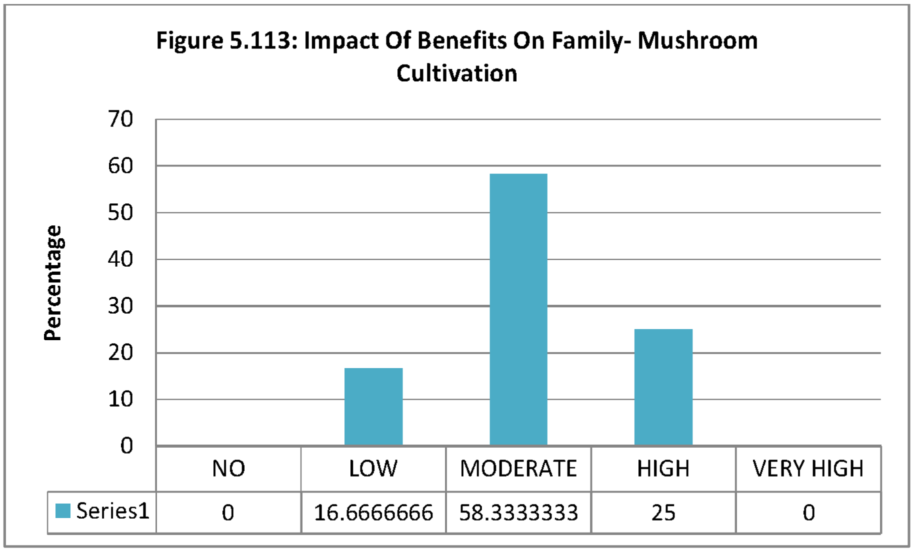


Impact of benefits on individual: In this parameter, the extent of benefits, on individual beneficiaries, was taken into consideration. 75% showed moderate impact of benefit, 25% responded for high impact of benefit. This status of indirect benefits was described graphically in Figure 5.112.

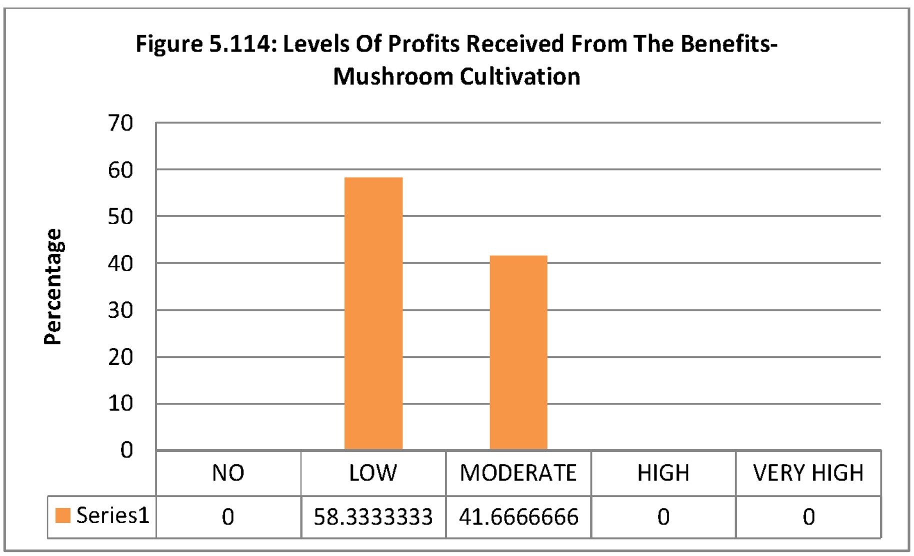
Figure 5.112: Impact Of Benefits On Beneficiaries- Mushroom Cultivation



Impact of benefits on whole family: In this parameter, the extent of benefits, on family basis, was taken into consideration. 58% shown moderate impact of benefit, 25% responded for high impact of benefit. This status of indirect benefits was described graphically in Figure 5.113.

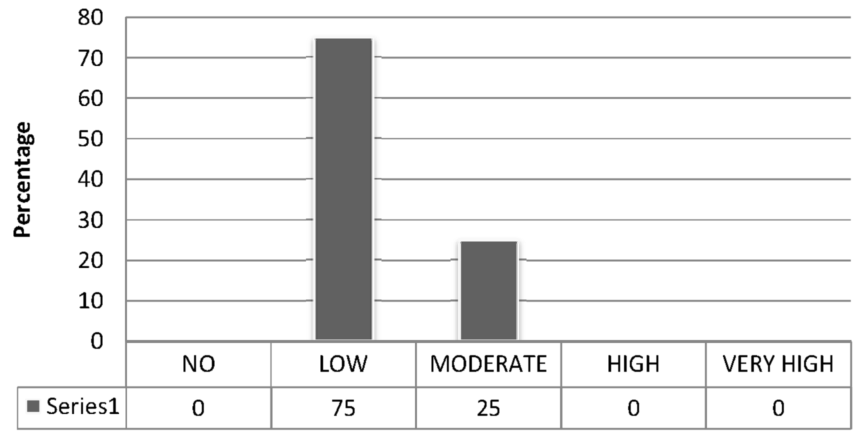


Levels of profits received from the benefits: In this parameter, the extent of profits earned from the benefits to the beneficiaries, was taken into consideration. Nearly 42% shown moderate profit earned from benefit. This status of indirect benefits was described graphically in Figure 5.114.



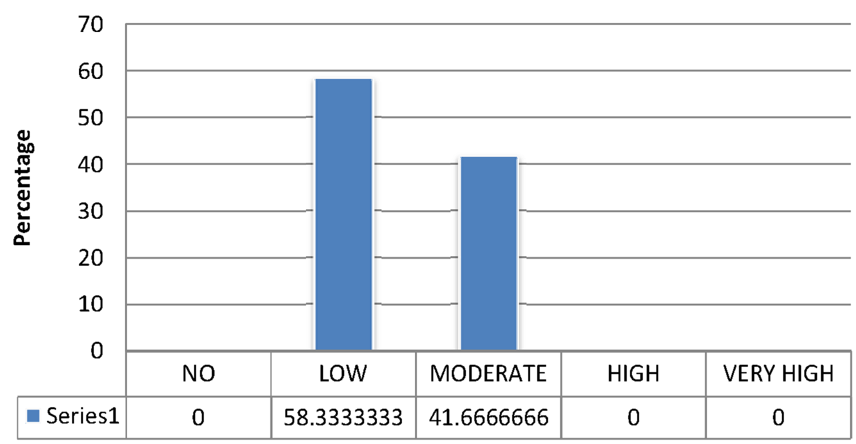
Economic changes after receiving the benefits: In this parameter, the economic changes after receiving the benefits to the beneficiaries, was taken into consideration. 25% showed moderate economic changes from benefit. This status of indirect benefits was described graphically in Figure 5.115.

Figure 5.115: Status of Economic changes after receiving the benefits- Mushroom Cultivation



Social changes after receiving the benefits: In this parameter, the social changes after receiving the benefits to the beneficiaries, was taken into consideration. Nearly 42% showed moderate social changes from benefit. This status of indirect benefits was described graphically in Figure 5.116.

Figure 5.116: Status Of Social Changes After Receiving The Benefits- Mushroom Cultivation



5.2.8 Agarbati Making

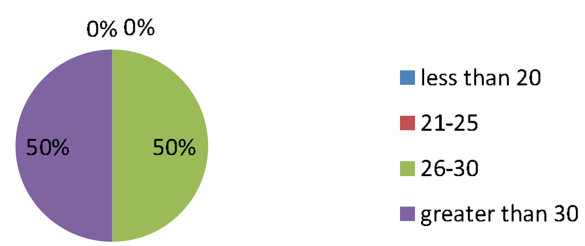
Incense sticks or Agarbatti making business is very profitable small scale business in India which you can start with very little investment. The procedure of agarbatti making is very simple and can be done using machines. If you dont want to invest in purchasing machines then you can go for manual handmade agarbatti production unit but machines makes it easier and produces high quality agarbatti in short time. In this article I will share information on how to start agarbatti manufacturing unit and how you can make profit out of this simple business.

Agarbattis have huge potential as a manufacturing business because its demand is at all time high and go even higher during festivals. More than 90 countries use Agarbattis and India is the sole producer of these Incense Sticks that caters to the demands of all countries worldwide.

In FY 2018-2019, Adani foundation has introduced Agarbati making as their CSR project in Ghumadhawada village of Tiroda to enhance the nutrition requirement of the villagers. The status of mushroom cultivation is given as follows:

- **Age:** the age wise distribution and percentage of the beneficiaries those who benefited by the mushroom cultivation process are given in Figure 5.117.

Figure 5.117: Age-wise Distribution Of Beneficiaries-Agarbati Making

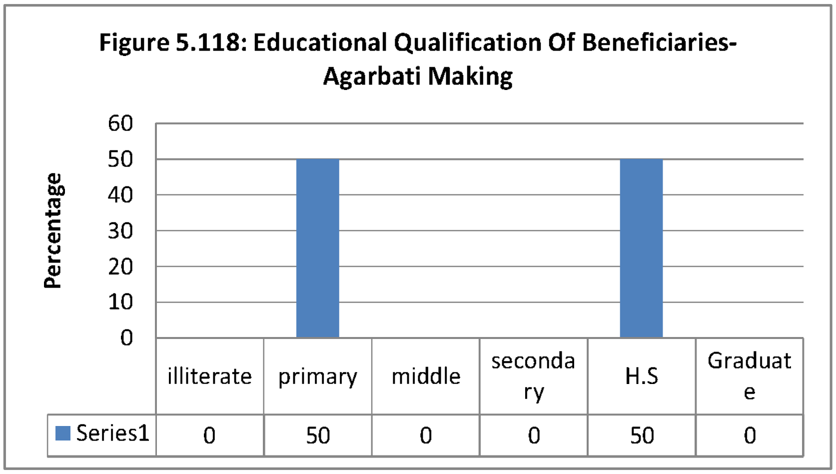


From the above-mentioned figure it is clear that near 50% of the benefited people are greater than 30 years, and 50% people are in 26-30 years.

- **Sex**: sex wise distribution of the beneficiaries are shown below:

From the analysis we can get sex distribution where the percentage of female beneficiaries is 100%.

Educational Qualification: the educational qualifications of the beneficiaries are given in Figure 5.118.



From the above mentioned figure it is shown that the education qualification of the benefited people are divided in categories i.e, primary 50% and H.S 50%.

Changes in Occupation & Income Level of Beneficiaries

The status of occupation before receiving the benefits and after receiving the benefits are given as follows:

From the analysis it is clear that there is very little changes take place within the beneficiaries. Before receiving the benefit, 50% of the beneficiaries were farmers and 50% was involved in service. After receiving the benefits, the same percentage was maintained in case of farmers and the remaining percentage of service holders have also been in farming thereafter.

The status of changes in income level before & after receiving the benefits is given as follows:

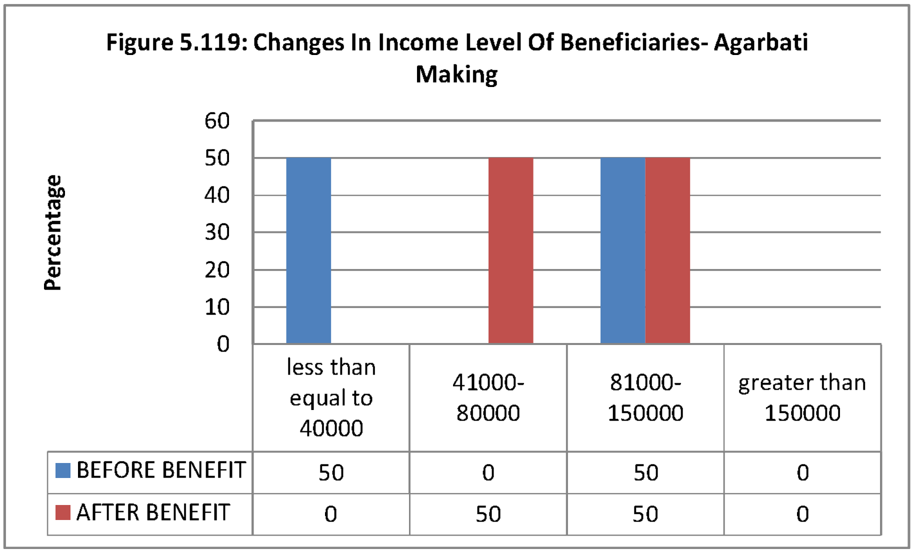
From the above data we can get a clear picture about the income changes after receiving the benefits. For the category less than or equal to 40000, the percentage of people before receiving the benefits was 50%, whereas after receiving the benefits everyone shifted to higher income group.

In the next category, i.e., 41000-80000 the before benefit percentage was nearly absent, and in after benefit case, the percentage increased to 50%, showing 100% increase.

For the subsequent class, i.e., 81000-150000, there was a no improve showing 50% of the people at before benefits stage and the same in after benefit stage.

The final income group, i.e., greater than 150000, also showed no improvement. Starting with insignificant number of people in before benefit stage and ultimately remained in the same stage.

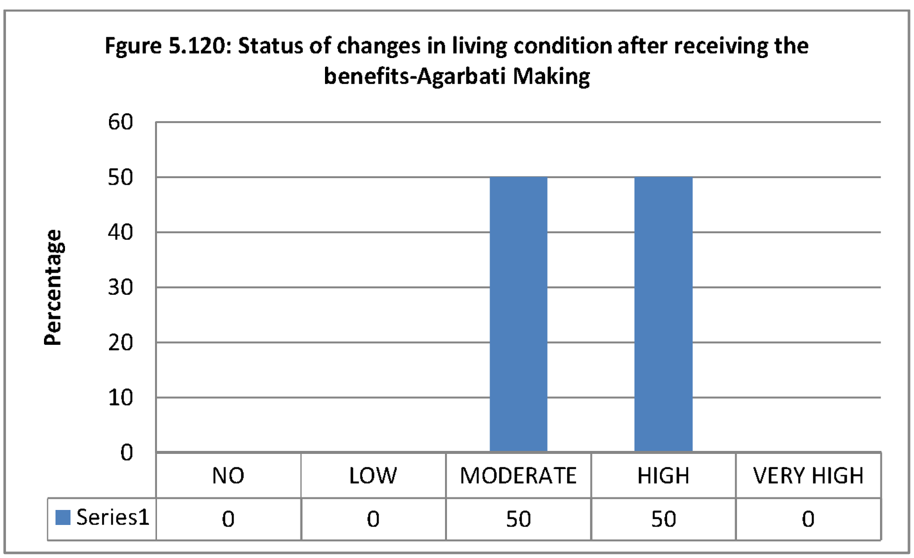
The graphical representations of the data are given in Figure 5.119.



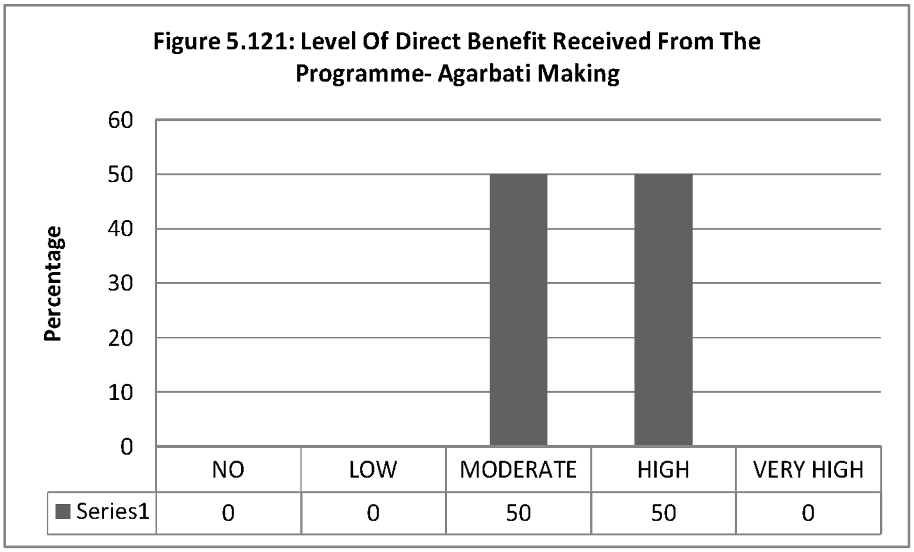
Evaluation of Impact of Agarbatti Making

Willingness to obtain the benefit: In this parameter, the willingness of the participants were taken into consideration. 100% of the participants were highly willing to obtain the benefit.

Changes in living condition after receiving the benefits: In this parameter, the changes in living condition of the beneficiaries after receiving the benefits were taken into consideration. Where nearly 50% were moderately in changed condition, and 50% were highly changed. This status of changes in living conditions was described graphically in Figure 5.120.

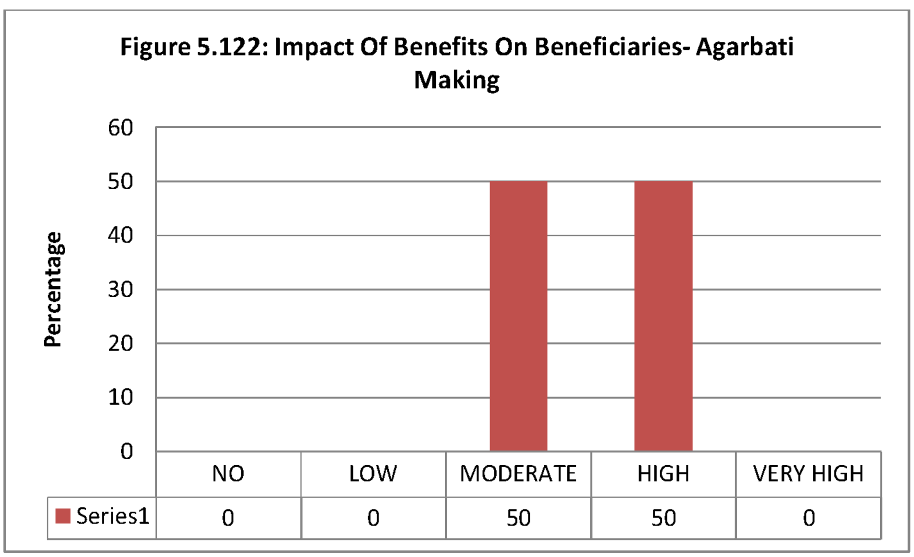


Level of direct benefit received from the programme: In this parameter, the extent of benefits, which was directly obtained by the beneficiaries, was taken into consideration. 50% were moderately benefitted, 50% were highly benefitted. This status of direct benefits was described graphically in Figure 5.121.

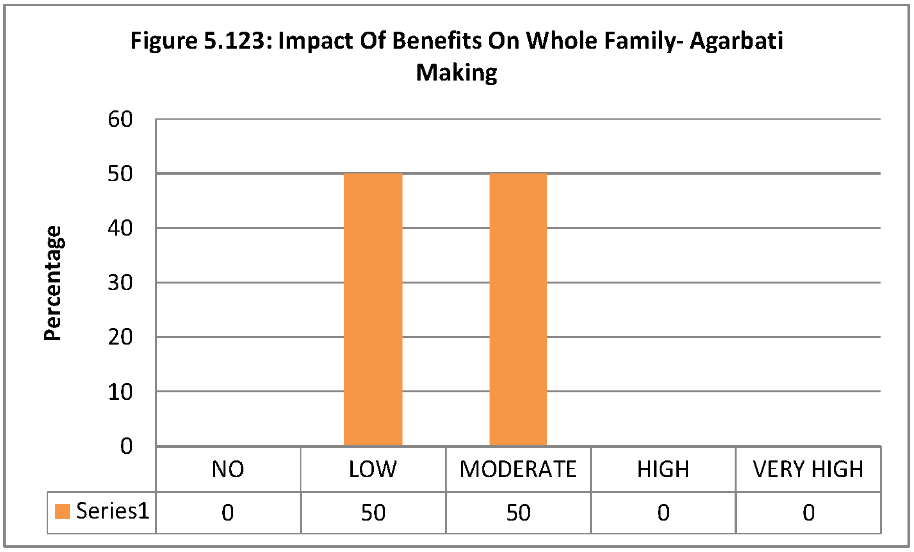


Level of indirect benefit received from the programme: In this parameter, the extent of benefits, which was indirectly obtained by the beneficiaries, was taken into consideration. 100% were moderately benefitted.

Impact of benefits on individual: In this parameter, the extent of benefits, on individual beneficiaries, was taken into consideration. 50% showed moderate impact of benefit, 50% responded for high impact of benefit. This status of indirect benefits was described graphically in Figure 5.122.

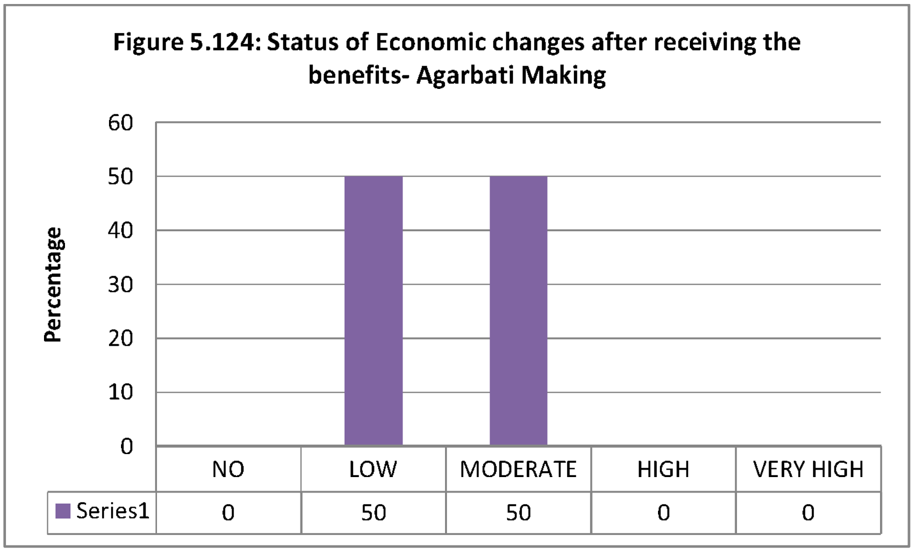


Impact of benefits on whole family: In this parameter, the extent of benefits, on family basis, was taken into consideration. 50% shown moderate impact of benefit. This status of indirect benefits was described graphically in Figure 5.123.



Levels of profits received from the benefits: In this parameter, the extent of profits earned from the benefits to the beneficiaries, was taken into consideration. Where 100% of the beneficiaries showed low profit earned from benefits.

Economic changes after receiving the benefits: In this parameter, the economic changes after receiving the benefits to the beneficiaries, was taken into consideration. 50% showed moderate economic changes from benefit. This status of indirect benefits was described graphically in Figure 5.124.



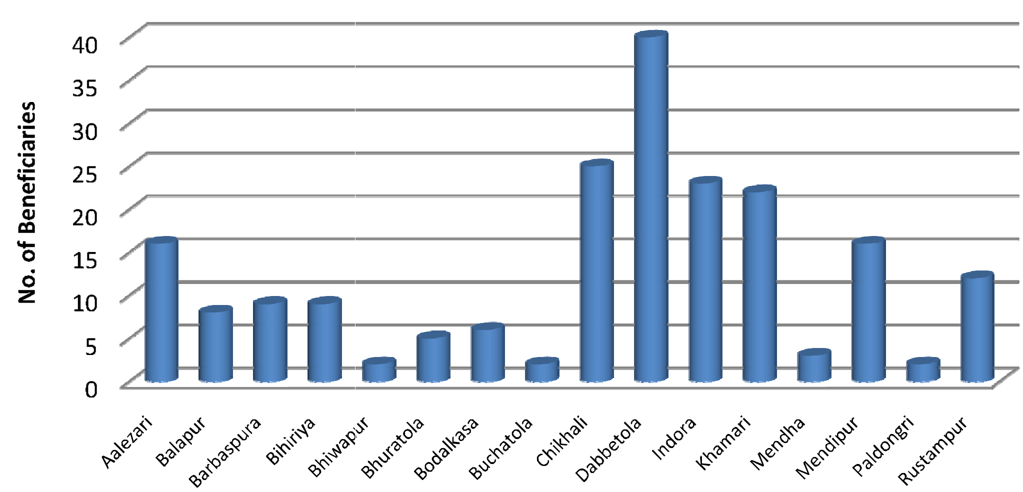
Social changes after receiving the benefits: In this parameter, the social changes after receiving the benefits to the beneficiaries, was taken into consideration. Where 100% of the beneficiaries showed low social changes from benefits.

5.2.9 Lac Bangle Making

Bangles are used by women all across the country. This bangles play as one important and must-have make-up item of the women. No matter now modern Indian women are they never forget to wear bangles. They decorate their hands more on occasion like festivals, social gatherings like weddings, and parties. Women cannot image her without bangles to their hands. These bangles play very important role in the life of every Indian woman.

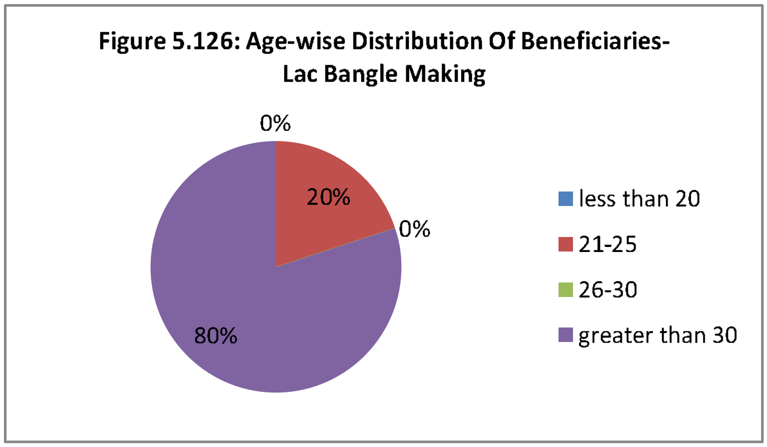
In FY 2018-2019, Adani foundation has introduced Lac Bangle making as their CSR project in Barbaspura, Khamari and Chikalli village of Tiroda to enhance the nutrition requirement of the villagers. The status of mushroom cultivation is given in Figure 5.125.

Figure 5.125: Village Wise Distribution of Lac Cultivation Beneficiaries



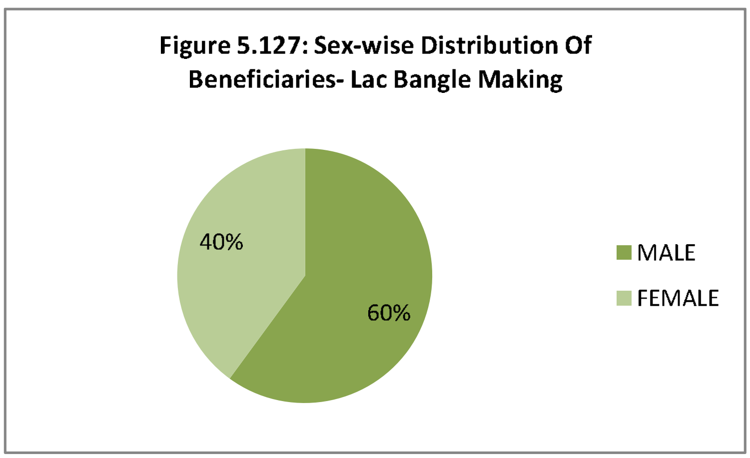
Socio-Economic Profile of Beneficiaries

- **Age:** the age wise distribution and percentage of the beneficiaries those who benefited by the mushroom cultivation process are given in Figure 5.126.



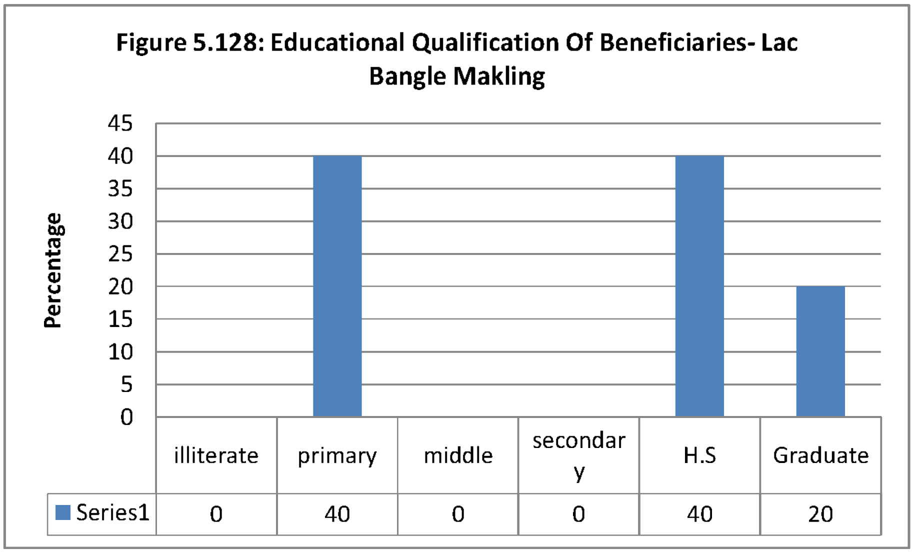
From the above-mentioned figure it is clear that near 80% of the benefited people are greater than 30 years, and 20% people are in 21-25 years.

- **Sex**: sex wise distribution of the beneficiaries are shown in Figure 5.127.



From the analysis we can get sex distribution where the percentage of male beneficiaries is 40% and female beneficiaries is 60%.

Educational Qualification: the educational qualifications of the beneficiaries are given in Figure 5.128.



From the above mentioned Figure it is shown that the education qualification of the benefited people are divided in categories i.e, primary 40%, H.S 40% and graduate 20%.

Changes in Occupation & Income Level of Beneficiaries

The status of occupation before receiving the benefits and after receiving the benefits are given as follows:

From the analysis it is clear that there is very little changes take place within the beneficiaries. Before receiving the benefit, 80% of the beneficiaries were farmers and 20% were students. After receiving the benefits, the same percentage was maintained in case of farmers and the remaining percentages of students engage themselves in bangle making.

In Figure 5.129, to make our interpretations clear, we made certain income groups as per the data.

From the above data we can get a clear picture about the income changes after receiving the benefits. For the category less than or equal to 40000, the percentage of people before receiving the benefits was 40%, whereas after receiving the benefits, very few people were in this income group.

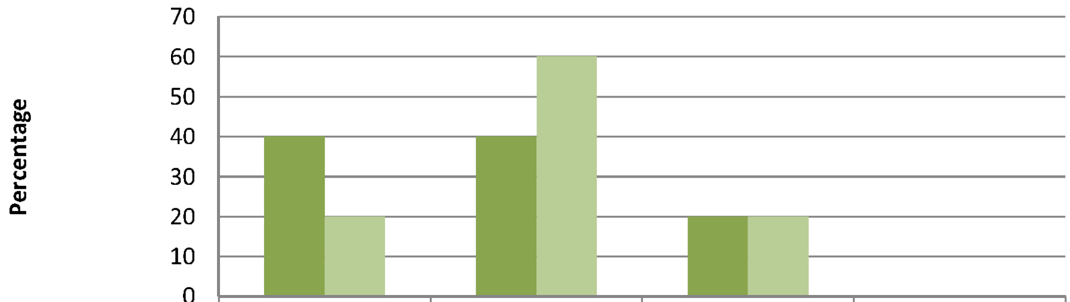
In the next category, i.e., 41000-80000the before benefit percentage was 40%, and in after benefit case, the percentage increased to 60%, showing 50% increase.

For the subsequent class, i.e., 81000-150000, there was a no improve showing 20% of the people at before benefits stage and the same in after benefit stage.

The final income group, i.e., greater than 150000, also showed no improvement. Starting with insignificant number of people in before benefit stage and ultimately remained in the same stage.

The graphical representations of the data are given in Figure 5.129.

Figure 5.129:Changes In Income Level Of Beneficiaries- Lac Bangle Making

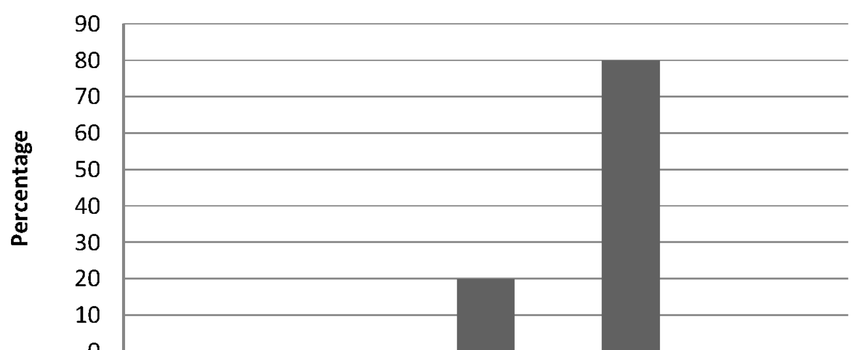


	less than equal to 40000	41000-80000	81000-150000	greater than 150000
BEFORE BENEFIT	40	40	20	0
AFTER BENEFIT	20	60	20	0

Evaluation of Impact of Lac Bangle Making

Willingness to obtain the benefit: In this parameter, the willingness of the participants was taken into consideration. 20% of the participants were moderately willing and 80% were highly willing to obtain the benefit. This status of willingness was described graphically in Figure 5.130.

Figure 5.130: Status Of Willingness Of Beneficiaries To Obtain The Benefit- Lac Bangle Making



	NO	LOW	MODERATE	HIGH	VERY HIGH
Series1	0	0	20	80	0

Changes in living condition after receiving the benefits: In this parameter, the changes in living condition of the beneficiaries after receiving the benefits were taken into consideration. Where 60% were moderately in changed condition, 20% were highly changed after receiving the benefit. This status of changes in living conditions was described graphically in Figure 5.131.

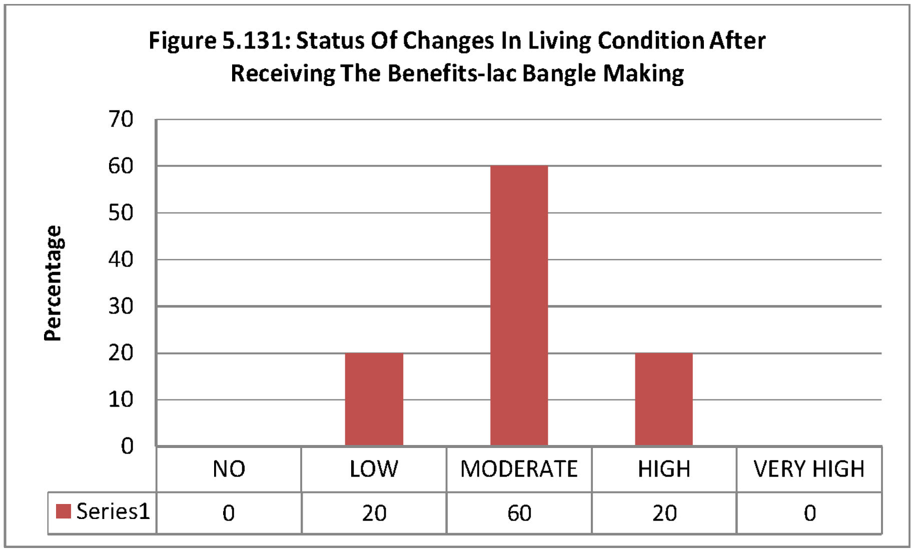


Figure 5.131: Status Of Changes In Living Condition After Receiving The Benefits-lac Bangle Making

Level of direct benefit received from the programme: In this parameter, the extent of benefits, which was directly obtained by the beneficiaries, was taken into consideration. 100% were moderately benefitted.

Level of indirect benefit received from the programme: In this parameter, the extent of benefits, which was indirectly obtained by the beneficiaries, was taken into consideration. 60% were moderately benefitted, again 20% were highly benefitted. This status of indirect benefits was described graphically in Figure 5.132.

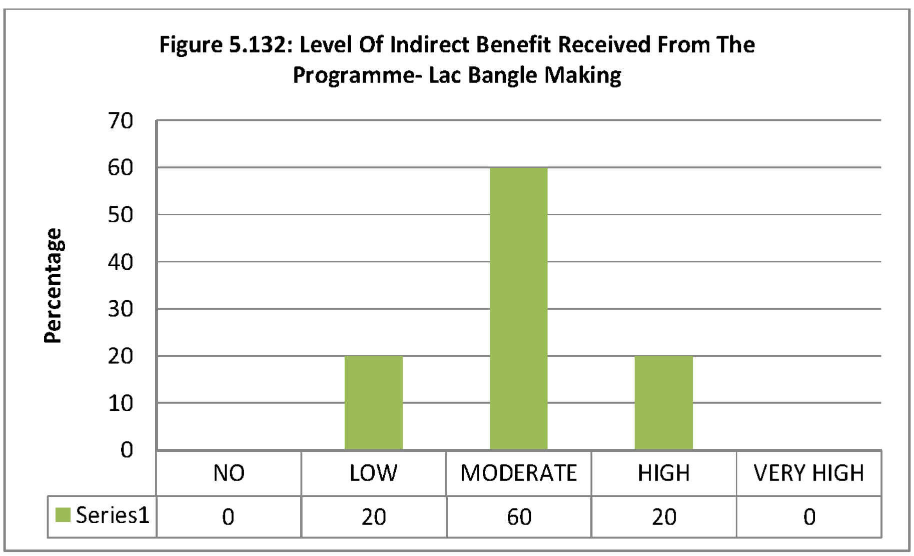
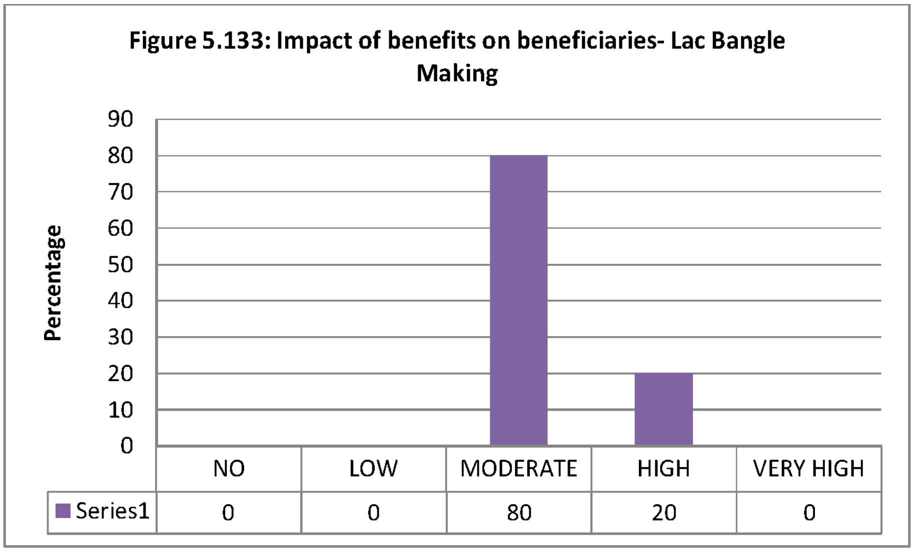
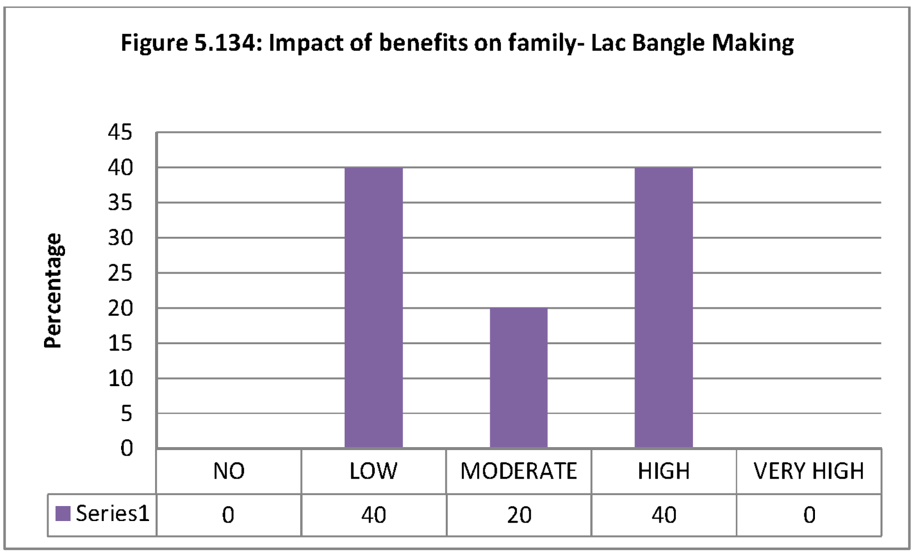


Figure 5.132: Level Of Indirect Benefit Received From The Programme- Lac Bangle Making

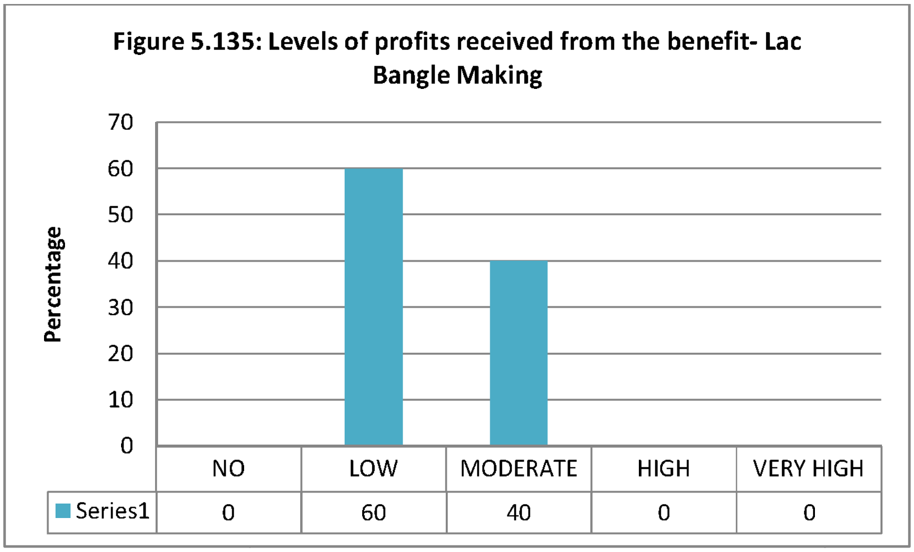
Impact of benefits on individual: In this parameter, the extent of benefits, on individual beneficiaries, was taken into consideration. 80% showed moderate impact of benefit, 20% responded for high impact of benefit. This status of indirect benefits was described graphically in Figure 5.133.



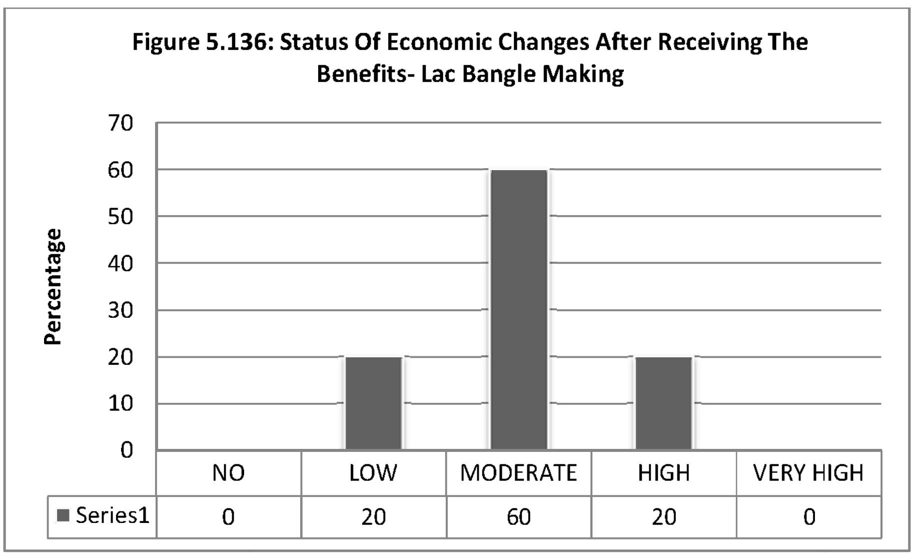
Impact of benefits on whole family: In this parameter, the extent of benefits, on family basis, was taken into consideration. 20% shown moderate impact of benefit, 40% responded for high impact of benefit. This status of indirect benefits was described graphically in Figure 5.134.



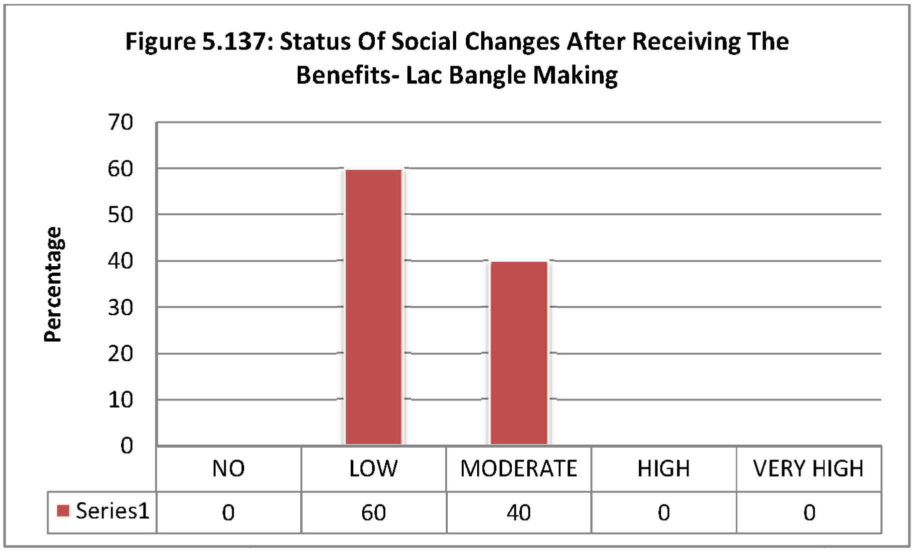
Levels of profits received from the benefits: In this parameter, the extent of profits earned from the benefits to the beneficiaries, was taken into consideration. 40% shown moderate profit earned from benefit. This status of indirect benefits was described graphically in Figure 5.135.



Economic changes after receiving the benefits: In this parameter, the economic changes after receiving the benefits to the beneficiaries, was taken into consideration. 60% showed moderate economic changes from benefit, 20% of them responded for high economic changes. This status of indirect benefits was described graphically in Figure 5.136.



Social changes after receiving the benefits: In this parameter, the social changes after receiving the benefits to the beneficiaries, was taken into consideration. 40% showed moderate social changes from benefit. This status of indirect benefits was described graphically in Figure 5.137.



5.2.10 Kamdhenu Project

Livestock play a central role in our work, both as a strategy for alleviating poverty and achieving food security and proper nutrition.

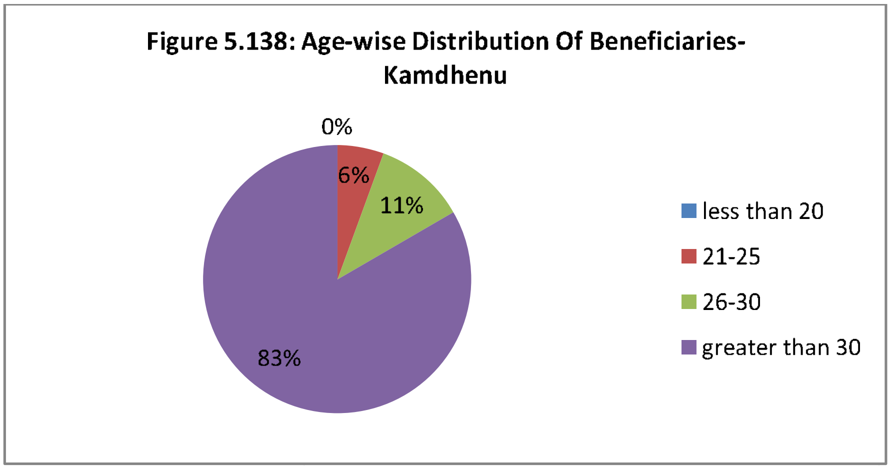
Livestock provide food and nutrition for people, while also giving them tangible assets with which they can improve their livelihoods. Each country program has a tailored approach to animal health and husbandry, based on local resources and livestock.

The attention to sustainable livestock development includes improved access to animal health services and disease control, improved management, improved nutrition and improved marketing of livestock and livestock products.

In FY 2018-2019, 3 Days residential training Programme was conducted to emphasize cow based livelihood and organic farming, organized by APL. The data of Churdi village is provided as follows:

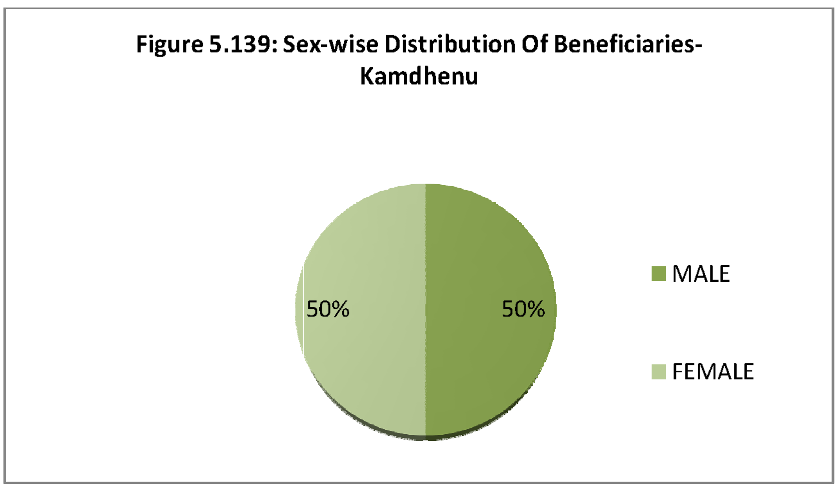
Socio-Economic Profile of Beneficiaries

- **Age:** the age wise distribution and percentage of the beneficiaries those who benefited by the mushroom cultivation process are given in Figure 5.138.



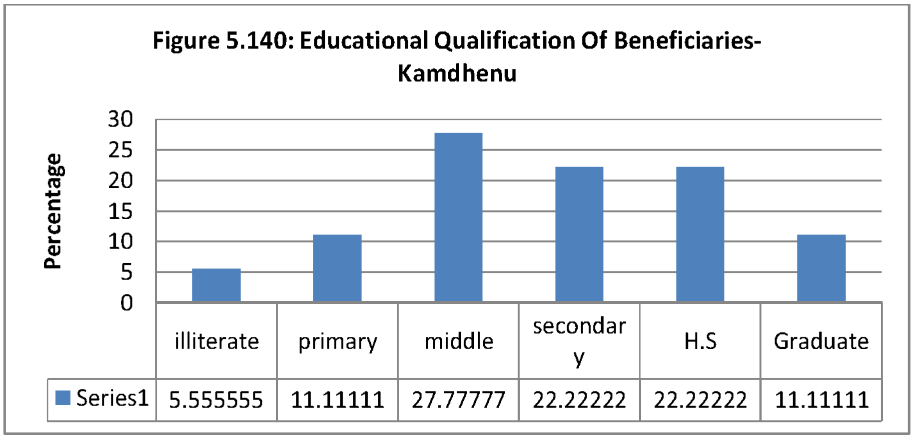
From the above-mentioned figure it is clear that near 83% of the benefited people are greater than 30 years, and 11% people are in between 26-30 years and 6% people are in between 21-25 years of age group.

- **Sex**: sex wise distribution of the beneficiaries are shown in Figure 5.139.



From the Figure 5.139 we can get sex distribution where the percentage of male beneficiaries is 50% and female beneficiaries is 50%.

Educational Qualification: the educational qualifications of the beneficiaries are given in Figure 5.140.



From the above mentioned figure it is shown that the education qualification of the benefited people are divided in categories i.e, illiterate 5%, primary 11%, middle nearly 28%, secondary 22%, H.S 22% and graduate 11%.

Changes in Occupation & Income Level of Beneficiaries

The status of occupation before receiving the benefits and after receiving the benefits are given as follows:

From the analysis it is clear that there is very little changes take place within the beneficiaries. Before receiving the benefit, 100% of the beneficiaries were farmers. After receiving the benefits, the same percentage was maintained in case of farmers.

The status of changes in income level before & after receiving the benefits is given as follows:

From the above data we can get a clear picture about the income changes after receiving the benefits. For the category less than or equal to 40000, the percentage of people before receiving the benefits was 33%, whereas after receiving the benefits, only 11% remained in this income group.

In the next category, i.e., 41000-80000 before benefit percentage was 33%, and in after benefit case, the percentage increased to 38%, showing a little of nearly 17% increase.
For the subsequent class, i.e., 81000-150000, there was a significant improvment showing nearly 17% of the people at before benefits stage and 33% in after benefit stage, showing 100% of massive growth.

The final income group, i.e., greater than 150000, showed no improvement. Starting with nearly 17% of people in before benefit stage and ultimately remained in the same stage.

The graphical representations of the data are given in Figure 5.141.

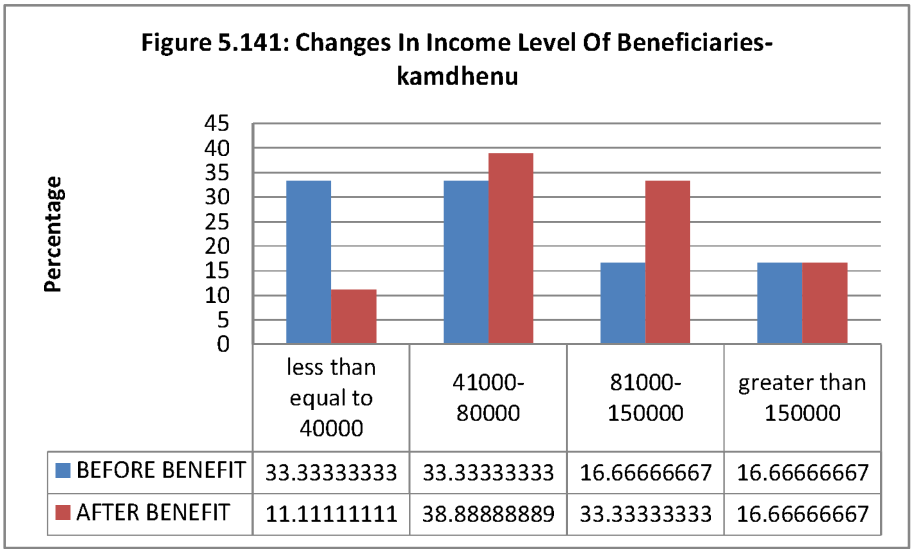


Figure 5.141: Changes In Income Level Of Beneficiaries-kamdhenu

Evaluation of Impact of Kamdhenu Programme

Willingness to obtain the benefit: In this parameter, the willingness of the participants was taken into consideration. 33% of the participants were moderately willing , 61% were highly willing. This status of willingness was described graphically in Figure 5.142.

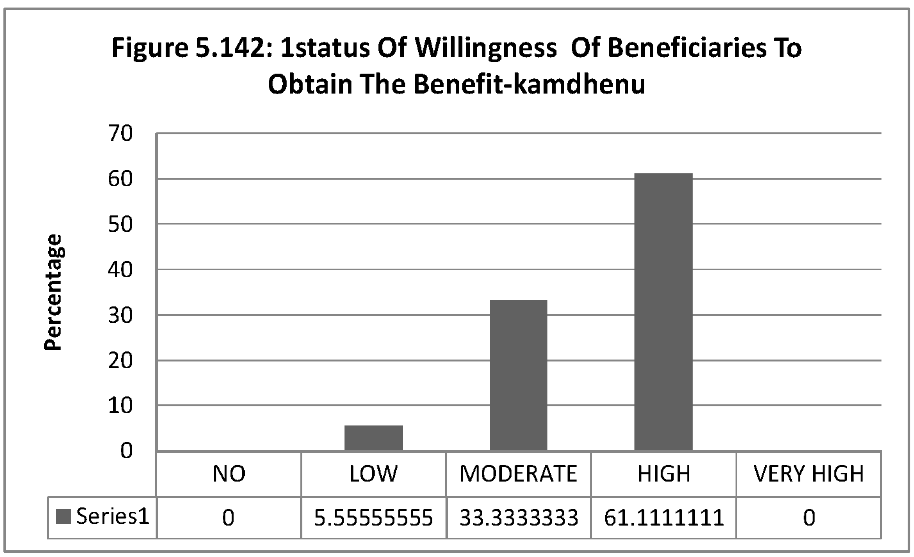
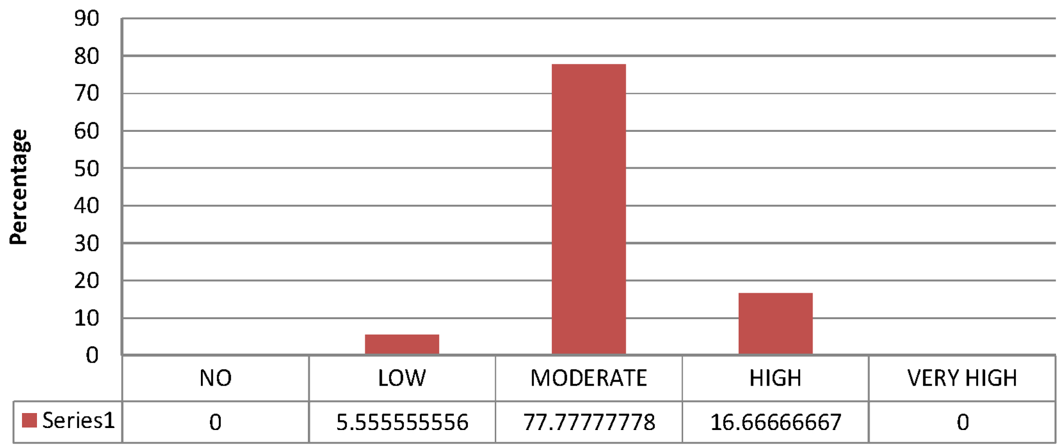


Figure 5.142: 1status Of Willingness Of Beneficiaries To Obtain The Benefit-kamdhenu

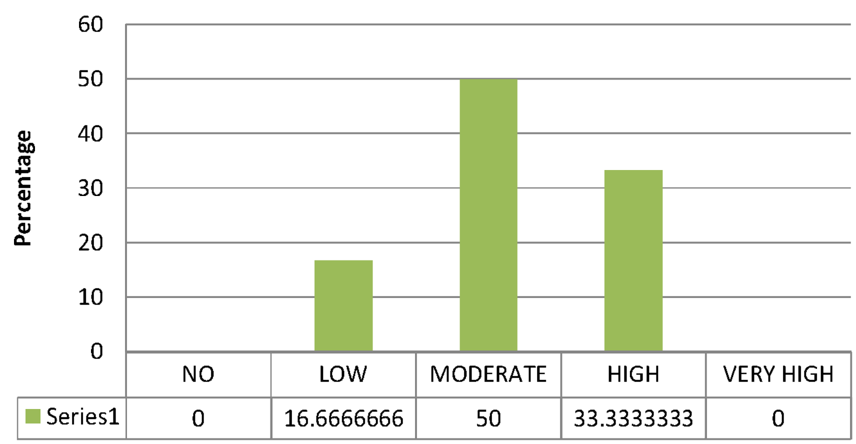
Changes in living condition after receiving the benefits: In this parameter, the changes in living condition of the beneficiaries after receiving the benefits were taken into consideration. where nearly 78% were moderately in changed condition, 16% were highly changed after receiving the benefit. This status of changes in living conditions was described graphically in Figure 5.143.

Figure 5.143: Status Of Changes In Living Condition After Receiving The Benefits-kamdhenu

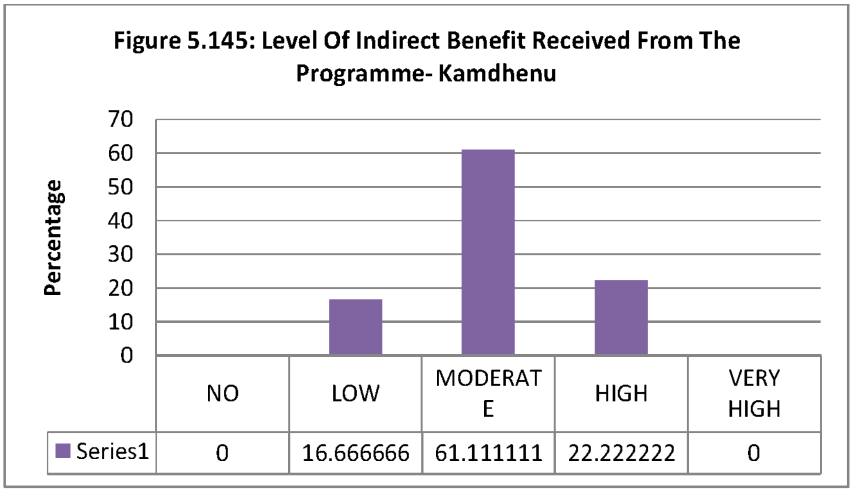


Level of direct benefit received from the programme: In this parameter, the extent of benefits, which was directly obtained by the beneficiaries, was taken into consideration. 50% were moderately benefitted, 33% were highly benefitted. The level of direct benefit received from the programme are graphically represented in Figure 5.144.

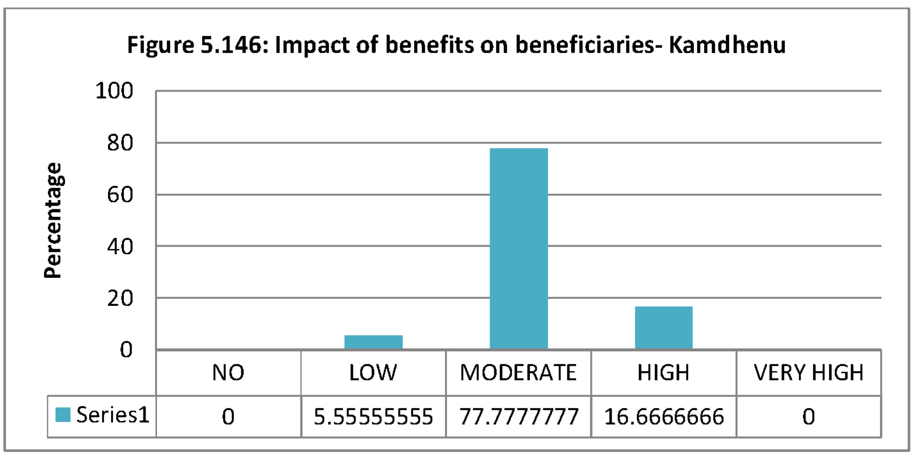
Figure 5.144: Level Of Direct Benefit Received From The Programme- Kamdhenu



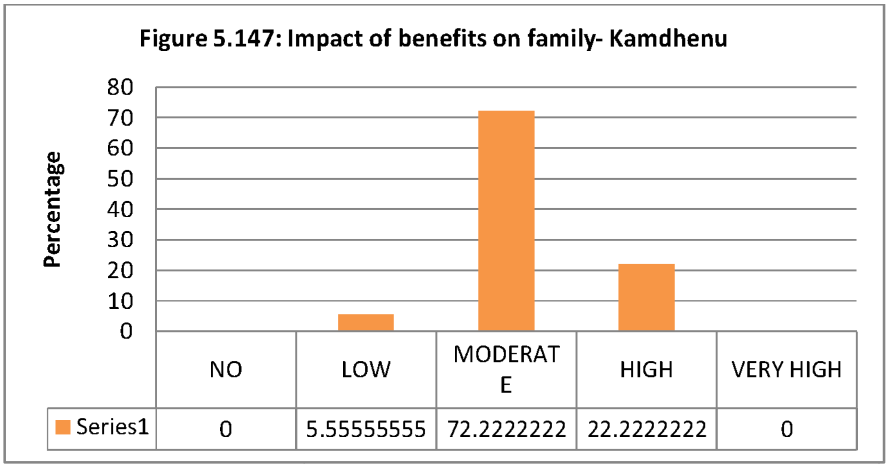
Level of indirect benefit received from the programme: In this parameter, the extent of benefits, which was indirectly obtained by the beneficiaries, was taken into consideration. 61% were moderately benefitted, 22% were highly benefitted. This status of indirect benefits was described graphically in Figure 5.145.



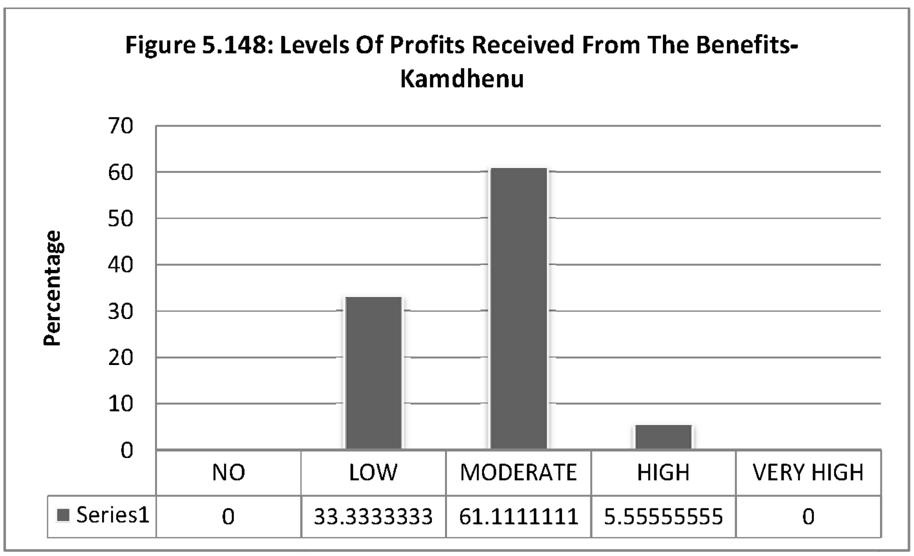
Impact of benefits on individual: In this parameter, the extent of benefits, on individual beneficiaries, was taken into consideration. Nearly 78% showed moderate impact of benefit, nearly 17% responded for high impact of benefit. This status of indirect benefits was described graphically in Figure 5.146.



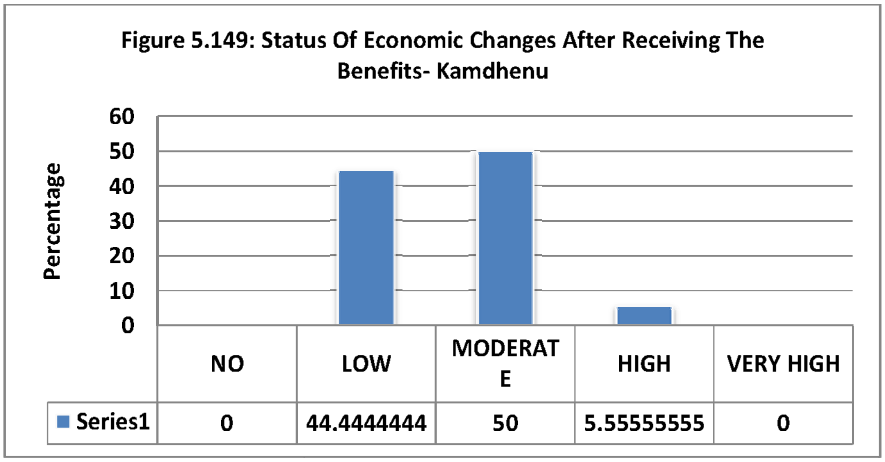
Impact of benefits on whole family: In this parameter, the extent of benefits, on family basis, was taken into consideration. 72% shown moderate impact of benefit, 22% responded for high impact of benefit. This status of indirect benefits was described graphically in Figure 5.147.



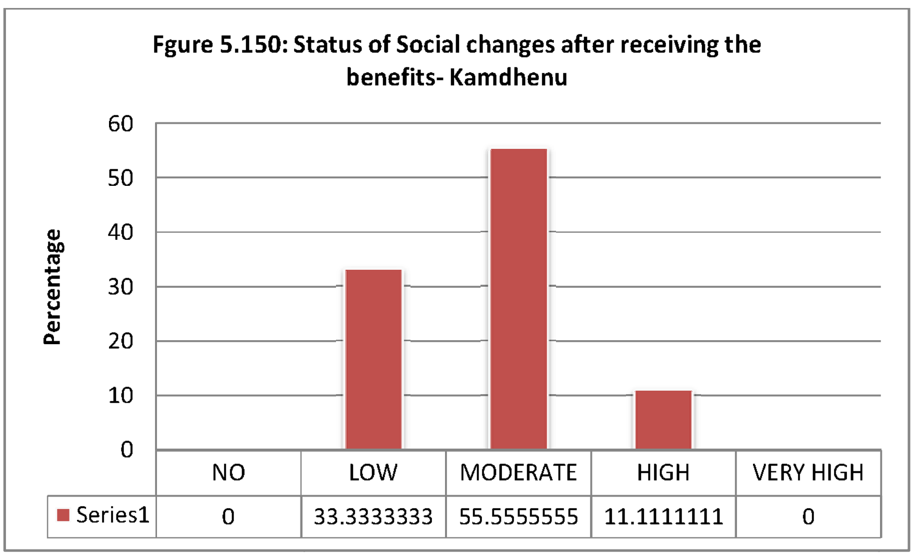
Levels of profits received from the benefits: In this parameter, the extent of profits earned from the benefits to the beneficiaries, was taken into consideration. 61% shown moderate profit earned from benefit, 5% responded for high profit. This status of indirect benefits was described graphically in Figure 5.148.



Economic changes after receiving the benefits: In this parameter, the economic changes after receiving the benefits to the beneficiaries, was taken into consideration. 50% showed moderate economic changes from benefit, 5% of them responded for high economic changes. This status of indirect benefits was described graphically in Figure 5.149.



Social changes after receiving the benefits: In this parameter, the social changes after receiving the benefits to the beneficiaries, was taken into consideration. 55% showed moderate social changes from benefit, 11% responded for high social changes from benefit. This status of indirect benefits was described graphically in Figure 5.150.



5.2.11 Saksham - Electrician Skill Development Programme (ASDC)

The Learning intervention has been designed to be an occupationally based, short term learning programme. When successfully completed by the learner, it constitutes credits towards a qualification. The National Skill Development Corporation India (NSDC) was setup as a one of its kind, Public Private Partnership Company with the primary mandate of catalysing the skills landscape in India. NSDC is a unique model created with a well thought through underlying philosophy based on the following pillars:

1. Create: Proactively catalyse creation of large, quality vocational training institutions.
2. Fund: Reduce risk by providing patient capital. Including grants and equity.
3. Enable: the creation and sustainability of support systems required for skill development.

This includes the Industry led Sector Skill Councils.

The main objectives of the NSDC are to:

- Upgrade skills to international standards through significant industry involvement and develop necessary frameworks for standards, curriculum and quality assurance
- Enhance, support and coordinate private sector initiatives for skill development through appropriate Public-Private Partnership (PPP) models; strive for significant operational and financial involvement from the private sector
- Play the role of a "market-maker" by bringing financing, particularly in sectors where market mechanisms are ineffective or missing
- Prioritize initiatives that can have a multiplier or catalytic effect as opposed to one-off impact.

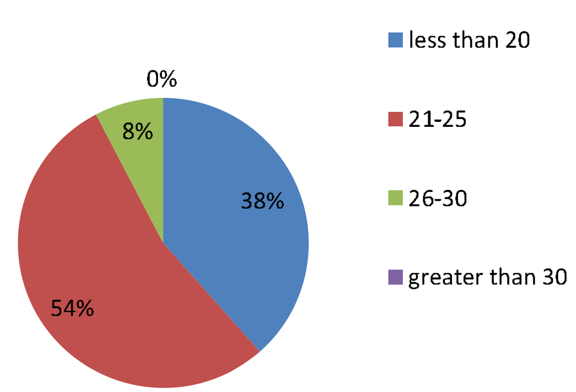
SAKSHAM - Adani Skill Development center has been inaugurated in Tiroda under the guidence od NSDC. In FY 2017- 2018 Under the programme SAKSHAM the Adani foundation avails three months residential training on Welding Technician and Assistant Electrician, transforming the life of the village youths and especially tribal youths from remote areas. During the course of training, these participants are acquainted of computer literacy, basic knowledge of English speaking, personality development etc.

In the villages named, Chandori, Wakeshwar, Khursipar, Pathari, Sale Kurd, Yed Makot, Chikhala moil, Ghorpad the SAKSHAM workshop on electrician training was provided and te outcomes are discussed as follows:

Socio-Economic Profile of Beneficiaries

- **AGE:** the age wise distribution and percentage of the beneficiaries those who benefited by the electritian programme are given in Figure 5.151.

Figure 5.151: Age-wise Distribution Of Beneficiaries- Electrician (Saksham)



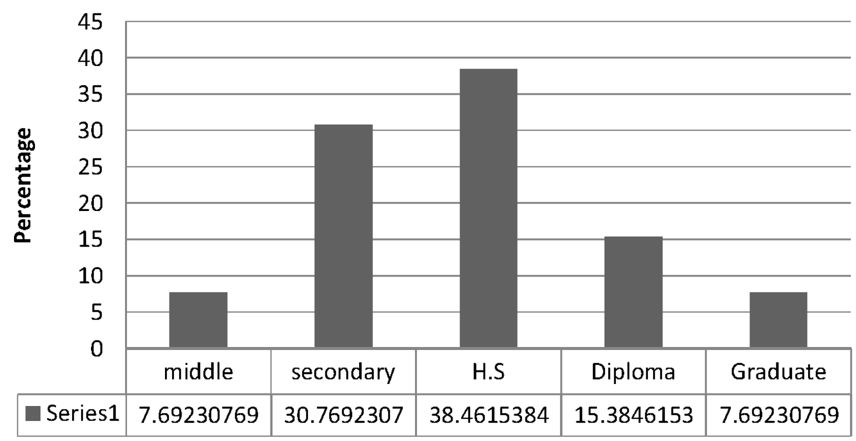
From the above-mentioned figure it is clear that insignificant number of the benefited people are greater than 30 years, and 8% people are in between 26-30 years and 54% people are in between 21-25 years of age group and 38% people belonged to less than 20 age group.

- **Sex**: sex wise distribution of the beneficiaries are shown below

From the analysis we can get sex distribution where the percentage of male beneficiaries is 100%

EDUCATIONAL QUALIFICATION: the educational qualifications of the beneficiaries are given in Figure 5.152.

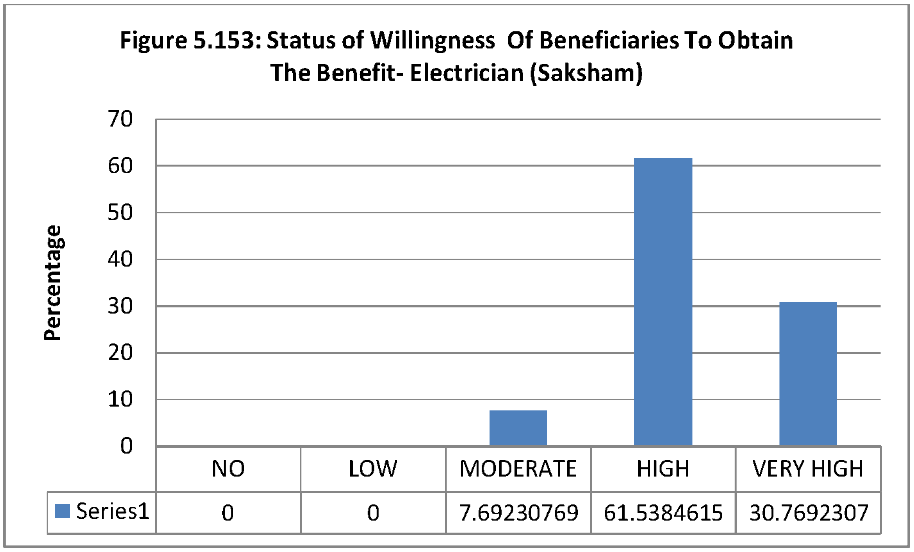
Figure 5.152: Educational Qualification Of Beneficiaries-Electrician (Saksham)



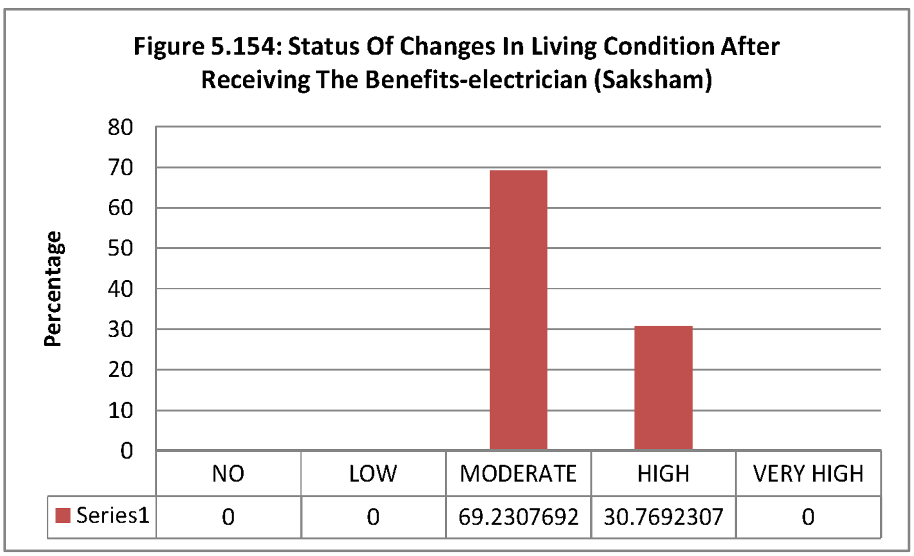
From the above mentioned figure it is shown that the education qualification of the benefited people are divided in categories i.e, middle nearly 8%, secondary nearly 31%, H.S 38% and graduate nearly 8%.

Evaluation of Impact of Electrical Skill Development

Willingness to obtain the benefit: In this parameter, the willingness of the participants was taken into consideration. Nearly 8% of the participants were moderately willing , 61.5% were highly willing and nearly 31% of them was very highly willing to obtain the benefit. This status of willingness was described graphically in Figure 5.153.

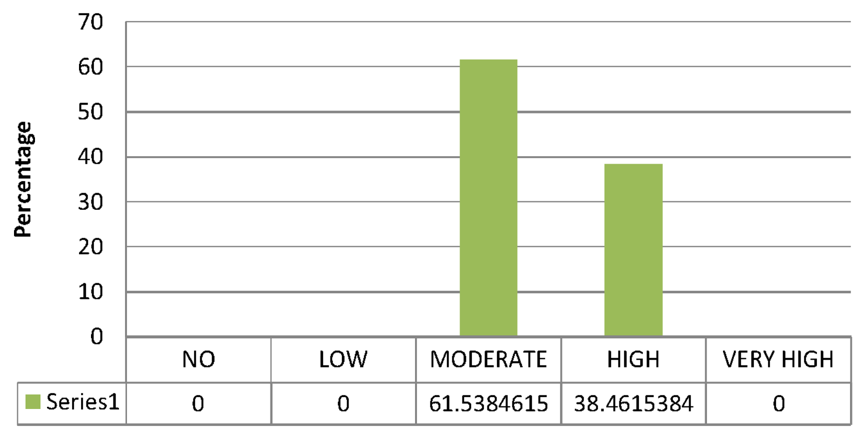


Changes in living condition after receiving the benefits: In this parameter, the changes in living condition of the beneficiaries after receiving the benefits were taken into consideration. Where 69% were moderately in changed condition, nearly 31% were highly changed after receiving the benefit. This status of changes in living conditions was described graphically in Figure 5.154.



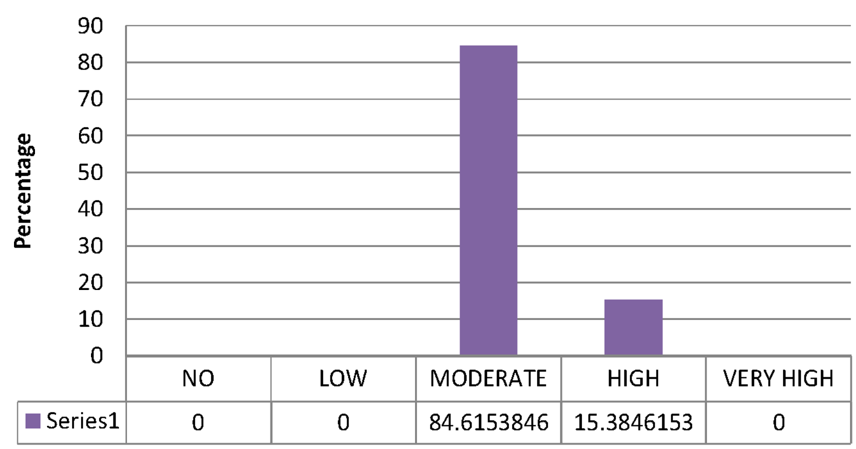
Level of direct benefit received from the programme: In this parameter, the extent of benefits, which was directly obtained by the beneficiaries, was taken into consideration. 61.5% were moderately benefitted, 38% were highly benefitted. The level of direct benefit received from the programme are graphically represented in Figure 5.155.

Figure 5.155: Level Of Direct Benefit Received From The Programme- Electrician (Saksham)

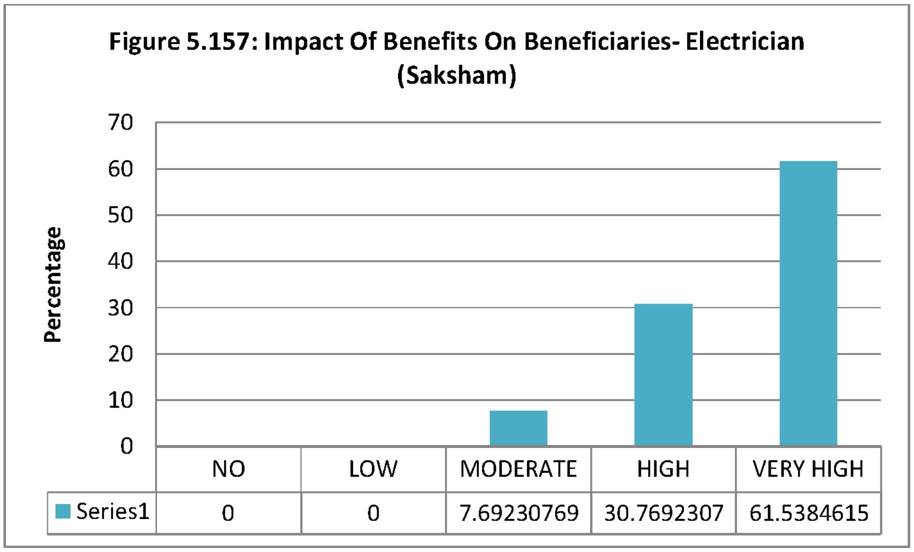


Level of indirect benefit received from the programme: In this parameter, the extent of benefits, which was indirectly obtained by the beneficiaries, was taken into consideration. Nearly 85% were moderately benefitted, 15% were highly benefitted. This status of indirect benefits was described graphically in Figure 5.156.

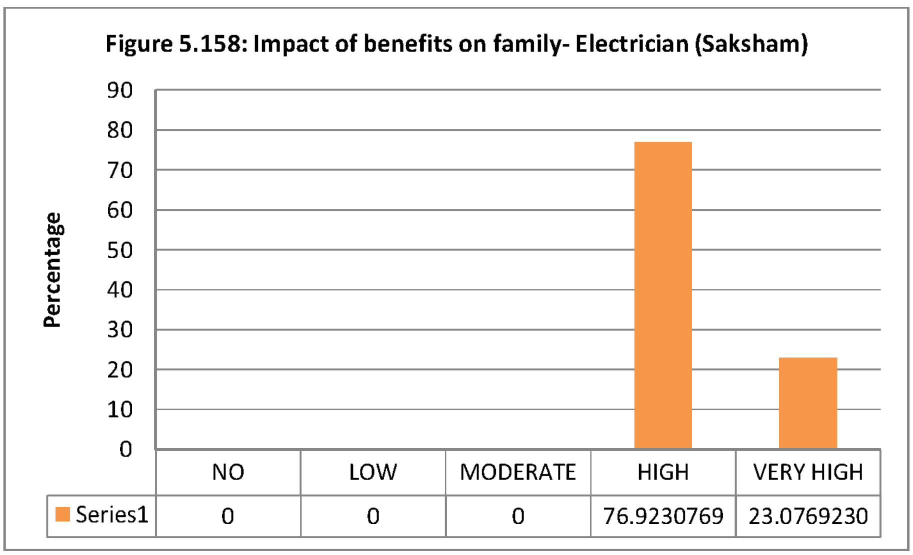
Figure 5.156: Level Of Indirect Benefit Received From The Programme- Electrician (Saksham)



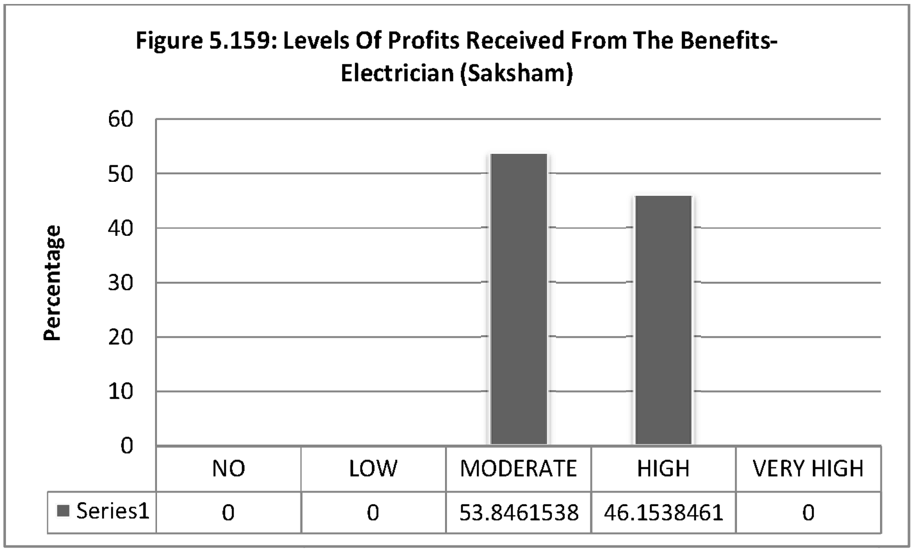
Impact of benefits on individual: In this parameter, the extent of benefits, on individual beneficiaries, was taken into consideration. Nearly 8% showed moderate impact of benefit, nearly 31% responded for high impact of benefit and 61.5% showed very high impact of benefit. This status of indirect benefits was described graphically in Figure 5.157.



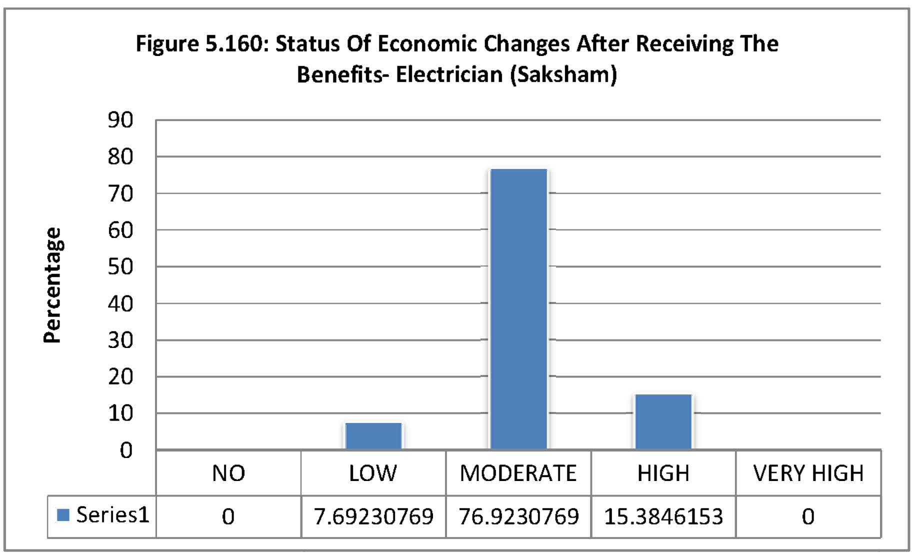
Impact of benefits on whole family: In this parameter, the extent of benefits, on family basis, was taken into consideration. Nearly 77% responded for high impact of benefit and 23% of the families showed very high impact of benefit. This status of indirect benefits was described graphically in Figure 5.158.



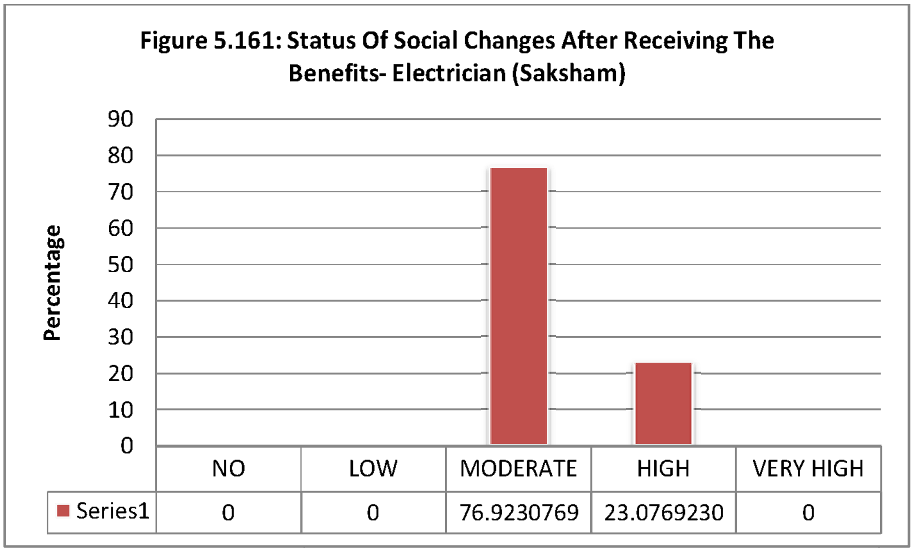
Levels of profits received from the benefits: In this parameter, the extent of profits earned from the benefits to the beneficiaries, was taken into consideration. Nearly 54% shown moderate profit earned from benefit, 46% responded for high profit earned from benefit. This status of indirect benefits was described graphically in Figure 5.159.



Economic changes after receiving the benefits: In this parameter, the economic changes after receiving the benefits to the beneficiaries, was taken into consideration. Nearly 77% showed moderate economic changes from benefit, 15% of them responded for high economic changes from benefit. This status of indirect benefits was described graphically in Figure 5.160.



Social changes after receiving the benefits: In this parameter, the social changes after receiving the benefits to the beneficiaries, was taken into consideration. Nearly 77% showed moderate social changes from benefit, 23%esponded for high social changes from benefit. This status of indirect benefits was described graphically in Figure 5.161.



5.2.12 Saksham- Welding Skill Development Programme (ASDC)

Welding is the process of joining metals by melting the parts and then using a filler to form a joint. It can be done using different energy sources, from a gas flame or electric arc to a laser or ultrasound.

There are different welding processes in use in modern times:

Arc welding is done through the use of an electrical current, and can be performed by using inexpensive equipment.

Gas Welding is widely used for repair work, especially in anything involving pipes and tubes. It is common in the jewelry industry, as well as for connecting plastics and other materials that cannot stand higher temperatures.

Resistance welding involves the use of additional sheets of metal to encase the pieces to be welded together. It is the most environmentally-friendly of all methods, but it requires costly equipment that cannot be used in all situations.

Energy beam welding, also known as laser beam welding, is one of the most modern techniques used. This method is fast and accurate, but the high equipment cost makes it prohibitive for many industries.

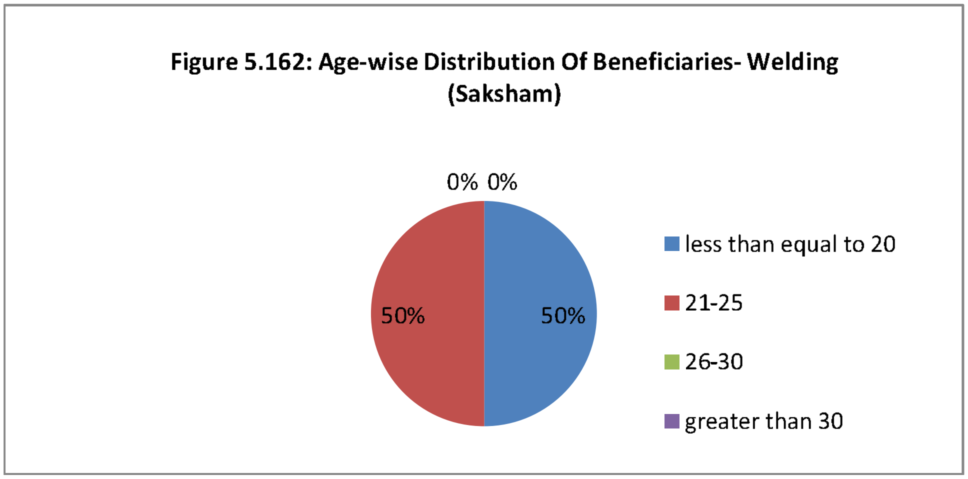
A welder fabricates and puts together metal parts. They do this through the use of various machines that create intense heat to. They also smooth and polish the metal surfaces once welded together. Welders must have the ability to study blueprints or project specifications in addition to calculating the dimensions of the parts to be welded. Welders also inspect materials or structures that need welding, monitor the process of welding as a caution for overheating, and maintain welding machinery and equipment they work with.

In their CSR project Adani foundation has implemented Welding training as a part of their skill devdelopment programme SAHSHAM at Lendezaki,Fattepur,Buenatoke,Warthi

Bhadara,Parsodi, Ramatola, Raje Gaon, Ganesh pur,Jungitola and Banjaeitola villages. The outcome from the villagaes are analyzed as follows:

Socio-Economic Profile of Beneficiaries

- **AGE:** the age wise distribution and percentage of the beneficiaries those who benefited by the electritian programme are given in Figure 5.162.



From the above-mentioned figure it is clear that insignificant number of the benefited people are greater than 30 years, and 50% people are in between 21-25 years of age group and 50% people belonged to less than 20 age group.

- **Sex**: sex wise distribution of the beneficiaries are shown below

From the Figure 5.162 we can get sex distribution where the percentage of male beneficiaries is 100%.

Educational Qualification: the educational qualifications of the beneficiaries are given in Figure 5.163.

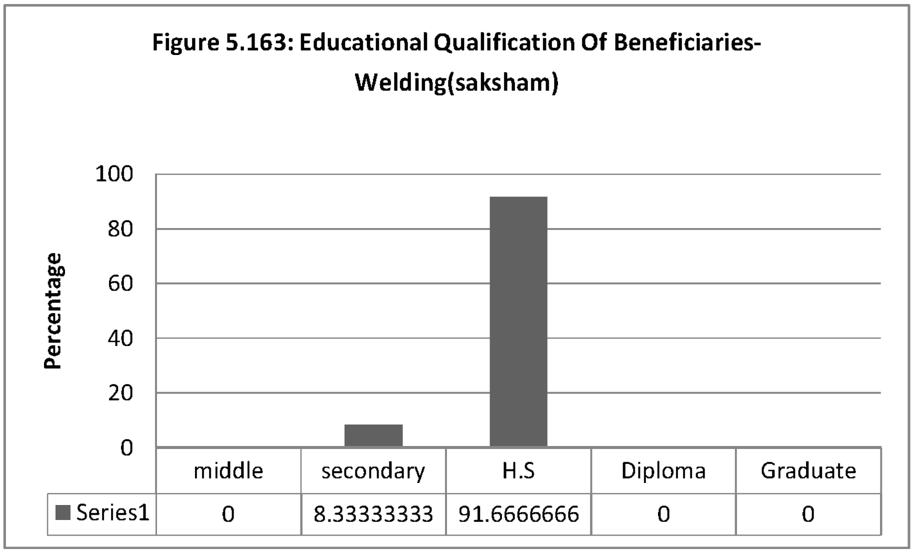


Figure 5.163: Educational Qualification Of Beneficiaries-Welding(saksham)

From the above mentioned figure it is shown that the education qualification of the benefited people are divided in categories i.e, secondary nearly 8.33%, H.S 92%.

Evaluation of Impact of Welding Skill Development

Willingness to obtain the benefit: In this parameter, the willingness of the participants was taken into consideration. nearly 8.33% of the participants were moderately willing , 83.3% were highly willing and nearly 8.33% of them was very highly willing to obtain the benefit. This status of willingness was described graphically in Figure 5.164.

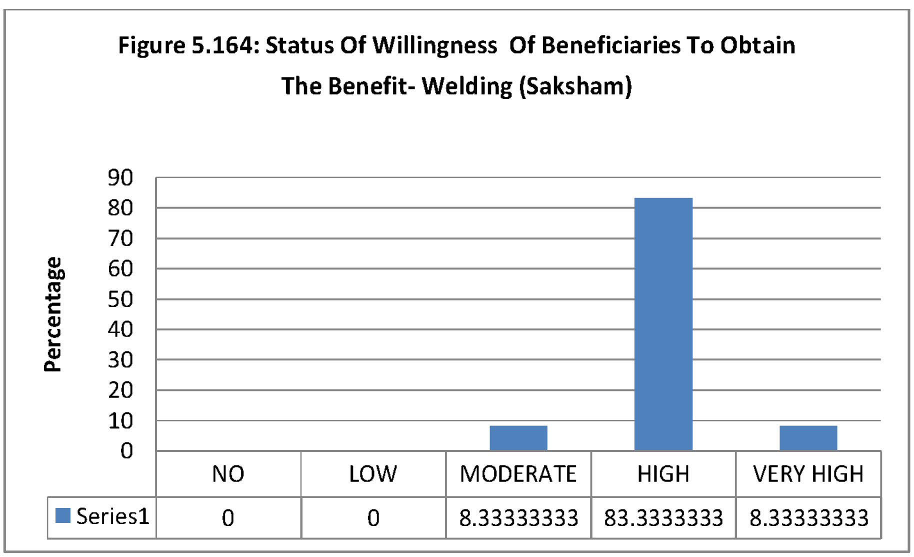
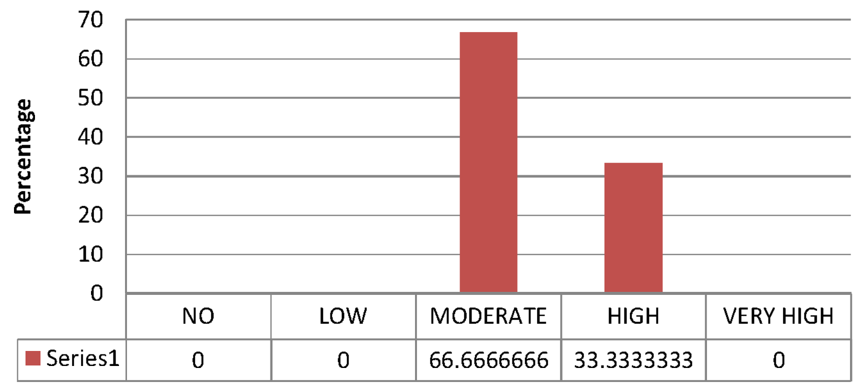


Figure 5.164: Status Of Willingness Of Beneficiaries To Obtain The Benefit- Welding (Saksham)

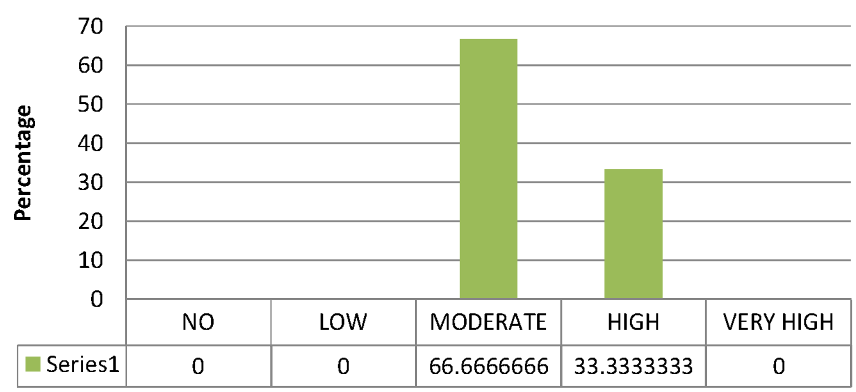
Changes in living condition after receiving the benefits: In this parameter, the changes in living condition of the beneficiaries after receiving the benefits were taken into consideration. Where 67% were moderately in changed condition, nearly 33% were highly changed after receiving the benefit. This status of changes in living conditions was described graphically in Figure 5.165.

Figure 5.165: Status Of Changes In Living Condition After Receiving The Benefits-welding (Saksham)



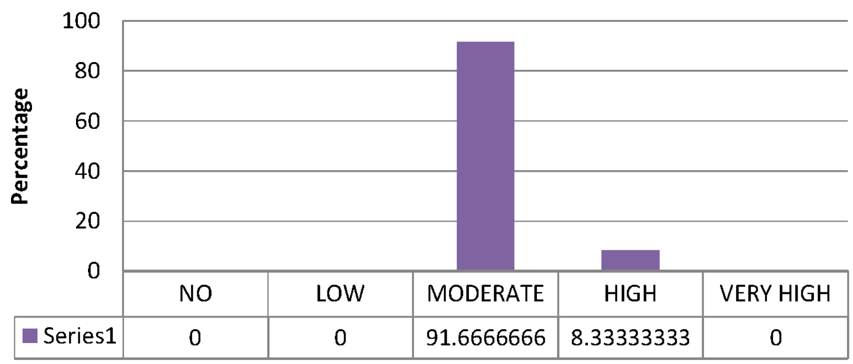
Level of direct benefit received from the programme: In this parameter, the extent of benefits, which was directly obtained by the beneficiaries, was taken into consideration. 67% were moderately benefitted, 33% were highly benefitted. The level of direct benefit received from the programme are graphically represented in Figure 5.166.

Figure 5.166: Level Of Direct Benefit Received From The Programme- Welding (Saksham)



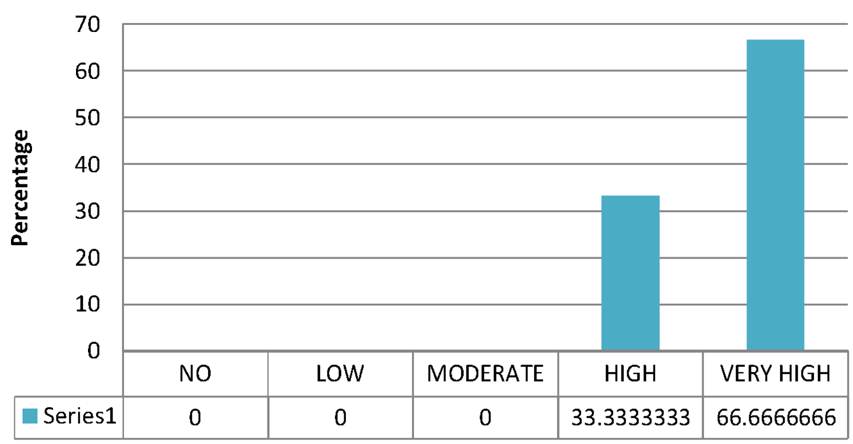
Level of indirect benefit received from the programme: In this parameter, the extent of benefits, which was indirectly obtained by the beneficiaries, was taken into consideration. Nearly 92% were moderately benefitted, 8% were highly benefitted. This status of indirect benefits was described graphically in Figure 5.167.

Figure 5.167: Level Of Indirect Benefit Received From The Programme- Welding (Saksham)

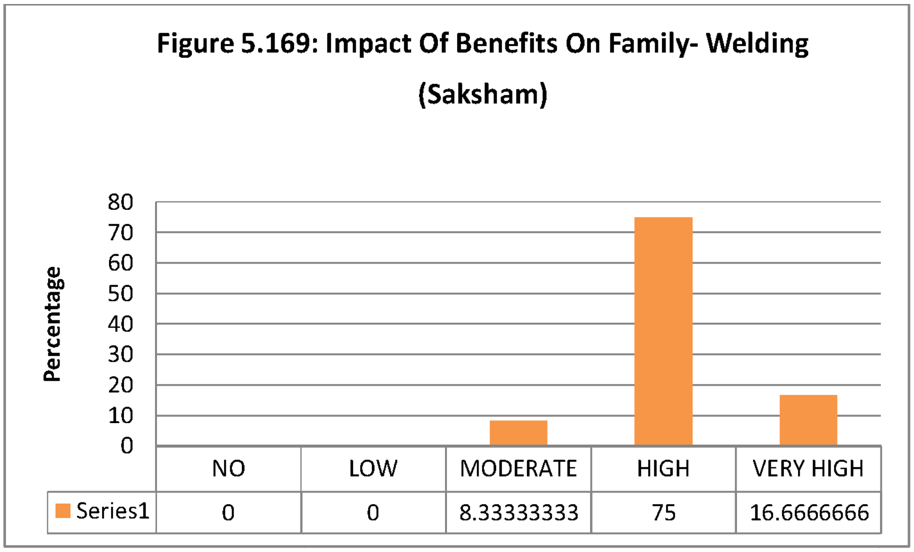


Impact of benefits on individual: In this parameter, the extent of benefits, on individual beneficiaries, was taken into consideration. Nearly 33% responded for high impact of benefit and 67% showed very high impact of benefit. This status of indirect benefits was described graphically in Figure 5.168.

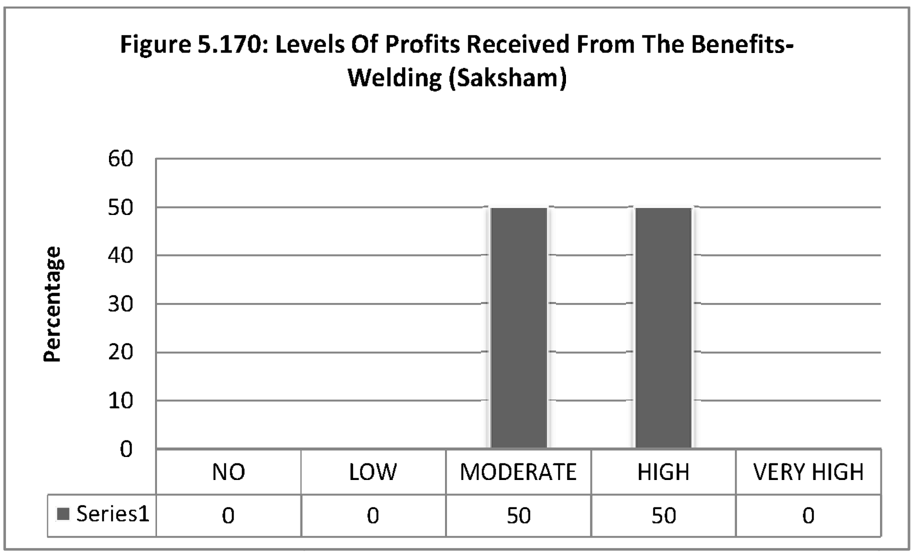
Figure 5.168: Impact Of Benefits On Beneficiaries- Welding (Saksham)



Impact of benefits on whole family: In this parameter, the extent of benefits, on family basis, was taken into consideration. 8.33%moderate impact of benefit, nearly 75% responded for high impact of benefit and 17% of the families showed very high impact of benefit. This status of indirect benefits was described graphically in Figure 5.169.

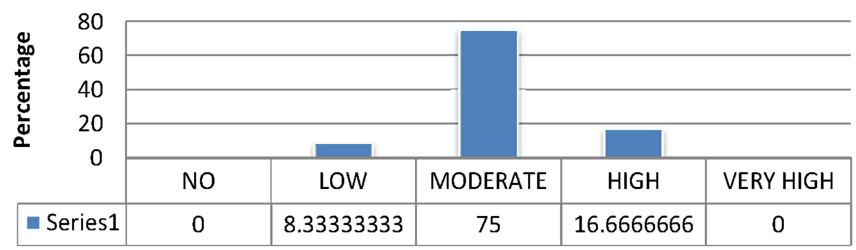


Levels of profits received from the benefits: In this parameter, the extent of profits earned from the benefits to the beneficiaries, was taken into consideration. Nearly 50% shown moderate profit earned from benefit, 50% responded for high profit earned from benefit. This status of indirect benefits was described graphically in Figure 5.170.



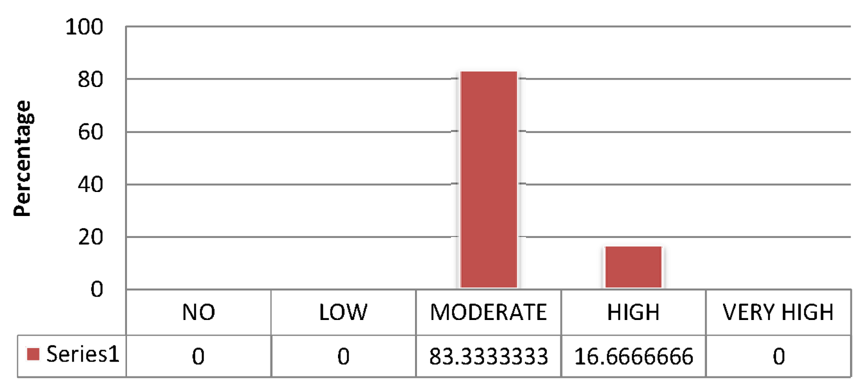
Economic changes after receiving the benefits: In this parameter, the economic changes after receiving the benefits to the beneficiaries, was taken into consideration. Nearly 75% showed moderate economic changes from benefit, 17% of them responded for high economic changes from benefit. This status of indirect benefits was described graphically in Figure 5.171.

Figure 5.171: Status Of Economic Changes After Receiving The Benefits- Welding (Saksham)



Social changes after receiving the benefits: In this parameter, the social changes after receiving the benefits to the beneficiaries, was taken into consideration.Nearly 83% showed moderate social changes from benefit, 17%esponded for high social changes benefit. This status of indirect benefits was described graphically in Figure 5.172.

Figure 5.172: Status Of Social Changes After Receiving The Benefits- Welding (Saksham)



5.2.13 Saksham - Nursing Skill Development Programme (ASDC)

Nurse education consists of the theoretical and practical training provided to nurses with the purpose to prepare them for their duties as nursing care professionals. This education is provided to nursing students by experienced nurses and other medical professionals who have qualified or experienced for educational tasks. Most countries offer nurse education courses that can be relevant to general nursing or to specialized areas including mental health nursing, pediatric nursing and post-operatory nursing. Courses leading to autonomous registration as a nurse typically last four years. Nurse education also provides post-qualification courses in specialist subjects within nursing.

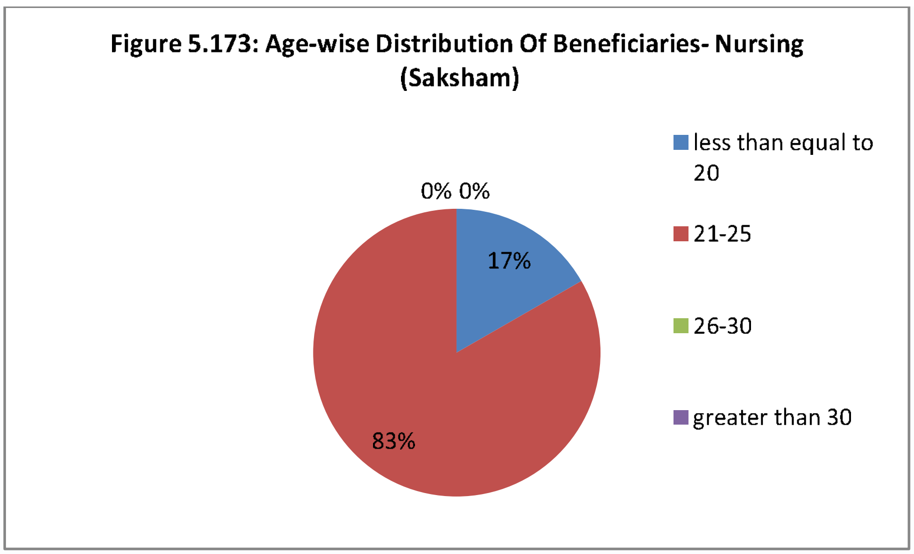
Poor education and a lack of sufficient knowledge can lead to mistakes that are costly for people's health. Improved knowledge is an essential tool for prevention of errors and providing higher quality care.

Education and understanding best practice care delivery is more than numbers earned each year; it's a commitment to being a professional, keeping up-to-date, continuously seeking to improve, and ultimately a commitment to provide individuals with the best care.

In their CSR project Adani foundation has implemented Welding training as a part of their skill devdelopment programme SAHSHAM at Pathri,Bhandara,Nabatola,Owara,Mandbi,and Dhamnewadavillages. The outcome from the villagaes are analyzed as follows:

Socio-Economic Profile of Beneficiaries

- **Age:** the age wise distribution and percentage of the beneficiaries those who benefited by the electritian programme are given in Figure 5.173.



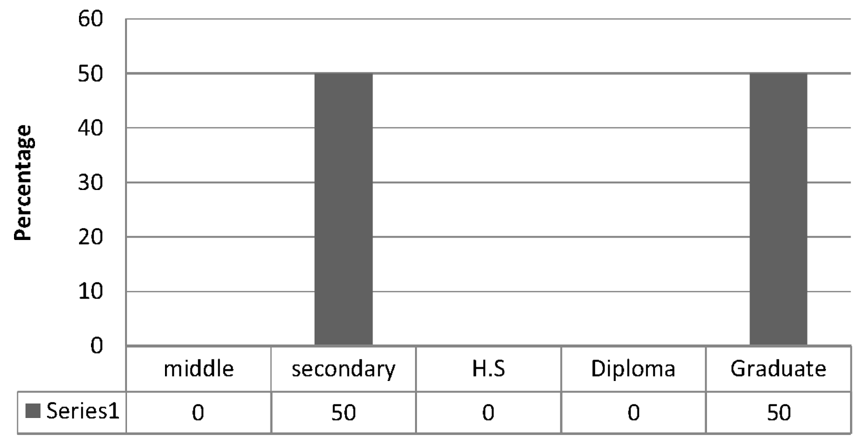
From the above-mentioned figure it is clear that insignificant number of the benefited people are greater than 30 years, and 83% people are in between 21-25 years of age group and 17% people belonged to less than 20 age group.

- **SEX**: sex wise distribution of the beneficiaries are shown below

From the analysis we can get sex distribution where the percentage of female beneficiaries is 100%.

Educational Qualification: the educational qualifications of the beneficiaries are given in Figure 5.174.

Figure 5.174: Educational Qualification Of Beneficiaries-Nursing(saksham)

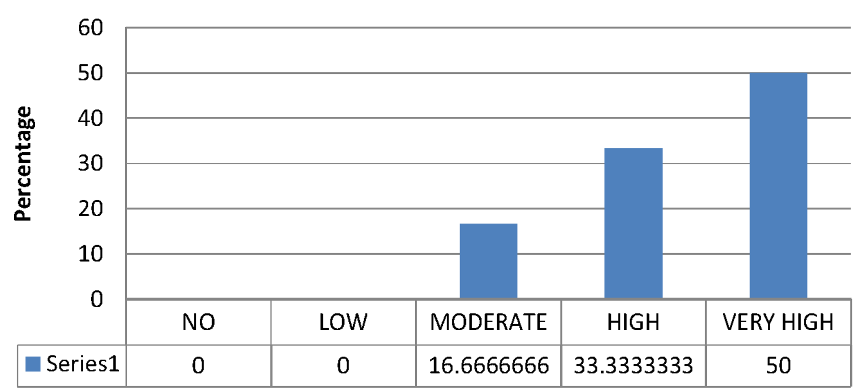


From the above mentioned figure it is shown that the education qualification of the benefited people are divided in categories i.e, secondary 50% and graduate 50%.

Evaluation of Impact of Nurshing Assistant Skill Development

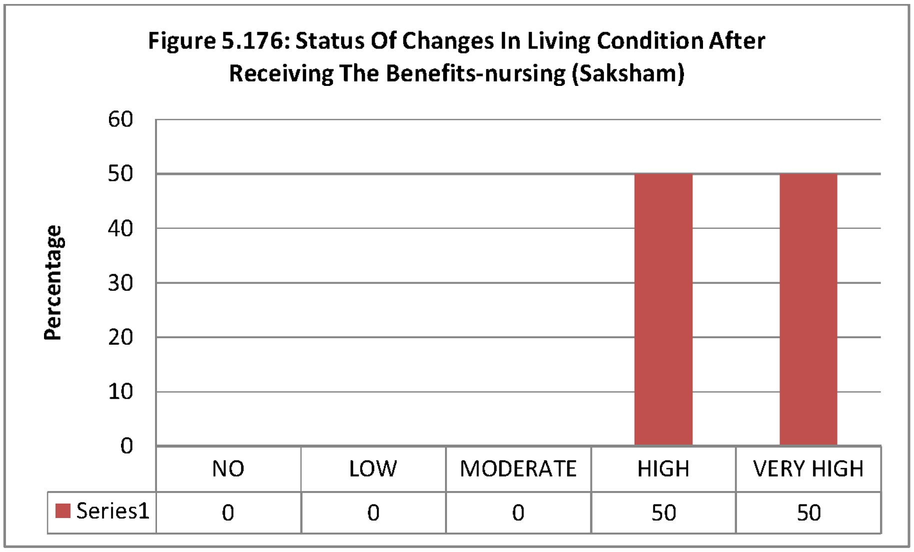
Willingness to obtain the benefit: In this parameter, the willingness of the participants was taken into consideration. Nearly 17% of the participants were moderately willing , 33% were highly willing and nearly 50% of them was very highly willing to obtain the benefit. This status of willingness was described graphically in Figure 5.175.

Figure 5.175: Status Of Willingness Of Beneficiaries To Obtain The Benefit- Nursing (Saksham)

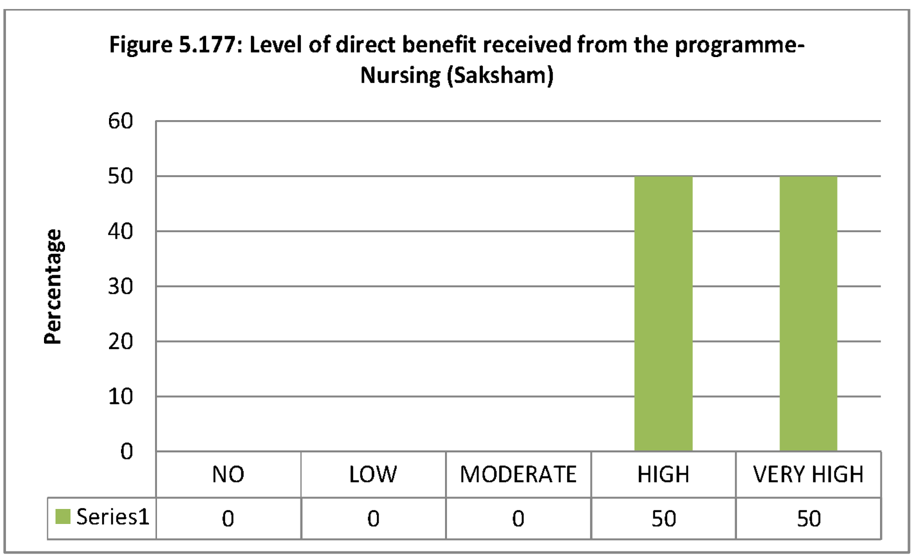


Changes in living condition after receiving the benefits: In this parameter, the changes in living condition of the beneficiaries after receiving the benefits were taken into consideration.

50% were highly changed and 50% was very highly changed after receiving the benefit. This status of changes in living conditions was described graphically in Figure 5.176.



Level of direct benefit received from the programme: In this parameter, the extent of benefits, which was directly obtained by the beneficiaries, was taken into consideration. 50% were highly benefitted and 50% were very highly benefited. The level of direct benefit received from the programme are graphically represented in Figure 5.177.



Level of indirect benefit received from the programme: In this parameter, the extent of benefits, which was indirectly obtained by the beneficiaries, was taken into consideration. 33% were highly benefitted and nearly 67% were very highly benefited. This status of indirect benefits was described graphically in Figure 5.178.

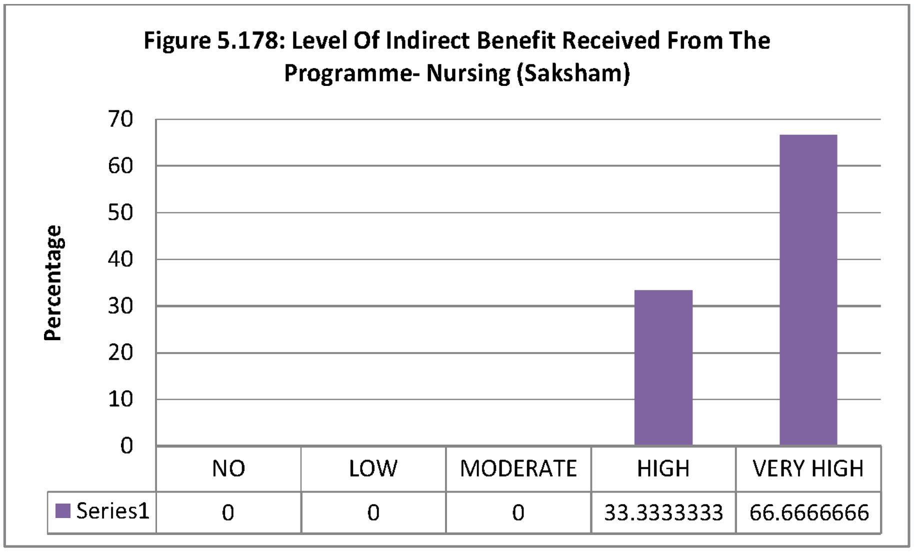


Figure 5.178: Level Of Indirect Benefit Received From The Programme- Nursing (Saksham)

Impact of benefits on individual: In this parameter, the extent of benefits, on individual beneficiaries, was taken into consideration. nearly 33% responded for high impact of benefit and 67% showed very high impact of benefit. This status of indirect benefits was described graphically in Figure 5.179.

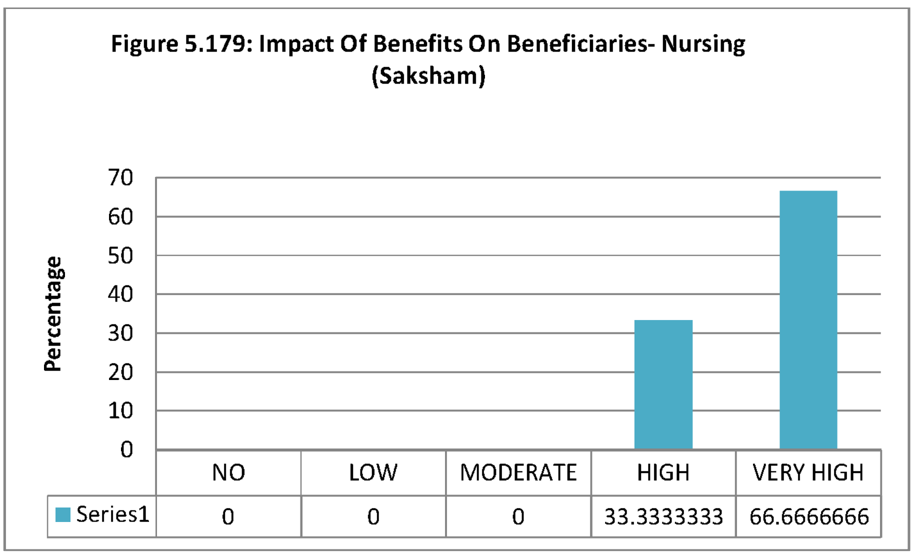
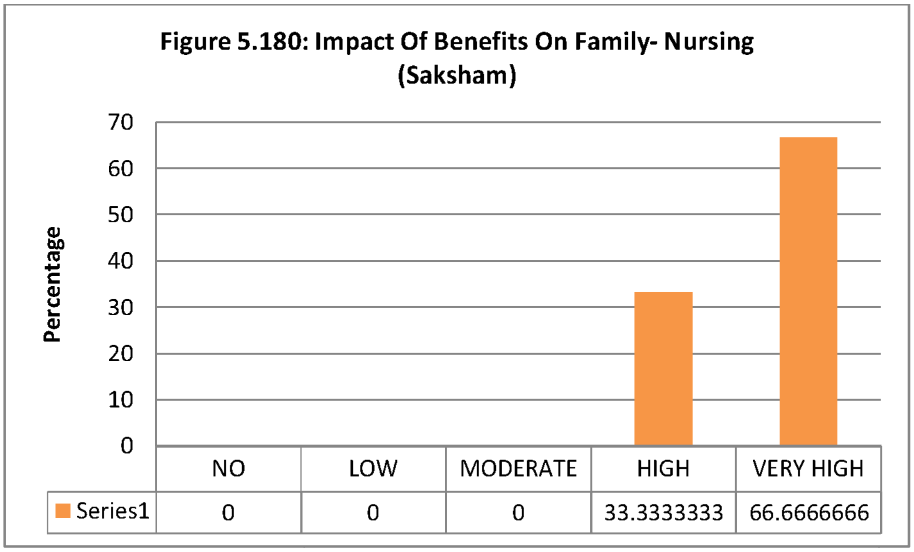
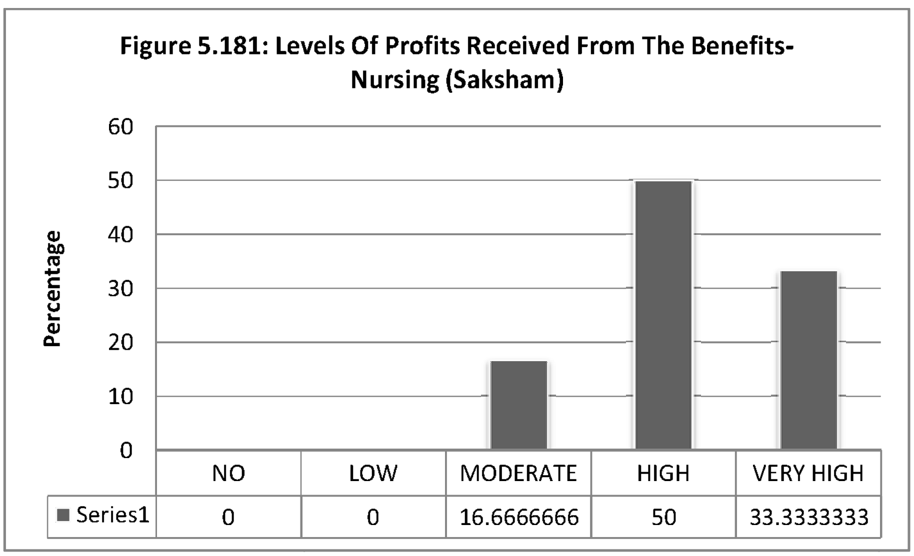


Figure 5.179: Impact Of Benefits On Beneficiaries- Nursing (Saksham)

Impact of benefits on whole family: In this parameter, the extent of benefits, on family basis, was taken into consideration. 33% responded for high impact of benefit and nearly 67% of the families showed very high impact of benefit. This status of indirect benefits was described graphically in Figure 5.180.



Levels of profits received from the benefits: In this parameter, the extent of profits earned from the benefits to the beneficiaries, was taken into consideration. Nearly 17% shown moderate profit earned from benefit, 50% responded for high profit and nearly 34% responded for very high level of profit earned from benefit. This status of indirect benefits was described graphically in Figure 5.181.



Economic changes after receiving the benefits: In this parameter, the economic changes after receiving the benefits to the beneficiaries, was taken into consideration. Nearly 17% showed moderate economic changes from benefit, 33% of them responded for high economic changes and 50% showed very high level of economic changes from benefit. This status of indirect benefits was described graphically in Figure 5.182.

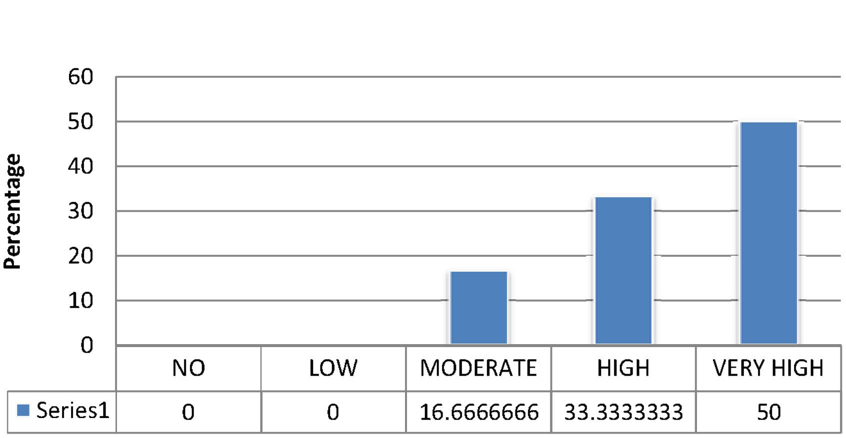


Figure 5.182: Status Of Economic Changes After Receiving The Benefits- Nursing (Saksham)

Social changes after receiving the benefits: In this parameter, the social changes after receiving the benefits to the beneficiaries, was taken into consideration. Nearly 17% showed moderate social changes from benefit, 83% responded for high social changes from benefit. This status of indirect benefits was described graphically in Figure 5.183.

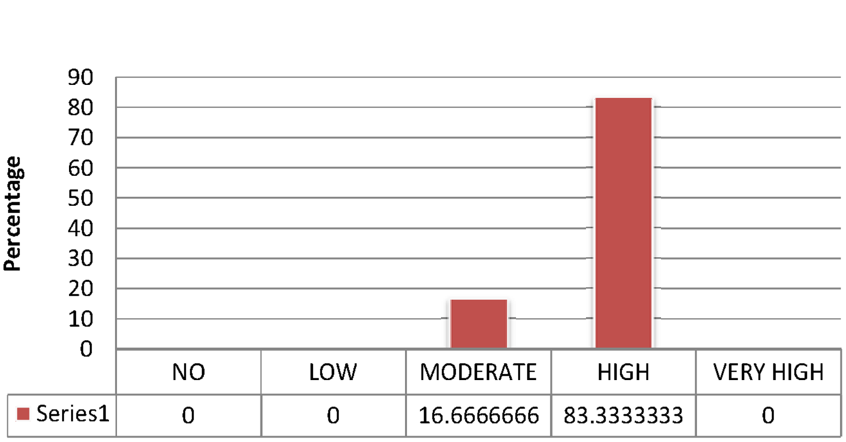


Figure 5.183: Status Of Social Changes After Receiving The Benefits- Nursing (Saksham)

CHAPTER VI

SOCIAL AUDIT OF CSR ACTIVITIES

CHAPTER 6
SOCIAL AUDIT OF CSR ACTIVITIES

APL has always endeavored to be a leader in community development (CD) and corporate performance, which can be measured in terms of economic, social, and environmental impacts. Further, specifically on CD, APL is governed by the CSR policy formulated in August, 2014 (Annexure 2.1). APL CSR policy is primarily governed by Section 135 of the Companies Act, 2013, which was passed by both Houses of the Parliament, and had received the assent of the President of India on 29 August 2013 on CSR and also conforms to the guidelines of CSR for central public sector enterprises, issued by the Department of Public Enterprises, Ministry of Heavy Industries, and Public Enterprises, Government of India.

6.1 IDENTIFICATION OF CSR PROJECTS

As per the APL's CSR policy, August 2014, the first step of planning is identification of broad activities. The broad activities closely linked with the long-term social development goal and objectives and adhere to the practice of sustainable development. An indicative list of prime areas of intervention is placed at Table 6.1. The list is only indicative and not exhaustive. However, the key focus of CSR projects were on facilitating infrastructure provision for qualitative improvement in health, education, access to water/sanitation, and improved roads.

TABLE 6.1: INDICATIVE LIST OF MAJOR AREAS OF INTERVENTIONS FOR COMMUNITY DEVELOPMENT

Sl. No.	Area of Intervention for CSR Activities
1	Drinking water facility
2	Education
3	Improving the quality of life of girl child
4	Improving lives of vulnerable persons such as physically challenged, destitute women, widow
5	Improving lives of scheduled caste and scheduled tribe people
6	Electricity
7	Solar lighting system
8	Health and family welfare
9	Irrigation facilities
10	Sanitation and public health
11	Grazing land development
12	Promotion of sports and games
13	Promotion of art and culture
14	Promotion of livelihood for economically weaker sections through forward and backward linkages
15	Relief of victims of natural calamities like earthquake, cyclone, drought, flood situation in any country
16	Supplementing development programs of the government
17	Construction of community centres/ night shelters/ old age homes

18	Imparting vocational training
19	Setting up of skill development centers
20	Adoption of villages
21	Scholarships to meritorious students belonging to SC, ST, OBC and disabled categories
22	Adoption or construction of hostels (especially those for SC/ST and girls)
23	Skill training, entrepreneurship development and placement assistance programs for youth
24	Building roadways, pathways, and bridges
25	Entrepreneurship development programmes
26	Activities related to improvement of livestock
27	Capacity building of the project affected persons to improve their employability

6.2 IDENTIFICATION OF CSR PROJECT AREA

The geographical area for implementation of the CSR project extends to entire CSR zone of TTPP. Under the Tiroda CSR zone, there are altogether 69 CSR villages, which have been identified on the basis of their proximity with the TTPP along with the magnitude of impact. The detail of CSR zone of TTPP has been already presented in earlier chapter.

6.3 ACTION PLANS FOR CSR ACTVITIES

Action plan involves empowering project affected persons (PAPs), community and the target villages in a phased manner and for an identified planned period. This involves the basic and immediate needs of the PAPs, community and target villages, such as roads, school, health, sanitation and drinking water-related plans, and projects.

A three phased CSR action plan (CSRAP) plan has been prepared:

Long-term Plan: Long-term perspective social development plan for 20 years, which is in accordance with the long-term corporate plan of Adani Foundation. The plan includes the overall social development in the vicinity of Tiroda TPP.

Medium-term Plan: Medium-term project plan for five years, which is in coherence with the APML business plan. The plan considers different sector specific projects such as education, health, infrastructure development and sustainable livelihood in the vicinity of TirodaTPP.

Short-term Plan: Short-term action plan for one year which is in accordance with APML's annual target plan. The plan includes the activities to be undertaken in a particular year under the medium term plans.

The phase wise action plan for undertaking CSR activities in TirodaCSR zone is presented in subsequent section:

6.3.1 Identification of Area for CSR Activities

The need based community development work is being undertaken in the CSR villages as an integral part of the TTPP under CSR activities. These facilities may also be available to the host population and the neighbouring community and facilitate socio-economic development of the area. The facilities/ amenities may include following:

- Strengthening of educational facilities
- Strengthening of medical facilities
- Strengthening of sanitation facilities
- Strengthening of drinking water facilities
- Strengthening of vetetrinary facilties
- Setting up of skill development centre/ Adoption of ITI
- Strengthening of irrigation facilities
- Women & child empowerment
- Community hall/panchayat ghar
- Strengthening of cultural and sports facilities
- Tree plantation, etc.
- Internal and link/approach road with proper drainage
- Infrastructural strengthening for rural electrification

The land for developing above facilities is being provided by the State Government. The infrastructural facilities shall be set up by TTPP on the basis of assurance from the State Government that it will take over the infrastructural facilities and maintain it properly.

Special emphasis for community developmental work is being given to the villages/hamlets, which are falling close to the TTPP as well as water intake. The need assessment survey for community development in the CSR villages had indicated for undertaking the following programmes at GP level:

- Strenghtening of educational facilities

- Strengthening of Medical & Sanitation facilities

- Strengthening of Inter-village roads within the GP

- Sustainable Livelihood Development

- Water conservation and management for domestic and agricultural needs

- Afforestation on roadside and other government vacant lands under the possession of local Panchayat and Block authority

The above mentioned programme are being undertaken in association with State Government and concerned District authority.

Development programmes for the selected CSR villages include:

- Intra-village concrete roads
- Development of village drinking water facilities
- Development of rain water harvesting system
- Strengthening of infrastructural facilities in primary schools
- Formation and development of Self Help Groups / Mahila Samitis
- Skill Development Programmes with special emphasis on vulnerable groups
- Social and farm forestry for fuel, fodder and other domestic needs
- Strengthening of cultural and sports facilities

APML has been continuously working towards the improvement of the quality of life of the people in the communities surrounding their plants. The following measures are being undertaken for minimizing the adverse impacts on socio-economy and parameters of human interest:

- Communication with the local community had been institutionalized and done on regular basis by the AF-APML authorities to provide an opportunity for mutual discussion to undertake CSR activities.

- AF-APML authorities organize regular awareness programmes to bring forth beneficial aspects of the project and social welfare measures, being undertaken for improving their Quality of Life.

- For social welfare activities being undertaken by the AF-APML authorities, collaboration has been sought with local administration, Gram Panchayat, Block Development/Tehsil Offices etc. for better co-ordination, records and also to approach the public.

- Providing skill development training to the women folk as part of welfare activities greatly enhanced and improved their economic strength. Self help groups for women are being encouraged in nearby CSR villages and proper skill upgradation training are being imparted besides encouraging local entrepreneurship around the project activities.

- Job oriented skill training courses have been organized through Adani Skill Development Center (ASDC) as well as Industrial Training Institutions (ITI) for Educated Youth (both for male and female), like Welding, Electrical, Nurshing, computer, tailoring, mushroom cultivation, agarbatti making, lac bangle making and other project related specific trades.

- Regular awareness and sensitization programmes are being organized involving women participation in conservation efforts and creating awareness about environmental pollution and health, encouraging respect for local traditions and religious beliefs and promoting local folk dance and music.

- Awareness programmes are being organized to help and educate the local people about the Disaster Management as well as Environmental and Social Management in the project area in association with local administration.

- Some of the community development schemes include tree plantation on avenue roads and other open spaces, providing free health check-up facility and medicines to the poor villagers, providing assistance to construct school building, providing scholarships to deserving and needy students, giving educational aids to poor students, constructing community centers at selected CSR villages, strengthening drinking water facilities like tube-wells & installation of RO Plant in some villages, sponsoring sports tournaments and summer coaching camps, etc.

It has been observed that the constraints of accessing civic amenities are primarily associated with the inappropriate governance and institutional arrangements in managing and monitoring of the services and lack of community involvement in operation and management of services which is resulting unsustainable financing and poor implementation of various developmental schemes of Central as well as State Government.

There is a need for strengthening an execution process for civic amenities and to establish a strong local governance institution supported by an appropriate monitoring framework and taking into account the following issues:

- ➢ Strengthening of intra village road along with drainage facilities.

- ➢ Adequate drinking water facilities in most of the CSR villages.

- ➢ A clear focus of measurable improvements in health services.

- ➢ Individual sanitation with proper solid waste and waste water disposal system.

- ➢ Providing teaching aids viz., bench, desk, computer, etc. and developing the sports facilities in primary/secondary schools.

- ➢ Providing additional support to Angandwadi Centers with nutritional food and recreational aspects in mind.

- ➢ Providing street lighting facility, preferably solar powered to ensure regularity of light at night.

- ➢ Involvement of all the major stakeholders in community development programme i.e. identification, implementation as well as sunsequent operation and maintenance of the same.

The most pressing health needs identified by the representatives of the community include:

- Organize preventive healthcare campaign in the CSR villages.
- Organize regular health camps and/or run a mobile clinic.
- Make community access to reproductive health information and services.
- Increase access to better quality drugs, especially anti-malarial drugs and for water borne diseases.
- Promote sanitation practices which includes construction of closed drainage systems.

The key needs for intervention in education include:

- School stakeholders including teachers, parents, panchayat representatives, etc. needed to be consulted thoroughly and identify their role and functions for delivery of quality education
- Expansion of school services, e-learning tools/kits, learning ambience, infrastructural facilities, sports facilities, improve Mid-Day-Meal (MDM)
- Some schools require additional infrastructure facilities (classrooms, boundary wall, drinking water treatment and supply system, latrines, teacher's room, Computer facilities, development of play ground, MDM cooking shed or storage, seating arrangements etc)
- Improve teaching skills and access to teaching-learning materials through e-learning solutions
- Adequate sanitation facilities, including facilities for girls
- Provision of learning aids like science model, exposure, basic laboratory teaching materials, library and textbooks.
- Support transport facilities for children especially girls for secondary and higher education.

The major reasons of failure of agriculture and allied sector in the area in providing enough employability includes natural drawbacks viz. poor quality of soil, irregular rainfall and ineffective irrigation facilities; the reasons at the human interface includes drawbacks like use of traditional methods of farming, lack of proper backward and forward linkages, inadequate skills and paucity of funds for investment.

Underdevelopment of market, lack of technical skills and limited opportunities of employment in the industrial activities are the reasons of unemployment in the nonfarm activities. Among the educated youth, lack of technical education, training and disinterest for self-employment and lack of resources for the same are the visible reasons of significant numbers of unemployed youths in the area.

Key needs of intervention in the livelihood and employment sector include:

- Creation of irrigation infrastructure
- Introduction of improved agriculture practices viz; inter cropping, SRI paddy, usage of sprinklers, horticulture crops, etc through demonstrations and trainings.
- Promotion of dairy and poultry as a secondary occupation.
- Technical and business development trainings for youth.
- Computer and English trainings for graduates.
- Seed capital support for setting up enterprises.
- Job counselling and career development programme for better employability.

As an essential pre-requisite for skill development and self-employment of the local people, two kinds of needs could be visualized. These are:

- Orientation and development of skills in traditional occupation
- Skill development in new type of occupation

Skill development training is essential so that the technical and financial aspects of any trade or business can be clearly understood and resources are utilized optimally. Different types of skill development and orientation programme may be required for the men and women or their family member separately. The required new skills may be developed in line with DDU-KVY in collaboration with the Director General of Employment and Training, Ministry of Labour & Employment, Government of India.

The traditional skills may be developed with the help of local vocational training institutes/NGOs, etc. These programs may be organized at the school premises or community hall at village level.

6.3.2 CSR Action Plan

Medium-term CSR action plan (CSRAP) for five years envisages improvements of the standard of living of more than 70% of the people in the CSR villages of TTPP. For the purpose, TTPP plans to undertake CSR activities in the phase manner initially covering the CSR villages which are closer to the main plant, ash dyke, water intake and subsequently, extending the same to the other CSR villages.

The focus is being provided to increase access to basic services like drinking water, sanitation, education and health for all households. Livelihood opportunities both in agriculture and non-farm are being promoted ensuring increase in real incomes by at least 50% by the end of five years. A multi pronged approach to the same is being followed:

- Improving quality of education
- Strengthening services for Community Health
- Promotion of Sustainable Livelihood Activities
- Rural Infrastructure Development

The strategy is to work with local gram panchayat for planning and development of infrastructure, while user groups may be created operation and maintenance of these structures. TTPP provides around 60% of the capital cost of the structures, while the respective Panchayat is being supported to raise the other 40% from its own funds, through various government schemes and community contribution. It is also proposed that a user fee based maintenance mechanism is being developed for all infrastructure created.

Focus is being laid on covering at least 30% of SC/ST households in all the programmes implemented. Women and Children are being specifically targeted for health programmes. A special focus may be given on providing training and business development/ job counselling support to all ITIs, Diploma holding youths in the CSR villages. For building the capacities of the communities on local governance; SHGs of women; Youth Clubs and Farmers Societies may be promoted and strengthened.

1. Improving Quality of Education

a. **Infrastructure Support & Upgrading Local Education Institutes:** There is need for improvement in school infrastructure and upgrade the services of educational institution in the first two years. This includes activities like repairing or adding on the existing infrastructure:

   - Additional room construction in primary schools. Development of library in each school which has classes between 5th to 7th standard.
   - Construction of multipurpose Activity hall
   - Computer Center
   - Bench, desk, blackboard, etc.
   - Separate Toilets for Girls & Boys
   - VEC, PTA and MTA members are being trained and focus is being laid on regularizing their meetings.

b. **Increase Access to Provisions of Learning Aids** viz.

- School Bags may be provided to poorer students
- Teaching Learning Material, Books may be provided to schools
- Supports like bicycle, books, school fee etc may be provided to Girls for promotion of girl child education

c. **Youth Development Programmes** viz.

- Extra classes after School Time may be organized for weaker students
- Sports promotion activities may be organized in local schools and colleges
- Cognitive development activities viz. essay writing, quiz, debates etc may be held through intra and inter school competitions
- Health check-up camp may be held every year
- Career/Job Counselling camps may be held every year.

d. **English & Computer Training Centers and Adoption of ITI:**

The employability of the local educated youth viz. undergraduates and graduate to be increased by providing effective skill building in applied knowledge of English language, computer application. The courses and learning facilities need to be upgraded with Private-Public Partnership approach to go with the market demand in technical workforce.

- Computer and English training courses are being organised for graduate/undergraduate youth.
- Skill upgradation training and business development courses for ITI/Diploma passed youth may be conducted. They are being supported to access bank loan/govt schemes for setting up their own enterprise and/or also provided with job counselling services.

2. Strengthening Services for Community Health

- Health Camps, Gynec Camps may be undertaken every six months.
- A 24x7 mobile health clinic may be initiated and free check up and medicines may be provided.
- Special Health Camps & Multi Specialty Camps may be organized for general diseases and with a focus of women and child health

- Contribution towards up-gradation & support to Primary Health Centre & CHCs

- Aids are being provided to poor patients for referral to district and state hospitals

- Material support for construction of individual toilets.

- Water and sanitation facilities are being provided viz. drainage, potable water & distribution facilities in surrounding CSR villages

3. Promotion of Sustainable Livelihood Activities

a. Skill Development Activities

- Skill development training for income generation through ASDC and using other local resources is being organized regularly.

- A small credit fund may be developed with an initial capital to provide seed money for each SHG of women.

- Farmers society, Youth Club which can demonstrate credibility (and preferably has taken and repaid bank loan at least once) may be entitled to take loan up to Rs. 25,000/- from this fund at a minimal interest rate of 9% per annum.

b. Promote Improved Agriculture and Cattle Care Practices

- Agriculture and Horticulture demonstration activities may be taken up. This includes provision of improved seeds, compost development, sprinkler sets for farmers, etc.

- Since Paddy is the only crop undertaken in Kharif season, inter cropping/second crop with pulses may be promoted.

- Kitchen garden with drip may be promoted.

- Development of fodder plots

- Construction of Low Cost Cattle Shed

- Cattle Health Camp & Cattle Care Programmes

- Introduce organic farming & vermi compost & awareness creation for the same

- Small poultry units of 50 chicks of improved variety may be promoted as IGA.

- Deepening of ponds, providing of diesel pump sets to farmers in groups of 5-7 for using on share and pay basis.

- Introduction of group well concept: This includes deepening of an existing well along with irrigation infrastructure (diesel pump and pipeline) to small-holder farmers' group including 5-7 farmers. This could be particularly useful for also providing support irrigation for fodder/vegetable cultivation in Rabi season or summer months which can then be marketed by the group to get additional income.

4. Rural Infrastructure Development

Under infrastructure development programme, emphasis is being laid on repairing or adding on the existing infrastructure in the CSR villages initially. This includes activities like:

- Construction of common community facilities viz. Community Centre, Bus Shelters, Gardens etc

- Construction of toilets in public institutions, angandwadi, school and panchayat.

- Construction & up-gradation of village approach roads and internal roads under PPP model

- Provision of solar street lights in CSR villages particularly ensuring coverage of SC/ST hamlets.

- A PPP model may be taken to increase access to housing facilities by construction of low cost houses in collaboration with Government schemes viz. IAY.

- Check dams & pond deepening & other water & soil conservation activities

- As a part of irrigation infrastructure development, it is useful to undertake repair and maintenance of canal works in collaboration with irrigation department and the canal society, since more than 70% of the farmer's land is covered under the canal irrigation schemes.

The year wise plan for community development programmes (infrastructure development in CSR villages) and skill development programmes are being finalised in consultation with Village Development Advisory Committee (VDAC) consisting of representatives of PAPs, District Administration, other stakeholders and TTPP.

6.3.3 Community Engagement Plan

Youth represent a large segment of the population (i.e. aprox 27.5% of the population comprise the youth), it that can be mobilised for community service and development programmes. On one hand, by participating in community service schemes, youth can contribute to grassroots development efforts and help create progress in backward regions. At the same time, these initiatives help the youth build their own skills, such as communication, leadership, inter-personal relationships and develop a sense of moral responsibility and national ownership.

Ministry of Youth Affairs & Sports (MoYAS) currently runs several schemes to enable youth to engage with their community, as well as to participate in grassroots development. Some of these schemes are NYKS, NYPAD and the NSS. These schemes target varying youth segments, and have different models of participation. In addition to MoYAS schemes, there are a range of other government schemes like the Bharat Nirman Volunteers (BNV) programme of Ministry of Rural Development. BNVs are dedicated volunteers working in rural areas for generating awareness among the people about their rights and entitlements. Similarly, the positions of community workers created under NRLM provide opportunity to such workers to get intensely involved in the development programmes, besides being avenues of substantial income to them.

There are also several community-based youth organizations in various parts of the state as well as the country that work towards community development. NGOs, non-profit organisations, corporates through their CSR programmes and social entrepreneurs are engaged across the country on issues ranging from clean fuel usage to prevention of trafficking and rehabilitation. Several of these organisations have youth volunteers and youth employees.

There is a need to institutionalise community engagement and to design and streamline schemes such that they cater to the non-homogenous youth population. Accordingly following community engagement plan may be explored:

a) Promotion of Community Development Organisations (CDOs):

While the government continues to implement the schemes that have seen great success, going forward APML may also leverage the large number of organizations that are already working towards community development in project area. This may multiply the scope of youth community engagement and has significant potential to generate positive outcomes at the grassroots level.

- A framework for inventory of accreditated and certified NGOs or CDOs is being developed. This may enable funding agencies and youth volunteers to select the most appropriate organisations based on their needs. It can promote the scaling up of organisations that have clearly defined goals and a successful track record for community development.

- A volunteer exchange platform has been set up in project area. Through this platform, the youth that are willing to participate in community development programmes can be identified. Similarly, organisations working in the field that require young volunteers or employees can post their requirements. This may enable the matching of volunteers with organisations in an efficient manner.

- Institutionalise the involvement of youth in disaster response activities. Local youth, because of their dynamism and proximity, are invariably the first responders in any disaster relief and rescue activity. Such team activity in the face of adversity not only builds camaraderie and leadership but also provides a much needed succour to the affected individuals. There is a need to create structures that tap this latent resource and realize its full potential through proper training, equipping and coordinating their efforts with those of the state disaster relief mechanism. Every State and district of the country has Disaster Management Authority as mandated by Disaster Management Act, 2005. The Civil Defence Act, 1968 has also been amended to bring 'disaster management' within its scope. In addition, the panchayats also have a major role under the Disaster Management Act, 2005. The youth can be closely involved in disaster response activities through these mechanisms.

- Similarly, the latent potential and dynamism of youth is also being harnessed in promoting communal harmony and environmental protection.

- The energies of the youth are also being channelized in constructive areas through Panchayati Raj Institutions, which are increasingly playing greater role in local self-governance. This includes campaigning on various social issues and helping in effective implementation of various Government programmes.

b) Promotion of Social Entrepreneurship:

There are a growing number of social entrepreneurs who recognise that they can create sustainable grassroots development, while making a return for themselves. The social entrepreneurship space is fragmented and largely unregulated and the APML in association with Government may create an enabling environment for social entrepreneurs.

- Promoting social entrepreneurship as an attractive employment proposition for youth creates a positive shift away from volunteerism and philanthropy to sustainable development. This can transform community development and engagement from a short-term prospect for the youth into a sustainable career option.

- Social entrepreneurs require support in the form of seed funding and angel investment. The government can create an enabling policy regime that supports the creation of these funds. It can *enable identification of credible enterprises and financiers* through an endorsement process. It can also *reward the performance of social entrepreneurs through grants-inaid and award programmes.* These rewards can create further mobilisation of youth towards social enterprise.

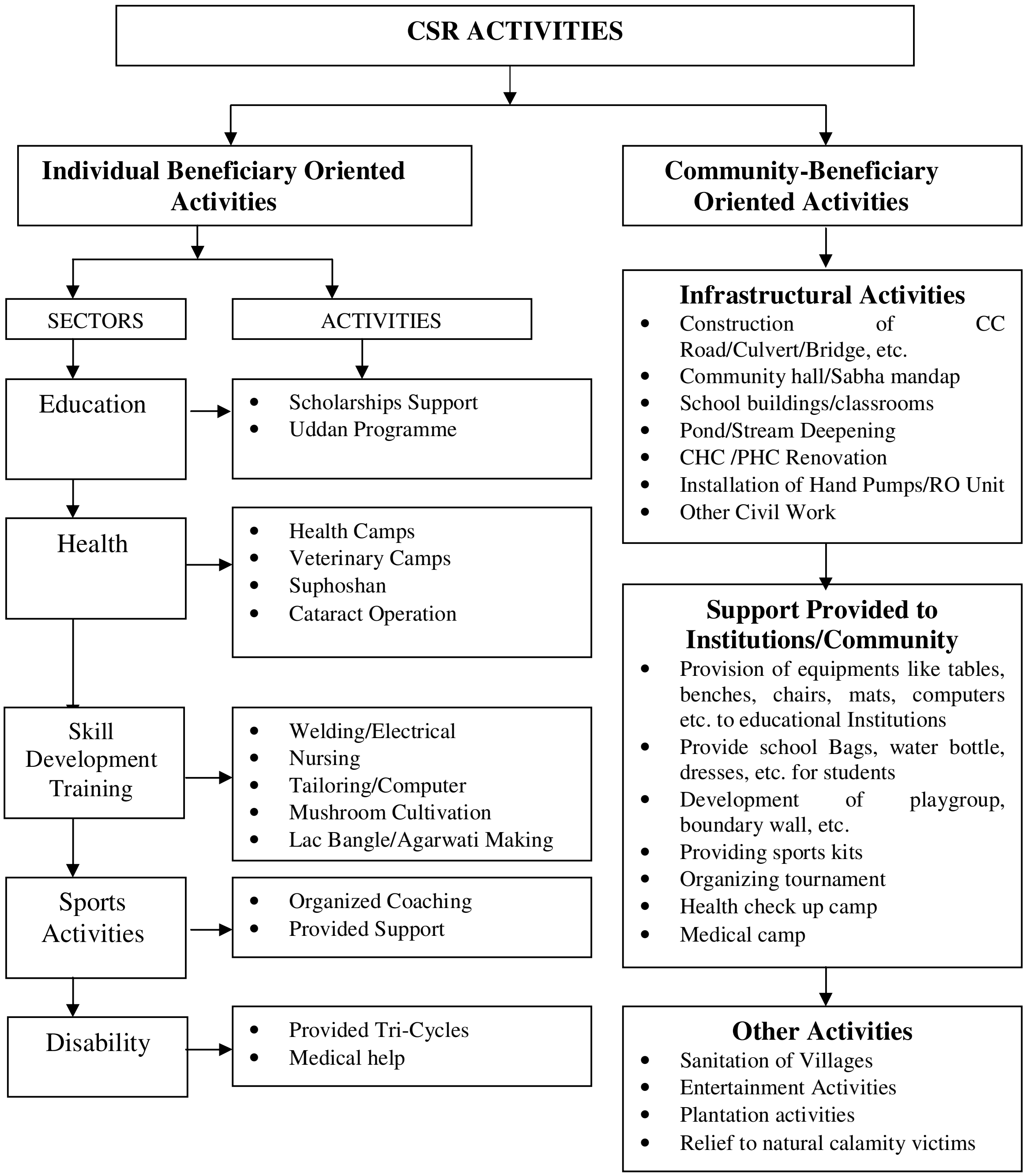
- The Government is well positioned to create channels of communication between social entrepreneurs, local communities, investors and policymakers. Social enterprise forums can be convened that enable the exchange of information around *successful models, navigating the complex policy environment, and can generate forward and backward linkages between enterprises. Removing barriers* *to business* on a priority basis for organisations with a social objective can also spawn the development of more social enterprises.

6.4 CONCEPTUALIZATION OF SOCIAL AUDIT

The APML has identified 5 villages in the core zone, 17 villages in buffer zone-I (i.e. within 5 km radius of TTPP) and 47 villages in buffer zone-II (i.e. within 5-10 km radius of TTPP) i.e. total 69 villages as the CSR villages. In addition to this, some other villages in the vicinity have been selected besides Gondia town for undertaking various CSR activities. The social audit of CSR activities have been undertaken for the last three years i.e. 2016-17 to 2018-19.

The comprehensive profile of all CSR activities illustrate the two types of programmes and target groups namely, i) Activities targeted to individual persons like students, physically challenged persons, women, unemployed youth, etc. and ii) Activities targeted on whole community, namely, infrastructure works, support provided to resource-poor institution (school, colleges, Panchayets, etc.), entertainment, health and sanitation etc. Thus, the activities were bifurcated into two major parts, namely, individual beneficiary oriented activities and community-beneficiary oriented activities. Further, the individual beneficiary oriented activities and community-beneficiary oriented activities were divided into various sectors. The individual beneficiary oriented activities were sub-divided into five sectors, namely, education, health, vocational training, sports & disability. The community-beneficiary oriented activities were similarly sub-divided into three broad areas, namely infrastructure, provision of additional support to institutions and other such activities. A diagrammatic representation of the conceptual framework is shown in Figure 6.1.

FIGURE 6.1: CATEGORISATION OF CSR ACTIVITIES FOR SOCIAL AUDIT



6.5 SOCIAL AUDIT OF COMMUNITY BENEFICIARY ORIENTED CSR ACTIVITIES

6.5.1 Reactions of Local Community

This section presents the reaction of local community on the various activities and programmes conducted in their villages based on the records of focused group discussions (FGDs). The FGDs were held in the selected villages where CSR activities were undertaken and the reactions of the groups were documented. Issues like awareness of the local people on the prospective implementation of various community beneficiary oriented CSR activities, information on the selection process and procedures, decision making body on assessment of the needs of the village, involvement of level of the local people in such decision and implementation process, assurance given to local and extent of meeting of expectations of the local people, and other such issues were taken up for detailed discussion. The groups were further advised to make self-assessment and place their opinion on the various CSR programmes and their efficacy and utility.

6.5.2 Awareness of the Communities Regarding CSR Activities

In order to have views of the villagers on the impact of CSR related activities, more than 50 Focus Group Discussions (FGDs) were held in the CSR villages. On the whole, more than 80% of the total groups were aware that their villages had been selected for execution of CSR activities. However less than 20% of the groups primarily from Buffer Zone II villages were not aware of various community beneficiary oriented CSR activities being undertaken by AF-APML.

Of the 40 aware groups, about 82% informed that infrastructural development of their villages are being done under the CSR activities of the AF-APML. Nearly 70% also revealed that they are being provided skill development training for youth for better employment opportunities.

6.5.3 Implementation Process of CSR Activities: Responses of the Local Communities

A participatory approach is being taken up to assess the need of the village and its people. This bottom-up approach forms the basis of the success of CSR activities. Majority of the groups (40) were of the view that the activities were undertaken as per decision taken by the AF-APML officials. About 70% and 75% of the groups stated that they were cognizant of the decision making authority for CSR activities and that Gram Pradhan along with AF-APML officials and school teachers took the decision on behalf of the villagers. The CSR activities were mostly conducted in consultation with the village heads or representatives, the involvement of the local villagers was also moderate to high.

After the decision for conducting any activity under CSR was taken up by the decision making authority, 68% of the groups viewed that the particular activity was put up for discussion with Gram Pradhan, teachers and AF-APML officials. 78%

FGD groups also viewed that meeting with local people of the community were held to understand the need for the particular work.

The CSR activities show its impact in terms of fulfillment of the expectations of the local people. About 85% of the groups opined that assessment of the local needs before execution of CSR activities was highly effective. Of the total groups, 30 groups opined that their consent was taken before initiation of CSR activities. However, remaining groups expressed their resentment that no prior opinion was taken from the local people.

Involvement of the local people in execution of the CSR activities was limited. About 30% of the groups informed that no participation of the local people was ensured. Yet another 20% informed that the level of participation of the people was very low.

More than 75% of the groups informed that the responsibility for monitoring of the work done and executed by AF-APML is taken up by the AF-APML officials. Nearly 70% groups also opined that the Panchayat members have taken up interest in up-keeping and protection of the community property created by AF-APML under CSR activities.

6.5.4 Assessment of Need of the Villagers Prior to Execution of CSR Activities

Programmes like deepening of ponds and construction of check dam, CC roads & bridges/culvert, installation of borewells were perceived as very high priority areas by the villagers. Similarly, the programmes for improvement of health and sanitation facilities, assistance for construction of toilets, skill development for unemployed youth were considered next priority area for intervention under CSR activities. There were some programmes that were considered unnecessary from the point of view of the groups. Construction of bus stop and benches, village gate and sabha mandap, etc were considered as least priority area by few groups.

6.5.5 Quality of Works: Opinion of the Communities

To ascertain public opinion on the quality of the work done under CSR, the groups were asked to grade their perception/opinion on the various activities undertaken. While activities like construction of check dam and deepening of ponds and streams, installation of handpumps & RO units, construction of community hall and school building were rated as 'very good', however activities like construction of Anganwadi centre, sabhamandap, crematorium, etc. were opined by few groups as 'average'. All these activities were perceived to be highly beneficial for the upliftment of the quality of life of local people around TirodaTPP including water intake and pipeline corridor.

All the groups opined that there are significant changes in the village socio-economic and cultural environment with initiation and implementation of CSR activities, though in varying degrees. More than 90% groups were of the view that the availability of drinking water has improved and will further enhance in future due to deepening of pond and construction of check dam as a part of CSR activity in the vicinity of Tiroda TPP. Building of school boundary wall has helped in keeping out stray animals, maintaining clean environment of school, and children safey inside the compound.

6.5.6 Impact of CSR Benefits on Target Families: Opinion of the Local Communities

Almost all the groups opined that CSR activities have had considerable impact ('good or very good') on the living conditions of the target beneficiaries. Furnishing the infrastructure of the classrooms was opined to have very good impact on the targeted beneficiaries and high impact on their living.

Of the total number of 50 groups surveyed, more than 40 admired the quality of works conducted by AF-APML under CSR. About 80% of the groups opined that with the efforts of AF-APML the availability of safe drinking water has improved. Similarly, 67% and 71% voted for very high quality as per their required standards of materials provided to them for training and boring depth of the hand pumps respectively. Quality of checkdam andd CC/Pitch road construction, installation of high mast light, construction of community hall were also appreciated. However, few groups opined that the quality of work was 'moderate'.

6.5.7 Need for Alternatives Activities in Lieu of Activities Performed

About 20% of the groups from core zone villages and 30% of the groups from buffer zone villages opined that other alternate activities should have been conducted in their villages as per their priority needs. Contrary to this, more than 70 to 80% groups opined that the CSR activities conducted in their villages are as per their priority need and no need of alternative activities to be conducted in place of already executed activities.

Around 20% groups which opined that alternate activities could better address or suit the needs of their villages are required to be conducted. Such groups placed a very high need for development of irrigation facilities and better drinking water facilities. This demand was placed by most of the groups. Nearly 20 groups also placed their need for strengthening drinking water facilities and construction of toilet facilities to their respective villages. Construction of rainwater harvesting structure, provision of skill development training which has got high employment potential and provision of tap water supply were also other important needs as placed by the groups.

6.5.8 Changes as Perceived by Villagers in Different Time Intervals

There were few groups which viewed that alternate activities that better suited the needs of their village were required to be conducted and placed the reasons for which the required activities were not conducted in their villages. Apathy of the officials towards the comprehensive need-assessment of the villages was cited as the major reason for non-execution of required activities (30%). Another major reason was that the performed activities were done not in consultation with the villagers (20%). This was especially true for the work conducted in the buffer zone villages.

The groups felt that there have been major positive as well as negative changes in the village in varying magnitude. As a positive change or transformation, more than 70% groups opined that there has been good to very good changes in the well-beings of people in the village. About 855% of the groups believed that the quality of education and its prospects has improved considerably. Heralding an era of change and as an indication of women's improved status in the society and empowerment of women, more than 90% of the groups opined that women now participate in the public sphere and could work outside. Similarly, more than 80% opined that the decision making autonomy of women has also improved. Against 75% groups that were of the view that the social relations well-being of the villagers and employment opportunities as well as cultivation have improved significantly in the last three years, About 20% groups also viewed that the social relation in the village had worsened due to economic disperaity. As a paradox to these positive changes, there have been some sectors viz cost of land, availability of cheap labour, etc that had slight negative impact in the last three years.

6.6 EVALUATION OF IMPACT OF CSR ACTIVITIES

To evaluate the social impact of the CSR activities undertaken by AF-APML, ranking of impact in the basic amenities and infrastructural facilities besides the livelihood pattern were undertaken in consultation with local people and village representatives during the FGDs conducted in the CSR villages. The overall impact evaluation of CSR activities undertaken were rated in selected areas, viz., road, drinking water, education, health, drainage and sanitation, skill development training, irrigation, veterinary service and sports in the scale 1 to 5, i.e. 1: Poor, 2: Average, 3: Good, 4: Very good and 5: Excellent.

The prime social impact of the CSR activities undertaken by AF-APML in the rural infrastructure, education facilities, health facilities including level of awareness regarding health, hygiene and various social issues, agricultural pattern, skill development training opportunities, socio-cultural improvement, etc are presented in Figure 6.2 .

Impact of of CSR activities on strengthening of road network shows that in more than 70% villages, impact of CSR activities is average, whereas some villages have excellent impact (about 7%). Furthermore, remaining (about 23%) villages have good to very good impact. The analysis shows that in more than 50% villages, impact of CSR activities on strengthening status of community building is average and in more than 30% villages the impact ranges between good to very good. Impact of CSR activities on providing safe drinking water in terms of availability is good in 70% villages and 30% villages show very good to excellent impact of the same. Impact of CSR activities on strengthening sanitation facilities reveals thatabout 70% villages have average impact, though in remaining 30% villages impact ranges between good to very good.

Impact of CSR activities on providing classroom in school shows that in more than 40% villages it is good and in 50% of the villages, there is very good to excellent impact. Impact of CSR activities on providing safe drinking water in school shows that in 30% villages it is good and in more than 55% villages it ranges between very good to excellent. Same picture is revealed in case of sanitation facilities in school. Impact of CSR activities on strengthening sanitation facilities in school shows that more than 90% of villages have average to good impact, though only few (less than 10%) villages have excellent impact. Impact of CSR activities on providing table, desk, etc. in school shows that more than 55% villages have very good to excellent impact, though 18% villages have average impact of the same. Impact of CSR activities on providing/developing playground in school shows that 60% of villages have good impact, though more than 30% villages have average impact. Impact of CSR activities on strengthening educational facilities and ambience during last three years reveals that more than 55% villages have average to good impact and about 45% villages have very good impact in this regard (Figure 6.2).

Similarly, remarkable impact of CSR activities on strengthening health facilities and ambience in Government Hospitals/Health Centers is envisaged during last three years. Analysis states that more than 55% villages have good impact and about 45% villages have very good impact. There is significant impact of CSR activities on enhancing level of awareness towards hygiene and sanitation. In more than 60% villages there is good impact.

Impact of CSR activities on enhancing level of awareness towards social issues reveals that in more than 70% villages the impact is average, whereas in remaining villages, it is good. Impact of CSR activities on reducing mortality rate of livestock shows that more than 70% villages have good impact. Similarly, impact of CSR activities on improving health status of livestock shows that 90% villages have good impact.

Impact of CSR activities on improving agricultural pattern during last three years reveals that 70% villages have good to very good impact and in remaining villages it is average. Impact of CSR activities on providing skill development training opportunities during last three years shows that more than 90% villages there is good to very good impact.

Impact of CSR activities on improving level of participation of people including children in sports shows that more than 80% of villages have average to good impact and about 15% villages have very good impact. Impact of CSR activities on improving level of participation of people including children in cultural activities shows that more than 85% of villages have average to good impact and about 15% villages have very good impact. Impact of CSR activities on improving socio-cultural pattern of communities due to project interventions in different fields shows that about 85% of the villages have average to good impact and more than 15% villages have very good impact.

6.7 ASSESSMENT OF MAGNITUDE OF IMPACT OF CSR ACTIVITIES

The assessment of magnitude of impact of any programme based on any single variable or factor is highly limited. Accordingly, to assess the actual impact of CSR activities on individual beneficiary oriented programmes and community beneficiary oriented CSR activities, executed by the AF-APML since 2016-17 to 2018-19, a number of variables have been evaluated. To assess the individual beneficiary oriented programmes in a significant manner, eight variables were studied (Table 6.4), while the assessment of the impact of the community beneficiary oriented CSR activities were based on seven variables (Table 6.5). The responses/perception of selected beneficiaries on all these variables, collected during the interview of the beneficiaries were taken for the assessment of agnitude of impact of CSR activities. All the variables were standardized on 'Z' score for preparation of Composite Index. Thus, separate composite indices were prepared for individual beneficiary oriented programmes and community beficiary oriented CSR activities. The subsequent section highlights the actual impact of the CSR activities based on this Composite Impact Index. Along with these indices, a separate economic index was also prepared. The beneficiaries were classified into different economic sections on their score on the seven variables as mentioned below:

- Occupations of the beneficiaries
- Annual income of the beneficiaries
- Availability of basic facilities
- Type of houses
- Land ownership of the beneficiaries
- Indebtedness among beneficiary households
- Assets holding

The economic index helps to understand the actual impact specially individual beneficiary-oriented programmes on different economic sections of the village community.

TABLE 6.4: VARIABLES FOR INDIVIDUAL BENEFICIARIES ORIENTED PROGRAMMES

Variables	Methodology
Willingness to obtain benefits	Given high score to higher extent of willingness to obtain benefits (Very High-4, High-3, Low-2, Very Low-1, Nothing-0)
Extent to which benefits were received	Given high score to higher extent of benefits received (Very High-4, High-3, Low-2, Very Low-1, Nothing-0)
Change in living condition of beneficiaries	Given high score for high level of positive change (Given 1 score to each change)
Direct or indirect benefits received from the programme	Given high score for high level of positive change (Given 1 score to each change)
Expectation level of people regarding future benefit by the programme	Given high score to high expectation level for future benefit (Very High-4, High-3, Low-2, Very Low-1, Nothing-0)
Social change with execution of CSR activities	Given high score to higher level of social changes (Very High-5, High-4, Moderate-3, Low-2, Very Low-1, No change-0)
Economic changes with execution of CSR activities	Given high score to higher level of economic changes (Very High-5, High-4, Moderate-3, Low-2, Very Low-1, No change-0)
Cultural changes with execution of CSR activities	Given high score to higher level of cultural changes (Very High-5, High-4, Moderate-3, Low-2, Very Low-1, No change-0)

TABLE 6.5: VARIABLES FOR COMMUNITY BENEFICIARY ORIENTED DEVELOPMENT PROGRAMMES

Name of Variables	Methods
Availability of roads	Given high score to high changes (Some improvement-1, High improvement-2, Very High improvement-3)
Constructions of community building	Given high score to high changes (Some improvement-1, High improvement-2, Very High improvement-3)
Safe drinking water	Given high score to high changes (Some improvement-1, High improvement-2, Very High improvement-3)
Ground water level	Given high score to high changes (Some improvement-1, High improvement-2, Very High improvement-3)
Sanitation facilities	Given high score to high changes (Some improvement-1, High improvement-2, Very High improvement-3)
Infrastructural resources for education	Given high score to higher level of changes (Some improvement-1, High improvement-2, Very High improvement-3)
Infrastructural resources for health	Given high score to higher level of changes (Some improvement-1, High improvement-2, Very High improvement-3)

6.7.1 Status of Beneficiaries of Different Economic Categories

Barring few beneficiary households belonging to ‘very low’ economic category, approx. 55% of the beneficiaries belonged to the ‘low’ economic category. The second economic category was that of the ‘moderate status’ with approx. 35% households in this category. Whereas, approx. 10% belonged to ‘high’ or ‘very high’ economic category. The distribution of economic categories across various caste groups reveals that the low economic group was a majority in all the caste categories in varying degrees. Against 70 and 65% low economic category households in the SC and Minority groups respectively, the proportion for the OBC and general caste were 45 and 35% respectively. Among the OBC and General caste beneficiary households, 30 and 25% were in the moderate economic group respectively. The ‘very high’ economic category comprised of less than 5% of beneficiary households from the general caste.

Distribution of beneficiaries across different economic groups shows that the low and moderate income groups took maximum benefits of the CSR programmes. The further distribution of the beneficiaries across various programmes shows majority of skill development training, scholarship, medical aid were provided to ‘low’ economic category. This distribution of beneficiaries across different economic categories justifies the selection criteria of the beneficiaries. Similarly, majority of the beneficiaries of computer training programme, tailoring and beneficiaries of aid to physically challenged were from the moderate economic class. However, very few beneficiaries belong to very high economic category taking benefit of medical aid and improved agricultural practice/water conservation/dairy farming.

6.7.2 Impact of Individual Beneficiary Orientated Programmes

In terms of impact on the villagers, the Tiroda town ranks first with a score value of 400. In the villages Berdipar, Gumadhawada, Mendipur and Kachewani (Rama tola and Tikaram tola) with significant beneficiaries selected, most of them opined that the CSR activities have had 'very high' to 'high' impact on their living conditions. The villages Khairbodi, Chikhli, Kawalewada, Chirekhani, Barbaspura, Berdipar, Jamunia and Garada with number of beneficiaries also opined that programmes have had 'very high' to 'high' impact. The buffer zone villages i.e. Thanegaon, Malpuri, Khamari and Dhamnewada were ranked lowest as few beneficiaries of these villages opined that the CSR activities have had 'moderate' to 'low' impact in the village.

6.7.3 Impact of Community Development Programmes

The impact of the community development CSR activities in improvement of qulity of life of local people and changes in socio-economic status as perceived by the villagers is presented in subsequent section. Based on the composite index, the villages have been ranked in order of impact. The community development activities of the AF-APML had best impact in the villages Gumadhawada, Khairbodi, Mendipur, Kachewani (Rama tola and Tikaram tola) and Garada in which more than 90% of the beneficiaries opined that there has been positive impact on the development of the village. Following the above-mentioned core zone villages in order of performance and impact of community development programmes, the villages Jamunia, Berdipar, Chirekhani, Tiroda, Jamunia, Chikhli, Kawalewada stood next with approx. 80% beneficiaries stating that such activities had good impact on the development of their village. Contrary to this, in the villages, However in Malpuri, Khamri, Thanegaon, majority of villagers opined that the CSR activities had not made significant impact in the improvement of the soio-economic condition of the villages.

The perception of the beneficiaries who felt that the village has improved in terms of availability of infrastructure facilities, for the various CSR activities conducted by AF-APML focusing on provision of safe drinking water by installation of RO units and better sanitation facilities was considered to have paramount impact. Similarly, provision of infrastructural facilities for promotion of health and education also had considerable impact with more than 85% and 90% of the beneficiaries perceiving that it had good to very good impact on the improvement of the quality of life respectively.

Improvement in the villages as a result of CSR activities was more strongly felt in the core zone villages of Tiroda TPP along with the villages adjacent to water intake and pipeline corridor compared to the buffer zone villages. Against 85% beneficiaries from core zone villages and villages adjacent to water intake and pipeline corridor perceived that there have been significant improvement in basic amenities and infrastructure facilities in their villages, the proportion of such beneficiaries was less than 50% in the buffer zone villages.

The ranking of impact of community development activities conducted in the selected villages has been done based on mean value. Higher the mean value, higher the order of the village in terms of ranking. The village Gumadhawada followed by the villages

Kachewani (Rama tola and Tikaram tola) and Mendipur were rated among the first three consecutively under the CSR villages of core zone. Similarly, Kawalewada was ranked first under the CSR villages adjacent to water intake and pipeline corridor.

6.7.4 Qualitative Observation regarding Impact of CSR Activities

The AF-APML undertook CSR activities under two heads, one being the individual beneficiary oriented programmes and other being community beneficiary oriented programmes. Under the individual beneficiary oriented schemes like providing scholarships, free education, skill development training, computer training, medical surgery, family planning, provision of tri-cycle, special shoes and hearing aids for handicapped were given. With the provision of scholarship, free education and aids for handicapped, there has been a rise in the sense of solidarity and self-dependence among the beneficiaries. Skill development training for women and girls has helped in capacitating them with skills and opened avenues for earning opportunities. Many of these women and girls have now opened up their business at home which is providing additional income to support their family besides economically empowering them. ASDC and other training has helped several beneficiaries to make self-reliant. The high pressure welding training as well as electrical and nurshing training at ASDC has made remarkable impact in terms of providing greater job opportunities especially to vulnerable group of people. The significant number of women in adjacent villages are motivated to scale up their business of mushroom cultivation, agrabtti making, lac bangle making. The adoption of SRI technique for paddy cultivation along with live stock development and vermicomposting has increased crop yield significantly in the APML CSR zone. The beneficiaries of free surgery/operation support have now been able to resume their household responsibilities. The AF-APML through promotion of female sterilization has been able to encourage small family potential benefits to local people.

Some of the benefits provided by the AF-APML for any particular village were also availed directly or indirectly by other villagers. Deepning of pond and streams, CC road, bridge/culvert and bus shelters for passengers have proved to be useful not only for the residents of the particular village, but also for all the other villagers who access these facilities. The problems of villagers with regard to water logging and swampy filthy areas have been solved with construction of magic pits and drains at various villages. With construction of school buildings/classroom and better sanitation facilities including development of play groud, the expected results have been achieved to enhance the learning ambience in the educational institutions. With building up of school boundaries, safety of children in the school has enhanced. With the commencement and subsequent strengthening of MHCU services in almost all the CSR villages, the health status of local people has improved significantly. With maintenance and renovation of schools and cleaning of drains, there has been a positive impact on the atmosphere of the villages.

The AF-APML has done commendable work in ensuring the provision of clean potable drinking water to villagers. In several adjoining villages, RO units and new hand pumps have been installed and being maintained by local people with and without smart card effectively. This has helped in solving the problem of shortage of water availability to great extent.

Besides the regular mobile health care unit services to various CSR villages, every year the AF-APML also conducts various health camps in different villages where people from the nearby villages also come to get free medical check-up. In these camps medical check-ups and advice or consultation by specialized doctors is provided. Seasonal ailments are treated and free medicines are distributed. Patients suffering from serious ailments are either sent to APML hospital or are referred to other hospitals. Such camps have had positive impact on the lives of the people who are now not only relieved of seasonal diseases but are also diagnosed for complicated ailments.

The live-stock development centres have been setup for improving the status of live-stock. From time to time health camps for livestocks are also organized wherein villagers from the concerned villages as well as nearby villages come for free medical treatment and advice. Apart from free medical checkups and medicines, other facilities like artificial insemination methods and vaccines are also provided. With these camps being organized from time to time, the livestock mortality rates have gone down.

Sports competitions are also conducted/sponsored by AF-APML regularly at various villages/town. Football, Volleyball, Kabaddi, Cricket, race, high jump, short puts throw and several other games are organized. The AF-APML bears the expenses of providing players uniforms, conveyance charges, food, etc. The winners are given medals and trophies. These tournaments have very positive impact on the local youths interested in games and sports. This not only enhances their interest in games and sports but also gives them recognition. Apart from this, AF-APML has provided computer, chairs, tables, sittings mats and games and sports appliances for schools. All the activities conducted in the selected villages under CSR were need-based and have had positive impact on the lives of the people.

Village wise assessment of impact of CSR activity undertaken by AF-APML is presented in subsequent section:

Gumadhawda: AF-APML has done excellent works in the field of strengthening of educational facilities in Gumadhawda village. Villagers are highly satisfied with the new opportunities being provided to their children for better education. AF has also improved rural infrastructure i.e. construction of RCC road, Village gate, toilets, installation of hand pumps along with borewell and solar street lights, etc., which have complemented Panchayat efforts in significantly improving the rural infrastructure facilities in the last three years. The setting up of Tiroda TPP has resulted in complete rejuvenation of village life leading to more business opportunities as well as employment potential to local people. In last three years economic growth of the region has increased manyfold.

Khairbodi: AF-APML has contributed towards the development of education by providing various assistance to Khairbodi school. In the area of drinking water, it has given emphasis by providing hand pumps with bore wells in the village. In the area of road development, it has significantly contributed in strengthening road network in the village. Therefore movement of people in the village has become easier. It has helped in improving socio-cultural relations by building Hanuman mandir. Setting up of Tiroda TPP has improved employment opportunities directly as well as indirectly.

Mendipur: AF-APML has helped in various ways to meet the educational needs of local students by providing different types of facilities to school which has benefited enormously to local students. Besides, it has helped a lot in building rural infrastructure, by which villagers are benefitted. MHCU services and frequent organisisation of various medical camp and awareness programme in the village has benefitted local villagers. Due to the power plant operation, AF-APML has worked in many areas of rural development in Mendipur village and employment opportunities also has increased significantly.

Kachewani: AF-APML has worked in the area of school education, community health, building of rural infrastructure as well as sustainable livelihood development for Kachewani village.

Garada: AF-APML has contributed to village development by providing different sets of rural infrastructure. It has also contributed to livestock development. The water conservation programme has also benefitted local people. The employment opportunities have also been increased after setting up of TTPP.

Chikhli: AF-APML has contributed in various ways in the life of local people of this village, as for example, enhancing in the educational facilities, strengthening the health status of the village people, side by side, it has helped a lot in various ways in improving the health status of animals resulted in more milk production. Adani Foundation activities has improved socio-cultural environment. Besides, it has increased employment opportunities and people of this village getting employment indirectly through contractors, selling their agricultural produce in higher prices.

Jamunia: AF-APML has helped in developing rural infrastructure of this village. It has also raised the quality of life of people as well as health status of animals. It has provided the employment facilities to various youths of this village.

Bhiwapur: AF-APML improves the education facilities of this village. It has contributed to raise the health status of both men and women of the village. The drinking water facilities have also improved significantly due to installtion of handpump with borewell and water conservation programme i.e. deepening of ponds and construction of check dams, etc.

Churdi: AF-APML has helped this village and a lot of changes are visible in the area of education, community health, sustainable livelihood and rural infrastructure development.

Tiroda: AF-APML has helped schools by onstructing additional classroom and halls, providing e-learning projectors, ceiling fans and organising visits to science centre for students. The installation of high mast light and handpump with borewell has benefitted people of Tiroda immensely. It has also increased employment opportunities.

Chirekhani: AF-APML has done exemplary work in the area of education, community health, sustainable livelihood development and in building of rural infrastructure. It has also trained local youths in computer and other capacity building programme. Besides, it has given the help of Fire Brigade, ambulance and water tanker. The MHCU facilities are also helping the villagers to take care of their health.

Berdipar (Kachewani): AF-APML provided help to education, community health and sustainable livelihood development work. It has also helped to improve village infrastructure facilities. Besides, it has also increased employment opportunities directly/indirectly.

Barbaspura: AF-APML has helped to meet the accommodation need of village school. It has also helped to improve the health status of villagers by providing mobile health care unit. It has also helped to raise the health status of animals by organising veterinary camp. It has also increased employment opportunities.

Thanegaon: AF-APML has done great job in the area of school education, community health, sustainable livelihood development, rural infrastructure and raising health status of man as well as animals. It has also increased employment opportunities.

Malpuri: AF-APML has done tremendous work in the area of educational, rural infrastructure building. It has also worked for raising the health status of man and animals. It has given employment to skilled/semi-skilled persons in the plant.

Khamari: AF-APML has contributed significantly in the area of education, safe drinking water and raising the health status of the village. It has also assisted to raise the health status of animals through organising veterinary camp in the village. It is also visible in the village that villagers are happy with APML.

Dhamnewada: AF-AMPL has worked in field of school education and provided aids to Anganwadi centres of the village. In the area of sustainable livelihood development for sustainable agriculture development, various initiatives have been undertaken. It has also organised Nesha Mukti campaign, organised veterinary camp, etc. It has also worked in the area of health and drinking water.

6.8 ALLOCATION OF FUNDS

In accordance with its mission of being socially responsible corporate entity with thrust on community development, APML aims to focus on implementing community development and engagement programs in the affected/ neighboring villages around its TTPP. To accomplish this mission, a survey has been conducted to identify the social, economic and cultural needs of the villages falling within the 10 km radius of TTPP, societies that can facilitate in formulating a comprehensive long-tern development programme, to be undertaken under Corporate Social Responsibilities (CSR) activities. The whole exercise aims to set long-term priorities for CSR activities, which could be achieved within the specified time frame. Generally, the needs that are rated most important are the ones that get addressed on priority. In this connection, a comprehensive plan has been chalked out delineating a budget allocation as per CSR policy of APL.

6.9 INSTITUTIONAL ARRANGEMENT

A Corporate Social Responsibility Committee (CSRC) is being constituted at the APML for identification and implementation of activities which involve the followings:-

- To interact with the concerned State Officials/Govt officials to confirm the areas for undertaking activities under CSR and ensure to avoid duplicacy of the job.
- To decide the priority of the activities to be undertaken under CSR.
- To interact with the NGOs for determining the activities to be undertaken.
- Based on the total activities to be undertaken the Committee recommends the quantum of budget for the year.
- Utilisation Certificate with statement of expenditure duly certified by an Authorised Auditor need to be submitted by the Organisation/ Institution to whom CSR fund is allocated.
- To monitor and review the progress of activities undertaken/completed.

The committee has been constituted with the representation from all parts of the local community, headed by Vice President (P&IR) and in every 6 (six) months Managing Director of APL reviews the CSR activities.

Assistance of NGOs is being sought, as and when necessary, for preparation of baseline data, action plans and involvement of the local communities. For this purpose, only NGOs of national repute or with a good track record are being involved.

6.10 UPKEEP AND MAINTENANCE OF ASSETS CREATED

Maintenance of Assets created under CSR is the Responsibility of the concerned State Government and local representative of the Society. Before any Capital investment is made, an undertakin is being taken from the representatives of local community that they are responsible for maintenance of the Assets.

6.11 REFLECTION OF CSR ACTIVITIES

Annual audit of all activities undertaken by the company is being done by local Authorized auditor. The CSR activities are reflected in the Annual Report and Accounts of APL under Social Overhead (CSR).

CHAPTER VII

CONCLUSIONS

CHAPTER 7
CONCLUSIONS

APML has been continuously working towards the improvement of the quality of life of the people in the vicinity of TTPP. APML's CSR activities are primarily governed by APL's CSR policy, August, 2014 which was formulated inline with Section 135 of the Companies Act, 2013, on CSR and also conforms to the guidelines of CSR for central public sector enterprises, issued by the Department of Public Enterprises, Ministry of Heavy Industries, and Public Enterprises, Government of India.

The APML has identified 5 villages in the core zone, 17 villages in buffer zone-I (i.e. within 5 km radius of TTPP) and 47 villages in buffer zone-II (i.e. within 5-10 km radius of TTPP) i.e. total 69 villages as the CSR villages on the basis of their proximity with the TTPP along with the magnitude of impact. In addition to this, some other villages in the vicinity have been selected besides Gondia town for undertaking various CSR activities. The need based CSR activities are being undertaken in the Tiroda CSR zone by AF-APML. The prime aims of the present social audit were to evaluate social impact of CSR activities undertaken during the period of 2016-17 to 2018-19 in and around the vicinity of the Tiroda TPP area for upliftment of quality of life of local people of the neighbouring villages.

The AF-APML undertook CSR activities under two heads, one being the individual beneficiary oriented programmes and other being community beneficiary oriented programmes. The prime area of intervention for CSR activities includes improving quality of education, strengthening services for community health, promotion of sustainable livelihood activities and rural infrastructure development.

To evaluate the social impact of the CSR activities undertaken by AF-APML, ranking of impact in the basic amenities and infrastructural facilities besides the livelihood pattern were undertaken in consultation with local people and village representatives during the FGDs conducted in the CSR villages. The overall impact evaluation of CSR activities undertaken were rated in selected areas, viz., road, drinking water, education, health, drainage and sanitation, skill development training, irrigation, veterinary service and sports.

Under the individual beneficiary oriented schemes like providing scholarships, free education, skill development training, computer training, medical surgery, family planning, provision of tri-cycle, special shoes and hearing aids for handicapped were given. With the provision of scholarship, free education and aids for handicapped, there has been a rise in the sense of solidarity and self-dependence among the beneficiaries. Skill development training for women and girls has helped in capacitating them with skills and opened avenues for earning opportunities. Many of these women and girls have now opened up their business at home which is providing additional income to support their family besides economically empowering them.

The setting up of state-of-the-art skill development center for SC/ST and other back ward people of the region under GoI Kausal Vikash Youjana at APML is one of the unique initiative of APML. The center is not only providing skill on latest welding techniques through digital simulator but also providing soft-skill training to increase employbility of trainees. ASDC and other training has helped several beneficiaries to make self-reliant. The high pressure welding training as well as electrical and nurshing training at ASDC has made remarkable impact in terms of providing greater job opportunities especially to vulnerable group of people.

During the field visit the IISWBM team member interacted with benificiaries of Mushroom Cultivation, Agarbatti Making and Lac Bangle Making, etc and it was observed that these recent income generation intervention are highly motivating to the local people and effective in terms of ensuring sustainable livelihood as well as women empowerment. However, to scale up these interventions markting channel would be required to be developed more formal and robust on priority basis.

The IISWBM team also interacted with some of the benificiaries of SRI, Vermi Composting, Biogas, Improved Chula, Kamdhenu schemes, swachhagrah, etc. and results of these interventions are also highly encouraging. The adoption of SRI technique for paddy cultivation along with live stock development and vermicomposting has increased crop yield significantly in the APML CSR zone. The beneficiaries of free surgery/operation support have now been able to resume their household responsibilities. The AF-APML through promotion of female sterilization has been able to encourage small family potential benefits to local people.

The community beneficiary oriented intervention like smart card based RO water treatment system, e-learning kits, water conservation measures trough deepening of existing village ponds and creating rain water harvesting structure are also highly successful and social impact of these interventions are highly positive.

Some of the benefits provided by the AF-APML for any particular village were also availed directly or indirectly by other villagers. CC road, bridge/culvert and bus shelters for passengers have proved to be useful not only for the residents of the particular village, but also for all the other villagers who access these facilities. The problems of villagers with regard to water logging and swampy filthy areas have been solved with construction of magic pits and drains at various villages. With construction of school buildings/classroom and better sanitation facilities including development of play groud, the expected results have been achieved to enhance the learning ambience in the educational institutions. With building up of school boundaries, safety of children in the school has enhanced. With the commencement and subsequent strengthening of MHCU services in almost all the CSR villages, the health status of local people has improved significantly. With maintenance and renovation of schools and cleaning of drains, there has been a positive impact on the atmosphere of the villages.

The AF-APML has done commendable work in ensuring the provision of clean potable drinking water to villagers. In several adjoining villages, RO units and new hand pumps have been installed and being maintained by local people with and without smart card effectively. This has helped in solving the problem of shortage of water availability to great extent.

Besides the regular mobile health care unit services to various CSR villages, every year the AF-APML also conducts various health camps in different villages where people from the nearby villages also come to get free medical check-up. In these camps medical check-ups and advice or consultation by specialized doctors is provided. Seasonal ailments are treated and free medicines are distributed. Patients suffering from serious ailments are either sent to APML hospital or are referred to other hospitals. Such camps have had positive impact on the lives of the people who are now not only relieved of seasonal diseases but are also diagnosed for complicated ailments.

The live-stock development centres have been setup for improving the status of live-stock. From time to time health camps for livestocks are also organized wherein villagers from the concerned villages as well as nearby villages come for free medical treatment and advice. Apart from free medical checkups and medicines, other facilities like artificial insemination methods and vaccines are also provided. With these camps being organized from time to time, the livestock mortality rates have gone down.

Sports competitions are also conducted/sponsored by AF-APML regularly at various villages/town. Football, Volleyball, Kabaddi, Cricket, race, high jump, short puts throw and several other games are organized. The AF-APML bears the expenses of providing players uniforms, conveyance charges, food, etc. The winners are given medals and trophies. These tournaments have very positive impact on the local youths interested in games and sports. This not only enhances their interest in games and sports but also gives them recognition. Apart from this, AF-APML has provided computer, chairs, tables, sittings mats and games and sports appliances for schools. All the activities conducted in the selected villages under CSR were need-based and have had positive impact on the lives of the people.