

**COMPREHENSIVE STUDY OF POLLUTED RIVER STRETCHES
AND PREPARATION OF ACTION PLAN OF RIVER GODAVARI
FROM NASIK D/S TO PAITHAN**



Funded by



Maharashtra Pollution Control Board

महाराष्ट्र प्रदूषण नियंत्रण मंडळ

Submitted by



Aavanira Biotech P. Ltd.

Kinetic Innovation Park, D-1 Block,

Plot No. 18/1, MIDC Chinchwad,

Pune 411 019, Maharashtra, India,

Email: info@aavanira.com, Web: www.aavanira.com

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We hope that action plan will be implemented for polluted river stretches of river Godavari, Nasik D/s to Paithan and it will help in making pollution free river.

Thanking You

Yours Faithfully,
For Aavanira Biotech P. Ltd.
Rahul Sawant
Manager - Environment

1

Introduction

1.1 Importance of Rivers

From time immemorial, the rivers are said to be the lifeline for living beings, as all types of developments, directly or indirectly relate to them. That is why all the oldest civilizations developed at the bank of rivers e.g. Indus Valley at Indus, Egypt at Nile, Babylon at Tigris, Mesopotamia between Euphrates and Tigris. Even the old cities were located at the bank of rivers considering river as lifeline. Being so close to human activities, rivers are sink of terrestrial and aquatic pollution. Water contamination weakens or destroys natural ecosystems that support human health, food production and biodiversity. Livelihoods such as agriculture, fishing and animal husbandry are affected by poor water quality. Biodiversity, especially of fresh water ecosystems is under threat due to water pollution. The most polluting source for rivers is the city sewage and industrial waste discharge. Agricultural run-off, or the water from the fields that drains into rivers, is another major water pollutant as it contains fertilizers and pesticides.

1.2 Indian Rivers

India is a blessed country when water sources come into question which is available in the form of numerous rivers and lakes. Rivers in India play important social and economic roles. The 29,000 km of riverine resource of the country comprises 14 major rivers (catchment area >20,000 km²), 44 medium rivers (catchment area between 2,000 and 20,000 km²) and innumerable minor rivers (catchment area <2,000 km²). They can be grouped into five major river systems: the Ganga, the Brahmaputra and the Indus river systems in the north, and the east and west coast river systems in the Peninsular India. The East Coast River System is a composite system of rivers. Its main constituents are Mahanadi, Godavari, Krishna and Cauvery. The total combined length is about 6,437 km. This system drains the entire Peninsular India (from the east of Western Ghats in the west to the Bay of Bengal in the east) and southern parts of Central India (including Chhota Nagpur hill ranges).

1.3 River Godavari and its Religious Significance

Apart from Ganga and Yamuna, Godavari also holds the special religious importance in India. Godavari is one of the sacred river in India. According to the *puranas* river Ganga should only be visited after the visit to the Godavari. There

are several temples and pilgrimage places on the banks of the river. Godavari, is the second longest river in India after the river Ganges is also referred as "*Dakshin Ganga* or "Ganga of South". It is one of the large river basins and the only river in India that flows from west to east.

After every twelve years millions of devotees are organized at Nasik for major bathing festival called as *Pushkaram (Kumbh Mela)* is held on the banks of the Godavari river. According to mythological stories and verses of epics the drops of *Amrita* or nectar fell at the Godavari River in Nasik when Lord Vishnu flew from earth to heaven after *Samudra Manthan*. That is the reason why the place is considered sacred and is of great importance amongst Hindus. In the lunar month of *Magh* when Sun and Jupiter are in Leo (*Singh Rashi*) zodiac sign *Kumbh Mela* is held at Trimbakeshwar in Nasik. The fair is celebrated with full passion and keenness in Nasik as one can evidence and about millions of pilgrims come here to wash away their sins in the holy river, Godavari. The two bathing ghats, Ramkund and Kushavarta holy reservoirs appreciate faith and belief of thousands of *sadhus*, holy men and millions of pilgrims as they take dips in holy river Godavari on the specific date and at specific time. Apart from *Kumbh Mela* hindus perform many religious rituals at river Godavari.

1.4 Salient Features of Godavari Basin

River basin has been recognized as an ideal and practical unit of water resources management because it allows the holistic understanding of upstream-downstream hydrological interactions and solutions for management for all competing sectors of water demand. Hence it is essential to understand basic characteristics of particular river basin. Salient features of Godavari basin are depicted in Table 1.

Table 1 Salient Features of Godavari Basin

Sr. 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.	Mean Annual Rainfall (mm)	1093.21
6.	Mean Maximum Temperature (o C)	33.04
7.	Mean Minimum Temperature (o C)	20.63
8.	Highest Elevation (m)	1664
9.	Avg. Annual Water Potential (BCM)	110.540
10.	Utilizable Surface Water (BCM)	76.30
11.	Number of Sub Basins	8
12.	Number of Watersheds	466
13.	Number of water resources structures	Dams (921) Barrages (28) Weir (18) Anicuts (1) Lifts (62) Power House (16)
14.	Highest Dam	Bandardhara Dam -82.35 m
15.	Longest Dam	Sriramsagar(SRSP)/Pochampad dam-15.6 km
16.	Highest Barrage	Kolar barrage-15.5 m
17.	Longest Barrage	Kolar barrage-1.195 km
18.	Number of Irrigation projects	Major-70 Medium-216 ERM-6
19.	Number of HE projects	14
20.	Number of Ground water observation wells	1875
21.	Number of Hydro-Observation Sites	88
22.	Number of Flood Forecasting Sites	18
23.	Water tourism sites	53

1.5 Geographical Setting of River Godavari

The river Godavari rises at an elevation of 1067 m in the Western Ghats near the Triambak hills in the Nasik district of Maharashtra. 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 147320.65 Sq.km. (48.7%), Andhra Pradesh 71797.49 Sq.km. (23.7%), Chhattisgarh 37463.28 Sq. km. (12.4%) and Odisha 17213.97 Sq. km (5.7%) in addition to smaller parts in Madhya Pradesh 23767.44 Sq. km (7.8%), Karnataka 4469.3 Sq. km. (1.4%) and Union territory of Puducherry 36.94 Sq. km (0.01%). Graphical representation of state wise distribution of Godavari basin is represented in Figure 1.

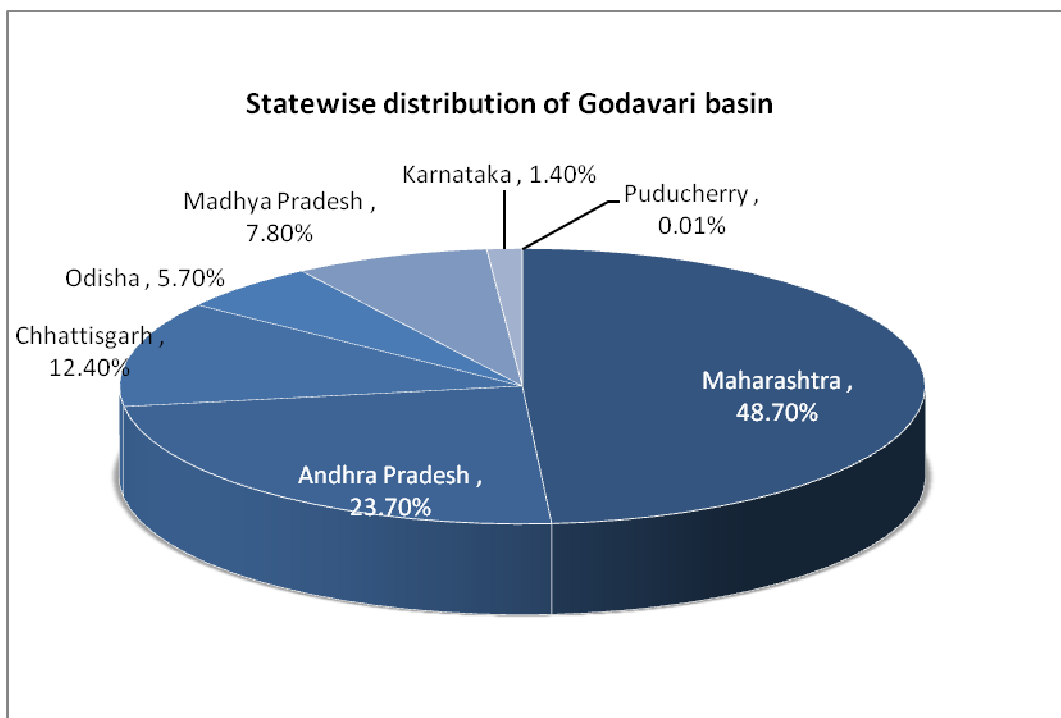
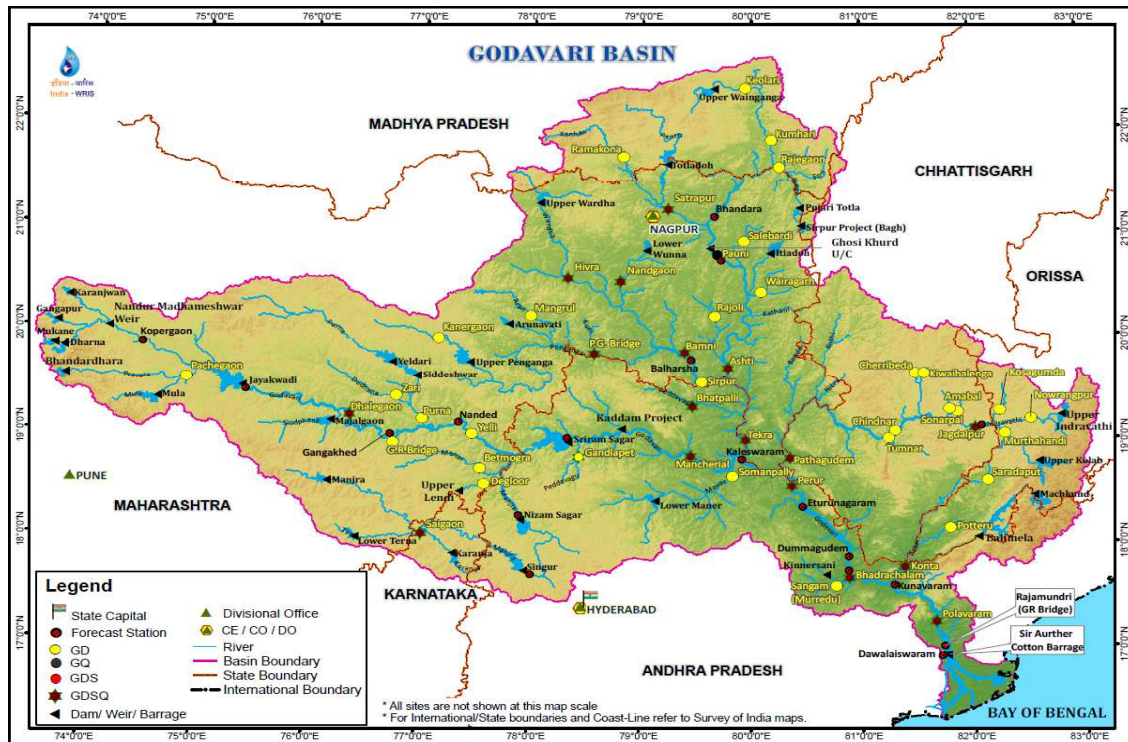


Figure 1 State Wise Distribution of Godavari Basin

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 geographical setting of the basin is shown in Map 1 below-

Map 1 Geographical Setting of Godavari Basin



1.6 Godavari River System

The largest tributary of the Godavari is the Pranhita with about 34.87% coverage of drainage area. The Pravara, Manjira and Maner are right bank tributaries covering about 16.14%, the Purna, Pranhita, Indravathi and Sabari are important left bank tributaries, covering nearly 59.7% of the total catchment area of the basin. The Godavari in the upper, middle, and lower reaches make up for the balance 24.16%. The particulars of the catchment area, length, elevation of the source points of the river and its tributaries in the order of their occurrence along the length of the main river are indicated in the Table 2 below-

Table 2: Principal Tributaries of River Godavari and its Length in km.

Sr. No.	Name of River	Elevation of Source	Length of Tributary (km)	Catchment area (sq.km.)
1.	Upper Godavari (source to Manjira confluence)	1,067	675	33502
2.	Pravara	1,050	208	6537

3.	Purna	838	373	15579
4.	Manjira	823	724	30844
5.	Middle Godavari (between confluence points Manjira and Pranhita)	323	328	17205
6.	Maner	533	225	13106
7.	Penganga	686	676	23898
8.	Wardha	777	483	24087
9.	Pranhita	640	721	61093
10.	Lower Godavari (Pranhita confluence to sea)	107	462	24869
11.	Indravati	914	535	41665
12.	Sabari	1,372	418	20427

1.7 Demography of River Godavari

Demographics are the quantifiable statistics of a given population. On the basis of the 2001 census, and the percentage of each district, within the basin, the total population in the basin works out to about 60.48 million. The population density ranges from 25-50 persons per Sq. km to 500-1000 persons per Sq. km. The important urban centers in this basin are Nagpur, Ambejogai, Ballarpur, Bhandara, Buldhana, Chalisgaon, Hinganghat, Hingoli, Manmad, Nandurbar, Osmandabad, Parli, Pusad, Shrirampur, Udgir, Latur, Kamptee, Ahmadnagar, Parbhani, Aurangabad, Wardha, Bid, Nasik, Chandrapur, Jalna, Nanded, Yavatmal, Amalner, and Gondiya in Maharashtra; Jagdalpur in Chhatisgarh, Chiklikalan, Parasia, Chindwara, Seoni, Balaghat in Madhya Pradesh, Rajahmundry, Nizamabad, Ramagundam, Eluru, Warangal, Khammam, Kothagudem, Karimnagar, Bhimavaram, Kakinada, Adilabad, Bellampalle, Bodhan, Jagtial, Kagaznagar, Mancheri, Mandamarri, Narsapur, Nirmal, Palacole, Palwancha, Sangareddy, Siddipet, Siricilla, Tadepalligudem and Tanuku in Andhra Pradesh; Bidar in Karnataka; and Jeypur in Orissa.

1.8 Status of Rivers in India

In India, most of the major rivers are badly polluted resulting in non compliance of the water quality standards specified for best designated uses of the specified river stretches. Almost 70 percent of the surface water resources and groundwater reserves are contaminated by inorganic, biological, toxic and organic pollutants. In many cases, these sources have been rendered unsafe for human consumption as well as for other activities. Due to draught conditions and limited releases from dams in the downstream river stretch during non monsoon months, the minimum required flow in the river is not maintained at many places. The degraded water quality and inadequate quantity contribute to water scarcity and ecological stress.

1.9 River Water Quality Monitoring and River Conservation

Considering the fact, Government of India has undertaken initiative through the Central Pollution Control Board (CPCB) which has established a network of monitoring stations on rivers across the country. The present network comprises of 2500 stations in 28 States and 6 Union Territories spread over the country. The monitoring network covers 445 Rivers, 154 Lakes, 12 Tanks, 78 Ponds, 41 Creeks/Seawater, 25 Canals, 45 Drains, 10 Water Treatment Plant (Raw Water) and 807 Wells. Among the 2500 stations, 1275 are on rivers, 190 on lakes, 45 on drains, 41 on canals, 12 on tanks, 41 on creeks/seawater, 79 on ponds, 10 Water Treatment Plant (Raw Water) and 807 are groundwater stations. Presently the inland water quality-monitoring network is operated under a three-tier program i.e. Global Environmental Monitoring System (GEMS), Monitoring of Indian National Aquatic Resources System (MINARS) and Yamuna Action Plan (YAP).

The monitoring data from the CPCB on water quality of rivers in India from 1995 to 2011 has identified 150 polluted stretches based on the oxygen consuming substances (bio-chemical demand) and indicator of pathogenic bacteria (total coliform and faecal coliform). The result of such analysis shows that there is gradual degradation in water quality. The number of observations having BOD and coliform density has increased during 1995 to 2011.

There are certain initiatives are taken up by the Government for pollution abatement program. The National River Conservation Directorate (NRCD) in the Ministry of Environment, Forests and Climate Change is implementing the Centrally Sponsored Schemes of National River Conservation Plan (NRCP) and National Plan for Conservation of Aquatic Eco-systems'(NPCA) for conservation of rivers, lakes and wetlands in the country.

The objective of the River Action Plans is to improve water quality of rivers through implementation of pollution abatement schemes in identified polluted stretches of rivers. NPCA aims at conserving aquatic ecosystems (lakes and wetlands) through implementation of sustainable conservation plans, and governed with application of uniform policy and guidelines.

The river conservation program in the country was initiated with the launching of the Ganga Action Plan (GAP) in 1985. The Ganga Action Plan was expanded to cover other rivers under National River Conservation Plan (NRCP) in the year 1995. NRCP, excluding the GAP-I, GAP-II and National Ganga River Basin Authority (NGRBA) program presently covers polluted stretches of 40 rivers in 121 towns spread over 18 States at a sanctioned cost of ₹5334.97 crore.

In Maharashtra there are four rivers are considered under the NRCP namely Panchaganga, Tapi, Krishna and Godavari.

2

Methodology of Survey

2.1 Background of the Study

Considering the ever increasing problem of river water pollution, Central Pollution Control Board (CPCB) decided to carry out comprehensive study on polluted river stretches. Hence accordingly directions were given to Maharashtra Pollution Control Board (MPCB) to carry out such comprehensive studies on prescribed river stretches. Godavari is important river of India, it is popularly called as *Dakshin Ganga* (South Ganga) hence comprehensive study of Godavari river was supposed to assess polluting sources, requirement of environmental flow, sewage generation from cities/ towns located on banks of river, contribution of industrial sources and probable treatment technologies need to be adapted. Hence to complete this study following objectives were determined.

Objectives

- To assess the polluting sources
- To estimate the pollution load reaching to river
- To carryout detailing of pollution sources viz. large, medium and small scale industries
- To collect data and assess operating / requirement regarding pollution abatement infrastructure.
- To quantify domestic pollution
- To procure information on river water quality
- To assess environmental flow
- To study existing STPs/ ETPs/ CETPs and other infrastructure available
- To suggest additional requirement to infrastructure
- To suggest long term and short term action plan from above findings

2.2 Methodology

The present study includes field investigations, water sampling of identified polluted stretches and its detailed analysis. The samples after detailed study have been checked for the various anthropogenic activities and their impacts on the river environment. The field study was carried out during the period January 2015.

In order to achieve the objectives mentioned above following appropriate techniques was used. The data collection was done to cover the best possible

data for every polluted stretch. Data generation is done by two techniques, Primary data generation and Secondary data generation.

2.2.1 Primary Data Generation

To assess the river water quality and ground truthing field visits, sample collection and focus group discussion were carried out at all locations. The sample collection, preservation and analysis of samples were done as per methods given in the manual of American Public Health Association (APHA, 2001) and IS each water sample were analyzed for below physico-chemical and microbiological parameters. The parameters assessed and methods used are depicted in Table 3 below -

Table 3: Parameters and Methods Adopted for Analysis.

Sr. No.	Parameter	Units	Method adapted
1.	Temperature	°C	IS: 3025 Part-09 (R.A : 2002)
2.	pH	--	IS: 3025 Part-11 (R.A : 2002)
2.	Electrical Conductivity	µS/cm	IS: 3025 Part-14 (R.A : 2002)
3.	Chlorides as Cl	mg/lit	IS: 3025 Part-32 (R.A : 2003)
4.	Sulphate as SO ₄	mg/lit	APHA :22 nd edition -(4500- SO ₄ ²⁻ E)
5.	DO	mg/lit	IS: 3025 Part-38 (1989)
6.	BOD	mg/lit	IS: 3025 Part-44 (R.A : 2003)
7.	COD	mg/lit	IS: 3025 Part-58 (R.A : 2006)
8.	Aluminium as Al	mg/lit	IS: 3025 Part-02 (2004)
9.	Arsenic as As	mg/lit	IS: 3025 Part-02 (2004)
10.	Cadmium as Cd	mg/lit	IS: 3025 Part-02 (2004)
11.	Chromium as Cr	mg/lit	IS: 3025 Part-02 (2004)
12.	Iron as Fe	mg/lit	IS: 3025 Part-02 (2004)
13.	Nickel as Ni	mg/lit	IS: 3025 Part-02 (2004)
14.	Lead as Pb	mg/lit	IS: 3025 Part-02 (2004)
15.	Zinc as Zn	mg/lit	IS: 3025 Part-02 (2004)
16.	Pesticides	mg/lit	APHA :22 nd edition
17.	Total Coliform	MPN/100ml	IS: 1622 (R.A : 1996)
18.	Fecal Coliform	MPN/100ml	IS: 1622 (R.A : 1996)

2.2.2 Secondary Data Generation

Secondary data played a vital role in gathering qualitative and quantitative data regarding river water quality, industrial locations, treatment technologies adapted for STPs/ ETPs with their locations, demographic pattern of cities/ towns and villages, land use pattern of study area, pollution abatement measures implemented by various authorities.

Secondary data also collected and referred for action plan suggested by National Environmental Research Institute, Nagpur (NERI). Performance evaluation of Sewage Treatment Plants under NRCD by Central Pollution Control Board (CPCB). Performance Benchmarking of Urban Water Supply and Sanitation in Maharashtra by CETP University, District Socio-Economic Reviews by Directorate of Economics and Statistics, City Sanitation Plan and Environmental Status Report by Nasik Municipal Corporation. Integrated Hydrological Data Book by Central Water Commission. Report on Godavari Basin published by India-WRIS WebGIS (a joint venture of Central Water Commission (CWC) and National Remote Sensing Centre (NRSC), Indian Space Research Organization). District Industrial Profile by MSME. Annual Reports by Maharashtra Pollution Control Board *etc.*

Various researchers did research and published numerous scientific research papers on polluted river stretches and river Godavari. Findings of these research papers are also referred.

2.3 Identification of Polluted River Stretches

CPCB is monitoring the water quality in India under National Water Quality Monitoring Program. The water quality data is analysed and monitoring locations exceeding the water quality criteria are identified as polluted locations with respect to risk. Priority levels of polluted stretch are based on the risk. Risk is defined as;

$$\text{RISK} = \text{FREQUENCY OF VIOLATION OF CRITERIA} \times \text{CONSEQUENCE (MAGNITUDE)}$$

The degree of violation is with respect to water quality criteria for drinking water source with conventional treatment with respect to BOD. The polluted

locations in a continuous sequence are defined as polluted river stretches.

Criteria for Priority 1

- Monitoring locations exceeding BOD concentration 30 mg/l has been considered as it is the standard of sewage treatment plant and in river it appears without dilution.(River locations having water quality exceeding discharge standards for BOD to fresh water sources)
- All monitoring locations exceeding BOD concentration 6 mg/l on all occasions.
- Monitoring locations exceeding 3 mg/l BOD are not meeting desired water quality criteria but does not affect to Dissolved Oxygen level in water bodies. If BOD exceeds 6mg/l in water body, the Dissolved Oxygen is reduced below desired levels.
- The raw water having BOD levels upto 5 mg/l are does not form complex chemicals on chlorination for municipal water supplies. Hence the water bodies having BOD more than 6 mg/l are considered as polluted and identified for remedial action.

Criteria for Priority 2

- Monitoring locations having BOD between 20-30 mg/l.
- All monitoring locations exceeding BOD concentration 6 mg/l on all occasions.

Criteria for Priority 3

- Monitoring locations having BOD between 10-20 mg/l.
- All monitoring locations exceeding BOD concentration 6 mg/l on all occasions.

Criteria for Priority 4

- Monitoring locations having BOD between 6-10 mg/l.

Criteria for Priority 5

- Monitoring locations having BOD between 3-6 mg/l.
- The locations exceeding desired water quality of 3mg/l BOD.

The polluted locations in a continuous sequence are defined as polluted river stretches. Polluted river stretches on river Godavari is depicted in Table 4 below -

Table 4: Polluted River Stretches of River Godavari.

River	Polluted Stretch	Monitoring Location
Godavari	Nasik D/s to Paithan	U/S of Gangapur Dam, Nasik
		Near Someshwar Temple
		Hanuman Ghat, Nasik
		Panchavati at Ramkund
		Tapovan
		Kapila Godavari, confl.Point, Tapovan
		Saikheda
		U/s of Paithan, Jayakwadi
		D/s of Paithan, Pathegaon
		Jayakwadi Dam, Raheer

2.4 Statistical Analysis

To know the general status of the river Godavari, the earlier monitored data from the Maharashtra Pollution Control Board was procured and studied for the important parameters.

3

Study Area

3.1 Background of Present Study

As mentioned above the polluted river stretches are identified by CPCB, Now CPCB directed state pollution control boards for comprehensive study on polluted river stretches and preparation of action plans for various rivers. Maharashtra Pollution Control Board (MPCB) vide its **letter No. MPCB/ROA/1598/2014 dated 25/08/2014** awarded work of Comprehensive Study on Polluted River Stretches and Preparation of Action Plan of River Godavari from Nasik D/s to Paithan. In the present study with the help of TOR suggested by Central Pollution Control Board, sincere efforts were made to understand features of Godavari river basin, location of cities and towns on identified stretches, pollution load exerted by large scale and small scale industries, estimation of water quality of polluted river stretches and preparation of action plan for river Godavari.

3.2 Selection of Sampling Locations

Sampling locations are selected in consultation with Maharashtra Pollution Control Board and polluted river stretches identified by CPCB and are represented in Table 5. The sampling stations were selected in districts of Maharashtra such as Nasik, Aurangabad and Nanded. Whereas study area covers districts namely Nasik, Ahmednagar, Aurangabad, Parbhani and Nanded. The present study covered the stretch of the river in Maharashtra State only. Whereas entire river stretch under study is passing through districts Nasik, Ahmednagar, Aurangabad, Jalna, Beed, Parbhani and Nanded.

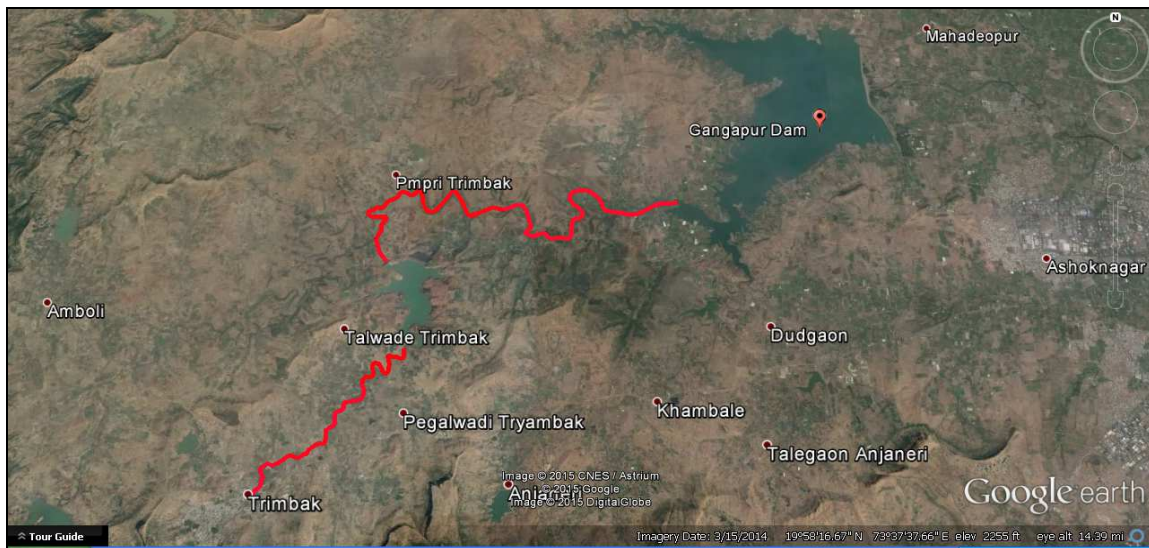
Table 5: Sampling Locations in River Godavari.

Sr. No.	Sampling Locations	Village	Taluka	District
1.	U/s of Gangapur Dam	Gangapur	Nasik	Nasik
2.	Near Someshwar Temple	Nasik city	Nasik	Nasik
3.	Hanuman Ghat	Nasik city	Nasik	Nasik
4.	Panchavati at Ramkund	Nasik city	Nasik	Nasik
5.	Tapovan	Nasik city	Nasik	Nasik
6.	Kapila-Godavari Confluence Point	Nasik city	Nasik	Nasik
7.	Saikheda	Saikheda	Niphad	Nasik

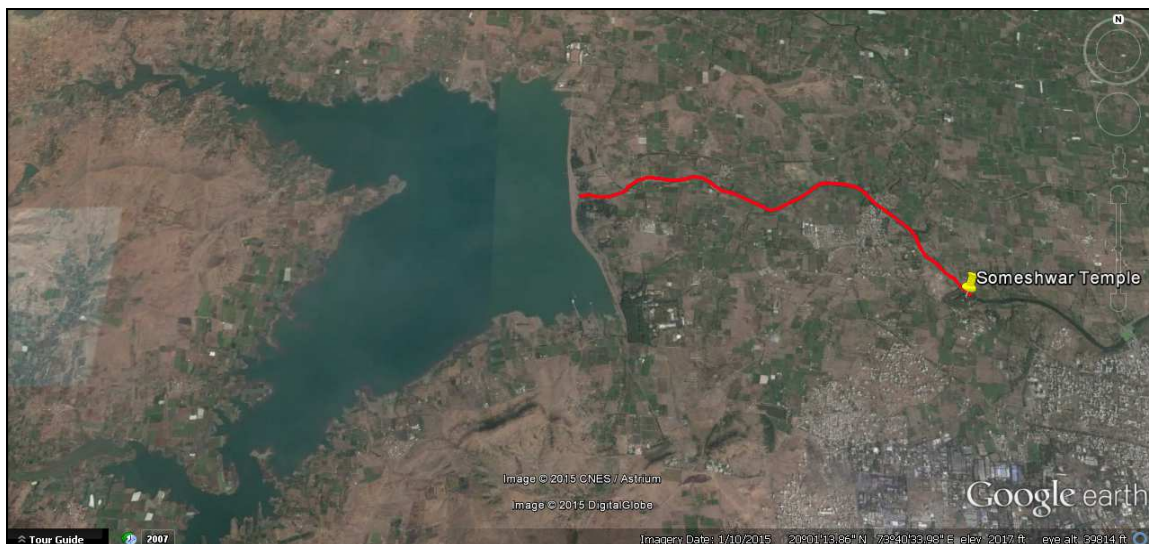
8.	U/s of Paithan, Jayakwadi	Tokka	Nevasa	Ahmadnagar
9.	D/s of Paithan, Pathegaon	Pathegaon	Paithan	Aurangabad
10.	Jayakwadi dam, Raheer	Raheer	Nayagaon	Nanded

3.3 Geographical Setting of Polluted River Stretches

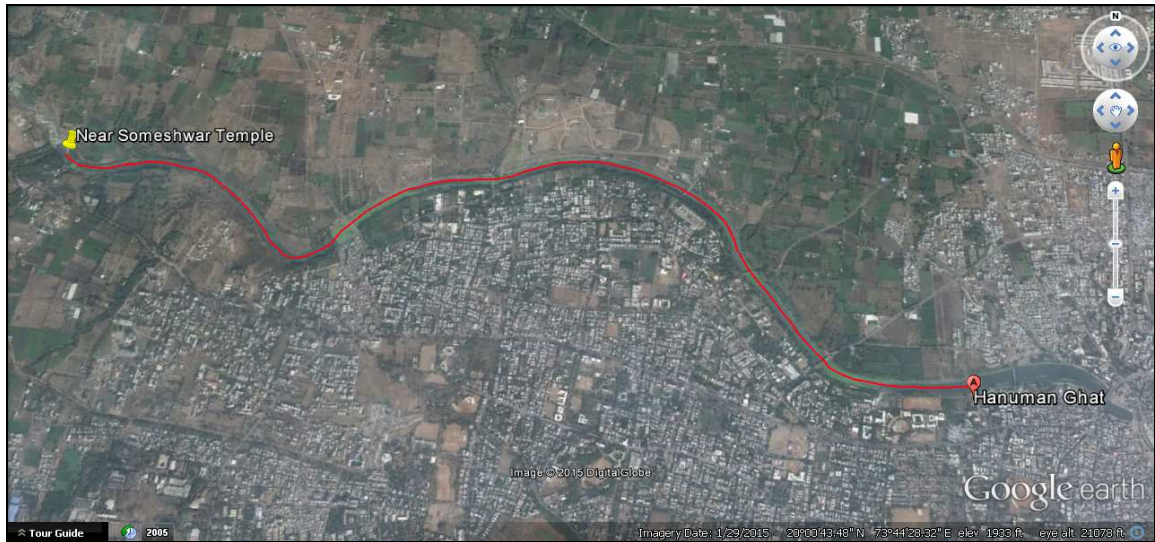
For better understanding of geographical setting of polluted river stretches Google images are given below-



U/s of Gangapur Dam



U/s of Gangapur dam to Someshwar temple



Someshwar Temple to Hanuman Ghat



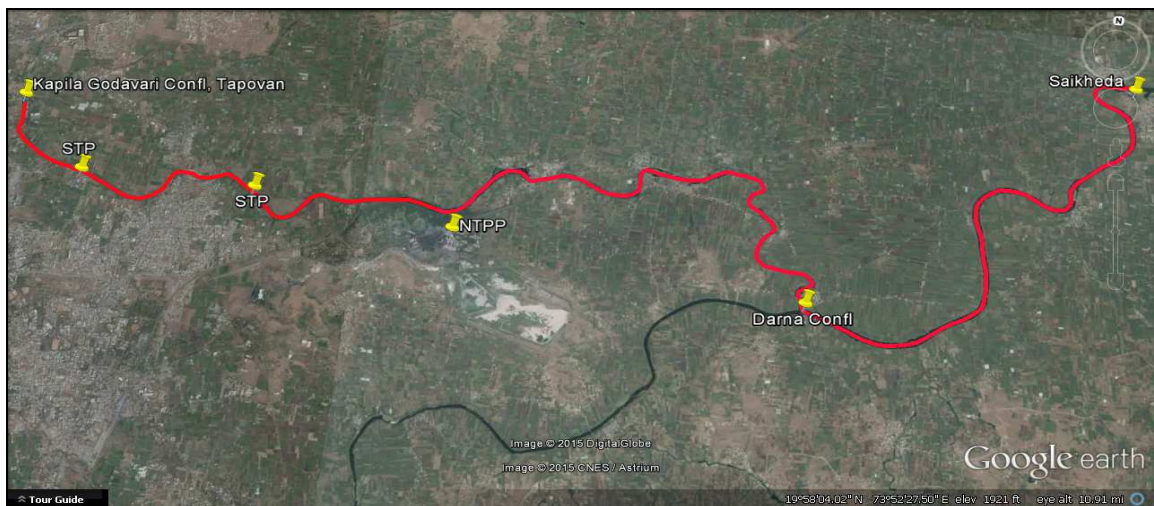
Hanuman Ghat to Panchvati at Ramkund



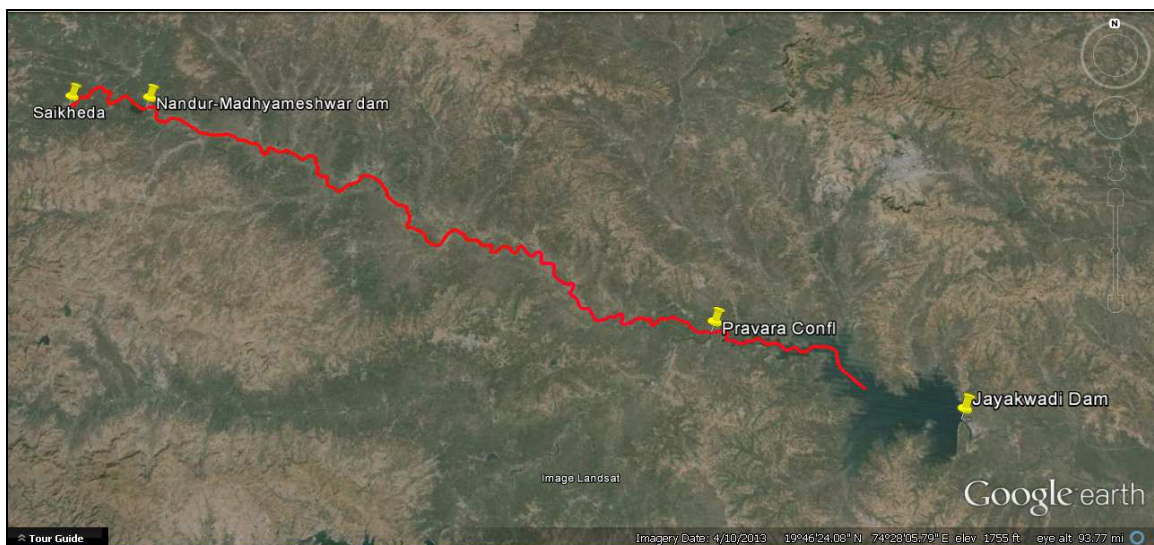
Panchvati at Ramkund to Tapovan



Tapovan to Kapila Godavari Confluence



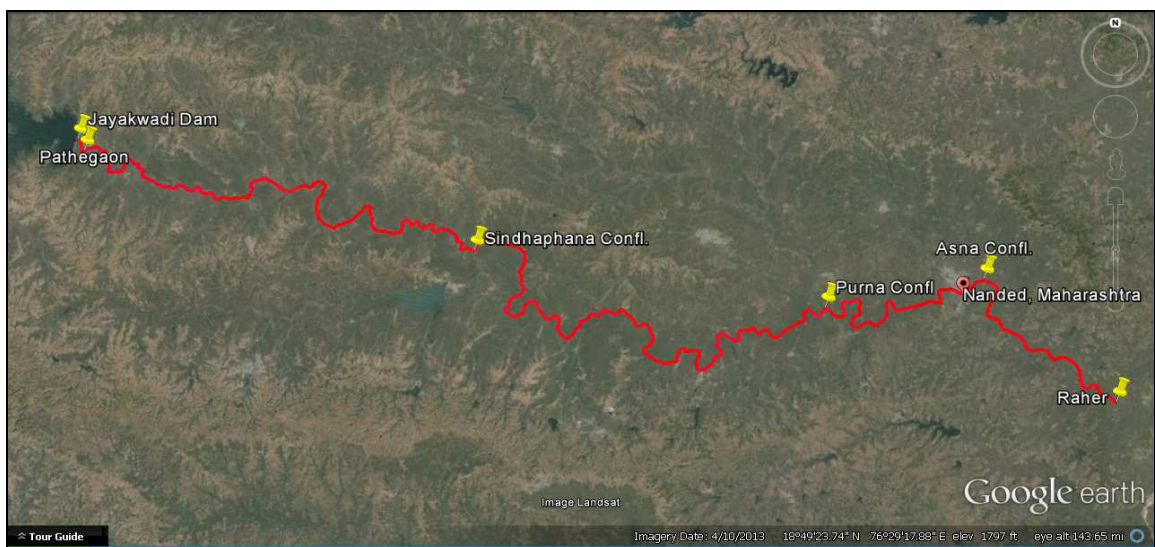
Kapila Godavari Confluence to Saikheda



Saikheda to U/s of Paithan, Jayakwadi



D/s of Paithan, Pathegaon



Jayakwadi Dam, Raheer

3.4 Major Cities/ Towns on Polluted River Stretches

Major cities/ towns on polluted river stretches are Trimbakeshwar, Nasik, Kopargaon, Paithan, Gangakhed and Nanded. Administrative details of these cities/ towns are represented in Table 6.

Table 6: Major Cities/ Towns on Polluted River Stretches.

Sr. No.	Name of City/ Town	Name of Administrative District	Class of Local Body	Population as per Census 2011	Sewage Treatment Facility Available
1.	Trimbakeshwar	Nasik	C class Municipal Council	168,423	Yes
2.	Nasik	Nasik	B class Municipal Corporation	1,486,053	Yes
3.	Kopargaon	Ahemadnagar	B class Municipal Council	65,273	No
4.	Paithan	Aurangabad	C class Municipal Council	41,536	No
5.	Gangakhed	Parbhani	B class Municipal Council	49,891	No
6.	Nanded	Nanded	C class Municipal Corporation	550,439	Yes

3.5 An insight of the Cities/ Towns Located of Polluted River Stretches of Godavari from Nasik D/s to Paithan

Trimbakeshwar, Trimbak is a taluka situated in Nasik District in the state of Maharashtra at a distance of 28 km from Nasik- Jawahar road. Trimbak is located at 19°56'0"N 73°33'0"E at an elevation of 720 metres (2362 feet). Trimbakeshwar town is an ancient Hindu Pilgrim centre located at the origin of the Godavari river. Godavari river originates from Bramhagiri mountains at Trimbakeshwar. The Lord Shiva temple at Trimbakeshwar was built by Nanasaheb Peshwa and is worshipped by recitations *Rudra*, *Maha Rudra* or *Ati Rudra puja*. Trimbak falls under "C" class Municipal Council. Trimbakeshwar is considered as the most sacred town in India. The Hindu belief is that those who visit Trimbakeshwar attain salvation or *Moksha*. This place is believed to be the

holiest and ideal place to do *Shraddha* ceremony, a Hindu ritual for the salvation of the soul. Rituals like *Ganga Pujan*, *Ganga Bhet*, *Deh Shuddhi Prayaschitta*, *Tarpan Shraddha*, *Vayan*, *Dasha Dana*, *Gopradan* etc. are performed in Trimbakeshwar. The serene ambiance and the pleasant climate make the town of Trimbakeshwar a hot spot for nature loving tourists apart from Hindu pilgrims. It is dedicated to Lord Shiva and is one of the twelve *Jyotirlingas*.

Water Supply and Sewage Generation: The source for water supply to Trimbak city is Amboli dam at a distance of 11 km from Trimbakeshwar. The capacity of the dam is 129.37 ML/ft². The water reservation for the city is 26 MCFT. During 2003, during *Sinhastha Kumbhmela*, a sewage treatment plant is constructed with MBR technology. The plant is located at the back side of the Shiva Temple with a capacity of 1.0 MLD.

Nasik, located at 20° 02' N and 73° 50' E. The third-largest city located in northern Maharashtra at 600m above Mean Sea Level, is the district headquarters of Nasik District and an important node of the industrial triangle, with Pune and Mumbai. Nasik is famous for its grape, vineyards and is also an important pilgrim center. Spread over 259.13 sq.km. Population is projected to cross 3 million in 2026 and 5 million in 2041. Nasik forms North West part of Maharashtra with diverse landscape made up of Deccan trap, plateau, hills, linear ridges and alluvial plains. The main rivers flowing in the district is Godavari and its tributaries Kashyapi, Darna, Girna, Kadwa and Nasardi (Nandini), Mula, Prawara, Panjarakan, Gomai etc. Nasik city is an important and famous ancient city of Maharashtra. The banks or the Ghats of the river Godavari are considered to be sacred. People take holy dip in the “*Kundas*” (Ponds) constructed on the river banks. Panchavati is one of the densely populated areas of Nasik where Ramkund is a unique place of religious importance at all the times, especially in the “*Kumbhamela*”.

Nasik is also known as holy city, many temples and ghats like Trimbakeshwar, Panchavati, Sita Gumph, Kalaram temple, Godavari temple, Tapovan, Ramkund, Hanuman ghat, Dutondya Maruti has religious importance. Ramkund is a unique place of religious importance at all the times, especially in

the “*Kumbhamela*”. Temples and ghats on the banks of Godavari have made Nasik one of the holiest places for Hindus all over the world. Devotes offer *pujas* and perform rituals at *Dakshin Ganga* “Godavari”. Whereas offerings increase organic load in the river. On several occasions, large numbers of people gather at such locations. Due to the sudden huge gathering of people at one time, a number of problems are generated, which adversely affect the environment and public health. The problems arising out of such activities mainly associated with mass bathing, cloth washing, idol immersion, *nirmalya visarjan* etc.

Water Supply Sewage Generation and Treatment: Nasik city receives piped water from two sources Gangapur dam headwork’s on river Godavari, which supplies almost 1.6 million residents of NMC area and Headwork’s on river Darna which services Nasik Road area. Presently Nasik Municipal Corporation is pumping 392 MLD raw water from these two sources. The average supply of drinking water to citizen is at 150 LPCD. Nasik has Sewage Treatment Plants having combined capacity of 270.5 CMD and all are operating. Details of STPs are mentioned in Table 7 below

Table 7: Details of STPs in Nasik City.

Sr. No.	Name of STP	Qty. of effluent MLD
1.	Tapovan STP	130
2.	Chechedi STP	42
3.	Panchak STP	28.5
4.	Agar takli	210
5.	Total	270.5

Source: Studies on Rejuvenation of River Godavari by NEERI

Industrial zones: There are two industrial estates namely Satpur having 1600 Acres and 750 no. of units and Ambad having 1400 Acres area with 850 nos. of units. List of Water Polluting Industries in Satpur Zone of Maharashtra Industrial Development Corporation, Nasik Division is attached as an annexure. Till 2014 there was no Common Effluent Treatment Plant (CETP) in this region for the combined treatment of effluent generated from small scale units of water polluting industries. Individual treatment schemes are constructed by the respective water polluting industries. The MIDC has not provided any underground drainage system for collection of industrial and domestic waste

water. It is the need of the hour to provide common effluent treatment plant in these industrial areas. Hence recently an initiative has been taken up for the construction of CETP at MIDC for 1 MLD capacity. In addition to these industrial zones, variety of major water intensive industries have come up like India Bulls, The Eklahare Thermal Power Plant is also located at the downstream of Nasik and its water requirement is met by releases from Gangapur dam on River Godavari, managed by Irrigation department.

Kopargaon, Situated in 19°54' north latitude and 74°33' east longitude. Kopargaon is the head-quarters of the taluka. Municipality was established in 1947. Kopargaon Municipal Council is a B class Municipal Council. Water source for Kopargaon Municipal Council is Darna and Nandur Madhyameshwar dam. Water consumption of Kopargaon Municipal Corporation is 11 MLD and Quantity of domestic effluent generated is 7 MLD whereas there is no adequate treatment facility available to treat the sewage generated. Sanjivini (Takli) S.S. K. Ltd. is located in close proximity of river generating trade effluent 313 CMD and Domestic effluent 104 CMD. Godavari Biorefineries Ltd is also located in close proximity of river where as industry is not generating effluent.

Paithan an ancient town in the Aurangabad district is located on the north bank of the river Godavari. A shrine of saint Eknath Maharaj rests on the banks of river Godavari. Paithan Municipal Council is a C class Municipal Council. Having water consumption 2.4 MLD and Sewage generation is of 1.7 MLD. There is no adequate treatment facility available to treat the sewage generated. No effluent generating industries were identified from river pollution point of view.

Gangakhed, is a city and a municipal council in Parbhani district. It is situated on the bank of Godawari river it has largest number of various temples on the bank of the holly river. Water sources for town is Godavari and Masoli river. Water consumption for town is 5 MLD. Domestic waste water generation is 3.5 MLD. There is no adequate treatment facility available to treat the sewage generated. No effluent generating industries were identified from river pollution point of view.

Nanded is one of the historical places in Marathwada region of Maharashtra State. It is situated on the north bank of Godavari river. It is famous for Sikh Gurudwaras. Nanded City is getting treated water from the W.S. operated by Corporation and CIDCO. The total supply is considered at 135 lpcd. City is having Godavari River as source with four head works situated on the banks of Godavari 2 in submergence of Shankar Sagar (Vishnupuri Dam) and two downstream of Dam. Treated water is served to CIDCO from WTP of capacity 12.5 MLD. Major Part of the city is being served with the WTP having capacity 60 MLD. Presently average rate of water supply is 85 LPCD. There are two STPs available having capacity of 87 MLD and 30 MLD.

3.6 Villages on the Banks of River Godavari

Villages located within 3 Km play important role in contribution of pollution load as they are located in close proximity of river and having no sewage treatment facilities. Due to close proximity of river villagers utilize river water for agriculture, washing of cloths, cattle, brick making, vehicle washing and open defecation etc. Since Godavari is religiously important river many temples are found in these villages. Villagers and devotees visit temples and perform many religious rituals hence it is important to know population of these villages to roughly estimate pollution load exerted in river. List of villages with total population (census 2011) is depicted in Table 8 below-

**Table 8: List Villages along The Bank of River Godavari under Study Area
With Total Population (Census 2011).**

Sr No.	Name of Village	Total Population	Sr No.	Name of Village	Total Population
1	Talwade Trimbak	2,277	31	Kothure	5,022
2	Beze	1,072	32	Kurudgaon	1,102
3	Rajewadi	1,239	33	Karanjgaon	5,256
4	Chokore	371	34	Chapadgaon	1,347
5	Ganeshgaon Trimbak	1,707	35	Kathargaon	1,929
6	Ganeshgaon Naik	1,191	36	Bhuse	2,027
7	Pimpalgaon Garudeshwar	1,501	37	Dindori	1,702
8	Shivangaon	1,049	38	Tamaswadi	2,288
9	Ozarkhede	2,877	39	Khangaon Thadi	1,633
10	Nagalwadi	1,105	40	Nandur Madhyameshwar	4,693
11	Mahadeopur	1,708	41	Tarukhedle	2,135
12	Sawargaon	722	42	Sarole Thadi	2,600
13	Yashawantnagar	849	43	Khedale Zunge	3,620
14	Matori	2,843	44	Bramnhanwadi	1,182
15	Shivangaon	1,049	45	Karanji Kh.	1,470
16	Nandur	1,458	46	Somthane	3,344
17	Eklahare	350	47	Baktarpur	5,159
18	Shilapur	2,436	48	Kanlad	1,146
19	Odha	3,321	49	Morvis	1,140
20	Lakhalgaon	4,282	50	Chas	3,893
21	Lalpadi	959	51	Manjur	2,779
22	Sawali	801	52	Dhamori	5,159
23	Chatori	5,882	53	Maygaon Devi	2,008
24	Jogaltembhi	1,516	54	Suregaon	12,230
25	Darna Sangvi	1,765	55	Kolpewadi	5,449
26	Shimpi Takali	1,687	56	Velapur	3,027
27	Nagapur	2,005	57	Kolgaon Thadi	2,055
28	Chandori	12,594	58	Malegaon Thadi	2,737
29	Shingave	5,237	59	Mahegaon Deshmukh	4,146
30	Gondegaon	993	60	Dharangaon	3,498

Sr No.	Name of Village	Total Population	Sr No.	Name of Village	Total Population
61	Kumbhari	3,137	91	Deogaon Shani	709
62	Hingani	1,023	92	Chenduphal	904
63	Dauch Bk.	1,197	93	Ghogargaon	3,693
64	Dauch Kh.	2,069	94	Jainpur	1,524
65	Chandgavhan	950	95	Haibatpur	74
66	Ghari	1,632	96	Suregaon Gangapur	1,660
67	Kokamthan	10,932	97	Usthal Khalsa	973
68	Sade	1,470	98	Borgaon	1,178
69	Shingave	4,258	99	Bhalgaon	869
70	Rastapur	1,887	100	Mamdapur	846
71	Puntamba	13,098	101	Bagadi	1,711
72	Dongaon	2,321	102	Jamgaon	6,709
73	Nandur Dhok	1,028	103	Washim	459
74	Lakhganga	1,014	104	Toka	1,369
75	Matulthan	1,471	105	Pravarasangam	3,645
76	Babulgaon	1,338	106	Kaygaon	3,442
77	Babhulgaon Ganga	816	107	Mhalapur	116
78	Jafrabad	863	108	Amalner	2,298
79	Naur	2,246	109	Mangalapur	2,762
80	Rampur	913	110	Galnib	2,048
81	Govardhanpur	756	111	Suregaon	12,230
82	Wanjargaon	1,770	112	Suregaon Turf Dahigaon	719
83	Bhalgaon	1,542	113	Ager Wadgaon	1,785
84	Dagpimpalgaon	1,261	114	Warkhed	2,712
85	Nagamthan	3,094	115	Malewadi Dumala	739
86	Khanapur	2265	116	Ramdoha	1,622
87	Humrapur	660	117	Savkheda	2,333
88	Bhamathan	2,277	118	Lohagaon Kh	1,620
89	Bajathan	1,310	119	Lohagaon Bk.	2,809
90	Kamalpur	1,018	120	Mankapur	243

Sr No.	Name of Village	Total Population	Sr No.	Name of Village	Total Population
121	Dahigaon Ne	6,520	151	Surlegaon	1,752
122	Vaijapur	1,595	152	Balegaon	1,178
123	Dhakephal	2,368	153	Apegaon	642
124	Amrapur	773	154	Rakshasbhuwan	3,495
125	Pimpalwadi	404	155	Panchaleshwar	2,161
126	Erandgaon	4,242	156	Mhalas Pimpalgaon	737
127	Lakhefal	753	157	Sasht Pimpalgaon	4,491
128	Karhetakli	1,543	158	Gahininath Nagar	570
129	Telwadi	1,060	159	Gandhari	1,125
130	Chanakwadi	867	160	Shahgadh	7,866
131	Pathegaon	1,871	161	Sawaleshwar	836
132	Panthewadi	36	162	Khamgaon	1,064
133	Waghadi	779	163	Padalsingi	2,822
134	Wadvali	2,399	164	Walkeshwar	2,113
135	Dadegaon Jahadir	2,343	165	Nagzari	1,184
136	Mayagaon	851	166	Kuran	1,239
137	Naigaon	1,198	167	Sangam Jalgaon	983
138	Mungi	6,611	168	Hingangaon	1,025
139	Maygaon	851	169	Gondi Kh	842
140	Madke	1,119	170	Patharwala Bk.	3,357
141	Apegaon	2,204	171	Gondi	6,809
142	Navgaon	8,319	172	Hasnapur	211
143	Borgaon Bk.	2,190	173	Katchincoli	1,318
144	Awade Uchegaon	997	174	Pangulgaon	387
145	Patharwala Kh	438	175	Mirgaon	929
146	Guntegaon	1,264	176	Kothala Kh.	945
147	Takli Ambad	919	177	Ganga Chincholi	1,126
148	Patharwala Bk.	438	178	Indalgaon	371
149	Gulaj	3,881	179	Pandhari	971
150	Hiradpuri	3,397	180	Sadegaon	2,190

Sr No.	Name of Village	Total Population	Sr No.	Name of Village	Total Population
181	Bhogalgaon	1,804	211	Sawargaon Bk.	1,054
182	Daithana Kh.	1,079	212	Kalegaon Thadi	655
183	Jogaladevi	1,249	213	Changtpuri	1598
184	Borgaon Thadi	750	214	Golegaon	2,239
185	Ramasgaon	2,172	215	Purushottampuri	2,697
186	Raheri	1,770	216	Sultanpur	794
187	Shevta	1,498	217	Landakdara Tanda	527
188	Banegaon	816	218	Sawangi Ganga Kinara	1,285
189	Gangawadi	2,003	219	Jawala Zute	1,777
190	Soundalgaon Bk	1,189	220	Nathara	2,187
191	Bhoggaon	1,923	221	Sadola	3,272
192	Rajapur	2,006	222	Banegaon	1,200
193	Kathoda	905	223	Manjarath	1,150
194	Mangrul	3,240	224	Mardasgaon	2,277
195	Golegaon	1,451	225	Chhatra Borgaon	1,682
196	Rampuri	4,196	226	Gopegaon	1,431
197	Mudregaoon	1,166	227	Patoda Ganga Kinara	937
198	Shripat Antarwala	692	228	Niwali	754
199	Ukkadgaon	1,032	229	Somthana	1,529
200	Gopat Pimpalgaon	672	230	Dhalegaon	976
201	Dhalegaon	931	231	Adola	226
202	Shivangaon	1,449	232	Tura	1,742
203	Tape Nimgaon	706	233	Masala Tanda	537
204	Bhadli Kh	1,616	234	Gangamasla	3,225
205	Raja Takli	4,191	235	Gunj Kh	2,048
206	Gavhan Thadi	1,005	236	Sonna Thadi	2,478
207	Bhadli Kh	1,616	237	Andhapuri	1,247
208	Kaudgaon Thadi	515	238	Mogra	977
209	Gunj Bk	3,845	239	Pimpri Kh	1,235
210	Dubba Thadi	518	240	Digras	413

Sr No.	Name of Village	Total Population	Sr No.	Name of Village	Total Population
241	Umara	2,323	271	Mairal Sawangi	1,286
242	Khatgavhan	1,072	272	Mohala	378
243	Daku Pimpri	1,589	273	Pohandul	1,200
244	Tarugavhan	451	274	Mahatpuri	4,856
245	Pohner	3,455	275	Brahmanathwadi	1,084
246	Limba	3,908	276	Khali	2,006
247	Telasmukh	920	277	Shankarwadi	1,283
248	Limba Tanda	334	278	Anandwadi	632
249	Anandnagar	1,028	279	Chinchtakli	998
250	Vita Bk.	2,151	280	Khali	1,838
251	Wanisangam	1,019	281	Sunegaon Sayala	369
252	Vita Kh.	1,271	282	Dusalgaon	805
253	Waghalgaon	548	283	Muli	2,783
254	Mudgal	2,163	284	Bhambarwadi	478
255	Lasina	1,531	285	Zola	2,199
256	Wangi	711	286	Pimpri Zola	2,345
257	Ukkadgaon	1,032	287	Angalgaon	1,316
258	Wadi Pimpalgaon	495	288	Masla	1,895
259	Thadi Pimpalgaon	706	289	Kharbada	920
260	Ganga pimpri	994	290	Wazur	4,191
261	Golegaon	183	291	Raorajur	3,221
262	Rampuri	2,555	292	Dhanewadi	822
263	Lohigram	720	293	Devthana	882
264	Hatkarwadi	1,611	294	Khurlewadi	700
265	Lohigram Tanda	380	295	Umarthadi	708
266	Sakharam Tanda	706	296	Deulgaon Dhudhate	3,355
267	Sirori	893	297	Arkhed	1,510
268	Dharasur	4,190	298	Golegaon Palam	833
269	Kanhegaon	2,354	299	Someshawar	469
270	Khadaka	2,242	300	Phala	2,323

Sr No.	Name of Village	Total Population	Sr No.	Name of Village	Total Population
301	Mumber	1,078	331	Rahathi Bk	3,354
302	Pharkanda	2,993	332	Markand	1,468
303	Banegaon	502	333	Pimpalgaon Koraka	2,494
304	Digras	2,322	334	Boragaon Telang	1,072
305	Mahagaon	2,033	335	Kalhal	846
306	Barbadi	836	336	Vishnupuri	6,910
307	Sawangi Thadi	330	337	Sugaon Bk	1,540
308	Mithapur	250	338	Dhanegaon	9,809
309	Kantheshwar	1,344	339	Elechpur	291
310	Bhogaon	777	340	Fattepur	1,181
311	Pimpalgaon Sarangi	713	341	Injegaon	875
312	Rahati	507	342	Gadegaon	1,031
313	Sategaon	1,557	343	Degaon Bk.	2,635
314	Dhangar Takli	3,765	344	Wadi Janji	183
315	Dutka	871	345	Pathrad	2,160
316	Gunj	640	346	Dhanaj	1,047
317	Anteshwar	918	347	Mugat	6,422
318	Runj Tarf Parbhani	926	348	Siddhanath	834
319	Satephal kaulgaom tarf	2,528	349	Punegaon	1,691
320	Dhanora motya	2,927	350	Wadgaon	1,673
321	Penur	1,559	351	Basri	2,238
322	Bharaswada	653	352	Devapur	1,276
323	Bet Sangvi	3,412	353	Kakandi	3,613
324	Kawalgaon	5,273	354	Devapur	1,186
325	Someshwar	1,061	355	Chincholi P.U.	696
326	Gangabet	638	356	Kamlaj	1,899
327	Jaitapur	705	357	Kaudgaon	604
328	Wahegaon	785	358	Malkautha	3,894
329	Bhanagi	539	359	Yeli	1,710
330	Rahathi	507	360	Mahati	581

Sr No.	Name of Village	Total Population
61	Chilpimpri	1,178
362	Donwada	1,129
363	Khujda	1,136
364	Hangiranga	1,341
365	Barbada	7,383
366	Bhayegaon	1,167
367	Rahathi Kh.	1,246
368	Manur	1,487
369	Manur Tarf Ba	1,456
370	Ijjatgaon	2,024
371	Mahati	977
372	Rui Kh	1,096
373	Endala	349
374	Sangvi	471
375	Kaudgaon	1,269
376	Dhanaj	1047
377	Hassa	988
378	Hussa	1,694
379	Singnapur	662
380	Kawalguda Bk.	566
381	Kawalguda Kh	587
382	Raher	2675

Source: <http://www.censusindia.gov.in/pca/Searchdata.aspx>

4

Observations

4.1 Observations of Polluted Stretches

4.1.1 U/s of Gangapur Dam, Nasik In the study area, upstream of Gangapur dam there are two other dams constructed for water storage viz. Kashyapi and Gautami-Godavari dam. Kashyapi Dam, is an earth fill dam on Kashyapi river a tributary of Godavari near Rajapur, Nasik, it is constructed on U/s of Gangapur Dam. Gross storage capacity is 52,690.00 km³ (12,641.00 cu mi). Gautami Godavari Dam is constructed on U/s of Gangapur Dam on river Gautami tributary of Godavari at near village Beze Tal. Trimbakeshwar, Dist. Nasik. Gross storage of Dam is 1879 mcft. Gangapur dam reservoir located at 10 Km upstream of Nasik city is the main source of water for domestic and industrial use in Nasik city. The dam is near village Gangawadi and is 10 Km. from Nasik city. This is an earthen dam constructed from 1954 to 1963. The total catchment area of the dam is 357.4 Sq.km. The total gross storage of the dam is 215.88 MCM (7624 mcft). The total irrigable area of this dam is 15960 Ha. Due to deposition of silt, storage capacity of Gangapur Dam has reduced to 5630 mcft, also due to increase in residential zone (civilization) in command area of Nasik, Right Bank canal is closed. Since 1998, that land is given to Nasik Municipal Corporation for laying pipeline for drinking water from Gangapur Dam. The water from Gangapur Dam is used for irrigation through Nasik Left Bank canal. Dam water is used for drinking purpose of Nasik Municipal Corporation.

It is reported that due to siltation storage capacity of Gangapur dam has been reduced same cannot be denied in case of Kashyapi and Gautami – Godavari dam. Sedimentation is a complex process which varies with watershed sediment production, rate of transportation and mode of deposition. Sedimentation reduces reservoir storage capacity for flow regulation and with it all water supply and flood control benefits, navigation, recreation and environmental benefits that depend on release from storage. Besides storage loss, many types of sediment related problems can also occur both upstream and downstream of dams. The combination of sediment trapping and flow regulation also has dramatic impact on ecology, water quality, sediment balance, nutrient balance and river morphology.

Due to unique religious significance and the serene ambiance Trimbakeshwar attracts pilgrims and tourist on large scale especially on occasions like *Kumbha Mela*. This place is believed to be the holiest and ideal place to do Shraddha ceremony, a Hindu ritual for the salvation of the soul. Rituals like *Ganga*

Pujan, Ganga Bhet, Deh Shuddhi Prayaschitta, Tarpan Shraddha, Vayan, Dasha Dana, Gopradan etc. Due to *Nirmalya visarjan*, bathing, washing of cloths and poor management of solid waste organic load increases. Temples, *ashrams*, *aakharas* generally don't have their own *nirmalya* collection facility.

A Trimbakeshwar town is a "C" Class Municipal Council. During 2003, *Sinhastha Kumbhmela*, a sewage treatment plant is constructed with MBR technology. The plant is located at the back side of the Shiva Temple with a capacity of 1.0 MLD. The design of the plant was provided by IIT, Mumbai and the plant was constructed by MJP. Performance of this STP was evaluated by CPCB and it was then reported that status of STP is Operational (unsatisfactory) and disposal of treated sewage released in Godavari/ irrigation. Open defecation, washing of cloths and animals, *nirmalya visarjan*, farming at close proximity of river are observed in the villages nearby river course and at the back water of dams.



Photo 1: Washing of Cloths and Nirmalya at U/s of Gangapur Dam.

4.1.2 D/s of Gangapur Dam to Someshwar Temple, As mentioned above at the U/s of Gangapur dam there is Trambak city, STP for Trambak city, Kashyapi, Gautami-Godavari dams, religiously significant places and farms with cash crops where as D/s of Gangapur dam is not much populated but farms having cash

crops are observed. No industries are identified with regard to effluent generation. There are two nallas in the Someshwar area. Nalla 1 receives only sewage from Someshwar area and has flow in all the seasons. The Nalla 2 carries domestic solid waste along with sewage. This nalla at present has been diverted by NMC. At present Someshwar nalla is diverted to Tapovan STP as this sewerage zone does not have STP. The Someshwar temple is famous temple of lord Shiva, located on the bank of Godavari river. At Someshwar, activities like washing of clothes and vehicles were observed. *Nirmalya* (offerings) heaps are observed in river as well as on the banks of river. Proper collection facility for *nirmalya* was not observed at or nearby temple. Whereas river water arrested with the help of bund and recreational facilities are available near river bank.



Photo 2: Washing of Cloths near Someshwar.

4.1.3 Someshwar Temple to Hanuman Ghat is at D/s of Someshwar temple, farming or agricultural practices are relatively less after Someshwar temple. Geographically Satpur MIDC is located at the U/s of Hanuman ghat. Chikhli nalla carries wastewater from Satpur industrial zone thereby adding industrial pollution to river Godavari. At Anandvalli, discharges of wastewater from unauthorized slums are observed. Satpur Industrial area is spread across 1600 acres having

750 Industrial units (List of Water Polluting Industries in Satpur Zone of Maharashtra Industrial Development Corporation, Nasik Division is attached as an annexure) There is no Common Effluent Treatment (CETP) facility available till date but recently an initiative has been taken up for the construction of CETP at MIDC for 1 MLD capacity. The land has been approved by the competent authorities for construction of CETP. U/s of Hanuman ghat is densely populated. Open defecation, washing of vehicles, bathing and *nirmalya visarjan* was observed.



Photo 3: Human Activities at Hanuman Ghat.

4.1.4 Hanuman Ghat to Panchavati at Ramkund, Panchavati is one of the densely populated areas of Nasik where Ramkund is a unique place of religious importance at all the times, especially in the “*Kumbhamela*”. It is a place for holy dip. Daily thousands of people take a dip in Ramkund. During *kumbha parva* Lakhs of people take holy dip in Ramkund. The belief is that God Rama use to take a bath in Ramkund and the river takes a turn in ninety degree at this place. *Nirmalya visarjan*, religious activities, bathing and *Asthi visarjan* are daily activities at Ramkund. At U/s of Ramkund and Hanuman Ghat River receives sewage and industrial load. Whereas at this particular site religious activities are prominent. Stretch is mark with improper facilities for collection of *Nirmalya* and other solid

waste, bathing, washing of cloths, vehicles, *Dashakriya vidhi and asthi visarjan*. Also at Ram ghat there is a “*Bhaji Bajar*”, throwing of vegetable waste, remains *etc.* has been observed. It is also observed that temples don’t have their own *nirmalya* collection facility. Plastic bags are observed in river, color of river water is objectionable. Washing of vehicles also reported by local residents on the occasions like Dussehra, Diwali, Padva *etc.*



Photo 4. Human Activities at Ramkund.

4.1.5 Panchavati at Ramkund to Tapovan, is at D/s of Ramkund. At upstream of Tapovan there are religious places like Hanuman Ghat, Ramkund, Panchavati, Ram ghat and many temples. Several religious rituals are performed here. U/s of Tapovan is densely populated and there is no industrial or farming activity exists. Washing of vehicles are reported during festive season. Throwing of garbage, *nirmalya* from bridges were reported at the time of discussion with locals. In spite of availability of public urinals and latrine open defecation was observed at Tapovan.



Photo 5: Polluted Stretch at Tapovan.

4.1.6 Tapovan to Kapila Godavari Confluence Point, is just after Tapovan on the U/s of Kapila Godavari confluence religiously significant places like Hanuman Ghat, Ramkund and Tapovan are located. Geographically Tapovan STP is located after Kapila Godavari Confluence. STP having capacity of 78 MLD is established at Tapovan in year 2003. It has Up flow Anaerobic Sludge Bioreactor (UASB) technology. There are 2 UASB plants at Tapovan having capacity of 78 MLD and 58 MLD. The plant currently faces extensive foaming in UASB reactor, aeration tank, polishing tank and at the final outlet in the river. The technology was installed as a part of JnNURM. D/s of Kapila Godavari confluence there is discharge of Tapovan STP which causes extensive foaming in river Godavari. Kapila sewage pumping station located at junction of Godavari and Kapila having capacity 7.5 MLD. Nasardi River meets Godavari at the D/s of Kapila Godavari Confluence. Nasardi river flows through industrial and highly populated part of Nasik. Agartakli STP located near Old Saikheda road having combined capacity of 210 MLD. Foam formation is observed at the outlet of STP. Panchak STP having aggregate capacity of 28.5 MLD foam forming observed in river after discharge of treated effluent. Nasik Thermal Power Station is located at Ekalahre generating trade effluent 31210 CMD and Domestic effluent 2500 CMD same is utilized for

Ash handling, coal handling, dust suppression and remaining for gardening. Indiabulls Realtech Thermal Power Plant is located at D/s of Nasik Thermal Power Station generating 7421.0 CMD trade effluent and 3.2 CMD of domestic effluent same has been recycle and reuse on land. A closed industrial unit of Armstrong Energy Pvt. Ltd is located U/s of Ekalahre Thermal Power Station. Darna confluence is near Darna Sangvi U/s of Saikheda.



Photo 6: Extensive foam formation at the discharge of Tapovan STP in Godavari.

4.1.7 Kapila Godavari Confluence Point to Saikheda, River Darna arises from Mukane dam and extends to join Godavari near village Darna sangvi. Near Saikheda bridge brick making activities are observed in close proximity of river bank, river water is lifted with the help of diesel operated or electric motors, raw coal and heap of bagasse is dumped on river banks. Animal washing, bathing, open defecation and washing of cloths are also observed.



Photo 7: Brick Making on the Banks of Godavari River at Saikheda.

4.1.8 Saikheda to U/s of Paithan, Jayakwadi, after village Shilapur there is no major industrial activity till Kopargaon. A Nandur – Madhyameshwar dam is located just below the confluence of Kadwa and Godavari rivers at Nandur Madhameshwar. Dam was constructed in 1907 - 13 across the river Godavari. The water released from Gangapur and Darana water reservoirs is stored at Nandur Madhameshwar and subsequently released from here through canals for irrigation. Silts and organic matter that are carried away with water flow are accumulated in the lake due to which islands and shallow water ponds are created. This resulted in the biological enriched conditions by which aquatic vegetation has been stabilized. Thus the site has turned into good wetland habitat aptly described as “Bharatpur of Maharashtra”. Bird Sanctuary is located in Niphad Tehsil of Nasik district in Western Maharashtra. Nandur-Madhmeshwar is nice place for birding.

Kopargaon is the head-quarters of the Taluka. Kopargaon Municipal Council is a B class Municipal Council. Water source for Kopargaon Municipal Council is Darna and Nandur Madhyameshwar dam. Water consumption of

Kopargaon Municipal Corporation is 11 MLD and Quantity of domestic effluent generated is 7 MLD whereas no adequate treatment facility available to treat the sewage generated. Sanjivani (Takli) S.S.K. Ltd. is located near Godavari river generating 313 CMD trade effluent and 104 CMD of domestic effluent. Godavari Biorefineries Ltd. at Sakarwadi, and not generating any trade or domestic effluent. Other than these industrial units there is no major industrial activities are identified.

The confluence of Godavari and Pravara in Nevasa Taluka is at Pravarasangam. It is considered to be a holy place for as the name indicated there is a confluence of the rivers Pravara and Godavari at the place. There are ancient temples at Pravara Godavari confluence Hindus perform religious rituals at Pravara Sangm, *nirmalya* and *asthi visarjan* is observed at this site. At old Pravara Sangam bridge *asthi visrjan* is observed.



Photo 8: Human Activities at U/s of Jayakwadi.

Jayakwadi project is situated in Maharashtra, on Godavari River. The command area of the project is in five districts namely Aurangabad, Ahmednagar, Parbhani, Nanded and Beed respectively. Salient features of the projects are depicted in Table 9 below-

Table 9: Salient Features of Jayakwadi Project.

Name of the Irrigation Project	Jayakwadi Stage - I Major Irrigation Project
Type of project	Major
Engineering Type of Project	Storage
Purpose of Project	Irrigation
Name of the River	Godavari
Status	Completed
State	Maharashtra
Inter-Basin Project	No
Basin	Godavari
Year of Start	1976
Approved Cost by Planning Commission (Rs. in Crore)	38.46
Culturable Command Area (CCA) (Th ha)	183.64
Gross Command Area (GCA) (Th ha)	204.05
Potential Utilized (Th ha)	18.5
Net Irrigated Area(NIA) (Th ha)	141.64
Ultimate Irrigation Potential (Th ha)	126.53

Source: [http://indiawris.nrsc.gov.in/wrpinfo/index.php?title=Jayakwadi Project Stage-I JI00472](http://indiawris.nrsc.gov.in/wrpinfo/index.php?title=Jayakwadi+Project+Stage-I+JI00472)

4.1.9 U/s of Paithan, Jayakwadi to D/s of Paithan, Pathegaon, Paithan a city and a Municipal Council in Aurangabad district is located just below Jayakwadi project on river Godavari. It is a “C” class Municipal Council. It is located on the north bank of river Godavari. Paithan is one of the most historical and holy towns in the south central part of the country. Paithan is located to the 55 km to the south of Aurangabad city on State Highway No. 148 via Bidkin. The main source of water to Paithan town is from Jayakwadi Dam, through Municipal Corporation. Quantity of Water consumption is 2.4 MLD and estimated quantity of domestic effluent is 1.7 MLD. Treatment facility is not available to treat domestic sewage.



Photo 9: Human Activities at D/s of Pathegaon.

4.1.10 D/s of Paithan, Pathegaon to Jayakwadi dam, Raher, River flow is not adequate from Jayakwadi dam. No major industrial activities are seen in this area where as area is under cash crops like sugar cane. Villages are in close proximity with riverbed and no treatment facility available to treat domestic sewage. Washing of cloths, animals, vehicles and open defecation in and around riverbed is observed. Gangakhed town and a Municipal Council is located in this stretch. source of water for town is Godavari and Masoli rivers. Estimated quantity of water consumption is 5 MLD and waste water generation estimated to 3.5 MLD. There is no adequate treatment facility available to treat the domestic sewage. Nanded, is the second largest city in the Marathwada Division of Maharashtra. Nanded is one of the historical places in Marathwada region of Maharashtra State. It is situated on the north bank of Godavari river. It is famous for Sikh Gurudwaras. Nanded City is getting treated water from the W.S. operated by Corporation and CIDCO. The total supply is considered at 135 lpcd. City is having Godavari river as source with four head works situated on the banks of Godavari 2 in submergence of Shankar Sagar (Vishnupuri Dam) and two downstream of Dam. Nanded City is having three WTP. Oldest WTP is commissioned in 1985 of Cap. 27 MLD. Treated water is served to CIDCO from WTP of capacity 12.5 MLD.

Major Part of the city is being served with the WTP having capacity 60 MLD. Presently average rate of water supply is 85 LPCD. There are two STPs available having capacity of 87 MLD and 30 MLD. Raheer is a village having population 2,675 (census 2011) is located at the D/s of Nanded.



Photo 10: Godavari River at Raheer.

5

River Water Analysis

5.1 River Water Analysis by Maharashtra Pollution Control Board under National Water Quality Monitoring Program

Government of India has undertaken initiative through the Central Pollution Control Board (CPCB) which has established a network of monitoring stations on rivers across the country. The present network comprises of 2500 stations in 28 States and 6 Union Territories spread over the country. The monitoring network covers 445 Rivers, 154 Lakes, 12 Tanks, 78 Ponds, 41 Creeks/Seawater, 25 Canals, 45 Drains, 10 Water Treatment Plant (Raw Water) and 807 Wells. Among the 2500 stations, 1275 are on rivers, 190 on lakes, 45 on drains, 41 on canals, 12 on tanks, 41 on creeks/seawater, 79 on ponds, 10 Water Treatment Plant (Raw Water) and 807 are groundwater stations. Presently the inland water quality-monitoring network is operated under a three-tier program i.e. Global Environmental Monitoring System (GEMS), Monitoring of Indian National Aquatic Resources System (MINARS) and Yamuna Action Plan (YAP).

In Maharashtra there are four rivers are considered under the NRCP namely Panchaganga, Tapi, Krishna and Godavari.

The detailed analysis of the Godavari river sampling stations with respect to important parameters on monthly basis under this schemes were carried out by Maharashtra Pollution Control Board and the results are mentioned in tables below-

Table 10: Water Quality Monitored by Maharashtra Pollution Control Board at Godavari River at U/s of Gangapur Dam.

Year	Months	pH	Dissolved Oxygen	B.O.D.	C.O.D.	Nitrate	Fecal Coliform
			(mg/l)	(mg/l)	(mg/l)	(mg/l)	(MPN/100 ml)
2014	January	7.92	5.5	2.2	24	0.27	22
	February	7.66	5.9	2	20	3.81	34
	March	7.54	6.4	2	16	0.41	22
	April	7.88	6.1	2	28	0.24	22
	May	7.63	5.9	2.4	24	2.8	170
	June	7.61	6	2.2	20	0.194	14
	July	8.19	6.7	3	16	2.27	12
	August	7.82	7.1	3	20	0.923	60
	September	7.99	5.1	3.2	16	0.0166	50
	October	8.52	4.3	3.4	16	0.6936	70
	November	7.84	5.8	3.2	20	0.6396	70
	December	N/A	N/A	N/A	N/A	N/A	N/A
	Average	7.87	5.89	2.60	20.00	1.12	49.64
2013	January	8.06	7	3	16	1.654	21
	February	7.84	6.9	3	16	1.073	21
	March	7.61	6.9	3	12	2.49	22
	April	7.81	6.8	3	12	0.593	30
	May	7.48	6.9	3	16	0.704	34
	June	7.69	6.2	2	16	0.418	33
	July	7.78	6.6	2.4	18	0.0759	11
	August	7.29	7	2.4	20	1.08	22
	September	8.11	6.6	2.4	20	0.87	22
	October	8.08	5.7	2.8	24	0.49	22
	November	7.38	7.1	2.2	20	0.72	22
	December	7.8	5.9	2	20	0.51	40
	Average	7.74	6.63	2.60	17.50	0.89	25.00
2012	January	7.73	6.4	3	24	0.663	8
	February	7.47	6.5	3	20	0.545	9
	March	8.25	6.5	3	12	0.041	9
	April	7.5	6.4	4	16	0.221	9
	May	7.22	6.5	3	12	0.18	13
	June	7.5	6.6	3	16	0.069	11
	July	7.46	6.1	3.5	16	0.591	11
	August	7.05	6.5	3	N/A	4.487	11
	September	7.58	6.9	3	16	5.954	11
	October	7.6	6.8	3	12	3.977	11
	November	7.82	3	3	16	2.79	17
	December	7.66	6.7	3	12	2.258	21
	Average	7.57	6.24	3.13	15.64	1.81	11.75

Table 11: Water Quality Monitored by Maharashtra Pollution Control Board at Godavari River near Someshwar Temple.

Year	Months	pH	Dissolved Oxygen	B.O.D.	C.O.D.	Nitrate	Fecal Coliform
			(mg/l)	(mg/l)	(mg/l)	(mg/l)	(MPN/100 ml)
2014	January	7.29	5.2	2.2	28	0.44	90
	February	7.14	5.6	2.2	28	2.38	50
	March	7.19	6	2.4	16	0.65	70
	April	7.32	5.9	2.2	28	0.565	110
	May	7.5	5.7	2.4	16	8.29	220
	June	7.91	5.4	2.4	20	0.347	90
	July	8.17	6.7	3	20	0.448	90
	August	8.19	6.6	2.8	20	0.4212	110
	September	8.15	6.4	3.2	24	0.183	50
	October	8.67	4.7	3	24	0.7029	90
	November	8.2	6	4.6	32	2.5409	50
	December	N/A	N/A	N/A	N/A	N/A	N/A
	Average	7.79	5.84	2.76	23.27	1.54	92.73
2013	January	7.96	4.8	4	20	1.623	26
	February	7.98	4.9	N/A	24	1.648	50
	March	7.89	6.2	5	20	3.95	70
	April	8.01	5.2	4	20	2.588	90
	May	7.93	6	5	20	1.137	50
	June	7.43	5.8	3.2	24	2.318	40
	July	8.22	5.9	2.8	24	0.1243	170
	August	7.98	7	2.4	28	0.97	33
	September	8.25	6.3	2.6	28	1.8	70
	October	8.15	6.2	2.4	24	0.36	70
	November	7.61	7	2	28	0.82	90
	December	7.92	5.6	2.4	20	3	110
	Average	7.94	5.91	3.25	23.33	1.69	72.42
2012	January	7.67	5.1	6	32	1.8	23
	February	7.25	5.6	6	32	0.583	21
	March	8.1	5.2	6	24	0.917	11
	April	7.15	6.1	5.5	28	4.58	50
	May	7.01	5.6	5.5	32	0.118	22
	June	7.29	6.1	5.5	32	0.512	13
	July	7.6	7	3	28	0.437	21
	August	7.47	6.2	4	N/A	25.01	13
	September	7.82	5.3	5	24	21.11	17
	October	7.71	6.7	6	20	9.928	17
	November	7.89	5.2	3	16	2.38	26
	December	7.95	5.9	6	20	4.418	22
	Average	7.58	5.83	5.13	26.18	5.98	21.33

Table 12: Water Quality Monitored by Maharashtra Pollution Control Board at Godavari River at Hanuman Ghat.

Year	Months	pH	Dissolved Oxygen	B.O.D.	C.O.D.	Nitrate	Fecal Coliform
			(mg/l)	(mg/l)	(mg/l)	(mg/l)	(MPN/100 ml)
2014	January	7.31	5	2.4	20	0.96	110
	February	7.38	5.4	2.4	24	7.13	33
	March	7.66	5.7	2.6	28	2.9	110
	April	7.82	5.4	2.6	20	4.4	140
	May	7.56	4.9	9.5	48	9.8	220
	June	7.86	5.3	2.6	20	0.086	90
	July	7.59	3.2	5	28	0.228	50
	August	7.43	3.4	3.6	24	0.7738	40
	September	7.74	4.3	3	20	0.0198	80
	October	8.39	5.8	3.2	32	2.2926	80
	November	7.99	6.1	5.2	36	0.6938	90
	December	N/A	N/A	N/A	N/A	N/A	N/A
	Average	7.70	4.95	3.83	27.27	2.66	94.82
2013	January	7.5	6.7	6	28	1.437	30
	February	7.69	4.1	N/A	44	1.004	50
	March	7.8	6.7	6	24	11.51	40
	April	7.9	6	6	28	12.39	33
	May	7.65	6	15	32	4.133	33
	June	7.39	6.1	4.8	36	7.139	34
	July	8.18	6	3.2	34	0.1304	34
	August	7.97	6.7	2.6	36	1.47	90
	September	7.6	4.7	8	32	2.11	300
	October	7.74	5.2	3	32	2.06	33
	November	7.05	6.9	2.4	24	2.16	110
	December	7.86	5.2	2.4	28	2.11	140
	Average	7.69	5.86	5.40	31.50	3.97	77.25
2012	January	7.2	2.4	18	32	0.451	60
	February	7.14	5.5	6	40	3.359	27
	March	7.5	6.2	4	40	1.119	22
	April	7.11	6.2	4.5	36	3.52	170
	May	7.1	5.9	6.2	32	0.238	22
	June	6.51	6.2	5	40	0.016	60
	July	7.35	5.9	4	20	0.106	21
	August	7.04	6	12	N/A	9.25	40
	September	7.75	4.8	6	32	18.3	30
	October	7.8	6.4	6	20	14.27	33
	November	7.95	3.7	5	24	7.188	34
	December	7.44	4.8	6	28	7.115	33
	Average	7.32	5.33	6.89	31.27	5.41	46.00

Table 13: Water Quality Monitored by Maharashtra Pollution Control Board at Godavari River at Ramkund.

Year	Months	pH	Dissolved Oxygen	B.O.D.	C.O.D.	Nitrate	Fecal Coliform
			(mg/l)	(mg/l)	(mg/l)	(mg/l)	(MPN/100 ml)
2014	January	7.3	5.2	2.4	32	0.55	190
	February	7.34	5.6	2.2	28	4.13	90
	March	7.81	6.1	2.4	24	2	110
	April	7.4	5.8	2.2	28	3.25	170
	May	7.54	6.6	2	12	0.24	22
	June	7.88	5.5	2.4	20	1.922	60
	July	7.88	3.6	3	16	0.72	70
	August	7.26	2.2	4	32	0.9417	26
	September	8.18	4.8	2.6	24	0.65	50
	October	8.25	6.2	4	28	3.3149	60
	November	8.29	4.9	4	44	0.8602	50
	December	N/A	N/A	N/A	N/A	N/A	N/A
	Average	7.74	5.14	2.84	26.18	1.69	81.64
2013	January	7.86	6.7	6	24	2.763	70
	February	7.65	4.8	6	28	BDL	110
	March	7.37	6.7	4	16	4.61	110
	April	7.22	5.2	6	28	0.466	90
	May	7.59	6.9	4	28	4.54	90
	June	7.39	6.1	4.2	36	0.512	110
	July	8.04	6	3	32	0.1139	110
	August	7.74	6.9	2.6	36	1.93	110
	September	7.66	5	3.8	36	2.11	110
	October	7.73	4.5	3.4	32	0.94	110
	November	7.59	6.8	2.2	28	1.57	90
	December	7.82	5.7	2.2	32	1	110
	Average	7.64	5.94	3.95	29.67	1.87	101.67
2012	January	7.31	4.1	10	32	1.104	60
	February	7.5	5.2	8	44	3.735	24
	March	8.14	5.6	5	44	3.965	22
	April	7.1	6.2	5	40	7.67	110
	May	7.04	5.6	6	32	0.086	22
	June	7.4	6.3	4.5	40	BDL	22
	July	7.28	3.2	10	28	0.074	21
	August	6.79	5.4	5	N/A	10.71	26
	September	7.48	5.2	4	28	13.46	30
	October	7.39	5	5	24	16.44	40
	November	7.99	4.1	5	20	5.49	26
	December	7.75	5.8	6	16	1.99	60
	Average	7.43	5.14	6.13	31.64	5.88	38.58

Table 14: Water Quality Monitored by Maharashtra Pollution Control Board at Godavari River near Tapovan.

Year	Months	pH	Dissolved Oxygen	B.O.D.	C.O.D.	Nitrate	Fecal Coliform
			(mg/l)	(mg/l)	(mg/l)	(mg/l)	(MPN/100 ml)
2014	January	7.82	4.9	2.4	28	1.1	90
	February	7.53	5	2.8	24	3.89	33
	March	7.27	5.4	2.8	40	1.66	80
	April	7.76	5.7	2.4	24	4	220
	May	7.73	6.3	2	20	7	220
	June	7.66	5	3.2	20	1.365	140
	July	7.5	2.4	10	44	0.516	110
	August	7.46	4.9	3.2	28	0.9399	80
	September	8.15	5.5	3	32	0.192	170
	October	8.02	6	3	48	2.5409	110
	November	7.36	5.6	5.2	48	0.7254	170
	December	N/A	N/A	N/A	N/A	N/A	N/A
	Average	7.66	5.15	3.64	32.36	2.18	129.36
2013	January	7.39	4.9	3	16	2.039	50
	February	7.25	4.8	N/A	40	BDL	70
	March	7.6	5.9	18	44	14.12	70
	April	8.1	4.8	6	36	14.13	70
	May	7.62	5.6	18	44	6.1	90
	June	7.26	5.9	4.8	36	3.893	40
	July	8.23	6.2	3.4	40	0.1731	40
	August	7.9	6.5	2.8	48	2.25	70
	September	7.76	3.9	16	44	1.98	300
	October	7.6	4.1	17	40	1.65	210
	November	7.48	6.5	2.6	24	1.66	90
	December	7.85	5	2.8	28	0.29	110
	Average	7.67	5.34	8.58	36.67	4.39	100.83
2012	January	7.24	2.3	16	32	0.133	60
	February	7.45	6.1	4	52	3.673	50
	March	7.38	6.2	4	36	0.094	34
	April	7.65	6.1	4.5	32	21.73	350
	May	7.01	5.4	6.5	32	0.34	22
	June	7.69	6.1	5.5	40	0.18	34
	July	7.17	3	28	60	0.104	33
	August	6.87	4.1	9	N/A	19.21	34
	September	7.81	4	6	36	14.37	40
	October	7.73	6.8	6	28	13.78	50
	November	8.14	2.6	10	32	8.77	50
	December	7.68	3.7	7	36	2.725	50
	Average	7.49	4.70	8.88	37.82	7.09	67.25

Table 15: Water Quality Monitored by Maharashtra Pollution Control Board at Godavari River at Kapila Godavari Confluence Point.

Year	Months	pH	Dissolved Oxygen	B.O.D.	C.O.D.	Nitrate	Fecal Coliform
			(mg/l)	(mg/l)	(mg/l)	(mg/l)	(MPN/100 ml)
2014	January	7.6	4.8	2.4	32	1	170
	February	7.86	5.2	2.4	28	4.01	26
	March	7.4	5.3	2.8	44	1.71	170
	April	7.64	5.5	2.6	28	4.74	170
	May	7.59	6	2.2	24	4	220
	June	7.27	4.8	3.4	72	2.475	240
	July	7.53	2.8	10	40	0.509	140
	August	7.3	1.8	16	44	0.6809	140
	September	8.01	5.6	3	32	1.844	100
	October	8.18	5.7	4	108	2.8299	90
	November	7.13	6.2	4.8	48	0.2823	140
	December	N/A	N/A	N/A	N/A	N/A	N/A
	Average	7.59	4.88	4.87	45.45	2.19	146.00
2013	January	7.45	5.7	6	28	2.134	33
	February	7.31	4.1	N/A	48	BDL	50
	March	7.6	5.4	20	48	9.03	26
	April	8.16	4	9	40	14.16	30
	May	7.57	5.8	19	48	9.7	33
	June	7.01	6.1	5.2	40	4.012	33
	July	8.24	5	5.5	46	0.1771	33
	August	7.66	5.5	3.8	42	2.51	110
	September	7.42	2.6	22	48	2.18	350
	October	7.55	3.4	19	44	1.2	210
	November	7.7	7	2.4	20	1.71	170
	December	7.54	4.8	3.2	24	0.05	170
	Average	7.60	4.95	10.46	39.67	4.26	104.00
2012	January	7.1	1.1	40	128	0.644	70
	February	7.35	6.1	4	40	18.157	11
	March	7.12	6.1	4.5	32	0.2	22
	April	7.1	6.2	4.5	28	29.03	220
	May	7	6.1	5	28	0.428	21
	June	7.6	6.3	5	32	0.18	70
	July	7.11	2.6	24	64	0.092	60
	August	7.08	1.6	12	N/A	2.75	70
	September	7.65	4.2	8	40	31.54	60
	October	7.58	3.8	9	36	35.77	50
	November	8.08	2.8	12	36	8.69	40
	December	7.56	2.7	16	40	37.08	50
	Average	7.36	4.13	12.00	45.82	13.71	62.00

Table 16: Water Quality Monitored by Maharashtra Pollution Control Board at Godavari River at Saikheda.

Year	Months	pH	Dissolved Oxygen	B.O.D.	C.O.D.	Nitrate	Fecal Coliform
			(mg/l)	(mg/l)	(mg/l)	(mg/l)	(MPN/100 ml)
2014	January	7.65	5.2	2.4	20	0.68	70
	February	7.41	5.6	2.2	28	0.144	26
	March	7.24	6	2.2	20	1.83	50
	April	7.86	5.9	2.2	32	7.81	33
	May	7.12	4.4	12	48	7	NA
	June	7.39	5.6	2.4	20	0.344	33
	July	7.71	1.4	10	48	0.236	23
	August	7.02	3.2	3.4	24	0.9709	50
	September	7.81	4.6	3.6	28	0.9952	90
	October	7.7	5.2	4.8	20	4.703	50
	November	7.83	5.8	3.8	36	3.9958	50
	December	N/A	N/A	N/A	N/A	N/A	N/A
	Average	7.52	4.81	4.45	29.45	2.61	47.50
2013	January	7.87	6.2	N/A	24	2.771	26
	February	N/A	N/A	N/A	N/A	N/A	N/A
	March	7.54	6.4	3	12	1.81	33
	April	8.15	5.7	6	24	2.226	34
	May	7.31	6.2	4	20	11.09	33
	June	7.76	6.2	3.2	20	1.812	26
	July	7.85	5.5	4	24	0.1444	26
	August	8.01	6.5	2.8	28	1.53	70
	September	7.51	4.5	5.5	20	1.94	40
	October	7.81	4.6	5.5	32	2.22	170
	November	7.53	6.5	2.4	20	1.25	70
	December	7.74	5.8	2.2	28	1.94	70
	Average	7.73	5.83	3.86	22.91	2.61	54.36
2012	January	7.88	53	3.5	24	4.305	14
	February	7.11	6.3	3.5	20	0.6462	11
	March	7.21	6.6	3	16	3.344	11
	April	7.18	6.3	3.5	16	11.51	33
	May	7.02	6.1	4	16	0.066	17
	June	7.51	6.3	4.5	20	0.352	21
	July	7.31	4.8	4	80	BDL	17
	August	6.94	5.9	3	N/A	5.981	14
	September	7.66	4.8	5	20	5.571	17
	October	7.39	6	8	32	15.68	17
	November	7.52	4.7	3	16	11.59	17
	December	7.82	6	14	16	5.094	21
	Average	7.38	9.73	4.92	25.09	5.83	17.50

Table 17: Water Quality Monitored by Maharashtra Pollution Control Board at Godavari River at U/s of Jayakwadi dam at Tokka.

Year	Months	pH	Dissolved Oxygen	B.O.D.	C.O.D.	Nitrate	Fecal Coliform
			(mg/l)	(mg/l)	(mg/l)	(mg/l)	(MPN/100 ml)
2014	January	7.2	6	3	20	BDL	2
	February	7.9	6.4	3	16	0.1	2
	March	7.4	6.1	4	20	0.1	2
	April	8	6.6	4	20	0.1	2
	May	7.8	6.4	5	20	0.4	2
	June	7.1	7.1	3	16	1.8	3
	July	8.6	7	3	16	0.1	4
	August	8.3	6.2	6	16	0.4	2
	September	7.9	6.8	4	20	0.2	2
	October	8.3	5.9	4	20	0.1	2
	November	8.4	7.2	3	12	0.1	2
	December	8	6.8	8	20	BDL	2
	Average	7.91	6.54	4.17	18.00	0.34	2.25

2013	January	8.4	7	5.4	16	0.2	2
	February	8.4	6.5	4.2	12	1.5	2
	March	8.4	6.4	4	12	4.5	3
	April	N/A	N/A	N/A	N/A	N/A	N/A
	May	8.3	6.2	5	20	0.4	3
	June	8.2	6	2.6	12	0.5	3
	July	7.2	5.5	2	12	0.1	2
	August	7.8	5.9	4	20	0.2	2
	September	7.8	6.9	4	20	0.4	2
	October	8.2	6.1	4	16	0.0427	3
	November	7	6.7	6	24	0.1	3
	December	8	6.4	3	20	0.2	2
	Average	7.97	6.33	4.02	16.73	0.74	2.45

2012	January	8.4	7.1	4.2	12	0.099	2
	February	7.8	6.8	3.8	12	0.89	4
	March	8.4	7	4	12	0.8604	2
	April	8	6.9	3.2	8	0.1607	2
	May	8.1	6.2	3.5	16	0.2147	2
	June	9	6.5	4	12	0.2026	2
	July	7.8	6.8	0.3488	8	0.2359	2
	August	8	6.2	3.2	8	BDL	2
	September	8.3	6.9	5	12	BDL	2
	October	8.3	5.3	5.1	12	0.6	2
	November	8.5	7	3.3	8	BDL	2
	December	8.2	6.9	5.2	16	BDL	2
	Average	8.23	6.63	3.74	11.33	0.41	2.17

Table 18: Water Quality Monitored by Maharashtra Pollution Control Board at Godavari River at D/s of Jayakwadi Dam, Pathegaon.

Year	Months	pH	Dissolved Oxygen	B.O.D.	C.O.D.	Nitrate	Fecal Coliform
			(mg/l)	(mg/l)	(mg/l)	(mg/l)	(MPN/100 ml)
2014	January	7.6	6.9	5	16	0.1	2
	February	8	6.6	3	16	0.1	3
	March	8	6.4	2	12	0.5	2
	April	7	7	3	20	0.2	2
	May	7	6.4	5	24	0.9	2
	June	7	6.8	5	20	2.7	3
	July	8.4	7.1	3	16	0.4	4
	August	9.5	6	5	24	0.5	7
	September	8.7	6.4	4	20	0.4	2
	October	8.4	5.6	3	16	0.5	2
	November	8.1	6	8	40	0.3	2
	December	8.1	7.4	4	16	0.1	2
	Average	7.98	6.55	4.17	20.00	0.56	2.75
2013	January	8	4.3	4.2	12	0.7	2
	February	8.2	6.2	5.2	16	6.6	3
	March	8.4	6.8	4.2	12	2.3	3
	April	N/A	N/A	N/A	N/A	N/A	N/A
	May	9	6	4	12	1	2
	June	8.2	5.6	6.2	28	0.2	2
	July	7.5	5.8	2	16	0.1	2
	August	7.9	6.1	4	20	0.3	2
	September	8	6.8	4	20	0.3	2
	October	8.2	6.8	4	20	0.0332	3
	November	8.3	6.8	4	16	0.2	2
	December	7.9	6.9	4.2	24	0.2	3
	Average	8.15	6.19	4.18	17.82	1.08	2.36
2012	January	8.3	7.1	2.8	8	0.087	4
	February	9	6.6	4	12	1.8975	2
	March	N/A	N/A	N/A	N/A	N/A	N/A
	April	7.8	6.7	4	16	0.5539	2
	May	8.2	6.4	3.6	16	0.0727	2
	June	9	6.9	5.2	16	0.2074	2
	July	9.3	3.4	8.4	28	0.4235	4
	August	8.9	3.7	3.6	8	0.6343	2
	September	N/A	N/A	N/A	N/A	N/A	N/A
	October	8.3	5.6	5	12	3.8	2
	November	8.9	7	3.3	8	BDL	2
	December	8.3	6.9	5.4	16	BDL	2
	Average	8.60	6.03	4.53	14.00	0.96	2.40

**Table 19: Water Quality Monitored by Maharashtra Pollution Control Board
at Godavari River at Raheer.**

Year	Months	pH	Dissolved Oxygen	B.O.D.	C.O.D.	Nitrate	Fecal Coliform
			(mg/l)	(mg/l)	(mg/l)	(mg/l)	(MPN/100 ml)
2014	January	8	6.9	3	20	0.2	3
	February	7.8	6.6	5	20	0.2	2
	March	7.8	6.4	3	16	1.7	2
	April	7.5	6.8	5	20	0.1	2
	May	7	6.7	5	20	1.4	3
	June	N/A	N/A	N/A	N/A	N/A	N/A
	July	8.1	7	3	16	0.2	2
	August	8.3	6	5	16	0.3	2
	September	N/A	N/A	N/A	N/A	N/A	N/A
	October	7.6	6.4	4	195	0.2	2
	November	N/A	N/A	N/A	N/A	N/A	N/A
	December	N/A	N/A	N/A	N/A	N/A	N/A
	Average	7.76	6.60	4.13	40.38	0.54	2.25
2013	January	8.3	7	5.6	16	0.2	2
	February	8.4	6.7	3.6	8	1.7	2
	March	8.4	6.4	3	8	1.8	3
	April	8.32	6.92	5	12	0.02	2
	May	8.6	6.4	4	12	BDL	3
	June	7.6	6.9	5	24	0.1	2
	July	7.6	5.9	3	20	BDL	2
	August	8.2	6.9	3	16	0.2	3
	September	7.9	6.7	4	20	0.1	2
	October	8.18	6.8	3	12	0.0493	3
	November	8	6.4	4	20	0.2	2
	December	8	6.4	4	20	0.2	2
	Average	8.13	6.62	3.93	15.67	0.46	2.33
2012	January	8.1	7.3	2.8	8	0.079	2
	February	7.7	7.1	3	8	1.1948	2
	March	8	6.8	4.2	127	0.6081	2
	April	8.1	7.2	3.8	12	0.1282	2
	May	7.8	6.8	2.8	8	0.1042	2
	June	8.5	6.3	8	24	0.1792	4
	July	8.2	6	3.6	16	0.3012	2
	August	8.1	5.7	3.1	8	0.3278	2
	September	7.9	4.6	6.5	16	2.5	4
	October	8.3	4.9	6.5	16	1.4	2
	November	8.5	4.9	5	12	BDL	2
	December	8.4	6.9	3.2	8	2.5	2
	Average	8.13	6.21	4.38	21.92	0.85	2.33

5.2 Present River Water Analysis:

The river water analysis was carried out to show that the general status of the river Godavari at various stretches in the three districts viz Nasik, Ahmadnagar, Aurangabad and Nanded. There are 10 river pollution stretches identified by the CPCB and these are mentioned in the Tables below. Out of that, seven stretches are identified in Nasik District, one each in Ahmadnagar, Aurangabad and Nanded district respectively. The sampling was carried out during the month of January 2015 for all identified pollution stretches. The samples were tested for physico-chemical analysis including the metals and pesticides. With these laboratory results, it will enable to analyze the impact of human activities on the identified locations with respect to its upward and downward stream. The detailed analyses of the collected samples are as follows-

Table 20: Water Quality Monitored at Godavari River at U/s of Gangapur dam.

Sr. No.	Parameter	Results	Units	Standard Method
Physical Parameter				
1	Temperature	24.30	°C	IS: 3025 Part-09 (R.A : 2002)
Chemical Parameter				
1	pH	7.78	--	IS: 3025 Part-11 (R.A : 2002)
2	E. Conductivity	172.60	µS/cm	IS: 3025 Part-14 (R.A : 2002)
3	Chlorides as Cl	9.90	mg/lit	IS: 3025 Part-32 (R.A : 2003)
4	Sulphate as SO ₄	6.45	mg/lit	APHA :22 nd edition -(4500-SO ₄ ²⁻ E)
5	DO	7.0	mg/lit	IS: 3025 Part-38 (1989)
6	BOD	4	mg/lit	IS: 3025 Part-44 (R.A : 2003)
7	COD	12.0	mg/lit	IS: 3025 Part-58 (R.A : 2006)
Elemental Testing				
1	Aluminium as Al	0.11	mg/lit	IS: 3025 Part-02 (2004)
2	Arsenic as As	<0.01	mg/lit	IS: 3025 Part-02 (2004)
3	Cadmium as Cd	<0.01	mg/lit	IS: 3025 Part-02 (2004)
4	Chromium as Cr	<0.01	mg/lit	IS: 3025 Part-02 (2004)
5	Iron as Fe	0.23	mg/lit	IS: 3025 Part-02 (2004)
6	Nickel as Ni	<0.01	mg/lit	IS: 3025 Part-02 (2004)
7	Lead as Pb	<0.01	mg/lit	IS: 3025 Part-02 (2004)
8	Zinc as Zn	<0.01	mg/lit	IS: 3025 Part-02 (2004)
GC Testing				
1	Pesticides	N.D	mg/lit	APHA :22 nd edition
Microbiological Parameter				
1	Total Coliform	500	MPN/100ml	IS: 1622 (R.A : 1996)
2	Fecal Coliform	08	MPN/100ml	IS: 1622 (R.A : 1996)

Table 21: Water Quality Monitored at Godavari near Someshwar Temple.

Sr. No.	Parameter	Results	Units	Standard Method
Physical Parameter				
1	Temperature	23.90	°C	IS: 3025 Part-09 (R.A : 2002)
Chemical Parameter				
1	pH	8.39	--	IS: 3025 Part-11 (R.A : 2002)
2	E. Conductivity	354.0	µS/cm	IS: 3025 Part-14 (R.A : 2002)
3	Chlorides as Cl	19.80	mg/lit	IS: 3025 Part-32 (R.A : 2003)
4	Sulphate as SO ₄	15.16	mg/lit	APHA :22 nd edition -(4500-SO ₄ ²⁻ E)
5	DO	7.4	mg/lit	IS: 3025 Part-38 (1989)
6	BOD	3	mg/lit	IS: 3025 Part-44 (R.A : 2003)
7	COD	8	mg/lit	IS: 3025 Part-58 (R.A : 2006)
Elemental Testing				
1	Aluminium as Al	0.05	mg/lit	IS: 3025 Part-02 (2004)
2	Arsenic as As	<0.01	mg/lit	IS: 3025 Part-02 (2004)
3	Cadmium as Cd	<0.01	mg/lit	IS: 3025 Part-02 (2004)
4	Chromium as Cr	<0.01	mg/lit	IS: 3025 Part-02 (2004)
5	Iron as Fe	0.04	mg/lit	IS: 3025 Part-02 (2004)
6	Nickel as Ni	<0.01	mg/lit	IS: 3025 Part-02 (2004)
7	Lead as Pb	<0.01	mg/lit	IS: 3025 Part-02 (2004)
8	Zinc as Zn	<0.01	mg/lit	IS: 3025 Part-02 (2004)
GC Testing				
1	Pesticides	N.D	mg/lit	APHA :22 nd edition
Microbiological Parameter				
1	Total Coliform	70	MPN/100ml	IS: 1622 (R.A : 1996)
2	Fecal Coliform	17	MPN/100ml	IS: 1622 (R.A : 1996)

Table 22: Water Quality Monitored at Godavari near Hanuman Ghat.

Sr. No.	Parameter	Results	Units	Standard Method
Physical Parameter				
1	Temperature	23.80	°C	IS: 3025 Part-09 (R.A : 2002)
Chemical Parameter				
1	pH	7.17	--	IS: 3025 Part-11 (R.A : 2002)
2	E. Conductivity	732.0	µS/cm	IS: 3025 Part-14 (R.A : 2002)
3	Chlorides as Cl	94.03	mg/lit	IS: 3025 Part-32 (R.A : 2003)
4	Sulphate as SO ₄	34.20	mg/lit	APHA :22 nd edition -(4500-SO ₄ ²⁻ E)
5	DO	5.5	mg/lit	IS: 3025 Part-38 (1989)
6	BOD	8	mg/lit	IS: 3025 Part-44 (R.A : 2003)
7	COD	26.67	mg/lit	IS: 3025 Part-58 (R.A : 2006)
Elemental Testing				
1	Aluminium as Al	0.035	mg/lit	IS: 3025 Part-02 (2004)
2	Arsenic as As	<0.01	mg/lit	IS: 3025 Part-02 (2004)
3	Cadmium as Cd	<0.01	mg/lit	IS: 3025 Part-02 (2004)
4	Chromium as Cr	<0.01	mg/lit	IS: 3025 Part-02 (2004)
5	Iron as Fe	0.15	mg/lit	IS: 3025 Part-02 (2004)
6	Nickel as Ni	<0.01	mg/lit	IS: 3025 Part-02 (2004)
7	Lead as Pb	<0.01	mg/lit	IS: 3025 Part-02 (2004)

8	Zinc as Zn	<0.01	mg/lit	IS: 3025 Part-02 (2004)
GC Testing				
1	Pesticides	N.D	mg/lit	APHA :22 nd edition
Microbiological Parameter				
1	Total Coliform	1600	MPN/100ml	IS: 1622 (R.A : 1996)
2	Fecal Coliform	29	MPN/100ml	IS: 1622 (R.A : 1996)

Table 23: Water Quality Monitored at Godavari at Panchavati at Ramkund.

Sr. No.	Parameter	Results	Units	Standard Method
Physical Parameter				
1	Temperature	24.10	°C	IS: 3025 Part-09 (R.A : 2002)
Chemical Parameter				
1	pH	7.76	--	IS: 3025 Part-11 (R.A : 2002)
2	E. Conductivity	632.0	µS/cm	IS: 3025 Part-14 (R.A : 2002)
3	Chlorides as Cl	49.49	mg/lit	IS: 3025 Part-32 (R.A : 2003)
4	Sulphate as SO ₄	35.62	mg/lit	APHA :22 nd edition -(4500-SO ₄ ²⁻ E)
5	DO	4	mg/lit	IS: 3025 Part-38 (1989)
6	BOD	9	mg/lit	IS: 3025 Part-44 (R.A : 2003)
7	COD	30	mg/lit	IS: 3025 Part-58 (R.A : 2006)
Elemental Testing				
1	Aluminium as Al	0.02	mg/lit	IS: 3025 Part-02 (2004)
2	Arsenic as As	<0.01	mg/lit	IS: 3025 Part-02 (2004)
3	Cadmium as Cd	<0.01	mg/lit	IS: 3025 Part-02 (2004)
4	Chromium as Cr	<0.01	mg/lit	IS: 3025 Part-02 (2004)
5	Iron as Fe	0.025	mg/lit	IS: 3025 Part-02 (2004)
6	Nickel as Ni	<0.01	mg/lit	IS: 3025 Part-02 (2004)
7	Lead as Pb	<0.01	mg/lit	IS: 3025 Part-02 (2004)
8	Zinc as Zn	<0.01	mg/lit	IS: 3025 Part-02 (2004)
GC Testing				
1	Pesticides	N.D	mg/lit	APHA :22 nd edition
Microbiological Parameter				
1	Total Coliform	1600	MPN/100ml	IS: 1622 (R.A : 1996)
2	Fecal Coliform	27	MPN/100ml	IS: 1622 (R.A : 1996)

Table 24: Water Quality Monitored at Godavari at Tapovan.

Sr. No.	Parameter	Results	Units	Standard Method
Physical Parameter				
1	Temperature	24.20	°C	IS: 3025 Part-09 (R.A : 2002)
Chemical Parameter				
1	pH	7.58	--	IS: 3025 Part-11 (R.A : 2002)
2	E. Conductivity	654.0	µS/cm	IS: 3025 Part-14 (R.A : 2002)
3	Chlorides as Cl	54.44	mg/lit	IS: 3025 Part-32 (R.A : 2003)
4	Sulphate as SO ₄	36.55	mg/lit	APHA :22 nd edition -(4500-SO ₄ ²⁻ E)
5	DO	2.60	mg/lit	IS: 3025 Part-38 (1989)
6	BOD	5	mg/lit	IS: 3025 Part-44 (R.A : 2003)

7	COD	16.0	mg/lit	IS: 3025 Part-58 (R.A : 2006)
Elemental Testing				
1	Aluminium as Al	0.01	mg/lit	IS: 3025 Part-02 (2004)
2	Arsenic as As	<0.01	mg/lit	IS: 3025 Part-02 (2004)
3	Cadmium as Cd	<0.01	mg/lit	IS: 3025 Part-02 (2004)
4	Chromium as Cr	<0.01	mg/lit	IS: 3025 Part-02 (2004)
5	Iron as Fe	0.04	mg/lit	IS: 3025 Part-02 (2004)
6	Nickel as Ni	<0.01	mg/lit	IS: 3025 Part-02 (2004)
7	Lead as Pb	<0.01	mg/lit	IS: 3025 Part-02 (2004)
8	Zinc as Zn	<0.01	mg/lit	IS: 3025 Part-02 (2004)
GC Testing				
1	Pesticides	N.D	mg/lit	APHA :22 nd edition
Microbiological Parameter				
1	Total Coliform	240	MPN/100ml	IS: 1622 (R.A : 1996)
2	Fecal Coliform	30	MPN/100ml	IS: 1622 (R.A : 1996)

Table 25: Water Quality Monitored at Godavari at Kapila Godavari confluence.

Sr. No.	Parameter	Results	Units	Standard Method
Physical Parameter				
1	Temperature	23.80	°C	IS: 3025 Part-09 (R.A : 2002)
Chemical Parameter				
1	pH	8.76	--	IS: 3025 Part-11 (R.A : 2002)
2	E. Conductivity	826.0	µS/cm	IS: 3025 Part-14 (R.A : 2002)
3	Chlorides as Cl	84.13	mg/lit	IS: 3025 Part-32 (R.A : 2003)
4	Sulphate as SO ₄	71.25	mg/lit	APHA :22 nd edition -(4500-SO ₄ ²⁻ E)
5	DO	2.20	mg/lit	IS: 3025 Part-38 (1989)
6	BOD	6	mg/lit	IS: 3025 Part-44 (R.A : 2003)
7	COD	21.33	mg/lit	IS: 3025 Part-58 (R.A : 2006)
Elemental Testing				
1	Aluminium as Al	0.06	mg/lit	IS: 3025 Part-02 (2004)
2	Arsenic as As	<0.01	mg/lit	IS: 3025 Part-02 (2004)
3	Cadmium as Cd	<0.01	mg/lit	IS: 3025 Part-02 (2004)
4	Chromium as Cr	<0.01	mg/lit	IS: 3025 Part-02 (2004)
5	Iron as Fe	0.13	mg/lit	IS: 3025 Part-02 (2004)
6	Nickel as Ni	<0.01	mg/lit	IS: 3025 Part-02 (2004)
7	Lead as Pb	<0.01	mg/lit	IS: 3025 Part-02 (2004)
8	Zinc as Zn	0.01	mg/lit	IS: 3025 Part-02 (2004)
GC Testing				
1	Pesticides	N.D	mg/lit	APHA :22 nd edition
Microbiological Parameter				
1	Total Coliform	1600	MPN/100ml	IS: 1622 (R.A : 1996)
2	Fecal Coliform	1600	MPN/100ml	IS: 1622 (R.A : 1996)

Table 26: Water Quality Monitored at Godavari at Saikheda.

Sr. No.	Parameter	Results	Units	Standard Method
Physical Parameter				
1	Temperature	23.70	°C	IS: 3025 Part-09 (R.A : 2002)
Chemical Parameter				
1	pH	7.64	--	IS: 3025 Part-11 (R.A : 2002)
2	E. Conductivity	380.0	µS/cm	IS: 3025 Part-14 (R.A : 2002)
3	Chlorides as Cl	24.74	mg/lit	IS: 3025 Part-32 (R.A : 2003)
4	Sulphate as SO ₄	15.34	mg/lit	APHA :22 nd edition -(4500-SO ₄ ²⁻ E)
5	DO	7.0	mg/lit	IS: 3025 Part-38 (1989)
6	BOD	5	mg/lit	IS: 3025 Part-44 (R.A : 2003)
7	COD	16.0	mg/lit	IS: 3025 Part-58 (R.A : 2006)
Elemental Testing				
1	Aluminium as Al	0.02	mg/lit	IS: 3025 Part-02 (2004)
2	Arsenic as As	<0.01	mg/lit	IS: 3025 Part-02 (2004)
3	Cadmium as Cd	<0.01	mg/lit	IS: 3025 Part-02 (2004)
4	Chromium as Cr	<0.01	mg/lit	IS: 3025 Part-02 (2004)
5	Iron as Fe	0.03	mg/lit	IS: 3025 Part-02 (2004)
6	Nickel as Ni	<0.01	mg/lit	IS: 3025 Part-02 (2004)
7	Lead as Pb	<0.01	mg/lit	IS: 3025 Part-02 (2004)
8	Zinc as Zn	<0.01	mg/lit	IS: 3025 Part-02 (2004)
GC Testing				
1	Pesticides	N.D	mg/lit	APHA :22 nd edition
Microbiological Parameter				
1	Total Coliform	50	MPN/100ml	IS: 1622 (R.A : 1996)
2	Fecal Coliform	14	MPN/100ml	IS: 1622 (R.A : 1996)

Table 27: Water Quality Monitored at Godavari at U/s of Paithan Jayakwadi, at Tokka.

Sr. No.	Parameter	Results	Units	Standard Method
Physical Parameter				
1	Temperature	23.90	°C	IS: 3025 Part-09 (R.A : 2002)
Chemical Parameter				
1	pH	8.17	--	IS: 3025 Part-11 (R.A : 2002)
2	E. Conductivity	153.60	µS/cm	IS: 3025 Part-14 (R.A : 2002)
3	Chlorides as Cl	9.90	mg/lit	IS: 3025 Part-32 (R.A : 2003)
4	Sulphate as SO ₄	7.29	mg/lit	APHA :22 nd edition -(4500-SO ₄ ²⁻ E)
5	DO*	6	mg/lit	IS: 3025 Part-38 (1989)
6	BOD	3	mg/lit	IS: 3025 Part-44 (R.A : 2003)
7	COD	8	mg/lit	IS: 3025 Part-58 (R.A : 2006)
Elemental Testing				
1	Aluminium as Al	0.28	mg/lit	IS: 3025 Part-02 (2004)
2	Arsenic as As	<0.01	mg/lit	IS: 3025 Part-02 (2004)
3	Cadmium as Cd	<0.01	mg/lit	IS: 3025 Part-02 (2004)
4	Chromium as Cr	<0.01	mg/lit	IS: 3025 Part-02 (2004)
5	Iron as Fe	0.47	mg/lit	IS: 3025 Part-02 (2004)
6	Nickel as Ni	<0.01	mg/lit	IS: 3025 Part-02 (2004)

7	Lead as Pb	<0.01	mg/lit	IS: 3025 Part-02 (2004)
8	Zinc as Zn	<0.01	mg/lit	IS: 3025 Part-02 (2004)
GC Testing				
1	Pesticides	N.D	mg/lit	APHA :22 nd edition
Microbiological Parameter				
1	Total Coliform	220	MPN/100ml	IS: 1622 (R.A : 1996)
2	Fecal Coliform	2	MPN/100ml	IS: 1622 (R.A : 1996)

Table 28: Water Quality Monitored at Godavari at D/s of Paithan Pathegaon.

Sr. No.	Parameter	Results	Units	Standard Method
Physical Parameter				
1	Temperature*	23.80	°C	IS: 3025 Part-09 (R.A : 2002)
Chemical Parameter				
1	pH	7.14	--	IS: 3025 Part-11 (R.A : 2002)
2	E. Conductivity	708.0	µS/cm	IS: 3025 Part-14 (R.A : 2002)
3	Chlorides as Cl	49.49	mg/lit	IS: 3025 Part-32 (R.A : 2003)
4	Sulphate as SO ₄	38.39	mg/lit	APHA :22 nd edition -(4500-SO ₄ ²⁻ E)
5	DO	6.8	mg/lit	IS: 3025 Part-38 (1989)
6	BOD	5	mg/lit	IS: 3025 Part-44 (R.A : 2003)
7	COD	20	mg/lit	IS: 3025 Part-58 (R.A : 2006)
Elemental Testing				
1	Aluminium as Al*	<0.01	mg/lit	IS: 3025 Part-02 (2004)
2	Arsenic as As*	<0.01	mg/lit	IS: 3025 Part-02 (2004)
3	Cadmium as Cd*	<0.01	mg/lit	IS: 3025 Part-02 (2004)
4	Chromium as Cr*	<0.01	mg/lit	IS: 3025 Part-02 (2004)
5	Iron as Fe	0.05	mg/lit	IS: 3025 Part-02 (2004)
6	Nickel as Ni	<0.01	mg/lit	IS: 3025 Part-02 (2004)
7	Lead as Pb*	<0.01	mg/lit	IS: 3025 Part-02 (2004)
8	Zinc as Zn	<0.01	mg/lit	IS: 3025 Part-02 (2004)
GC Testing				
1	Pesticides*	N.D	mg/lit	APHA :22 nd edition
Microbiological Parameter				
1	Total Coliform	300	MPN/100ml	IS: 1622 (R.A : 1996)
2	Fecal Coliform	17	MPN/100ml	IS: 1622 (R.A : 1996)

Table 29: Water Quality Monitored at Godavari at Jayakwadi, Raher.

Sr. No.	Parameter	Results	Units	Standard Method
Physical Parameter				
1	Temperature	23.7	°C	IS: 3025 Part-09 (R.A : 2002)
Chemical Parameter				
1	pH	7.5	--	IS: 3025 Part-11 (R.A : 2002)
2	E. Conductivity	680	µS/cm	IS: 3025 Part-14 (R.A : 2002)
3	Chlorides as Cl	25	mg/lit	IS: 3025 Part-32 (R.A : 2003)
4	Sulphate as SO ₄	30	mg/lit	APHA :22 nd edition -(4500-SO ₄ ²⁻ E)
5	DO	7	mg/lit	IS: 3025 Part-38 (1989)

6	BOD	4	mg/lit	IS: 3025 Part-44 (R.A : 2003)
7	COD	12	mg/lit	IS: 3025 Part-58 (R.A : 2006)
Elemental Testing				
1	Aluminium as Al	<0.01	mg/lit	IS: 3025 Part-02 (2004)
2	Arsenic as As	<0.01	mg/lit	IS: 3025 Part-02 (2004)
3	Cadmium as Cd	<0.01	mg/lit	IS: 3025 Part-02 (2004)
4	Chromium as Cr	<0.01	mg/lit	IS: 3025 Part-02 (2004)
5	Iron as Fe	0.05	mg/lit	IS: 3025 Part-02 (2004)
6	Nickel as Ni	<0.01	mg/lit	IS: 3025 Part-02 (2004)
7	Lead as Pb	<0.01	mg/lit	IS: 3025 Part-02 (2004)
8	Zinc as Zn	<0.01	mg/lit	IS: 3025 Part-02 (2004)
GC Testing				
1	Pesticides	N.D	mg/lit	APHA :22 nd edition
Microbiological Parameter				
1	Total Coliform	250	MPN/100ml	IS: 1622 (R.A : 1996)
2	Fecal Coliform	15	MPN/100ml	IS: 1622 (R.A : 1996)

5.3 Discussions and Conclusions on the Results

The samples were analyzed and presented graphically in comparison to all identified sampling locations. It was interpreted from the results that the water parameters are well within the prescribed standards of A-II river.

5.4 Temperature

The temperature measured for all sampling locations are well with the prescribed limit and are presented graphically. The temperature measured was in the range of 23.7 °C reported at Saikheda and Raheer to 24.3 °C reported at u/s of Gangapur dam.

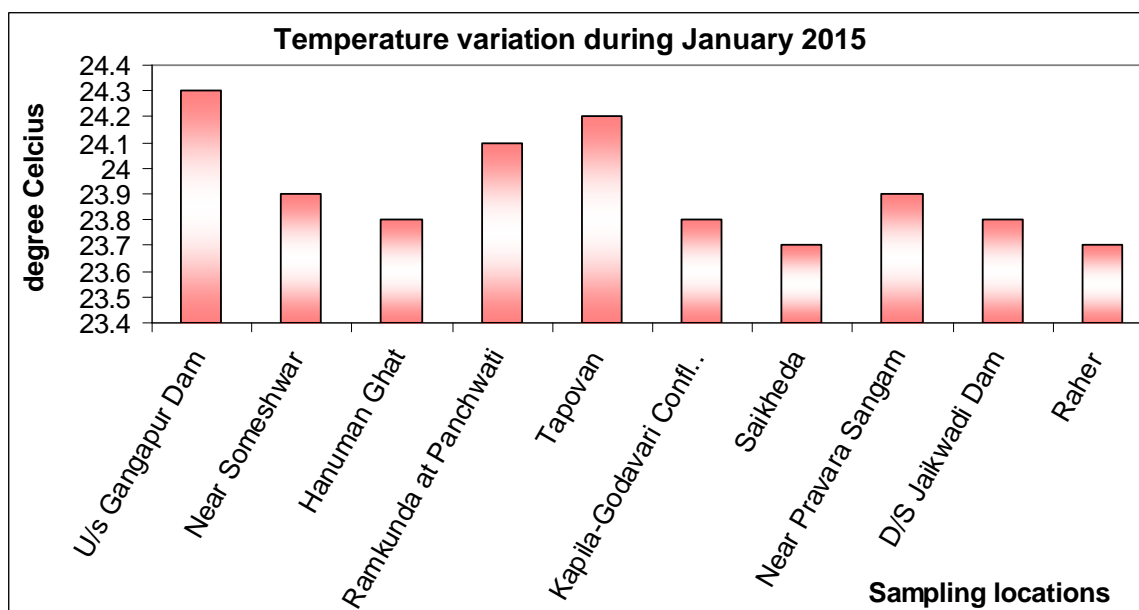


Figure 2: Temperature Variation during January 2015.

5.5 Electrical Conductivity

Total dissolved solids (TDS) is defined as the quantity of dissolved material in water, and depends mainly on the solubility of rocks and soils the water contacts. For instance, water that flows through limestone and gypsum dissolves calcium, carbonate, and sulfate, resulting in high levels of total dissolved solids.

A convenient way to measure TDS is to test the conductivity of the sample. Conductivity is a measure of the ability of water to pass an electrical current and is affected by the presence of dissolved solids. As the level of TDS rises, the conductivity will also increase. Discharges to water can change the conductivity depending on the discharge. A failing sewage system could raise the conductivity because of the presence of chloride, phosphate, and nitrate.

The conductivity of river samples in the present study reported in the ranges from 153 $\mu\text{S}/\text{cm}$ for u/s of Jaykwadi dam to 825 $\mu\text{S}/\text{cm}$ for Kapila-Godavari confluence point.

Conductivity outside the range of 500 $\mu\text{S}/\text{cm}$ could generally indicate that the water is not suitable for certain species of fish or macroinvertebrates.

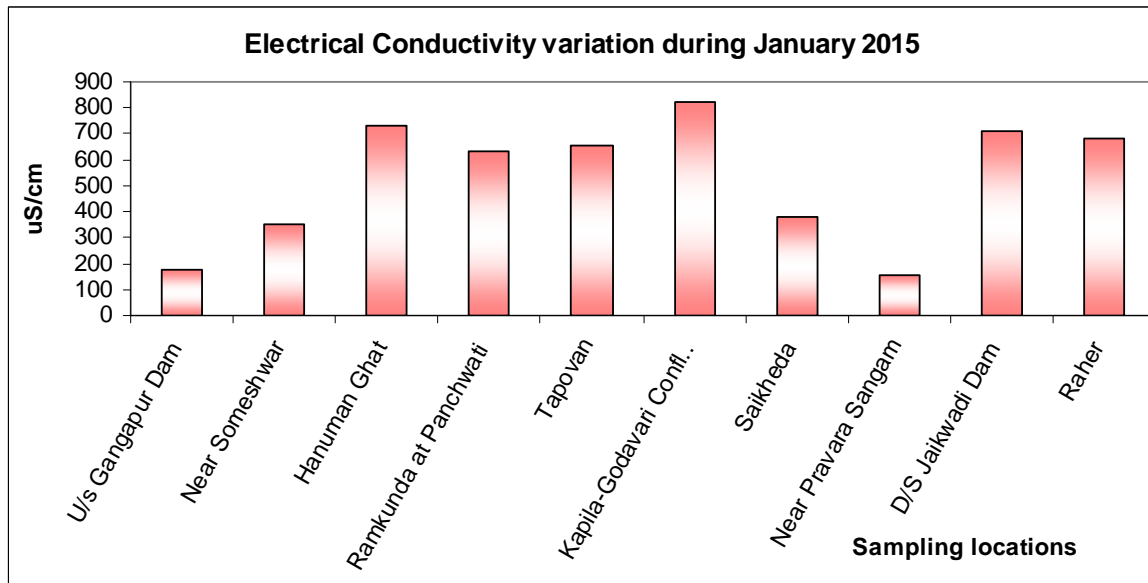


Figure 3: Electrical Conductivity Variation During January 2015.

5.6 Dissolved Oxygen / Biochemical Oxygen Demand / Chemical Oxygen Demand

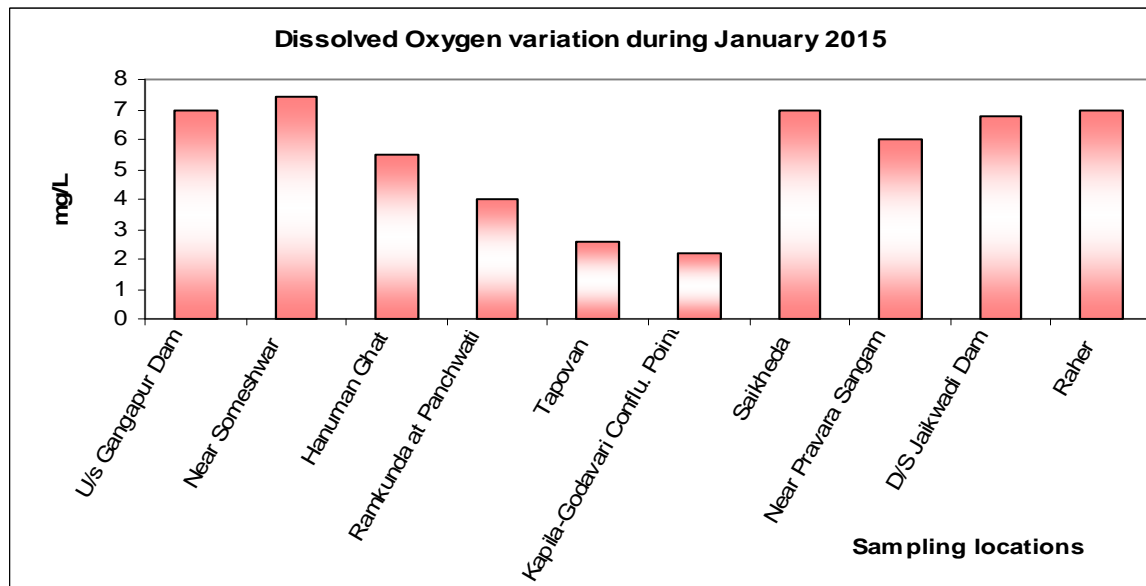


Figure 4: Dissolved Oxygen Variation during January 2015.

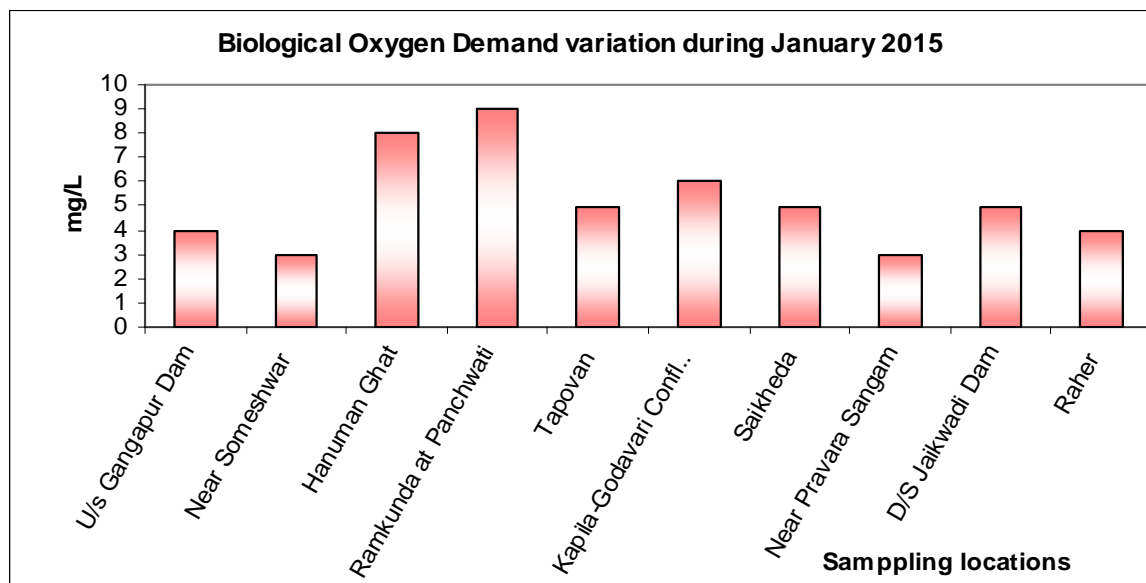


Figure 5: Biological Oxygen Demand Variation during January 2015.

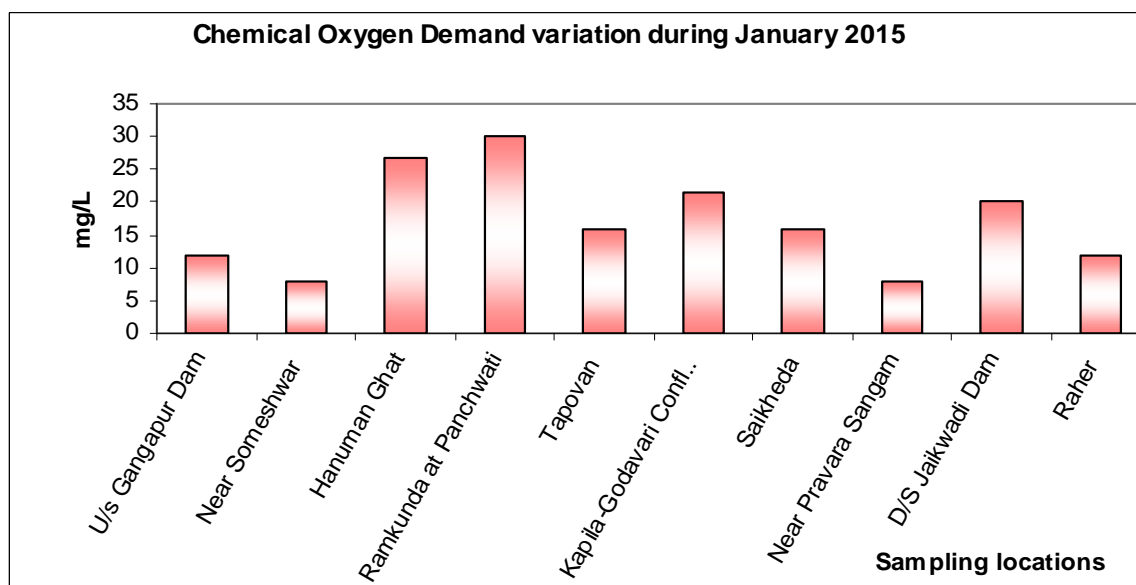


Figure No. 6 Chemical Oxygen Demand Variation During January 2015.

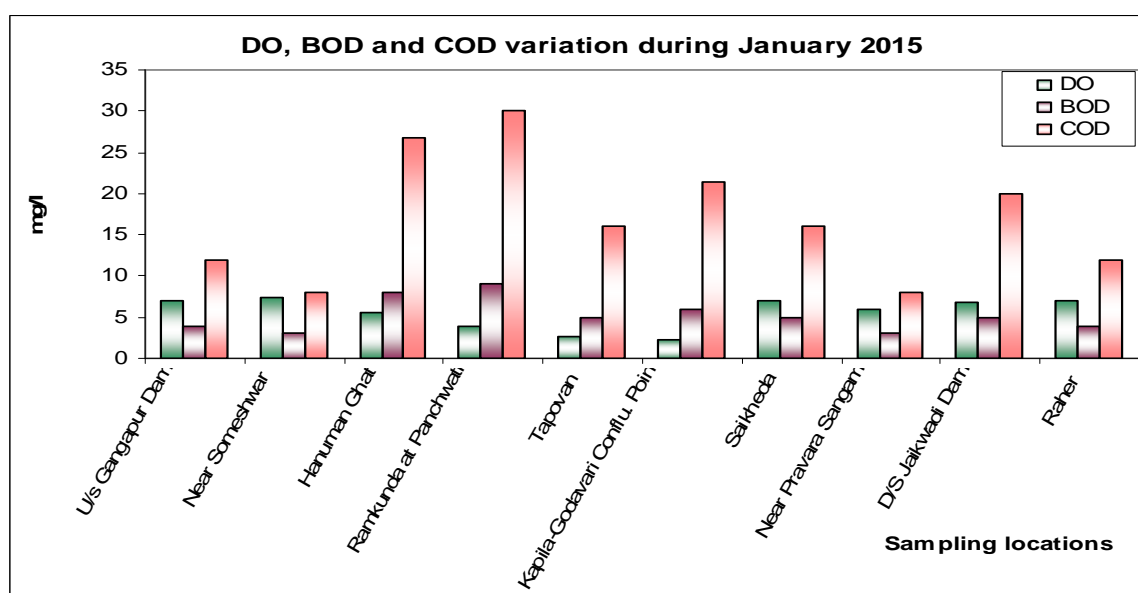


Figure 7: DO, BOD and COD Variation During January 2015.

BOD of river water in the Nasik area mainly including places like U/s of Gangapur Dam, Someshwar temple, Hanuman ghat, Ramkund, Tapovan, Kapila-Godavari confluence point, and D/s of Nasik Saikheda. The BOD broadly ranges from 3 mg/L at Someshwar temple to 9 mg/L Panchwati at Ramkund. The higher BOD values at Hanuman ghat, Ramkund Panchwati, can be due to the activities carried out on the banks of river including washing of clothes, vehicles, Nirmalya visarjan, performing Pujas, Asthi visarjan at Ramkund etc. It is further observed during the sampling that at the Ramkund, there is vegetable market (*Bhaji*

Bazar) on the bank of river. The waste from this market and open defecation activities are also contributing to pollute the river at some extent. The River water of Ramkund is an indication of pollution load and hence not fit for domestic and drinking purpose and need treatments to minimize the contamination.

BOD values are observed at D/s of Nasik at Tapovan, Kapila Godavari Confluence point and Saikheda typically ranged between 5 to 6 mg/L.

BOD values of Godavari River at U/s of Gangapur dam, Someshwar Temple, and downstream of Nasik city is quite low and meets A-II river water quality standards. Though BOD values of water samples from Nasik D/s to Raheer in Nanded district ranges from 3 to 6 mg/L, the values rarely exceeds the value of 5 mg/L.

5.7 Trace Metals and Pesticides

The water analysis was carried out for trace metals like Aluminium, Arsenic, Chromium, Iron, Nickel, Lead and Zinc for all identified pollution stretches on the River Godavari. After study of the results, it is observed that, according to the A-II water quality standards prescribed by Maharashtra Pollution Control Board. All the water samples of Godavari River do not exceed the prescribed limit of A-II river water quality standards.

It was observed that concentration of all the trace metals of environmental concern at all sampling locations was found to be low and thus do not pose any harm by its consumption.

Further Pesticides analysis is carried out for all the water samples with the Gas Chromatography. There are no pesticides detected from the analysis.

5.8 Chlorides and Sulphates:

The chlorides (Cl) and Sulphates were analysed for the checking of the potability of the water and it is interpreted from the results that for all samples, the values for chlorides and sulphates are well within the Water Quality Standards for best

Designated Usage from Maharashtra Pollution Control Board A-II.

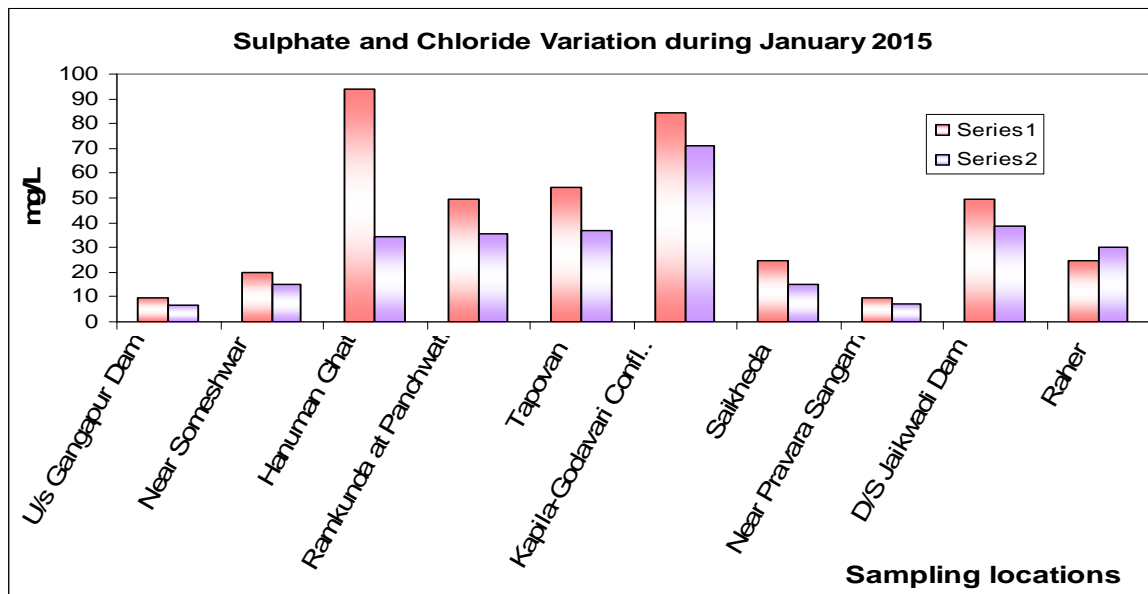


Figure 8: Sulphate and Chloride Variation During January 2015.

The values for Chlorides and Sulphate were ranges between 9.9 mg/L to maximum 94.03 mg/L and 6.45 mg/L to maximum of 71.25 mg/L respectively.

5.9 Total Coliform

According to the A-II water quality standards prescribed by Maharashtra Pollution Control Board, the total coliforms should not exceed the value of 5000 MPN per 100 ml sample. All the water samples of Godavari River do not exceed the prescribed limit of A-II river water quality standards.

6

Action Plan

6.1 Preamble

The main objective of the assessment study is to check the general status of river Godavari and provide suggestions / recommendations with action plan to improve the quality of the river water.

Based on the general observations during the assessment study, the following measures are recommended.

6.2 De-siltation of Gangapur Dam:

From many years due to deposition of silt, storage capacity of Gangapur Dam has reduced. This dam water is used for drinking purpose of Nashik Municipal Corporation MIDC Satpur /Ambad. Thermal Power station Eklhare and recently reused water received after Nashik Municipal Corporation treatment is given to India Bull's Realtech Co.Ltd. (IRC) for their Thermal power plant at Sinnar. IRC is not yet started. The need of water is increasingly being felt by all these sectors. The requirement of water for religious, social and ecological functions needs to be carved out. The decrease in dam storage will be detrimental for all these stakeholders and sectors. Therefore, De-silting should be taken up on priority basis after proper assessment and techno-economic feasibility study.

De-siltation of Gautami – Godavari, Kashyapi and Gangapur will be helpful in maintaining environmental flow of Godavari. Further it is also recommended that at de-siltation of other dams also need to be carried out.

Major issues for abatement of Godavari river pollution were identified for evaluation and immediate attention for rectification so that the river water quality improves and meets the stipulated A-II class standards.

6.3 Religious Activities Impacting River Quality

As Nasik city is a Holy place, huge number of devotees visits the city resulting in high floating population all through the year. Devotees perform various kinds of Pujas at certain places at the bank of the river. This leads to addition of organic matter in to the river directly. Some of the activities are as below-

- Proper use of collection facility for *nirmalya* should be placed at every religiously significant place like temples, ghats
- “Pindadan comprising of cooked rice during *Dashakriya* and *nirmalya* in the river at Ramkund.
- Human body ash (*Asthi*) Visarjan activities at Ramkund.
- *Bhaji bajar* and stalls of offerings to Devotees near river banks.

Control of ritual inputs by devotees is also essential to check the pollution at the banks of temples specifically at Ramkund. The following measures should be considered:

- Appointment of special vigilance squad for control of misuse of river at the banks for washing of clothes, vehicles, and open defecation is recommended.
- Awareness should be created through an audio visual show for violators with the help of NGOs and citizen groups.
- Artificial ponds should be constructed at the banks of Ramkund for “*Dashkriyavidhi* so that entry of putriciable organic matter into the main stream can be restricted. The water in the artificial pond should be replaced and separate treatment should be provided to this polluted water.

6.4 Disposal of *Nirmalya*

- Placing of nets on the bridges to avoid throwing of *nirmalya* across the river flow and also downstream of holy places such as Ramkund, Tapovan to collect floating *Nirmalya* disposed by the devotees can be helpful to reduce the amount of *nirmalya* in the river.
- At present, many permanent ghats have been constructed on the bank of River Godavari. As the river Godavari is a non perennial river, the banks of the river must be protected. Hence temporary ghats may be built if more ghats are needed in the future.
- Volunteers should be appointed for effective collection and disposal of such material.
- Awareness programmes should be organized for adoptions of the improved system for pollution prevention.

6.5 Collection of Domestic Wastewater

- 100% collection of wastewater from the Nasik Municipal area should be achieved in order to avoid any wastewater directly entering into the river.
- Wherever collection process is not feasible in short time, in situ nalla treatment should be adopted.
- Prior to awarding permission for development of new residential areas in the outskirts of the city, there should be provision of sewerage network and STP of appropriate capacity and accordingly authorities should take prompt action for construction of new STP.
- It is recommended to have soak pits for villages in close proximity of river in order to avoid direct discharge of sewage in to the river.

6.6 Status of Sewer

- Regular operation and maintenance sewers and sewerage chambers should be done as leakages or breakages in either can lead to flow of huge quantity of sewage in to the river Godavari.
- Deliberate breakages of Sewage chambers should be checked and stopped by undertaking strict actions and providing alternatives by using treated water for irrigation through decentralized system.
- The centralized sewer system is always problematic due to multiple lines and expensive due to need for pumping which requires electricity. All conventional sewer and STPs require very high O&M costs, especially uninterrupted power and trained manpower. Hence Decentralized wastewater treatment is recommended at least for all multi complex projects.
- Recommendations provided by NEERI on “Comprehensive study on Rejuvenation of River Godavari and Integrated Action Plan for Improvement of Environmental Status for Nasik Region, Maharashtra” shall be implemented.

6.7 Maintenance and Up-Gradation of STPs

- Regular maintenance and up gradation of STPs should be carried out for effective treatment of wastewater. The working status of each STP

performance unit should be strictly checked in order to comply the standard A-II. Recommendations provided by NEERI shall be implemented.

6.8 Industrial Wastewater

Presently, Satpur MIDC area does not Common Effluent Treatment Facility to treat their effluent. Hence in order to treat effluent generated from Satpur MIDC area Common Effluent Treatment facility should be provided on top priority.

- Reuse and recycle of treated wastewater for construction, gardening etc. Purposes should be implemented through formulation of new byelaws.

6.9 Other Recommendations:

- Activities such as soil excavation, brick making on the bank of river is seriously affecting the quality of river water, Hence such activities should be strictly prohibited upto 500 m. from high flood line.
- It is recommended to implement River Regulation Zone policy strictly to restrict activities in the river bank.
- Encroachments, depositions, construction or any kind of developmental activities on the bank of rivers should be banned.

From the present assessment study, It is concluded from the that if above recommendations are implemented within the administrative boundaries it will helpful in maintaining river water quality of river Godavari.

7

References

List of References

References	Particulars
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**Annexure 1: Effluent Generating Industries from MIDC, Satpur Tal. & Dist.
Nashik.**

Sr. No.	Industry	Category	Treatment provided (Industrial)	Treatment provided (Domestic)
1	ABB Ltd.	Red	ETP provided	STP
2	Atlas Copco (I) Ltd.	Red	ETP provided	STP
3	Epcos India Pvt Ltd	Red	NA	STP
4	Graphite India Ltd	Red	ETP provided	STP
5	Jyoti Structures Ltd.	Red	ETP provided	STP
6	Hindustan Fasteners Pvt.Ltd.	Red	ETP provided	Septic Tank & Soak Pit
7	M.G. Electrical.	Red	ETP provided	Septic Tank & Soak Pit
8	Mahindra and Mahindra Ltd.	Red	ETP provided	STP
9	Mahindra sonar Ltd.	Red	ETP provided	SepticTank & Soak Pit
10	Nilraj Engineering Works Pvt.Ltd	Red	ETP provided	Septic Tank & Soak Pit
11	Perfect Circle India Limited.	Red	ETP provided	Septic Tank & Soak Pit
12	Premium Tools Pvt Ltd	Red	ETP Provided	Septic Tank & Soak Pit
13	Schneider Electric (I) Pvt Ltd.	Red	ETP provided	STP
14	Seemegh Industries	Red	ETP Not provided	Septic Tank & Soak Pit
15	Supreme AutoshellIndia Pvt. Ltd.	Red	ETP provided	Septic Tank & Soak Pit
16	VRM Metazine Pvt,Ltd.119	Red	ETP provided	Septic Tank & Soak Pit
17	S.G. Gears	Red	ETP provided	Septic Tank & Soak Pit
18	Super Metal Industries	Red	ETP provided	Septic Tank & Soak Pit
19	Saniyo Electrofab Pvt Ltd,	Red	ETP provided	Septic Tank & Soak Pit
20	Neelay Metal Ltd.	Red	ETP provided	Septic Tank & Soak Pit
21	Jyoti Structures Ltd.	Red	ETP provided	Septic Tank & Soak Pit
22	Alcon Electronics Pvt. Ltd.	Red	ETP provided	Septic Tank & Soak Pit
23	Pawar Electro Systems Pvt Ltd	Red	ETP Provided	Septic Tank & Soak Pit
24	Supreme Autoshell India Pvt. Ltd.	Red	ETP Provided	Septic Tank & Soak Pit
25	Jyosh Steel Files (P) Ltd	Red	ETP Provided	Septic Tank & Soak Pit
26	Bosch Limited (Motor Industries Co. Ltd.)	Red	ETP provided	STP

27	Essem Tecnopinz Pvt. Ltd.	Red	ETP provided	Septic Tank & Soak Pit
28	Galaxy Metal Finishers	Red	ETP provided	Septic Tank & Soak Pit
29	Garima Enterprises	Red	ETP provided	Septic Tank & Soak Pit
30	Pinnacle Engplast Pvt Ltd	Red	ETP provided	Septic Tank & Soak Pit
31	Prajakta Enterprises	Red	ETP provided	Septic Tank
32	Ratnadeep Electroplate rs Pvt.Ltd	Red	ETP Provided	Septic Tank & Soak Pit
33	Satyam Metal Finisher	Red	ETP provided	Septic Tank & Soak Pit
34	SHREE GANESH ENTERPRISES	Red	ETP Not provided	Septic Tank & Soak Pit
35	Shree Swami Samarth Industries.	Red	ETP provided	Septic Tank & Soak Pit
36	Star Plating Industries.	Red	ETP provided	Septic Tank & Soak Pit
37	Veevaa Toolss Private Ltd.	Red	ETP provided	Septic Tank & Soak Pit
38	Victor Switchgear Pvt.Ltd.	Red	ETP provided	Septic Tank & Soak Pit
39	Seewell Containers Pvt. Ltd.	Red	ETP provided	Septic Tank & Soak Pit
40	Metacraft Corporation	Red	ETP provided	Septic Tank & Soak Pit
41	Nayan Enterprises	Red	ETP provided	Septic Tank & Soak Pit
42	Bajaj Sons Ltd.	Red	ETP provided	Septic Tank & Soak Pit
43	Om Processing Industries,	Red	ETP Not provided	--
44	Sai Omkar Enterprises,	Red	ETP Not provided	--
45	Precision Industries,	Red	ETP provided	Septic Tank & Soak Pit
46	Sudha Metal Finishers,	Red	ETP provided	Septic Tank & Soak Pit
47	Hindustan Electroplate rs,	Red	ETP Not provided	Septic Tank & Soak Pit
48	S.W. Metaform Pvt Ltd.,	Red	ETP provided	Septic Tank & Soak Pit
49	Taparia Tools Ltd.	Red	ETP provided	STP
50	Indian Tools (Birla Precision Tech. Ltd)	Red	ETP provided	Septic Tank & Soak Pit
51	VIP Industries Ltd	Red	ETP provided	STP

52	Super Metal Industries	Red	ETP Provided	Septic Tank & Soak Pit
53	Apex Printing Technology India Pvt. Ltd.	Red	ETP Provided	Septic Tank & Soak Pit
54	Viraj Engineering Company	Red	Primary & Secondary	Septic Tank & Soak Pit
55	Trinity Ventures	Red	ETP Provided	Septic Tank & Soak Pit
56	Spectrum Electro plater	Red	ETP Provided	Septic Tank & Soak Pit
57	Excel Engineering Industries	Red	ETP Provided	Septic Tank & Soak Pit
58	Micro Petrochem Pvt. Ltd.	Red	ETP Provided	Septic Tank & Soak Pit
59	Genext Precision Auto Tech Pvt. Ltd	Red	ETP provided	Septic Tank & Soak Pit
60	Mahan Enterprises	Red	ETP provided	Septic Tank & Soak Pit
61	Max Energy Pvt Ltd	Red	ETP provided	Septic Tank & Soak Pit
62	Zodiac Powder Coaters.	Red	ETP provided	Septic Tank & Soak Pit
63	Sharp Knife Co.Pvt.	Red	ETP Provided	Septic Tank & Soak Pit
64	Mayfair Soaps Ltd.	Red	ETP provided	Septic Tank & Soak Pit
65	Nashik Chemical Pvt. Ltd.	Red	ETP provided	Septic Tank & Soak Pit
66	Spak Orgochem (India) pvt Ltd.	Red	ETP provided	Septic Tank & Soak Pit
67	Nashik Photo- Tech Pvt Ltd	Red	ETP Provided	Septic Tank & Soak Pit
68	S.P. Industries	Red	ETP Not Provided	Septic Tank & Soak Pit
69	Godavari Paints Pvt Ltd.	Red	ETP provided	Septic Tank & Soak Pit
70	`Glanmark Pharma- ceutical Ltd.	Orange	ETP provided	STP
71	Vital Healthcare Pvt. Ltd.	Orange	ETP provided	STP
72	Jyoti Ceramics Ind. Pvt. Ltd	Red	Primary Treatment	Septic Tank & Soak Pit
73	Jyoti Ceramics Ind. Pvt. Ltd	Red	Primary Treatment	Septic Tank & Soak Pit
74	Perfect Circle India Ltd.	Red	ETP provided	STP
75	CEAT Limited	Red	Primary Treatment	STP
76	Shrirang Kisanlal Sarda	Red	ETP provided	Septic Tank & Soak Pit
77	Govind sons Flashlight Industries P Ltd.	Red	ETP provided	Septic Tank & Soak Pit
78	Caprihans India Ltd.	Orange	ETP provided	Septic Tank & Soak Pit

