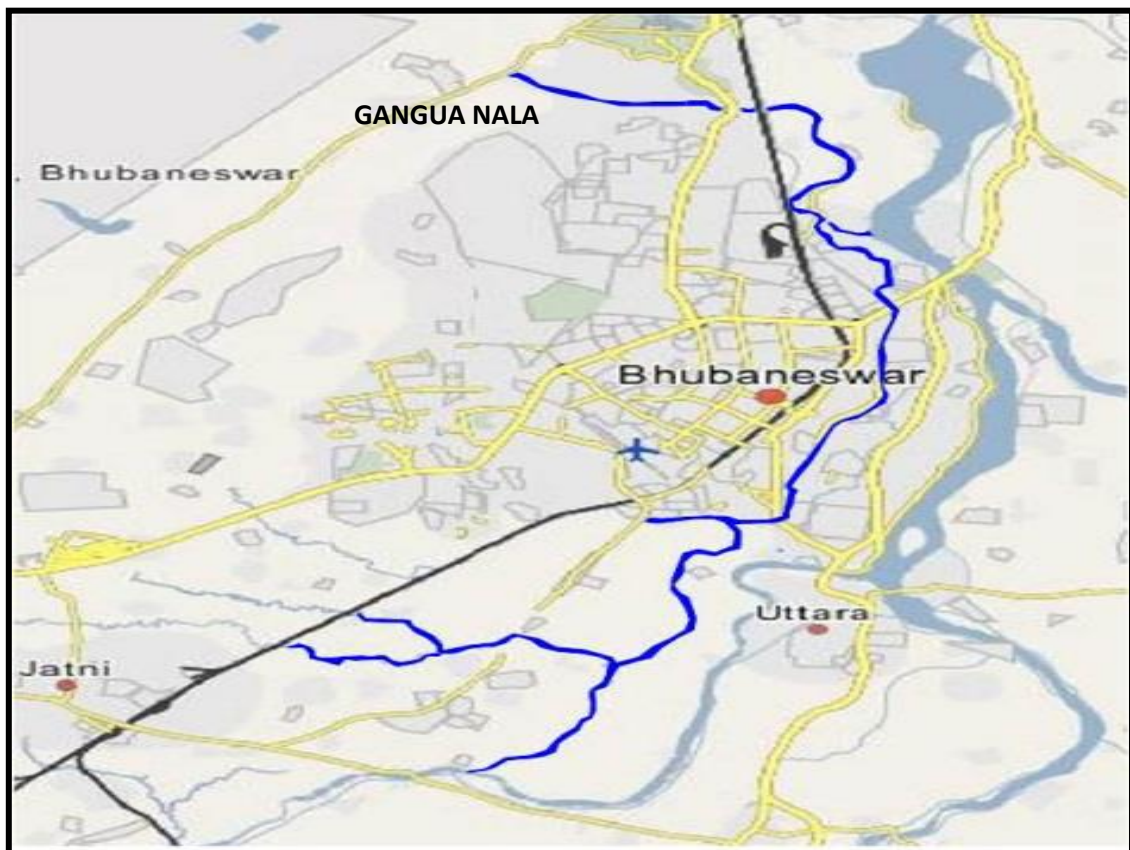


# **ACTION PLAN FOR RESTORATION OF POLLUTED STRETCH OF GANGUA (DOWNSTREAM OF BHUBANESWAR) (PRIORITY-I)**



**EXECUTING SUMMARY ON PROPOSED ACTION PLANS  
FOR REJUVENATION OF IDENTIFIED POLLUTED RIVER STRETCH ON GANGUA NALLAH**

\*\*\*\*\*

S. No.	DESCRIPTION OF ITEM	Details
1.	Name of the identified polluted river and its tributaries	: Gangua nallah. It has no tributaries
2.	Is river is perineal and total length of the polluted river	: Gangua nallah is a small stream with a length of approximately 45 Km from its origin to its confluence with Daya river.
3.	No of drains contributing to pollution and names of major drains	: Ten number of drains carrying wastewater as well as storm water of Bhubaneswar fall into Gangua nallah and thereby pollute the nallah . Name of these ten drains are Patia drain, Sainik School area drain, OAP area drain, Vani Vihar drain, Laxmisagar area drain, Bargarh area drain, Kedargouri drain , Airport area drain and Ghatikia drain.
4.	Whether 'River Rejuvenation Committee (RRC) constituted by the State Govt./UT Administration and If so, Date of constitution of 'RRC'	: Yes. Constituted by the State Government vide letter No. 24426 dated 12.11.2018
5.	Major Towns on the banks of the river with population	: Bhubaneswar
	a. Total water consumption and sewage generation in MLD	: Total Water demand 130 MLD Total Sewage generation 90 MLD
	b. Total no. of existing STPs and the total capacities in MLD	: Nil
	c. Gaps in sewage treatment in MLD and no. of towns not having STPs	: 90 MLD
	d. Total MSW generation in TPA	: MSW 520 MT per day (i.e. 189800 TPA)
	e. Existing treatment and disposal facilities and total capacity	: Total MSW is being disposed in the dumping yard located at Bhuasuni in an area of 61.485 Ac

6.	Major industrial estates located with total no. of industries	:	<table border="1"> <thead> <tr> <th data-bbox="1032 193 1219 222">Industrial Estate</th> <th data-bbox="1219 193 1468 222">No. of Industries</th> </tr> </thead> <tbody> <tr> <td data-bbox="1032 222 1219 268">2</td> <td data-bbox="1219 222 1468 268">103</td> </tr> </tbody> </table>	Industrial Estate	No. of Industries	2	103
Industrial Estate	No. of Industries						
2	103						
	a. Total water consumption and total industrial effluent generation in MLD	:	Total water consumption: 2.205 MLD Total Industrial effluent generation : 1.612 MLD				
	b. No. of industries having captive ETPs and their treatment capacity in MLD	:	18 Nos. Total treatment capacity in MLD 2.329 MLD				
	c. No of CETP's and their treatment capacity	:	Nil				
	d. Gaps in treatment of industrial effluent	:	Nil				
	e. Total HW generation in TPA in the catchment area	:	Nil				
	f. Existing HW Treatment and Disposal Facilities and total capacity with life span	:	Not applicable				
7.	Action plan includes mainly covering aspect such as (Proposal for utilisation of sewage, ground water recharging or rain water harvesting, measures for regulating ground water use, protection and management of flood plain zone, maintaining minimum E-flows and water shed management, plantation on both sides of the river, setting up of bio-diversity park etc., as per Hon'ble NGT Orders dated 20.09.2018 and 19.12.2018)	:	Laying of sewer lines, construction of sewage pumping stations and 5 nos of STPs with a total treatment capacity of 184 MLD will be completed by the end of 2020. Further one SeTP of 75 KLD has been commissioned for treatment of septage. Two more SeTPs will be constructed within the above period. Gangua nallah is a small seasonal stream which confluences with river Daya. Minimum flow will be maintained in Gangua. Improved water quality of Gangua will improve the water quality of Daya river.				
8.	Min. and Max. required time period for implementation of action plans	:	Min...2.....Years, Max...3..... Years				
9.	Total estimated budget in crores towards implementation of proposed action plans with break-up ( e.g. No. of STPs, capacity, total cost; No of CETPs, total capacity, Cost towards interception and diversion of sewage/effluent to STPs/CETPs etc.,)	:	Total requirement of fund for construction of 5 STPs as per agreement value is Rs. 689.13 crore.  Funds available with OWSSB is Rs. 430.46 crore Balance fund required is Rs.				

		<p>258.67 crore</p> <p>Total expenditure incurred up to 31.01.2019 is Rs. 84.31 crore</p> <p>State Government will provide the funds for implementation</p>
10.	Responsible Organisation (s) for implementation of proposed action plans (Please enclose details as annexure )	: Odisha Water Supply and Sewerage Board under Housing and Urban Development Department, Govt. of Odisha
11.	Proposed Mechanism for execution of action plans	: Construction of STPs and SeTPs for treatment of sewage and septage generated from Capital city Bhubaneswar. Construction of STPs and SeTPs will be done by OWSSB, Periodical monitoring of implementation will be done by the Chief Engineer, OWSSB, Principal Secretary to Govt, Housing and Urban Development Dept and River Rejuvenation Committee, Odisha.
12.	Expected deliverables w r to achieving Goals (Please enclose as annexure )	: <ol style="list-style-type: none"> <li>1. Construction and Commissioning of STPs.</li> <li>2. Construction and Commissioning of SeTPs.</li> <li>3. Treatment of municipal wastewater in STPs before discharge.</li> </ol> <p>Municipal wastewater of Bhubaneswar will be treated in STPs and treated wastewater will be discharged to Gangua nallah. The water quality of both Gangua nallah and Daya river will be improved and shall meet the bathing water quality for riparian users in Daya river.</p>

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## **1.0 Basic information about the stretch**

Gangua nallah, a stream originates from the western upland area of Bhubaneswar city (Chandaka Reserve Forest area) and flows along the south eastern side of the city almost parallel to Daya river along city-side and ultimately outfalls into Daya river near village Vadimula of Khurdha district in the state of Odisha. The total length of Gangua nallah from its origin to the confluence point is approximately 45 Km. After traversing along the city side, Gangua nallah confluences with Daya river approximately 9 km towards south direction from the city limit.

Gangua nallah flows along the city side of Capital city of Bhubaneswar. The city does not have any organised sewage treatment system and the sewage is discharged through storm water drains. There are about ten numbers of storm water drains in the city that carry untreated waste water and outfall into Gangua nallah at different locations. Thus Gangua nallah receives untreated sewage of the capital city and hence is polluted by the discharge of municipal waste water of the city only through several storm water drains. The city has a natural gradient from West to East and therefore has a natural advantage for drainage. The wastewater of the city flows through the storm water drains. Most of the households/ institutions have their own septic tanks and soak pits and rest are directly connected to the storm water drains.

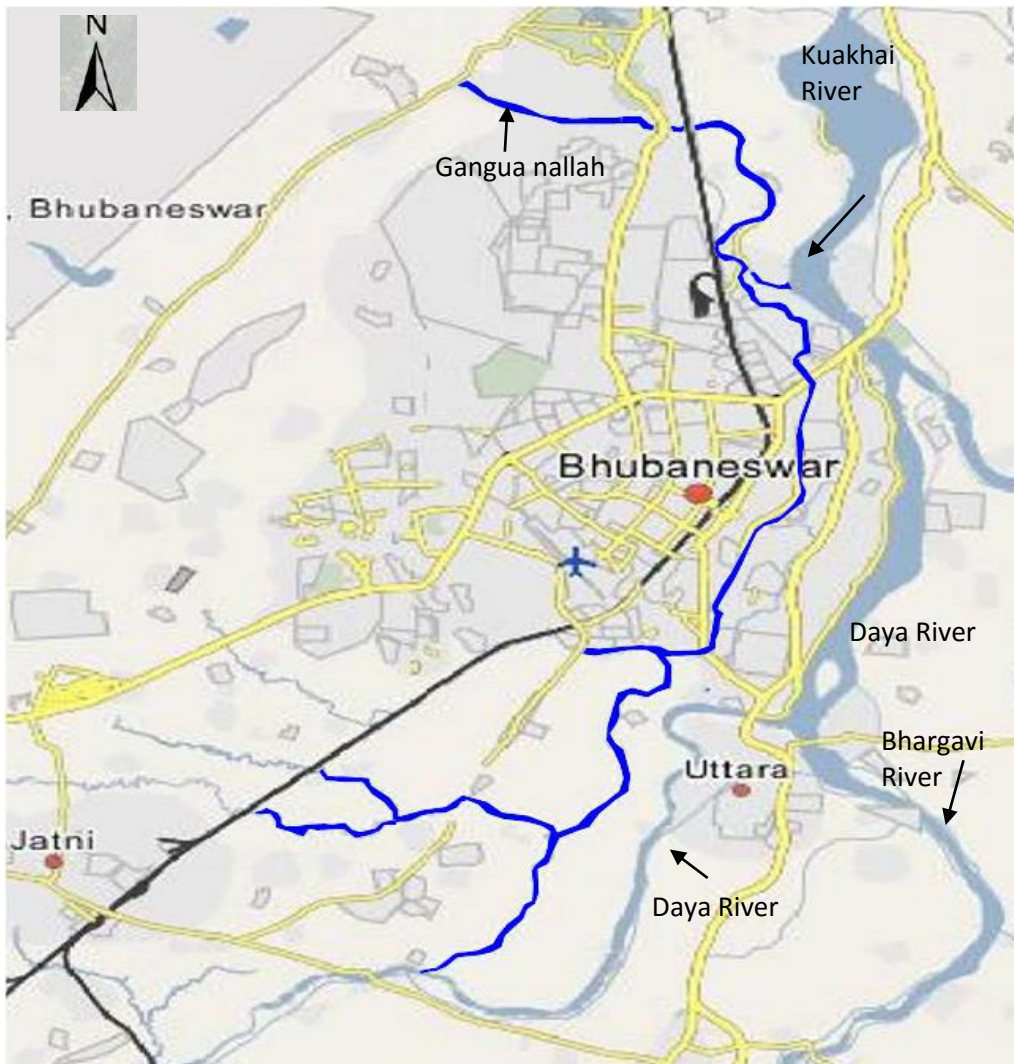
After traversing a distance of 13 Km from its origin, Gangua nallah starts receiving wastewater of the city through storm water drains at different points. Hence, the polluted stretch of Gangua nallah covers a distance of about 32 Km. There is an average flow of 1.17 meter/second throughout the stretch of the Gangua nallah. After receiving the wastewater of the city of Bhubaneswar, through storm-water drains, Gangua nallah has become a waste water carrying nallah and there are no beneficial uses of its water till its confluence with Daya river.

### **1.1 Major towns located on the bank between the stretch including population, water consumption details**

Bhubaneswar, the capital city of Odisha, is the only major urban local body situated on the right bank of Gangua nallah. Bhubaneswar is located at 84.50<sup>0</sup>E longitude and 20.16<sup>0</sup>N latitude in Khurdha district of Odisha. The city is bounded by two surface water bodies namely river Kuakhai on its east and river Daya on its south. Gangua nallah flows in between Bhubaneswar city and Daya river. Location of Bhubaneswar city with Gangua nallah, Daya and Kuakhai river is given in **Fig. 1**.



Bhubaneswar city is the largest urban agglomeration in the state. The city has been categorized as Tier-2 City. Besides being the capital city, it has been developed into an Information Technology hub of the state as well as an Educational hub and therefore considered as one of the country's fastest developing cities. The Bhubaneswar Municipal Corporation covers an area of 184 sq. Km. The city has an annual rainfall of 1436.1 mm.

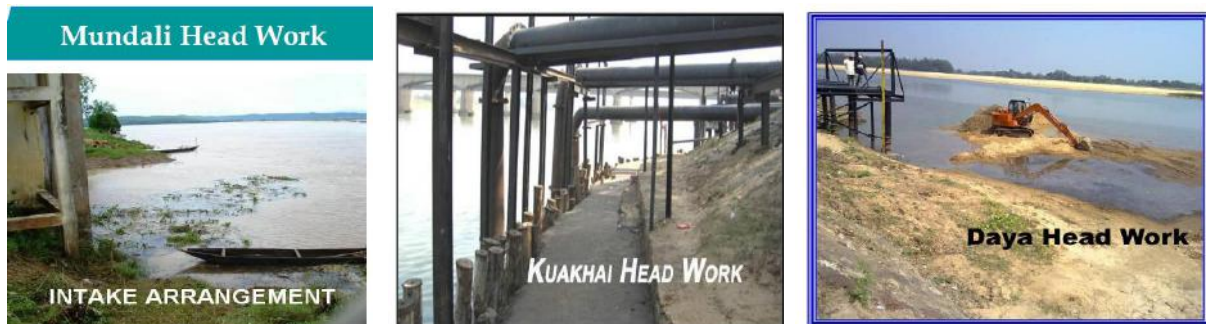


**Fig. 1** Location map of Bhubaneswar city , Gangua nallah, Daya river and Kuakhai river

As per 2011 census, Bhubaneswar had a population of 8,37,737 with a population density of 2131 persons per sq. Km. Due to its importance as a capital city, an educational hub and a tourist place, floating population in the city is very high.

## 1.2 Water supply

Total water supply to the Bhubaneswar city is 246.53 MLD of which 202.07 MLD is from surface water (Mahanadi, Kuakhai and Daya river) and 44.46 MLD is from ground water and spring. 64.22 MLD water is pumped from Mahanadi river at Mundali, 118.81 MLD water is pumped from Kuakhai river (distributary of Mahanadi river) near Mancheswar, and 19.04 MLD water is pumped from Daya river (a branch of Kuakhai river) near Bhuasuni,. 42.19 MLD water is supplied from 189 numbers of production wells and 2.27 MLD water is pumped from springs located within the city. Water intake points for Bhubaneswar city on Mahanadi river, Kuakhai river and Daya river are shown in **Fig. 2**.



**Fig. 2 Water intake points for Bhubaneswar city on Mahanadi river, Kuakhai river and Daya river**

## 1.3 Identified Industrial Estates/ areas

There are only two industrial estates such as Chandaka Industrial Estate and Mancheswar Industrial Estate within the jurisdiction of Bhubaneswar Municipal Corporation and are in the catchment of Gangua nallah. Being at the fringe of the municipality area, State Pollution Control Board, Odisha earlier had taken a decision not to allow any industry that uses fossil fuel to be set up in those two industrial estates. Further no major water intensive industry exists in the industrial estates and hence in the catchment of Gangua nallah.

#### **1.4 Industrial Pollution control**

A total 103 number of industries exist in those two industrial estates such as Chandaka Industrial Estate and Mancheswar Industrial Estate and are being regulated under the Consent administration of the State Pollution Control Board. Out of these, 24 are under Red category, 38 are under Orange category and 41 are under green category. However, no major water intensive industries are situated in these two industrial Estates.

Total water consumption of these 103 industries are 2205 KLD and wastewater generation is 1612 KLD. 18 number of Red Category industries operating in the Industrial Estates have installed their effluent treatment plants (ETP) to treat the wastewater prior to discharge into municipal drain which ultimately joins Gangua nallah through Budu nallah. The total treatment capacity of the ETPs have been estimated to be 2329 KLD. Small scale industries treat their domestic wastewater through soak pit via septic tank.

The total treatment capacity of the ETPs installed by the industries in the above two industrial estates has been estimated to be more than the wastewater generation quantity. The treated wastewater meet the discharge norms prescribed under consent administration of the Board. The SPCB regularly monitors the discharge water quality and verify its compliance.

There is no Common Effluent Treatment Plant (CETP) established in the industrial estates exist in the city.

#### **1.5 Bio-medical waste management**

Around 1082 Kg of biomedical waste per day is generated from 126 health care units existing in the city. The total waste is collected and transported to a Common Biomedical Waste Treatment Facility situated at Tangiapada in Khurda district which is far away from the city and beyond the catchment area of Gangua nallah. Therefore, there is remote possibility of contamination of Gangua nallah by bio-medical waste in the city.

#### **1.6 Solid waste management**

Bhubaneswar city generates around 520 MT of municipal solid waste per day. Solid waste is collected through both door to door collection and collection from secondary and community bins. Out of 67 municipal wards in the city, 10 wards are serviced by Municipal Corporation and in the remaining 57 wards door to door waste collection is carried out through private service providers. The collected solid waste are brought to the transfer station located

near Sainik School over an area of 25 acre land. From the transfer station, the solid waste is transported to the dumping site at Bhuasuni. At present there is no treatment of solid waste being done at the dumpsite. The topography of the dumpsite at Bhuasuni is a more of a valley type for which there is advantage of no overflow from the area to contaminate nearby-sites. Therefore, the chances of contamination of Gangua nallah by run-off from solid-waste dumpsite is remote.

There is a proposal for establishment of an energy recovery plant of 11.5 MW capacity at Daruthenga which is adjoining to the dumping yard at Bhuasuni. The plant will utilise the solid waste generated from the twin cities namely, Bhubaneswar and Cuttack for energy recovery.

## **2. Water Quality of river stretch/ Drains contributing pollution/ Ground water**

### **(i) Drains contributing pollution**

The city has a natural gradient from West to East and therefore has a natural advantage for drainage. The wastewater of the city flows through ten numbers of storm water drains. Most of the households/ institutions have their own septic tanks and soak pits and rest are directly connected to the storm water drains.

Usually, the waste water is conveyed through tertiary drains which is then conveyed to the secondary drains and then to the primary drains which empty into the Gangua nallah and from there it traverse to River Daya. At places, secondary drains also directly open into Gangua nallah. Only 33 % of the city is covered under drainage network.

There are ten natural drains flowing through Bhubaneswar city which carry municipal wastewater as well as storm water. After traversing a distance of 13 Km from its origin, Gangua nallah starts receiving wastewater of the city through these ten drains at different points. Out of ten natural drains, nine drains discharge into Gangua nallah within the city and one drain discharges into Gangua nallah outside the city limit. In the absence of sewage treatment plants the untreated wastewater of Bhubaneswar city are being directly discharged to Gangua nallah. Bhubaneswar city map indicating drains falling on Gangua nallah is shown in Fig. 3 and schematic diagram of major drains of Bhubaneswar city falling on Gangua nallah is shown in **Fig4.**



**Fig. 3 Bhubaneswar city map indicating drains falling on Gangua nallah**

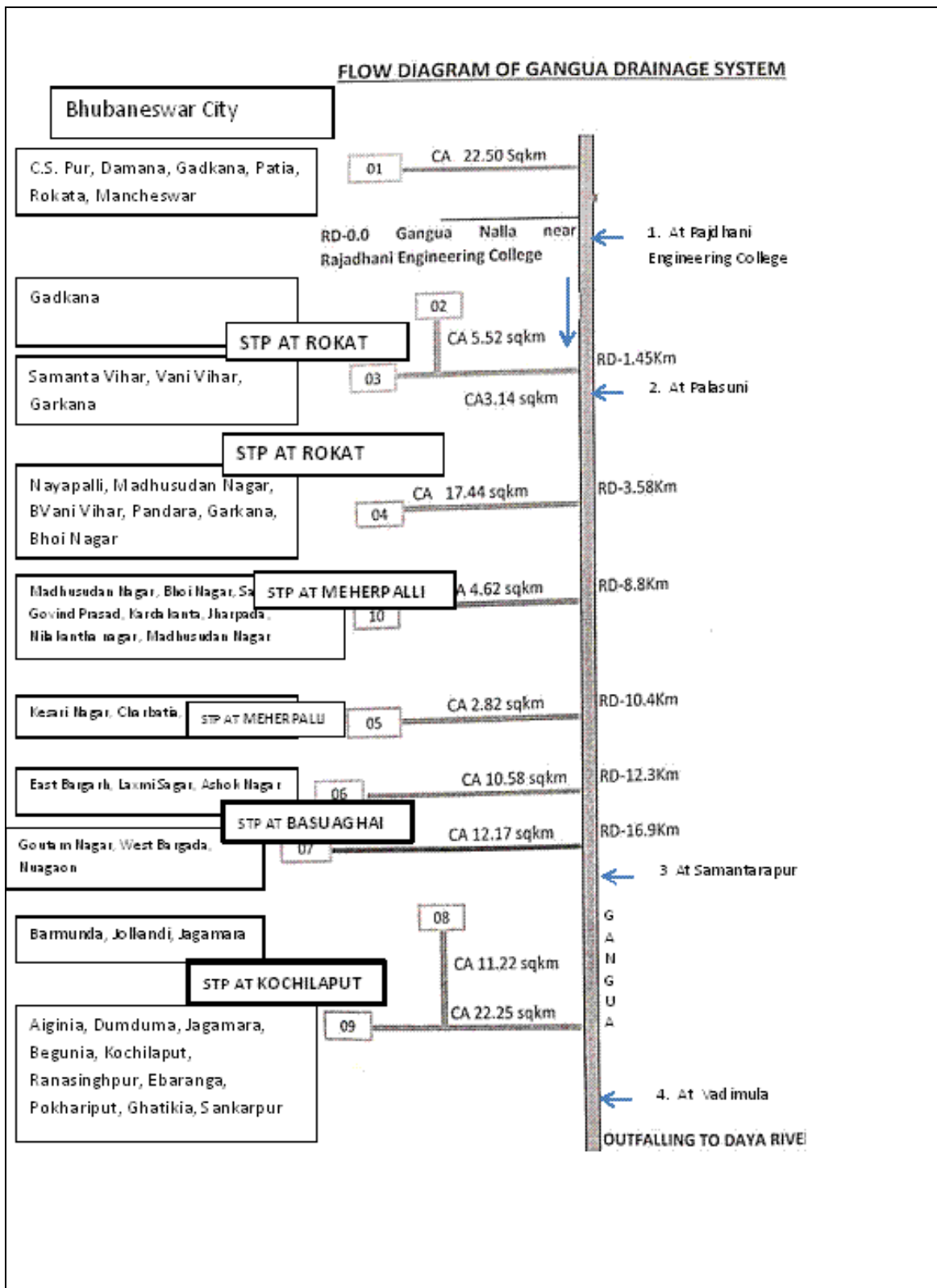


Fig. 4 Schematic diagram of major drains of Bhubaneswar city falling on Gangua nallah

The details of ten major storm water drains in the city of Bhubaneswar with their length, drainage area, average discharge and pollution load with respect to BOD are given in **Table-1**.

**Table – 1 Details of wastewater drain characteristics**

Drain No.	Drain Name	Length in Km	Drainage area in sq. Km.	Average Discharge (MLD)	Average BOD (mg/l)
1	Patia	4.32	16.93	17.00	160
2	Sainik School	1.13	1.44	1.55	127
3	OAP area	2.42	3.31	3.55	120
4	VaniVihar	5.63	13.67	16.40	100
5	Laxmisagar area	3.13	3.66	4.45	120
6	Baragada Area	2.16	2.89	3.45	140
7	Kedargouri	4.34	9.46	5.45	140
8	Airport area	4.33	12.99	14.30	24
9	Ghatikia	4.24	12.55	28.8	60
10	Nicco Park	5.48	10.28	12.3	100
	Total	37.18	103.23		

(Source : [http://forest.odisha.gov.in/pdf/Chap\\_8.pdf](http://forest.odisha.gov.in/pdf/Chap_8.pdf))

## 2.1 Water quality of Gangua nallah

Water quality monitoring of Gangua nallah is carried out by the State Pollution Control Board. The monitoring has been conducted during 2017 and 2018 at four different locations after the outfall of major primary drains of the city into Gangua nallah. Water quality data of Gangua nallah with respect to pH, DO, BOD, COD, Total coliform and Fecal coliform during the year 2017 (April-December) and 2018 (January-December) are given in **Table-2**.

**Table-2 Status of water quality of Gangua nallah along Bhubaneswar city during 2017 (April-December) and 2018 (January-December)**

Location	Year	pH		DO (mg/l)		BOD (mg/l)		COD (mg/l)		TC (MPN/100 ml)		FC (MPN/100 ml)	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Near Rajdhani Engineering College	2017	7.0	8.0	0.3	3.8	4.1	24.0	23.5	131.1	16000	160000	9200	160000
	2018	6.5	7.6	0.4	4.6	3.6	31.3	28.5	118.8	92000	160000	54000	160000
Near Palasuni	2017	6.9	8.1	0	2.3	3.9	39.0	27.5	160.2	22000	160000	13000	160000
	2018	6.5	7.7	0.5	3.2	4.1	34.3	26.6	96.4	92000	160000	54000	160000
Near Samantarapur	2017	7.1	8.3	0	3.2	5.9	35.0	27.5	160.2	160000	160000	160000	160000
	2018	6.7	7.9	0.2	3.8	3.6	70.8	29.9	216.7	54000	160000	54000	160000
Near Vadimula (before confluence with Daya river)	2017	6.8	8.1	0.3	5.2	4.1	19.9	23.0	93.2	54000	1600000	54000	540000
	2018	6.7	8.1	0.7	6.6	3.4	16.3	14.9	111.8	5400	160000	4900	160000

It is evident from Table-1 that Dissolved Oxygen content mostly remained much below the tolerance limit for Class C (4.0 mg/l, min.) in all locations. Maximum BOD value in Gangua nallah remained in the range 16.3-70.8 mg/l. This indicates significant contribution of untreated sewage on Gangua nallah. Maximum BOD value of 70.8 mg/l has been observed near Samantarapur. After Samantarapur, Gangua nallah passes through vast agricultural lands and there is virtually no discharge of wastewater to Gangua nallah. This was evident in the decreasing trend in BOD values in Gangua nallah at Vadimula (range : 4.1-19.9 mg/l during 2017 and 3.4-16.3 mg/l during 2018), before confluence with river Daya.

COD values ranged between 14.9-216.7 mg/l with the maximum COD values being at Samantarapur.

The annual range of Total and Fecal coliform bacteria during 2017 were observed to be 16000-1600000 MPN/100 ml and 9200-160000 MPN/ 100 ml respectively. Similarly, the annual range of Total and Fecal coliform bacteria during 2018 were observed to be 5400-160000 MPN/100 ml and 4900-160000 MPN/ 100 ml respectively. This indicates significant contribution of untreated sewage on Gangua nallah.



## 2.2 Ground water quality in the catchment of polluted river stretch

State Pollution Control Board, Odisha monitors the ground water quality at six locations of Bhubaneswar city in the month of April and October of each year. Ground water quality data during the year 2017 and 2018 are given in **Table-3**. The water quality data show that parameter like BOD in the ground water at Samantarapur and Chandrasekharpur (the locations near to Gangua nallah) remained much below the tolerance limit of 3.0 mg/l. This clearly indicates that the ground water has not been contaminated by the Gangua nallah.

**Table- 3 Ground water quality of Bhubaneswar city**

### (a) During 2017

Stn Name	Khandagiri Area,		Old town-Samantarapur Area		Kalpana-Laxmisagar Area		Chandrasekharpur		Capital Hospital Area		Secretariate-Govenor House-Old bus stand Area		Drinking water specification (IS : 10500 (2012))	
	A	O	A	O	A	O	A	O	A	O	A	O	Acceptable Limit	Permissible limit
pH	7.6	7.0	7.5	7.4	5.3	6.3	7.5	6.5	7.6	6.7	7.7	6.9	6.5-8.5	No relax
BOD, mg/l	1.4	1.6	0.7	1.1	0.2	0.7	1.5	0.7	0.1	0.3	0.7	0.3	-	-
TC, MPN/100 ml	<1.8	<1.8	3500	110	<1.8	<1.8	79	<1.8	<1.8	<1.8	>1600	<1.8	Absent	No relax
FC, MPN/100 ml	<1.8	<1.8	1400	26	<1.8	<1.8	23	<1.8	<1.8	<1.8	>1600	<1.8		

### (b) During 2018

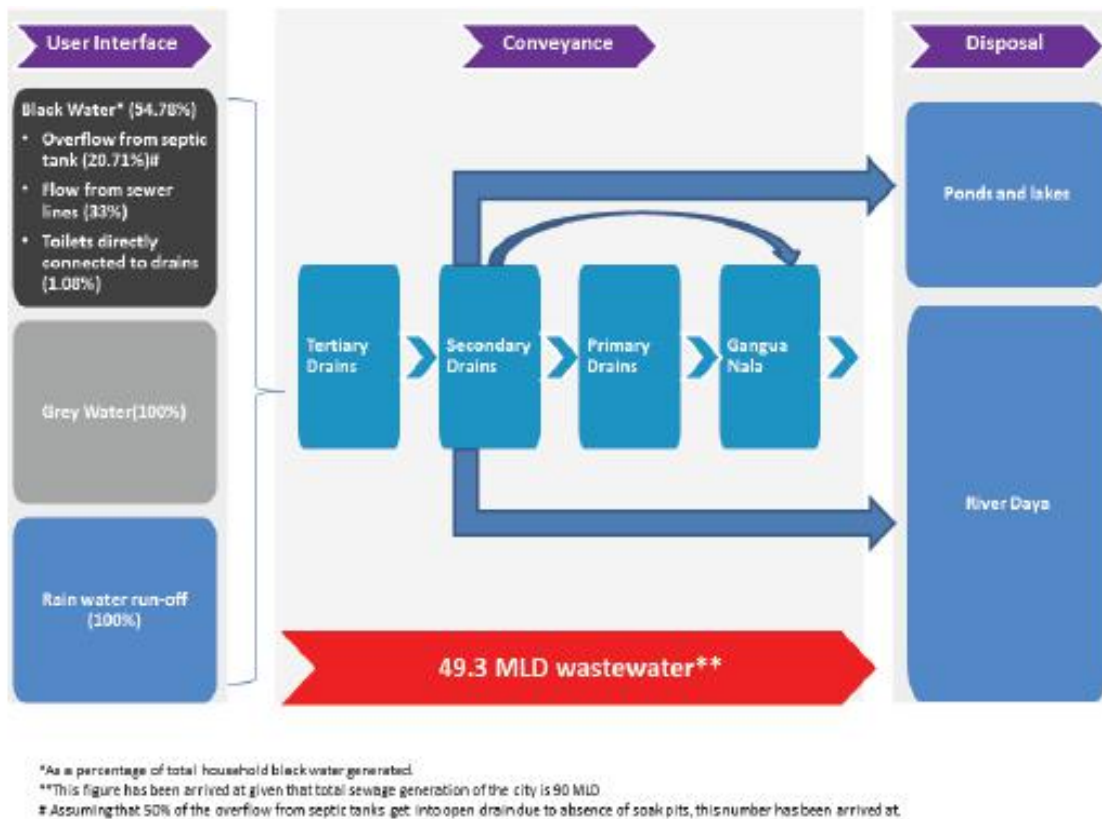
Stn Name	Khandagiri Area,		Old town-Samantarapur Area		Kalpana-Laxmisagar Area		Chandrasekharpur		Capital Hospital Area		Secretariate-Govenor House-Old bus stand Area		Drinking water specification (IS : 10500 (2012))	
	A	O	A	O	A	O	A	O	A	O	A	O	Acceptable Limit	Permissible limit
pH	7.4	5.4	6.8	7.3	5.8	6.8	6.6	6.8	6.7	6.2	7.2	6.7	6.5-8.5	No relax
BOD, mg/l	0.6	0.4	0.4	0.5	0.4	0.5	0.6	0.3	0.7	0.3	0.6	0.6	-	-
TC, MPN/100 ml	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	350	920	<1.8	Absent	No relax
FC, MPN/100 ml	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	130	540	<1.8		

### 3. Inventory of Sources of Pollution and Gaps Identified

#### Sewage generation from the towns located on the bank of the polluted river stretch

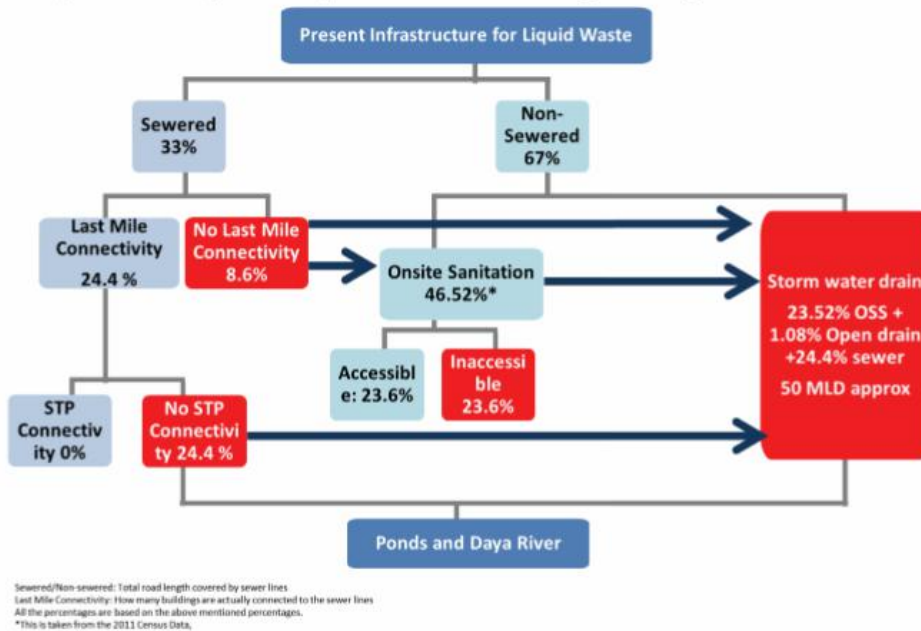
Bhubaneswar city is the only urban local body situated on the bank of Gangua nallah. Approximately 90 MLD sewage is generated from the city. About 55% of the total 90 MLD sewage generation of Bhubaneswar is flowing through the storm water drains. This amounts to 49.3 MLD of wastewater which includes overflows from septic tanks in the absence of soak pits (18.64 MLD), black water from toilets directly connected to drains (0.972 MLD), and wastewater from sewerage network (29.7 MLD) conveyed through the ten storm water drains in absence of separate sewer lines. Greywater is entirely conveyed through the drains. Greywater is entirely conveyed through the drains.

Schematic diagram of wastewater flow alongwith stormwater of Bhubaneswar city into Gangua nallah is given in **Fig. 5**.



**Fig. 5 Schematic diagram of storm water drainage of Bhubaneswar Municipal Corporation**

## City Level Gaps in Liquid Waste Management, Bhubaneswar



**Fig -6 City Level Gaps in Liquid Waste Management, Bhubaneswar**

At present, there is only one Lagoon at Laxmisagar functioning and there are no Sewage Treatment Plant existing in the city. Wastewater of the city are directly discharged through storm water drains to Gangua nallah. The pollution of Gangua nallah is mostly due to the discharge of untreated wastewater from Bhubaneswar. Hence treatment of sewage generated from the city of Bhubaneswar is considered as a priority in order to improve the water quality of Gangua nallah. The key action points for improvement in waste water management focuses on the intervention of Sewage Treatment Plants (STPs).

### 3.1 No. of STPs proposed and Capacity:

#### Projection of waste water generation:

As per the Census 2011 population in Bhubaneswar was 8,40,834. The water demand and waste water generation projection upto 2025 is presented in **Table 4**.

**Table-4 Waste Water generation Projection:**

Year	Population	Water Demand in MLD (Approx)	Waste Water Generation in MLD (Approx)
2011	840834	130	90
2025	1272096	197	136

It has been estimated that there will be generation of approx. 136 MLD waste water from the city during 2025. The total capacity of upcoming STPs is 184 MLD. Hence STPs will be able to cater to the demand of treatment of waste water till 2025.

Considering the topography of the city, it is divided into six sewerage districts, namely, Sewerage District-I, II, III, IV, V and VI. There is a proposal for establishment of six Sewage Treatment Plants (STP), one in each sewerage district under “Integrated Sewerage system of Bhubaneswar city” project, covering 163 sq. Km area of the city. There is provision of independent sewer network, sewage pumping stations and Sewage Treatment Plants (STP) in each sewerage district. Under the project, a total of 470.50 Km sewer network, 31 nos of sewage pumping station and 5 Nos. of Sewage Treatment Plants of total 184 MLD capacity based on Sequential Batch Reactor (SBR) Process will be constructed. Details of STPs proposed to be established in Bhubaneswar city are given in **Table-4**.

**Table -5 Details of six STPs proposed in Bhubaneswar city**

Sewage Districts (SD)	Project Scope	Name of Location of STP
SD- I	Sewer laying 76.146 Km Sewage Pumping Station – 5 Nos. STP Capacity -56 MLD- 1 No.	Meherapalli
SD- II	Sewer laying 27.728 Km Sewage Pumping Station – 5 Nos. STP Capacity -28 MLD- 1 No.	Basuaghai
SD- III	Sewer laying 97.812 Km Sewage Pumping Station – 9 Nos. STP Capacity -43.5 MLD- 1 No.	Kochilaput
SD- IV	Sewer laying 14.24 Km Sewage Pumping Station – 3 Nos. STP Capacity -8.5 MLD- 1 No.	Paikarapur
SD- V	Proposed STP Capacity -1.2 MLD- 1 No at Andharua. However, not taken up due to non-availability of land and sparsely populated inappropriate for sewer network construction	
SD- VI	Sewer laying 254.58 Km Sewage Pumping Station – 9 Nos. STP Capacity -48 MLD- 1 No.	Rokat

### **3.2 Drainage system/ Sewerage network present/ Proposed**

At present, 365 km. of sewer line covering 33% of total area of Bhubaneswar, which ultimately open into Gangua nallah exist in the city. 254 km. of sewer network is being laid under JICA funded Orissa Integrated Sanitation Improvement Project. Further 312 km. of sewer network is to be laid under Jawaharlal Nehru National Urban Renewal Mission (JNNURM). Hence at the end of the project period there will be a total of 931 km of sewer line connected to different STPs.

### **3.3 Details of Sewage Treatment Plant**

The project of Sewage Treatment in Bhubaneswar, the capital city basically constitutes construction of a Sewer network of RCC gravity sewer network, construction of Intermediate Sewage Pumping Stations (ISPS) with different numbers of Lifting stations (LS), construction of Terminal Sewage Pumping Station (TSPS), DI pipe Pumping Main, and construction of different capacity Sewage Treatment Plants (STP) based on SBR Technology.

The construction of different capacity Sewage Treatment Plants STP based on SBR Technology comprises of Main pumping Station, inlet chamber, screen chamber, grit chamber, aeration basins, return sludge pumping, centrifuge/ belt press, chlorination arrangement, sludge sump, sludge thickener, effluent disposal system by gravity, associated civil, mechanical, electrical, instrumentation system, construction of electrical substation and power supply, construction of DG room & MCC-cum-office room, site formation, service road, approach road to STP and pumping stations, construction of internal roads / pavements, laying of sewers and rising mains using trenchless technology at required places, construction of manhole chambers, valve chambers house sewers, road cutting & restoration, repair of municipal drains, reinstatement of public utilities etc. The treated water quality criteria will have BOD less than 10mg/l .

Details of each STP including their scope, location and scheduled completion date are given in **Table-6**. Locations of proposed STPs in Bhubaneswar city are shown in **Fig. 7**.

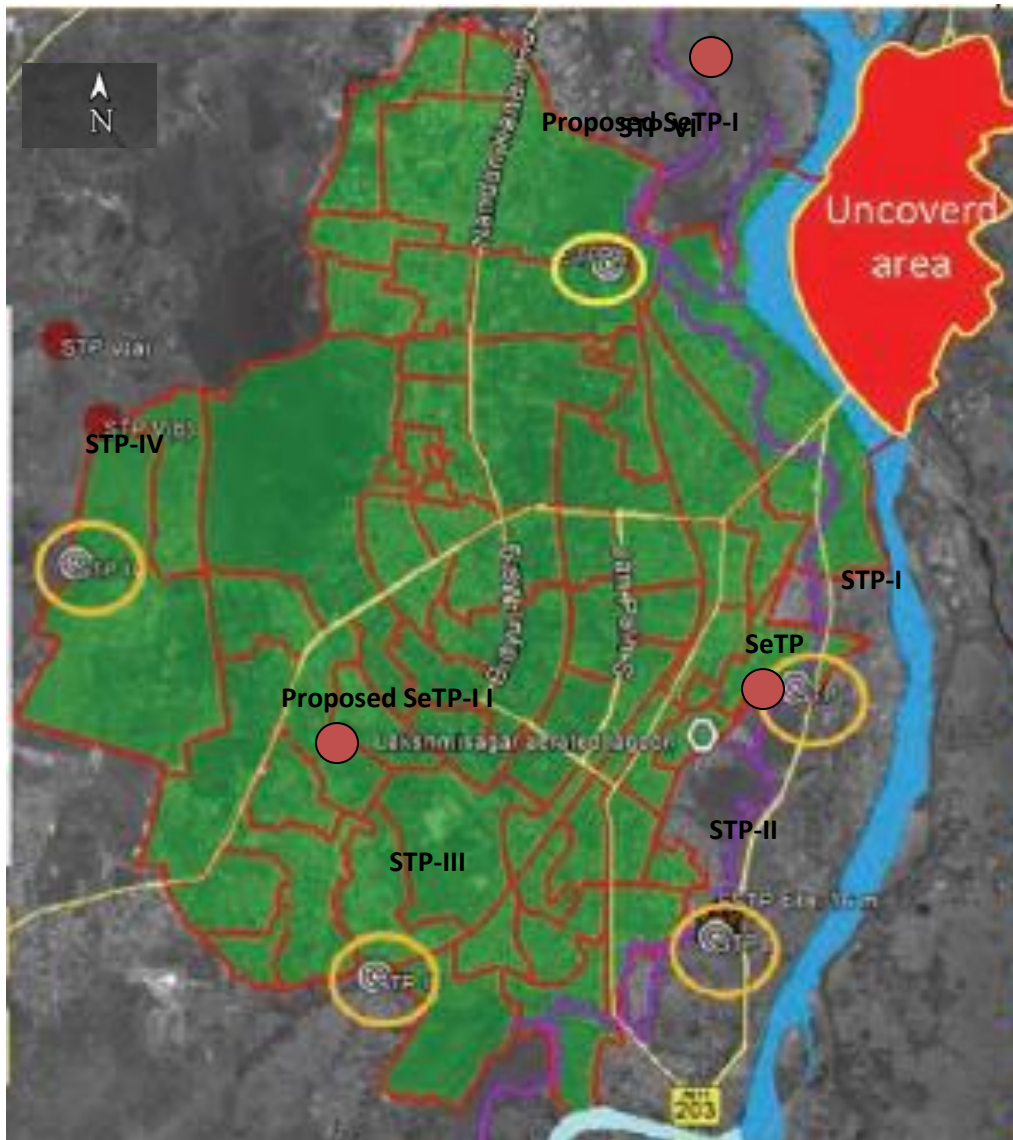


Fig. 7 Locations of proposed STPs and SeTPs in Bhubaneswar city

**Table 6 Scope, location and scheduled completion date of STPs to be established in Bhubaneswar city**

Sewage Districts (SD)	Project Scope	Name of Location of STP	Scheduled Commencement Date	Progress	Scheduled Completion Date
SD- I	Sewer laying 76.146 Km Sewage Pumping Station – 5 Nos. STP Capacity -56 MLD- 1 No.	Meherapalli	27.07.2017	Under Progress	26.07.2020
SD- II	Sewer laying 27.728 Km Sewage Pumping Station – 5 Nos. STP Capacity -28 MLD- 1 No.	Basuaghai	26.10.2017	Under Progress	25.10.2020
SD- III	Sewer laying 97.812 Km Sewage Pumping Station – 9 Nos. STP Capacity -43.5 MLD- 1 No.	Kochilaput	27.07.2017	Under Progress	26.07.2020
SD- IV	Sewer laying 14.24 Km Sewage Pumping Station – 3 Nos. STP Capacity -8.5 MLD- 1 No.	Paikarapur	09.02.2018	Under Progress	08.02.2020
SD- V	Proposed STP Capacity -1.2 MLD- 1 No at Andharua. However, not taken up dueto non-availability of land and sparsely populated inappropriate for sewer network construction				
SD- VI	Sewer laying 254.58 Km Sewage Pumping Station – 9 Nos. STP Capacity -48 MLD- 1 No.	Rokat	26.06.2013	Under Progress	Sep, 2019

The photographs of present status of construction of STP at different locations in Bhubaneswar are given in **Fig. 8 – Fig. 12**.



**Fig. 8 Present Progress of construction of STP at Meherpalli (Sewerage District-I)**



**Fig. 8 Present Progress of construction of STP at Meherpalli (Sewerage District-I)**



**Fig. 9 Present Progress of construction of STP at Basuaghai (Sewerage District-II)**







**Fig. 10 Present Progress of construction of STP at Kochilaput (Sewerage District-III)**



**Fig. 11 Present Progress of construction of STP at Paikarapur (Sewerage District-IV)**





**Fig. 12 Present Progress of construction of STP at Rokhat (Sewerage District-VI)**

### **3.4 Septage management**

In order to regulate, construct, cleaning, maintenance, treatment and disposal of septage in urban areas, Government of Odisha has formulated the **Odisha Urban Septage Management Guideline, 2016**.

### **3.5 Septage Treatment**

A full scale Septage Treatment Plant (SeTP) of 75 KLD capacity has been commissioned in Basuaghai of Bhubaneswar with a total investment of Rs.3.54 crores. It is a first of its kind SeTP in India which treat liquid part of the septage using DEWATS technology. This is a gravity flow based system, where septage collected through cesspool emptier trucks is discharged to receiving chamber from where it flows to different units such as Settler –cum-Thickener which separates solid and liquid fraction from septage, Anaerobic Settler, Anaerobic Baffle Reactor, Anaerobic Filter which removes settleable solids and anaerobic digestion of organic fraction of septage, Planted Gravel Filter which removes BOD and nutrients, Polishing pond which further reduces BOD and bacteria and the water from the pond is utilised for landscaping and plantation inside the area. There are also sludge drying beds which are used for dewatering and drying of sludge and the dried sludge is stored in sludge storage yard. The technology requires least mechanical and electrical interventions to run the process and is cost effective as compared to other technologies. Photographs of different units of the SeTP are given in **Fig. 13**.



**Fig. 13 SeTP commissioned at Basuaghai**

This SeTP covers an area of 2.47 acres out of which 1.3 acres have been utilised for landscaping and plantation. This is a low cost technology and its operation and maintenance demonstrates a scalable and sustainable model for septage management.

The SeTP reduces considerably indiscriminate disposal of untreated sludge and septage in the open area as well as in the water bodies thus will reduce pollution.

Two more Septage Treatment Plants are proposed to be constructed in Bhubaneswar City the details of which are as below.

Sl. No.	Location	Population to be served	Capacity	Cost (Rs.in crore)
1	Gadakana (near MPS, Sewerage District-VI, Bhubaneswar)	1,50,000	75 KLD	4.00
2	Kochilaput (near STP, Sewerage District-III, Bhubaneswar)	1,50,000	75 KLD	4.00

Locations of Existing and proposed SeTPs are shown in **Fig.- 7**.

#### **4.0 Funds for implementation of Action Plan**

Odisha Water Supply and Sewerage Board (OWSSB) under Housing and Urban Development Department in Government of Odisha is the implementing agency for construction and commissioning of STPs in Bhubaneswar.

Total requirement of fund as per agreement value is Rs. 689.13 crore.

Funds available with OWSSB is Rs 430.46 crore

Balance Fund required is Rs 258.67crore

Total expenditure incurred up to 31.01.2019 is Rs 84.31 crore

State Government will provide the funds for implementation.

#### **5.0 Public Awareness**

Under Swachh Bharat Mission open defecation is being discouraged and public/community toilets have been constructed. Awareness is generated amongst slum dwellers to use public/community toilets instead of open defecation. Efforts have been made by Bhubaneswar Municipal Corporation to make the city 100% open defecation free (ODF). In the city, there exist 23 public toilet blocks and 23 community toilet blocks for use in public places, slum areas and by group of households of low-wage income. Hence the open defecation has been reduced for which the influx of pollutants in to Gangua due to run off from the land area has been much reduced.

Further actions will be initiated by the Panchayati Raj and Drinking Water Department to provide public toilets/ community toilets and water supply in the slums along ten major drains falling on Gangua nallah.

Efforts are being made to generate Public Awareness

- To generate public awareness about fecal sludge and septage management and its linkage with public health as well as environmental health.
- To promote mechanism for sustaining behavioural changes aimed at adoption of healthy sanitation design and practices.

- To regulate the private cesspool owners to dispose the fecal sludge at the recently commissioned SeTP.
- To discourage people throwing garbages on the river bank.

## **6.0 Flood Plain Zone protection and its management**

Since Gangua nallah is a small storm water drain with a length of approximately 45 Km with an average flow of 1.17 meter/ second, and Kuakhai river and Daya River are flowing along its side (Fig. 1) , separate action plans covering aspects w.r.t. Flood Plain Zone protection and its management for Gangua nallah is not necessary as these are covered under the Flood Plain Zone protection and Management of Kuakhai and Daya river.

## **7.0 Maintaining E-flow of Gangua nallah**

From the water quality monitoring studies it has been revealed that the BOD level in Gangua nallah is much low than the BOD load in individual wastewater drains carrying untreated sewage falling on it. This indicates that there is sufficient dilution in Gangua nallah. However, it was decided in the 2<sup>nd</sup> meeting of River Rejuvenation Committee (RRC) held on Dt. 13.02.2019 to make field visit to explore possibilities of any further dilution by increasing the flow of Gangua nallah to reduce the BOD load. Representatives of Water Resource Department and State Pollution Control Board have jointly conducted the site survey for exploring the possibility of increase in flow of Gangua nallah. It has been prima facie observed by the visiting officials that if the situation warrants, then the flow can be augmented by discharging water from Daya West Canal to Gangua nallah near Kalajhari aqueduct and Kali Khamar aqueduct.

On an experimental basis water from Daya west canal at Palasuni Escape had been discharged during the month of March, 2019 to Gangua nallah. It has been observed that BOD in Gangua nallah at Palasuni (approximately 500 m distance from the mixing of Water from Daya west canal) has been decreased from 22.1 mg/l during February, 2019 to 12.1 mg/l during March, 2019. In the 3<sup>rd</sup> RRC meeting held on Dt. 04.06.2019, Water Resource Department in the Govt. of Odisha has been instructed to discharge water from Daya West Canal to Gangua nallah till monsoon starts so as to maintain e-flow of Gangua nallah. Fig. 14 indicates the discharge of water from Daya west canal to Gangua nallah.

Gangua nallah flows in between Daya west Canal and Saptasati canal. Therefore, no further action is needed for irrigation practices on Gangua nallah.



**Fig. 14 Discharge of water from Daya West canal to Gangua nallah**

## **8.0 Actions for Ground water recharge**

State Government is providing subsidy for construction of rain water harvesting structure in houses across urban area of Bhubaneswar to recharge ground water.

## **9.0 Removal of encroachment on Gangua nallah**

Bhubaneswar Municipal Commission is taking strong action for removal of encroachments on Gangua nallah and issuing notices to the defaulters under Section under the Section 407 of Odisha Municipal Corporation Act, 2003 and BMC Users' Charge Regulation, 2015 so as to facilitate the natural flow of Gangua nallah.

## 10.0 Plantation programme

Forest Department in Govt. of Odisha and Bhubaneswar Development Authority are taking adequate steps for plantation programme in Bhubaneswar. Under this programme, green belts in open areas, along river side are being taken up.

## 11.0 Water quality of Daya River

Daya river, a distributary of Kuakhai river originates from Kuakhai near Baliana village. Daya river flows along the south-eastern side of Bhubaneswar city. The stretch of Daya river along Bhubaneswar has been identified by Central pollution Control Board as polluted river stretch under Priority category-IV.

State Pollution Control Board, Odisha regularly monitors the water quality of Daya river at four stations, such as, Gelapur (Upstream of the confluence of Gangua nallah with Daya river), Bhubaneswar downstream at Kanti (downstream of the confluence of Gangua nallah with Daya river), Bhubaneswar further downstream at Manitri and at Kanas. Details of water quality monitoring stations on Daya river are given in **Table-6**.

**Table- 7 Details of water quality monitoring stations on Daya river**

Sl. No.	Water quality Monitoring station	Justification of the Water quality Monitoring station	Longitude	Latitude
1	Gelapur	Upstream of confluence of Gangua nallah and Daya River	85°51'04.83"E	20°12'34.26"N
2	Bhubaneswar D/s at Kanti	Downstream of Bhubaneswar city	85°46'08.97"E	20°08'17.09"N
3	Bhubaneswar FD/s at Manitri	To assess improvement of water quality at the further downstream of Bhubaneswar city	85°45'29.31"E	20°08'20.91"N
4	Kanas	To assess improvement of water quality at the further downstream of Bhubaneswar city	85°37'00.06"E	19°58'19.12"N

Status of water quality of Daya river has been assessed with respect to the criteria parameter Biochemical Oxygen Demand (BOD) and by comparing the value with the tolerance

limit laid down by CPCB for designated best use of surface water bodies. Based on the best use of the river stretch, these monitoring stations have been designated as Class C (drinking water source after conventional treatment followed by disinfection). Tolerance limit of BOD for class C is 3.0 mg/l or less. BOD values in Daya river at these monitoring stations during the year 2017 and 2018 are presented in **Table-8**.

**Table-8 Water quality of Daya River with respect to BOD (mg/l) during the year 2017 and 2018**

Monitoring station	BOD (mg/l) value					
	2017			2018		
	Minimum	Maximum	Average	Minimum	Maximum	Average
Gelapur	0.7	1.5	1.0	0.5	1.9	1.0
Bhubaneswar D/s at Kanti	3.7	7.7	5.0	1.5	7.4	4.6
Bhubaneswar FD/s at Manitri	2.5	7.3	4.2	1.3	7.4	4.3
Kanas	4.0	4.0	2.0	0.8	4.4	2.2

Maximum BOD values at Gelapur during 2017 and 2018 have been observed to be within the tolerance limit and therefore conform to Class C river water quality. However, the water quality of Daya river exhibits deterioration after the confluence of Gangua nallah with Daya river. Maximum BOD values at Bhubaneswar downstream (Kanti) during 2017 and 2018 were observed to be 7.7 mg/l and 7.4 mg/l respectively with frequent observation of BOD values exceeding the tolerance limit (3.0 mg/l). Similarly, BOD values at Bhubaneswar further downstream at Manitri and Kanas exceeded the tolerance limit of 3.0 mg/l frequently during the period 2017-2018.

The higher BOD values in Daya river stretch at the downstream of Bhubaneswar is mainly due to discharge of water from Gangua nallah with higher BOD load into Daya river near Vadimula (D/s of Gelapur).

Therefore the reduction of BOD load in Gangua nallah by taking the action suggested in previous sections will improve the water quality of Daya river. After the installation of five STPs in Bhubaneswar city, the treated wastewater of the city will be discharged to Gangua nallah and thereby the BOD load in Gangua nallah will be substantially reduced. Further, with the



augmentation of flow in Gangua nallah through Daya West Canal, it is also expected that the present observed BOD value of 7.4 mg/l in Daya river will be reduced to below 3 mg/l . Therefore, a separate action plan for restoration of polluted river stretch of Daya river has not been prepared.

#### **12.0 Organisation responsible for execution of the Action Plan**

Orissa Water Supply & Sewerage Board (OWSSB) is responsible for construction of Sewage Treatment Plants for abatement of Pollution in Gangua nallah in Bhubaneswar city, River Daya and Kuakhai.

#### **13.0 Officer responsible for implementation of components of Action Plan**

Member Secretary, Orissa Water Supply & Sewerage Board (OWSSB) is responsible for construction of sewage treatment plants mentioned in the Action Plan.

#### **14.0 Monitoring of the implementation**

Since OWSSB is the executing agency for construction and commissioning of STP, Chief Engineer OWSSB shall review the progress every fortnight and shall report to H&UD Deptt. Principal Secretary, H&UD Deptt. may review the progress of construction of STP every month. River Rejuvenation Committee (RRC) will review the progress of implementation of Action Plan every two months.

#### **15.0 Summary**

Against the backdrop of the challenges outlined in maintaining BOD level in Gangua nallah, source wise comprehensive action plan has been developed. Keeping in view the water pollution reduction targets in the city of Bhubaneswar, detailed strategies have been identified to indicate the nature, scale, scope of action needed for effective reduction to make the impact visible. In view of this, action points have been listed to guide implementation.

This action plan has integrated and built on the on-going actions of the State Government in city level waste water treatment for control of water pollution that are already underway. The action plan has been developed keeping in view the needs of the protection of riparian rights of the people living down stream of confluence point of Gangua Nallah with Daya River.

This plan has identified the agencies responsible for implementation of each action point and has also indicated the time line for implementation. This can be monitored for reporting and compliance. For proper implementation three tier monitoring mechanism has been suggested for implementation and periodic reporting.

Sl No	Action Points	Agency Responsible	Timeline
1	Construction of STPs	Orissa Water Supply and Sewerage Board	Within Two years By Oct, 2020
2	Construction of SeTPs	Orissa Water Supply and Sewerage Board	Within Two years By Oct, 2020
3	Monitoring of implementation	1.OWSSB 2. Housing & Urban Dev Dept 3. River Rejuvenation Committee	1. Every fortnight  2. Every Month  3. Bi-monthly

## 16.0 Conclusion

Gangua nallah is only a seasonal nallah discharging storm water and there are no riparian users along Gangua nallah. The implementation of Action Plan will definitely improve the water quality of Gangua and this improvement in water quality of Gangua will lead to improvement in water quality of the recipient water body i.e. Daya river having riparian users at the downstream of confluence point.

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