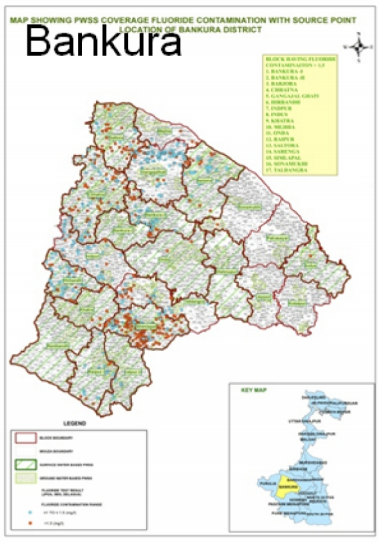
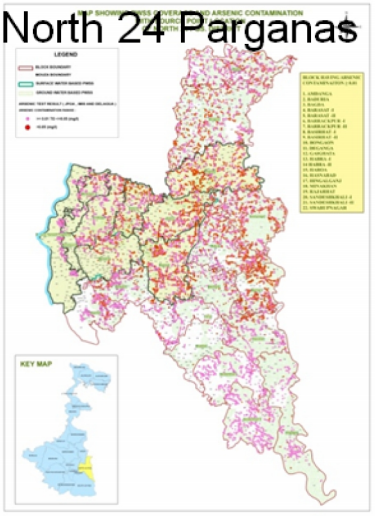
# West Bengal Drinking Water Sector Improvement Project

With
Assistance from
Asian Development Bank

**NORTH 24 PARGANAS DISTRICT**

**DRINKING WATER QUALITY ACTION PLAN**





**Public Health Engineering Department**
**Government of West Bengal**

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| | |
|---|---|
| RO | Reverse Osmosis |
| TW | Tubewell |
| PWSS | Piped water supply scheme |
| As | Arsenic |
| Bgl | Below Ground Level |
| CPCB | Central Pollution Control Board |
| CT | Census Town |
| GoI | Government of India |
| GoWB | Government of West Bengal |
| HHLT | Household Level toilet |
| IHHL | Individual Household Latrines |
| KMC | Kolkata Municipal Corporation |
| KMDA | Kolkata Metropolitan Development Authority |
| KoPT | Kolkata Port Trust |
| LRO | Land Revenue Officer |
| MoDWS | Ministry of Drinking Water and Sanitation |
| MoEF | Ministry of Environment and Forest |
| Msl | Mean Sea Level |
| NRDWP | National Rural Drinking Water Programme |
| SBM | Swacch Bharat Mission |
| SBM -G | Swachh Bharat Mission Gramin |
| SLB | Service Level Bench mark |
| SOR | Schedule of Rate |
| WBPCB | West Bengal Pollution Control Board |
| | |

# Chapter 1 Background and Introduction

## 1.1 Background to the Project

The coverage of water supply (at a rate of 40 lpcd) in rural India is around 76 percent, with more than 85% of from groundwater sources and mainly through hand-pumps. Only 54% of the rural households are catered by piped water supply1.Also 50% of urban and industrial needs and about 65% of irrigation water requirements are met by ground water. Recent analysis (August, 2016) shows that 71,000 habitations all over the country are affected by water quality issues due to presence of physio-chemical contaminants including Arsenic, Fluoride, Iron, Salinity and Nitrate. Arsenic and Fluoride are of major concern as their impact on health is immediate compared to the others. Prolonged exposure to excess arsenic in drinking water may lead to keratosis, melanosis and cancer, while exposure to excess fluoride may lead to dental, skeletal and non-skeletal /Fluorosis.

Under the recently revised (in 2015) permissible limit of 0.01 mg/l in the water for human consumption, the number of arsenic affected habitations in India is estimated at around 13,000 spread over 17 states, risking the life of 13.21 million people (as on August 2016)2 (Refer Table 1, Annex 1). Most of the affected states are in the Ganga - Brahmaputra fluvial plains with Assam, Bihar and West Bengal being the worst affected, with almost 80% of the affected habitations.

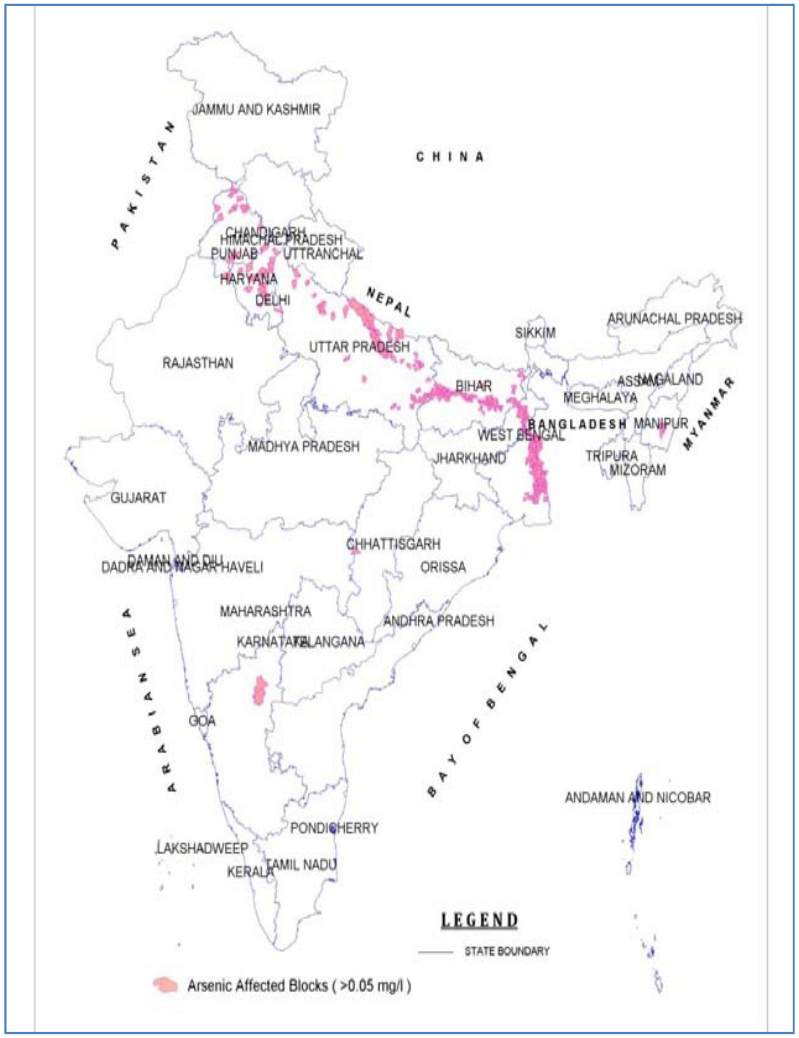


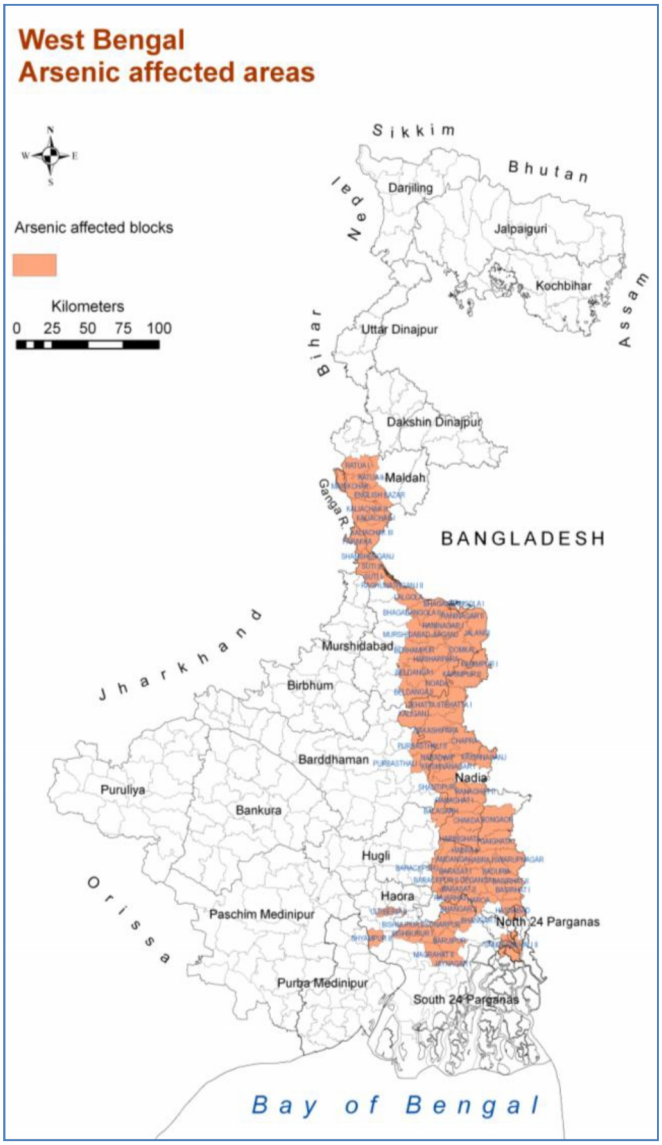

**Figure 1: Arsenic Affected States**

There are about 14,000 fluoride affected habitations, spread across 17 states. The total population at risk is estimated at around 11.5 million as of August 20163. However, successive studies show an increasing number of affected habitations, indicating a dynamically spreading nature of the contaminants.

[1]National Sub-mission guideline to provide safe drinking water in remaining Arsenic and Fluoride affected habitations in Rural India on Mission mode.
[2] Ibid
[3]Data provided by Ministry of Drinking Water and Sanitation, India.

West Bengal is the worst state affected by arsenic contamination in groundwater, with more than 50% of the affected population. The School of Environmental Studies (SoES, Jadavpur University) carried out extensive sampling from the tubewells in different districts, over a period of 20 years starting from 1988, and found that out of 135,555 samples analysed from nine districts 67,306 (49.7%) samples showed arsenic concentration above 0.010 mg/l and 33,470 (24.7%) samples above 0.050 mg/l.

After identification of arsenic in ground water in vast areas of South and North 24 Parganas, Nadia, Murshidabad, Malda and Burdwan, in course of epidemiological studies, the GoWB set up a working group in December, 1983.Through testing of ground water samples, the group confirmed the presence of arsenic beyond maximum contaminant level (then it was 0.05 mg/l) in a magnitude unprecedented anywhere in the national and international arena. This was followed up in 1988, by a state-level investigative study funded by the Technology Mission of GoI which gave its recommendation in 1991. This results in the formation of state-level Arsenic Task Force in 1993, which submitted a Perspective plan in 1996 with recommendation for surface water based schemes in affected areas under central Government funding.




The master plan recommended 338 no. groundwater based multi-village piped water supply schemes and 12 no .mega surface water based piped water supply schemes and 165 no. existing groundwater based schemes provided with ARP which will ultimately serve a design population of 16.5 million (design year 2036) with an estimated cost of 28314.8 million INR(US$416 million approx.). Surface water based schemes were considered as the first priority, but availability of surface water and higher per capita cost for bulk water supply schemes supplying water through long transmission mains, are a major area of concern. The option of utilising ground water tapped from safe aquifers and fitted with Arsenic Removal plant where necessary has been considered as another option for long - term solution.

**Figure 2: Arsenic Affected Areas in West Bengal**

After initial funding from the GoI through water quality sub-mission component of Bharat Nirman4 based on 75:25 cost sharing between central and state government, the funding was shifted to Accelerated Rural Water Supply Project. (ARWSP).

[4]Bharat Nirman was launched by the Government of India in 2005. Providing rural areas with safe drinking water facilities was one of the key objectives of the plan. It got implemented during 2005-06 to 2008-09.

In September, 2016, a National Sub-mission within the NRDWP was established with the goal of providing safe and perennial surface water based piped water supply to rural people in the arsenic and fluoride affected areas of the country. With a target to complete the objective of the sub-mission by 2020, the priority is:

(i) Habitations not covered by any other long term programme of the central and state Government
(ii) Habitations having higher concentration of the contaminants as per the IMIS data

The funding will be in 50:50 between centre and state and also cost of implementation of all en-route non arsenic /non fluoride affected habitations, towns, industries and cities with borne fully by the concerned state Government.

In line with the national objectives, Government of West Bengal (GOWB) has decided to consistently ensure the availability of safe and acceptable drinking water supply in sufficient quantity to priority areas of North 24 Parganas, Murshidabad, Hooghly, Bradhaman as the top four priority districts for arsenic mitigation while Bankura, Birbhum, Dakshin Dinajpur and Uttar Dinajpur are priority districts for fluoride mitigation. The district Water Quality Action Plans (WQAP) provide an assessment of the existing situation, including prevailing coverage of piped water supply and available water resources, as well as interventions, challenges, risks and mitigation measures to prepare a framework for priority funding and implementation of the projects for each identified district. The present document deals with North 24 Parganas district, one of the worst affected with arsenic contamination. The WQAP will provide a basis from which to develop a Water Supply Improvement Investment Plan for priority funding and implementation to ensure sustainable water supplies to the affected habitations.

## 1.2 Rationale for the Project

The initial strategy of the PHED was to implement short term measures like:

i)installation of the hand pump wells in deeper aquifers; ii) installation of Arsenic Treatment Unit (ATU) at existing hand pump tube-wells; and, iii) installation of ring wells. This failed due to various reasons5, and the Arsenic Master Plan put more emphasis on medium and long term goals like:

- All the arsenic affected villages to be covered by piped water supply schemes
- Areas covered by any successful short and mid-term measures such as ATU attached tube-wells should also be included in the future plan of action
- Attempts to be made to cover the affected areas with surface water wherever possible
- Affected areas where surface water based schemes are not feasible should be served by groundwater based PWSS
- All groundwater based PWWS should be fitted with ARP unless a safe aquifer, well separated from the contaminated layer by thick impermeable barrier, is available

Groundwater based PWSS fitted with ARP may be considered as a long term solution where the costs of bringing surface water from far away sources is uneconomic.

Out of the total 8066 arsenic affected habitations in West Bengal, almost 64% are within the North 24 Parganas and Murshidabad districts (Refer Table 2, Annex1).To date, there has been only one surface water based scheme completed in North 24 Parganas. As discussed later in Section 2.4.2, ground water sources do not provide a sustainable long term solution. So North 24 Parganas has been considered a priority district under the works to be implemented under National Sub-mission.

[5]Report on Field visit of Joint Secretary (Water) to Nadia District of West Bengal to Review Arsenic Mitigation Measures- 11-12th September, 2015

## 1.3 Project Objectives

The primary objective of the NRDWP program as outlined by the MoDWS is to:

- To ensure, that every rural person has enough safe water for drinking, cooking and other domestic needs as well as livestock throughout the year including during natural disasters and,
- By 2022, every rural person in the country will have access to 70 lpcd within their household premises or at a horizontal or vertical distance of not more than 50 meters from their household without barriers of social or financial discrimination.

Also, the main objective of the Arsenic-Fluoride National Sub-mission is to provide all arsenic and fluoride affected habitations with safe surfacewater based piped water supply schemes as the permanent and sustainable solution.

At the state level, with the objective of providing safe and adequate water, the Public Health Engineering Department, GoWB has taken up its most ambitious plan of "VISION 2020". The Vision incorporates, among other things:

Ensuring sustainable water supply to each habitation to the tune of 70 lpcd (litres per capita per day) in rural West Bengal.

Ensuring drinking water security through emphasis on piped water supply schemes with an objective to complete shift from hand pump tube-wells to piped water supply schemes in a phased manner, provision for house to house connection, conjunctive use of groundwater, surface-water and rain water harvesting.

Delivery of services by the system for its entire design period of quality of water in conformity with the prescribed standards at both the supply and consumption points.

- Issue of potability, reliability, sustainability, convenience, equity and consumers preference to be the guiding principles while planning for a community based water supply system
- To enable communities to monitor and maintain surveillance on their drinking water sources;
- To ensure that all schools and anganwadis have access to safe drinking water;
- To provide enabling environment for Panchayat Raj Institutions and local communities to manage their own drinking water sources and systems;
- To provide access to information through online reporting mechanism with information placed in public domain to bring in transparency, accountability and informed decision making.

The West Bengal Water Supply Improvement Investment Program (WBWSIIP) is an initiative of the GoWB, with funding from Asian Development Bank, to endeavor to fulfill the overarching goals of VISION-2020 in line with the guidelines and implementation frame-work of NRDWP and to provide water to the areas which are not covered by the Arsenic/Fluoride sub-mission.

The development of sustainable water supply schemes in North 24 Parganas is part of the larger West Bengal Water Supply Improvement Investment Program (WBWSIIP)

## 1.4 Scope of the Report

The Department of DWS has identified 5 strategic Objectives to achieve its goal:

As such, the present report dwells on the primary issues related to:

- Participatory Planning and Source Sustainability
- Water Quality Management and
- Sustainable Service Delivery Mechanism required to meet the obligations for the District
- of North 24 Parganas.


**Figure 3: Strategic Objectives**

## 1.5 Project Stakeholders and Roles

The WBWSIIP will be implemented by the Public Health Engineering Department, GoWB. Other stakeholders, such as the Panchayati Raj Institutions (The District Councils, Block Samitis etc) will have a significant role during operations and maintenance of the Water Supply System, since the mandate to overlook and manage the distribution end rests with the local communities, for which the formation of the Village Water and Sanitation Committees has been initiated.

Sustainable implementation of the WBWSIIP will require close co-ordination between the various project stakeholders. The principle project stakeholders are shown below:

Public Health Engineering Department
Public Health Engineering Department (PHED) was created as an independent full-fledged Department in 1987. It is primarily responsible for managing the Water Supply & Sanitation within the State.

Panchayats & Rural Development Department
The Panchayet & Rural Development Department of the Government of West Bengal is the nodal department for and controls the budget of rural sanitation.(The Municipal Affairs and Urban Development Departments look after activities of Urban Sanitation and Sewerage Sector) It is also entrusted with the responsibility for constitution and framing policy related to functioning of the rural local self-government, i.e, the Panchayats, providing administrative support to the three tier panchayat system as well as implementation of various rural development programmes. The associated local Zilla Parishads (District level governance), Panchayet Samitis (Block level governance) and Gram Panchayet (Village level governance) will also be stakeholders.

Water Resources Investigation and Development Department
The objective of Water Resources Investigation and Development Department (WRIDD) is to explore, utilize and conserve surface and groundwater in the state. The WRIDD is the mother department and has six Department under its fold

- Water Resources Development Directorate (WRDD)

- Command Area Development Authority (CADA)
- State Water Investigation Directorate (SWID)
- West Bengal Accelerated Development of Minor Irrigation Project (WBADMIP )
- West Bengal State Minor Irrigation Corporation Ltd (WBSMICL)
- West Bengal Agro Industries Corporation Ltd. (WBAICL)

State Water and Investigation Directorate is an important stakeholders in case water is required to be extracted from the rivers other than river Hooghly.

State Water Investigation Directorate (SWID)

SWID is responsible for carrying out investigation and quantitative & qualitative assessment of water resources in the State. It also shares expertise with other government developmental agencies in various groundwater and surface water projects for agriculture, industrial and drinking water development in the State, including augmentation of water resources through implementation of various conservation/artificial recharge schemes. Its key roles are in:

(a.) Periodical monitoring of groundwater level in different Blocks
(b.) Periodical monitoring of surface water discharge in different rivers
(c.) Groundwater Resources, Estimation and assessment
(d.) Assessment of GW & SW quality with respect to space and time
(e.) Delineation of aquifers containing salinity, arsenic, fluoride, iron and other heavy metals in groundwater
(f.) Evaluation of aquifer parameters through analysis & pumping tests data
(g.) Implementation of pilot schemes of artificial recharge to ground water,
(h.) Generation of hydro-meteorological data & its interpretation.
(i.) Preparation of District-wise and Block wise hydrogeological maps and groundwater resource feasibility maps.
(j.) Geophysical investigation of groundwater
(k.) Sharing technical expertise with to different Government Departments, Semi-Government Organizations, Local Self Bodies, Universities, WBSEB, Banks, individuals and groups of individuals in connection with surface water and groundwater development & management
(l.) Implementation of "West Bengal Ground Water Resources (Management, Control & Regulation) Act, 2005" in the state of West Bengal.

Irrigation and Waterways Department

The Irrigation and Waterways Department (IWD) is entrusted with the task of providing irrigation facilities, offering reasonable protection against flood, alleviating drainage congestion, arresting erosion, maintaining internal navigation channels and up-keeping the natural waterways in the state. The IWD has implemented several major and medium irrigation projects, a number of embankment schemes, town protection schemes, drainage schemes, anti-river-bank erosion schemes &anti sea - erosion schemes.

Ministry of Drinking Water and Sanitation

The Ministry of Drinking Water and Sanitation, as the reforms initiator of NRDWP and funding partner, has a principal stake in preparation, monitoring and implementation of schemes.

There are also some secondary stakeholders, including: the Pollution Control Board; Public Works Department(which overlooks the district and major roads); the National Highway Authority of India (NHAI); Land and Land Reforms Department; and Geological Survey of India; any of which could play a contributory role in and during the process of conceptualization, implementation of the schemes.

Kolkata Metropolitan Development Authority

The Kolkata Metropolitan Development Authority (KMDA) and the Municipal Engineering Directorate (MED) under the Department of Municipal Affairs, Government of West Bengal are the nodal agencies for technical guidance and preparation of project report for the development of municipal

water supply management plan for the municipal authorities situated within Kolkata Metropolitan Area (KMA) and Non-KMA areas respectively.

Kolkata Port Trust (KoPT)

For extraction of water from any particular location in the River Hooghly between Farakka and the outfall to the Sea, permission is required from KoPT. As most of the surface water supply schemes for North 24 Parganas are likely to be based on River Hooghly, the location of intake and installation of intake structure will required their clearance.

# Chapter 2 District Profile

## 2.1 Location and Project area

### 2.1.1 Location

North 24 Parganas district was formed as an administrative unit in 1986 by bifurcation of the old 24 Parganas district. The old 24 Parganas district is an ancient human settlement, mentioned even in the writings of the ancient Greek literature of second century AD[6].Located in the Eastern part of the State of West Bengal, Barasat is the district headquarters of North 24 Parganas. The district lies between 23°15'2" N and 22°11'6" N latitude and 88º20' East to 89º5' East longitude. The district has a shape of an irregular triangle. Nadia district lies to its North and the Bay of Bengal to its South. Much of its Eastern boundary is with Bangladesh. On the West it is bounded by Kolkata and the river Hooghly. The South-West boundary of the district is with 24 Parganas (South). As a border district 24 Parganas (North) is of special importance because of its proximity to Kolkata, the international gateway to Eastern India.

North 24 Parganas is West Bengal's most populous district (second most populous in the country) having a population of 1 0,009,781 (2011 census data) spread over an area of 4094 sq. km. The high population density of the district (2,463/km2) earns the district third place in the state (behind Kolkata and Howrah) with its area only tenth among the districts of the West Bengal.

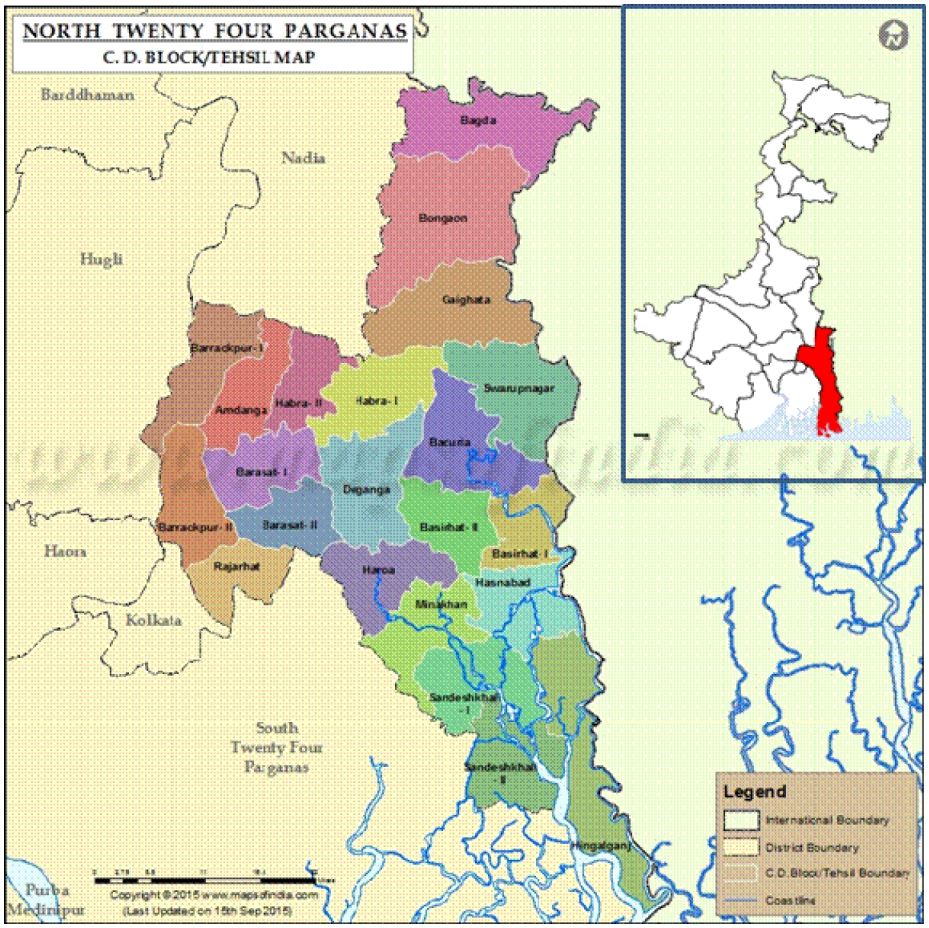



**Figure 4: Location of North 24 Parganas**

[6]According to Ptolemy's Treatise on geography, written in the 2nd Century A.D., the ancient land of Gangesridi was stretched between the rivers Bhagirathi-Hoogly (lower Ganges) and Padma-Meghna. The modern-day 24 Parganas was the Southern and the South-eastern territory of that legendary kingdom. The nomenclature 24 Parganas had its origin in 1757 when Mir Zafor as Nabab of Bengal, ceded to the East India Company the rights of revenue collection in twenty four mahals under the jurisdiction of Nabab of Bengal. 'Some of these mahals had been full Parganas (Parganas are unit of revenue collection of Mughal and British era), others being parts of parganas and one being Malang Mahal'. Perhaps "24 part parganas was found too cumbrous and the name was converted into twenty four Parganas. (District Gazetteers, 24 Parganas, March 1994).

### 2.1.2 **Administrative Divisions**

The district of North Twenty Four Parganas has five Sub-divisions namely

(i) Bongaon (ii) Barasat (iii)Barackpur(iv) Bidhannagar, (v) Basirhat.

**Bongaon Sub-division:7** Comprises one municipality namely Bongaon (M) and three Community Development (C.D.) Blocks:Bagdah;Bongaon; and Gaighata.

**Barasat Sub-division:** Comprises of six municipalities: Habra (M); Gobardanga (M); Ashokenagar-Kalyangarh (M); Barasat (M); Madhyamgram (M); and Rajarhat-Gopalpur (M). There are seven C.D. Blocks in this Sub-division:Habra-I, Habra-II, Barasat-I, Barasat-II, Amdanga, Deganga and Rajarhat.

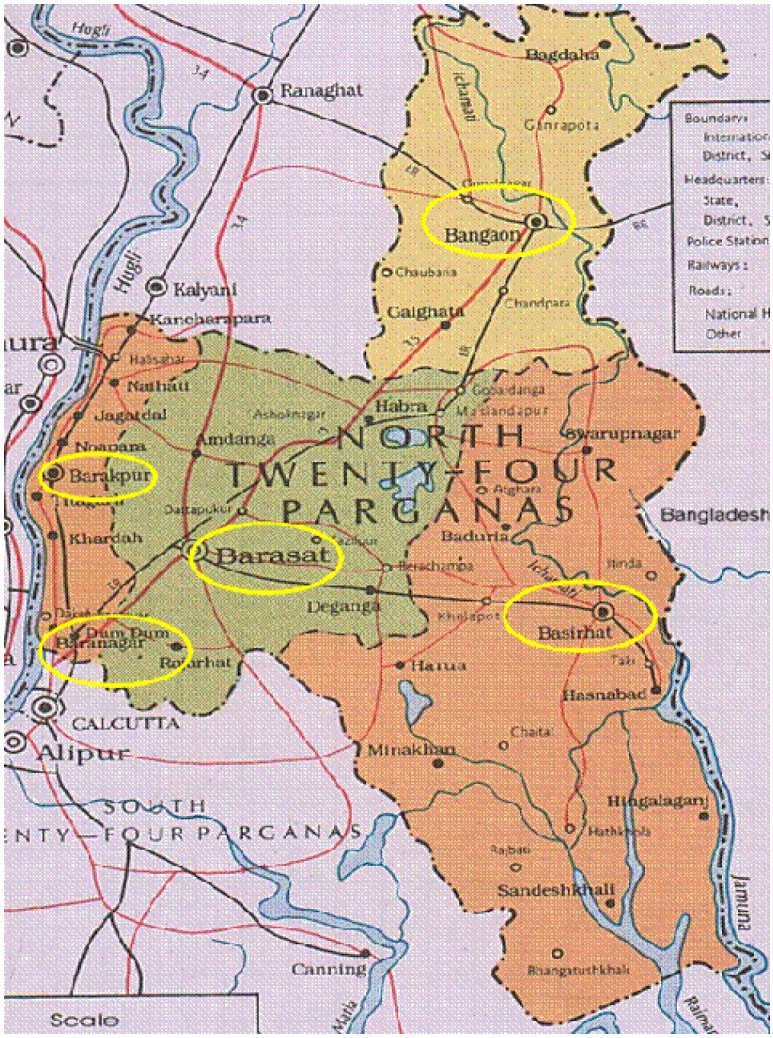



**Figure 5: Sub Divisions of North 24 Parganas**

**Barrackpur Sub-division:**Consists of 16 municipalities: Kanchrapara (M), Halisahar (M), Naihati (M), Bhatpara (M), Garulia (M), North Barackpur (M), Barackpore (M), Titagarh (M), Khardah (M), Panihati (M), New Barrackpur (M), Kamarhati (M), Baranagar (M), Dum Dum (M), South Dum Dum (M) and North Dum Dum (M). There are only two C.D. Blocks in this Sub-division viz. Barackpur-I and Barrackpur-II.

**Bidhannagar Sub-division:**Consist of only one municipality, namely Bidhannagar Municipality, and no C.D. Block.

**Basirhat Sub-division** consists of three municipalities: Baduria (M); Taki (M); and Basirhat (M). There are 10 C.D. Blocks in this Sub-division:

Baduria;Haroa; Minakhan; Swarupnagar; Hasnabad; Hingalganj; Sandeshkhali-I; Sandeshkhali-II; Basirhat-I; and Basirhat- II. The distribution can be summarised as follows

[7]For definition of Distircts, sub division, Blocks, Mouzas and Habitations refer to Annex 15 and 16

**Table 1: Summary of Administrative Divisions in North 24 Parganas[8]**

| Sl. No. | Sub-Division | C.D. Block | Panchayat | | Inhabited Villages | Number of | | |
|---|---|---|---|---|---|---|---|---|
| | | | Samity | Gram | | Municipality | Census Town | Out-growth |
| 1 | Bongaon | 3 | 3 | 38 | 355 | 1 | 7 | - |
| 2 | Barasat | 7 | 7 | 58 | 493 | 6 | 34 | - |
| 3 | Barrackpur | 2 | 2 | 14 | 53 | 16 | 24 | 4 |
| 4 | Bidhannagar | 0 | - | | - | 1 | - | - |
| 5 | Basirhat | 10 | 10 | 90 | 617 | 3 | 13 | - |
| | **Total** | **22** | **22** | **200** | **1518** | **27** | **78** | **4** |

The urban part of the district comprises of 27municipalities, 78 census towns, one cantonment board and one industrial township i.e., total 107 urban centres. The total area of these 27 municipalities (including the Cantonment Board and Industrial Township) is 455 sq. km., i.e, 11% of the total area of the district.

In total there are 22 Panchayat Samities and 200 Gram Panchayats and 1527 villages in the 22 Community Development Blocks (as per census 2011 data).Out of these, nine villages are uninhabited. The table below summarises the habitation and household details of the rural population. Block-wise details of the number of villages, habitations, census towns and present population (2011) and number of households are presented in Table 1 of Annex 2. There are 6950 habitations under the 1519 villages. However, different values for the number of villages and habitations are obtained from the IMIS data source (Refer Table 2 of Annex 2). For this report village and habitation related data has been considered as per the census data.

The total population of the district (2011) is approximately 10 million. The detail of the population of all the 78 census towns is summarised in Table 3 of Annex 2. It indicates that the total area of the census towns is 55 sq. km with a total population of 0.730 million. The total population of the 29 municipalities (including CB and Industrial township) is around 5 million (Refer to Table 4 of Annex 2 for detailed break up.)

A distribution of the population indicates that the district has had a growing trend of urbanisation and is now pre dominantly urban in nature.

**Table 2: Population Urbanisation Trend in Noth 24 parganas over last 100 years**

| Year | Total Population | Decadal Growth Rate | Urban Population | Rural Population | %. of rural population to total Population | %. of Urban population to total Population |
|---|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 1951 | 4,459,492 | 23.5% | 1,216,152 | 3243340 | 72.73 | 27.27 |
| 1961 | 6,280,915 | 40.8% | 1,997,957 | 4282958 | 68.19 | 31.81 |
| 1971 | 8,449,482 | 34.5% | 2,970,320 | 5479162 | 64.85 | 35.15 |
| 1981 | 5,529,497 | -34.6% | 2,821,366 | 2708131 | 48.98 | 51.02 |
| 1991 | 7,281,881 | 31.7% | 3,730,300 | 3551581 | 48.77 | 51.23 |
| 2001 | 8,934,286 | 22.7% | 4,850,947 | 4083339 | 45.7 | 54.30 |
| 2011 | 10,009,781 | 12.0% | 5,732,162 | 4277619 | 42.7 | 57.27 |

High population density along with a high rate of increase in the population is a problem for the district. Illegal immigration from Bangladesh, mainly along its eastern border and expansion of the

[8]District Statistical Hadbook, North 24 Pargans,2013

State Capital Kolkata in the western part of the district, area aggravating the threat of high population pressure. Out of the 27 municipalities in the district, 20 fall under the KMA area and the rest in non-KMDA area. The non-KMDA municipalities are: i) municipalities falling in the Naihati-Barrackpur Zone, ii) municipalities adjacent to Kolkata and iii) Bidhannagar municipality.


**Figure 6: Distribution of Municipalities under KMA Area**

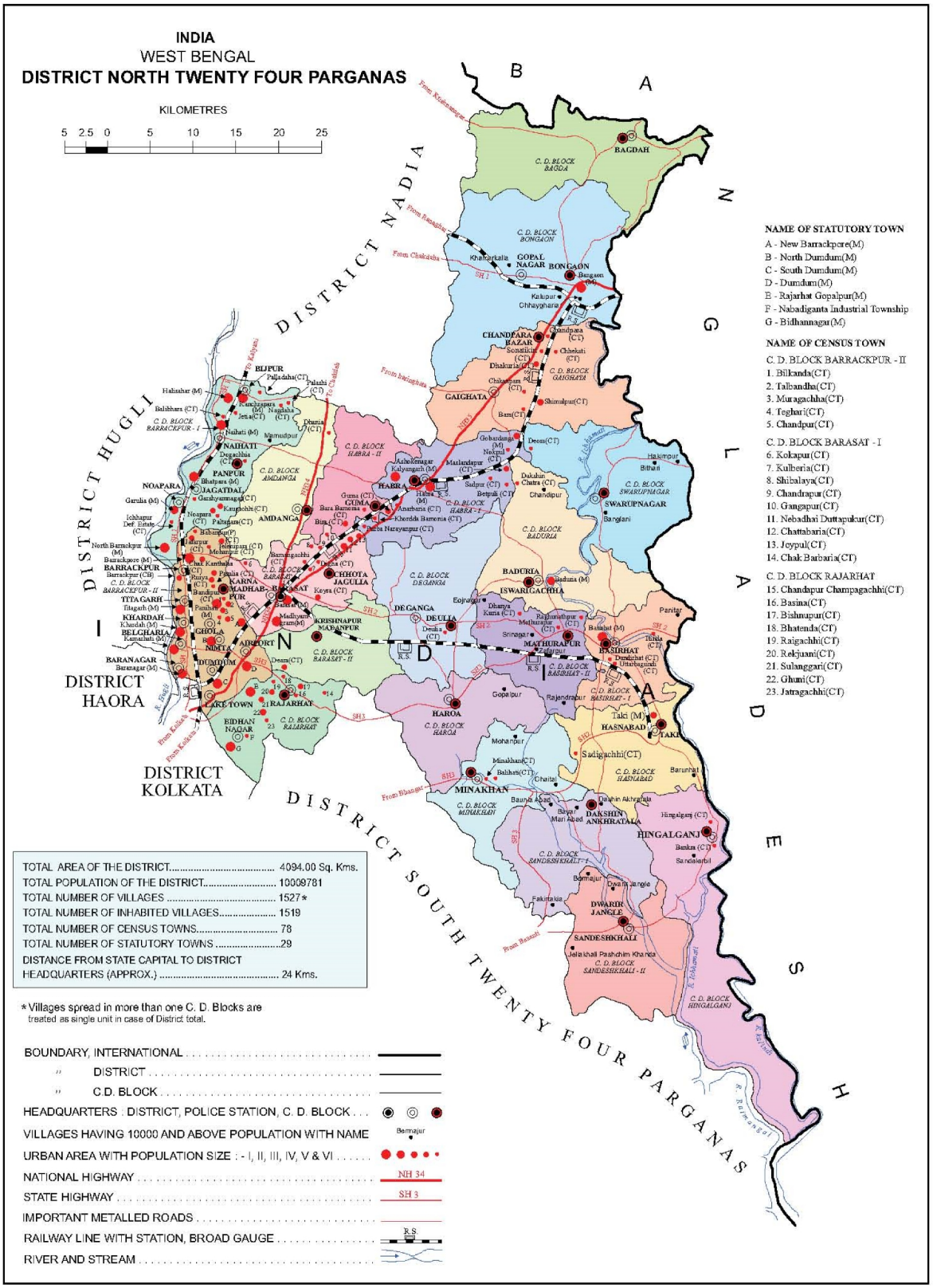



**Figure 7: Map showing the Blocks in North 24 Parganas**

### 2.1.3 **Road Network and Connectivity**

The total length of road in the district, maintained by different agencies, is 8746 km, out of which 60% is surfaced road9. A detailed breakdown of the road length is provided in Annex 7.

The road network is fairly well developed and the district is well connected with the rest of the country by National and State highways through NH2 (Kolkata-Delhi Road), NH 34 (Kolkata -Barasat -Dalkhola), and NH 35 (Barasat - Habra - Gaighata - Chandpara - Bangaon - Indo/Bangladesh Border). The Controlling authority of NH 34 and 2 is National highway

Authority of India (NHAI), while NH 35 is controlled by National Highway Division V. National Highway No. 35 runs from the district and connects larger towns to smaller villages to other parts of the country..The State Highway Circle - I under P. W. (Roads) Directorate is administering the road sector of North 24-Parganas. The five divisions under this circle office are:(i) Barasat highway Division - I looking after VIP Road and Major District Roads; (ii), Other District Roads and Village Roads of the Southern part of North 24-Parganas; (iii) Barasat Hwy. Division - II looks after Major District Roads; (iv) Other District Roads; and (v) Village Roads of the northern part of North 24-Parganas. For any work involving dismantling of the abovementioned road works, permission has to be obtained from the concerned Division.

Dumdum and Barasat are two major junctions of Eastern Railway. The electrified suburban rail network of the Eastern Railway is extensive and penetrates far and deep into the neighbouring districts of Kolkata, South 24 Parganas, Nadia, Howrah, Hooghly etc. The Northern section of Sealdaha division under Eastern Railway connects all the towns from Dumdum to Majhergram via Bangaon while the Southern section extends upto Hasanabad, The rail link does not exist beyond Hasanabad.

[9]District Handbook, 2012-2013 length

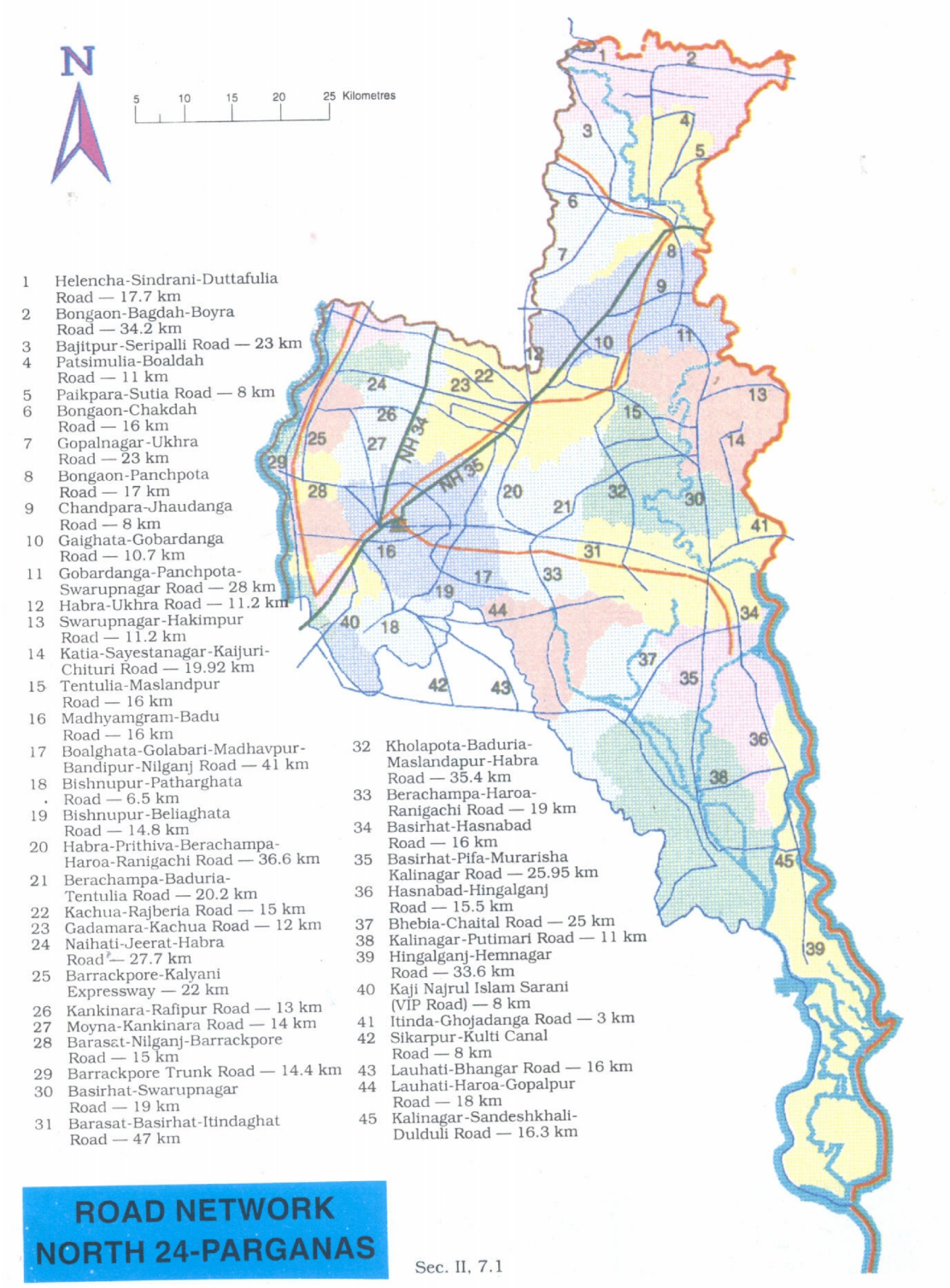



**Figure 8: Road Network of the North 24 Parganas**

## 2.2 Physiography

### 2.2.1 Topography

North 24 Parganas is a deltaic district of West Bengal. It embraces the moribund delta in the north, mature delta in the middle, and active delta in the south and a depressed zone of brackish marshes between the active and the mature delta. The active delta still growing southwards is a system of innumerable tidal rivers, canals and creeks, saline soils, swamps and marshes. A part of this active delta contains forests known as Sunderbans,

There are two distinct agro-ecological situations prevailing in the district: i) Gangetic alluvial zone and ii) coastal alluvial zone.

Gangetic alluvial zone comprises 16 blocks spread over the entire Barasat, Barrackpur and Bongaon sub-divisions and four blocks of Basirhat Sub-Division i.e. Basirhat -I &II, Baduria and Swarupnagar. The Gangetic alluvial region has further been sub-divided in two regions:

i) Icchamati basin, comprising Bongaon, Bagdah, Gaighata and Swarupnagar blocks; and

ii) Gangetic Plains comprising all blocks of Barasat and - Barrackpur Sub- Divisions, and Basirhat I&II, Baduria blocks of Basirhat Sub-Division.
The entire Bongaon Sub-Division of this district and Swarupnagar block ofBasirhat Sub-Division are entirely flood prone areas causing damages of agricultural land almost every year.

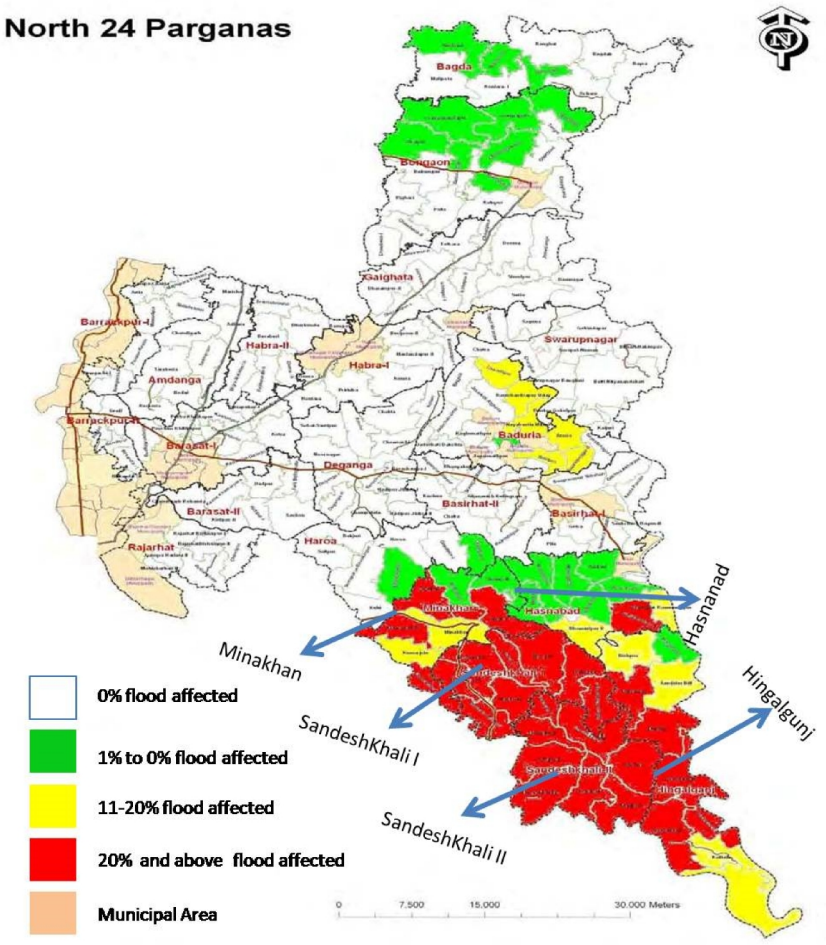



**Figure 9: Flood Prone Areas in the District**

Part of the North 24-Parganas falls within the Sunderbans Biosphere Reserve Area (Transition Zone, Refer Annex 6). It covers six blocks viz Sandeshkhali-I, Sandeshkhali-II, Hingalganj, Haroa, Minakhan and Hasnabad. These blocks are surrounded by tidal rivers, such as the Ichhamati,

Bidyadhari, Kulti, Dansa, and Raymangal, and are also crisscrossed by numerous creeks and channels. Except Haroa, the remaining five blocks are vulnerable to breach of embankment during high tide. Despite being an active delta, Sunderbans include the stable delta of the North, comprising Western Hooghly side flat area, the middle mature delta and the Piyali-Bidyadhari plains. Villages in Minakhan and Haroa blocks belong to this Piyali-Bidyadhari plain. Villages in Hasnabad, Sandeshkhali and Hingalganj blocksof the district belong to the active delta of Middle and Eastern Sunderbans part. The low flat region here is more vulnerable to cyclones and tidal waves. (Refer Annex 6 for details map and description of the portion of the North 24 Parganas in the Sunderbans. Only a small area (Jhingekhali) of the core Sunderban Biosphere falls within this district. Sandeshkali II is a riverine block. Bidyadhari River divides the Minakhan Block into three parts. There are six rivers in the Hingalgung block, viz Roymongal, Icchamati, Dansa, Gourershar, Kalindi&Sahebkhali; all of which are rainfed.

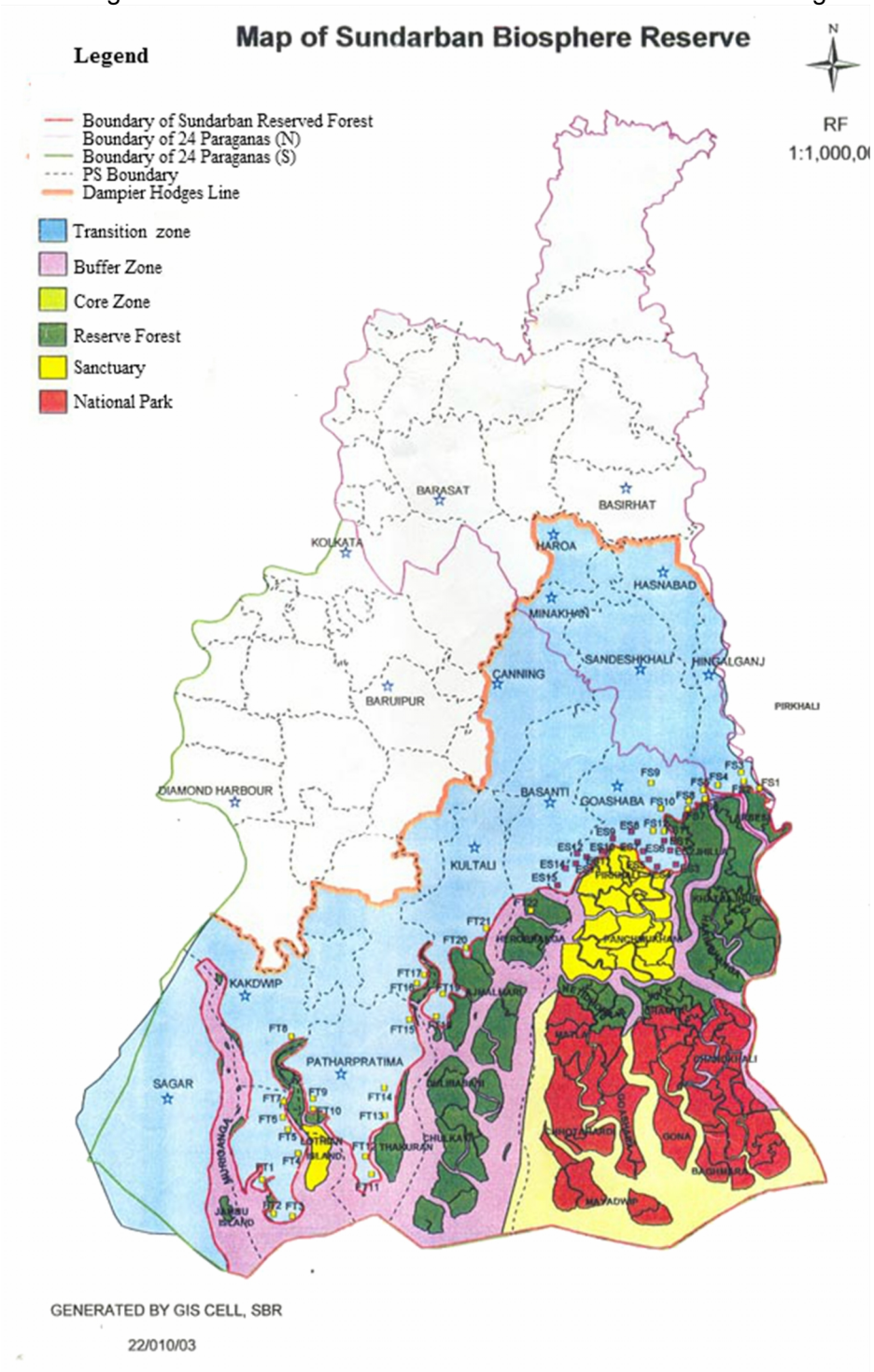



**Figure 10: Blocks of North 24 Parganas in Sunderban biosphere reserve**

### 2.2.2 **Land Use**

The area of the district is divided into three distinct zones: (1) the highly industrialized North zone; (2) the moderately industrialized North-Eastern zone; and (3) the highly agricultural North-Eastern zone.Out of the total 409,400 ha area of the district, around 66% is cultivable land. The break-up of Agricultural land can be summarised as follows

| Description Area | in Ha |
|---|---|
| Forest Land | 4221 |
| Cultivable Area | 271,845 |
| Net cropped Area | 264,952 |
| Current fallow land | 587 |
| Cultivable wasteland | 465 |
| Total vested Land | 31,791.72 |
| Gross cropped Area | 545,945 |

Source: http://north24parganas.gov.in/n24p/page.php?nm=Demography

The land records also indicate that there is no land in any block which could be considered as cultivable waste. Whatever landmass the district possesses is under human use. The reduction in agricultural land is to be explained mainly by the fact that increased utilisation of land for non-agricultural purposes, particularly in the areas adjacent to Kolkata, changed the land use pattern of the district radically.

Agriculture is still a major source of livelihood in rural North 24 Parganas. But with faster rate of urbanisation, the land use pattern in the district is changing rapidly and the area under cultivation is declining. 24.58 percent of total landmass of the district is now under non-agricultural use. Within a span of about 15 years the land under agricultural crops in the district reduced by 314,048 hectare. In this district, there is not a single piece of land which is barren or uncultivable.

In many areas croplands are being gradually converted to orchards and brick kilns.. In the Sunderban area, much of the land is used for pisciculture, particularly for shrimp cultivation. In the upper stream of Ichhamati much of the agricultural land used to remain inundated due to the loss of natural flow of water through this river. Over-silting coupled with encroachment on Ichhamati had aggravated the problem

### 2.2.3 **Forest**

The major forest area in the district is Sunderbans Reserve Forests. The total area under reserve forest is 93.75 hectares. Out of these 93.75 hectares, 63.00 have been earmarked as BhibhutiBhushan Wildlife Sanctuary.

### 2.2.4 **Rivers and River Basin**

River Hooghly (also known as Ganga) flows along the border of Hooghly district and the Western and North Western boundary of North 24-Parganas district.The main rivers of the district of North 24-Parganas are Ichhamati, Kalindi, Raimangal, Dansa, Borokalagachi, Benti, Haribhanga, Gourchrar, Bidyadhari, and Hooghly.

Hooghly River is the western most major distributary channel of the Gangetic delta. Hooghly River splits from the River Ganga at Farakka Barrage, 260km north of Kolkata and flows in a southerly direction towards the sea. North 24 Parganas is on east bank of the river, about 120km upstream of its mouth in the Bay of Bengal. A study[10] by the Hydraulic Study Department of Kolkata Port Trust assumes the flow in the river to be 1,135 cum/sec. The width of river varies, but near Kolkata it is roughly 1000m wide. The Hooghly is under tidal influence for upto 300km [11].The overall spring tide range is 4.27 m to 4.57 m and range of the neap tides is 1.83 m to 2.83 m. Near Kolkata, the water level fluctuates 4.0m per day during the rainy season and 2.75m twice in a day in the dry season. Highest high water level (HHWL) and the lowest low water level (LLWL) are 5.34m above mean sea level (msl) and 0.95m below msl respectively.


**Figure 11: Drainage Basin of West Bengal**

[10]Source : Feasibility studies for selection of best possible location for drawal of water from Hooghly River by Hydraulic Study Department, KPT, December 2008
[11]The Hooghly Estuarine System, NE Coast of Bay of Bengal, India.Dr. S. K. Mukhopadhyay, Workshop on Indian Estuaries, NIO, Goa, June 25, 2007

The Ichhamati is the longest among the rivers of North 24 Parganas. It is the only major river on the eastern side of the Bhagirathi / Hooghly River and is a link between the 'Nadia group of rivers' (viz. Jalangi, Mathabhanga, Churni etc.) in the north and the Sunderbans in the south. After bifurcation near Majdia. (Krishnaganj block) of Nadia district, the southern course of the Ichhamati, also known as Mathabhanga, enters the north of the district. After traversing a length of 20 km in India, it enters into Bangladesh near Mubarakpur. From here it flows for 35 km in Bangladesh and again re-enters into India at Duttaphuliain Nadia and flows south through BangaonSwarupnagar, Baduria, Bashirhat-I, Hasnabad and Hingalganj. This river flows into the river Kalindiin the Sunderbans area.. The Ichhamati forms the borderline between India and Bangladesh during its course of flow from Bashirhat to Hingalganj. Its total length is 208 km. No water enters the Ichhamati during the dry season[12]

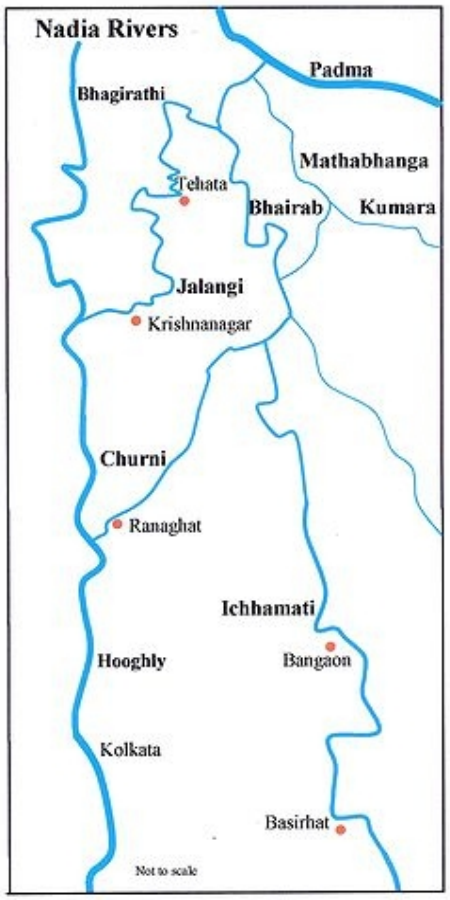



**Figure 12: IchhamatiRiver**

Kalindi- Raimangal –Haribhanga: The Ichhamati bifurcates into two separate channels at Hingalganj: the Western smaller channel is known as Sahebkhali; and the main flow at the eastern side known as Kalindi. The Bidyadhari and Sahebkhali Rivers join at Sandeshkhali to form the Raimangal River, which flows southward and merges with the river Kalindiat. The combined flow of Raimangal and Kalindi meets the Bay of Bengal in the south as Haribhanga River, which serves as the international boundary between Bangladesh and India in the South-East.

The Bidyadhari originates near Haringhata in Nadia district and then flows through Deganga, Habra and Barasat areas of North 24 Parganas before joining the Raimangal River in the Sunderbans. It is the major drainage system of North 24 Parganas and Kolkata and is tidal for 95km. Before 100 years. The upstream part the river were fed by the upland freshwater discharge from the Hooghly and Padma rivers. This river system has changed with time, now being cut-off from the headwater discharge and only active during the rainy season with runoff from catchment area. Like many other drainage systems of North 24 Parganas, the drainage systems of the Bidyadhari River are under great threat due to stresses arising from both natural and anthropogenic sources.

Jamuna: The Jamuna is an independent rain fed channel that emerges east of the Haringhata region in Nadia district and drains into the Ichhamati River. Besides, Sunderban deltas make many rivers flow in this region due to high tidal water entering from Bay of Bengal.

[12]Morphodynamic Change of The Ichhamati River And Land Use/Land Cover Changes Through Space and Time Using Remote Sensing and GIS Techniques North 24 Parganas, West Bengal, India, (Bagdah, Bongaon, Gaighata And Swarupnagar Block), Mr. Ismail Mondal, Dr.JatisankarBandyopadhyay, ISRS Proceeding Papers of Sort Interactive Session, December 9-12, 2014

### 2.2.5 Soil Characteristics

The soils of the district are generally: sandy in the north; sandy with clay loam in the central middle part; and clay loam in the south. The physiography of the district is mostly plain.

The arable land of the district and divided into three main classes:

(1) Comparatively high land above the banks of the rivers,

(2) Low lying depressions below the river banks; and

(3) The plain alluvial lands.

## 2.3 Climate

The climate can be categorised as sub-tropical with monsoonal regime. In general, it is hot and humid between March and October. Cooler dry weather sets in by mid-November and lasts until about mid-February. Average temperatures range between a minimum of 13°C in January and a maximum of 36°C in April/May. Limited rainfall occurs from the latter part of February to end of May.

The main rainfall in this district occurs between the first week of June and the end of September during the South-West monsoon season.

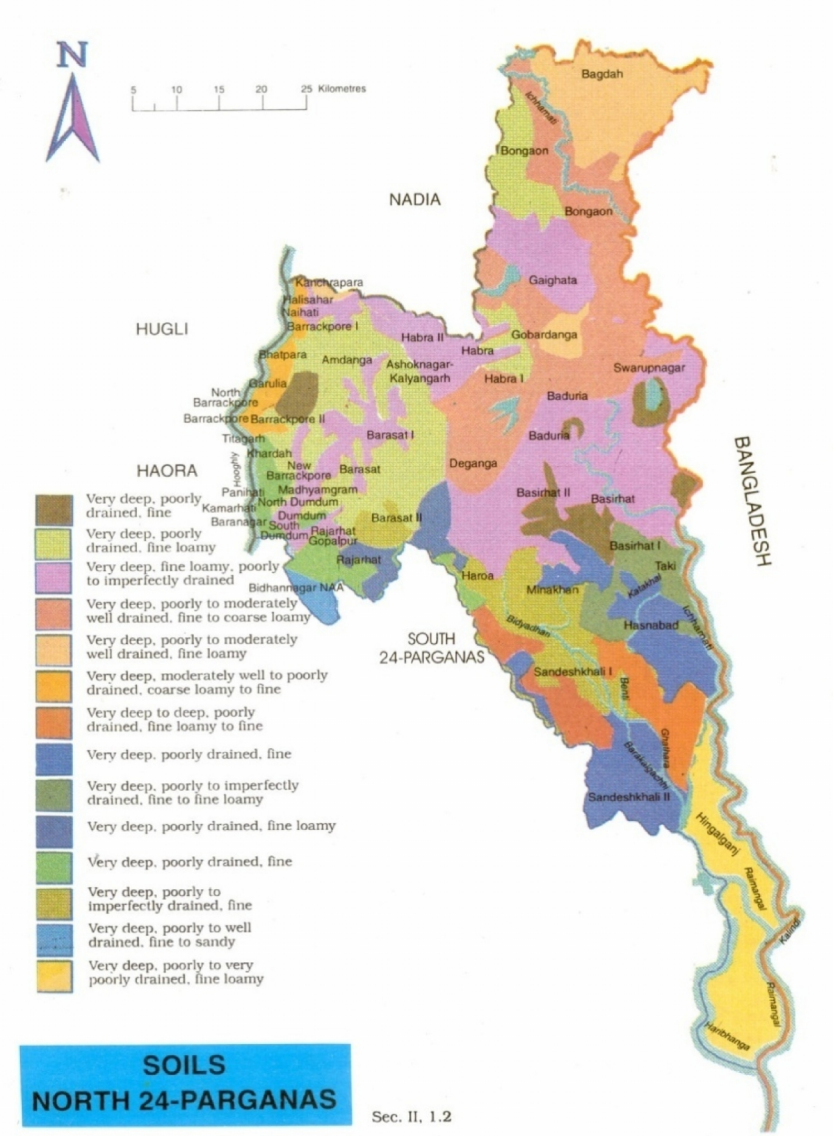



**Figure 13: Soils of North 24 Parganas**

As per the classification of the Annual Flood Report of the Irrigation and Waterways Department, the North 24 Parganas district falls within the Gangetic Plain Sector II category where expected annual average rainfall is between 1400 to 1650 mm. The average rainfall is 1137 mm during the monsoon and 386 mm during non-monsoon period. The average monthly rainfall data is shown in Table 3 below:

**Table 3: Monthly Average Rainfall Distribution**

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rainfall (in mm) | 2.1 | 11.9 | 46.6 | 50.9 | 118 | 255 | 326 | 320 | 262 | 216 | 34 | 4.8 |

In the coastal Sunderbans area of the District the climate has a tendency towards tropical oceanic. The heavy rainfall during monsoon interacts with the tidal variation in almost all the rivers of Sunderbans. The maximum wind velocity ranges from 16.7 to 20.0 km/h during April to June, but during severe cyclones, which number 3 or 4 in a year, the wind velocity often ranges from 80 to 140 km/h.

The entire North 24 Parganas district is vulnerable to different natural calamities like flood, cyclone, hailstorm - Kalbaishakhi, earthquake, drought and embankment erosion, and includes High Risk Multi-Hazard Zones13 (See Annex 18 for details of recent natural calamities).

In May 2009, the District was hit by high speed cyclone named 'AILA' and subsequent rainfall which continued for two days. This created a disaster in 20 out of 22 blocks of the district. 10 out of 27 municipalities of the district were also severely affected. The intensity of the cyclone was most severe in Sundarban region of the district, almost an area of 47670 Hectares of cultivable area spread over 250 mouzas of 50 Gram Panchayats under nine blocks of this district have been effected by saline water inundation. Sweet water pond is the major source of irrigation during Rabi crop (summer season) in the affected areas and around 15783 sweet ponds have been affected in nine blocks[14].

## 2.4 Geomorphology and Hydrogeology

### 2.4.1 Geomorphology

The district of North 24 Parganas is part of the Bengal Basin.The district is divided into three geographic units:

i. Natural Levee areas
ii. Swamp areas
iii. Older flood plains

The district is a part of the lower delta plain of Bengal Basin which is the largest fluvio-deltaic sedimentary system on earth—the Ganga-Brahmaputra delta. The delta can be divided into two regions:

A. The upper delta plain of meander belts of the Padma- Bhagirathi rivers in the North;
B. The lower delta plain with several tidal creeks in the South

The upper delta plain is characterized by a series of meander scars of various wavelengths and amplitudes, abandoned channels and oxbow lakes formed under varying hydrodynamic conditions in

[13] Model Disaster Management Plan of North 24 Parganas District, 2011

a fluvial regime. Abandoned meander scrolls are the most common form and could be related to flood-plain formation in the upper delta plain with a very gentlesoutherly slope.

The lower deltaic plain consists of tidal mudflats, distributaries levees and inter distributary marsh complexes formed under a fluvial-estuarine – marine environment under the influence of fluctuating sea level conditions in geologically recent times ( Pleistocene-Holocene)[15].

### 2.4.2 Geology

The district is a part of Lower Gangetic basin and is underlain by huge thickness of Quaternary alluvium, laid down by the southerly flowing Bhagirathi River and its tributaries. The major area of the district is occupied by recent alluvium consists of grey sand, silt and grey (semi-plastic) clay. Older alluvium sediments occurs beneath recent alluvium and comprises grey to brown sand fine to coarse grained gravel, clay (grey to yellow) with kankar and ferruginous concretion. In the northern and central part of the district top surface clay is occurring down to 5 to 12 mbgl, whereas in southern and south-eastern parts of the district average thickness of top clay layer is up to 25 mbgl.

### 2.4.3 Ground Water Potential and Hydrogeology

Groundwater occurs in a thick zone of saturation in the alluvium deposited by the river system. The sand and gravel horizons of different textures constitute main aquifers. Report on the hydrogeology of the area suggests that there is shallow aquifer (12 - 15 mbgl) in the upper delta plain and is mostly under unconfined conditions except near its southern fringe, where it occurs under semi-confined to confined conditions. Groundwater in the northern and central part of the district occur under water table conditions i.e, under unconfined condition. However, in isolated patches in Barrackpur, Amdanga, Habra –II and Rajarhat blocks, the top clay and sandy clay are locally thick (20-30m) imparting semi-confined nature to the groundwater body.

In the southern and south-eastern part of the district comprising Hasnabad, Hiingalganj, Sandeshkhali and Minakhan blocks groundwater occurs under confined condition. These blocks are found to be affected by a saline groundwater environment, but there is a wide variation in the disposition of fresh and saline groundwater bearing aquifers within the blocks. These aquifers sometimes co-exist without maintaining any definite pattern, especially in the shallow aquifer systems. The saline water bearing aquifers are found to exist in general upto a depth of about 150m below ground level. However, a group of fresh water bearing aquifers is generally available in the depth span of 150m - 330m below ground level. These lower groups of aquifers are effectively separated by a thick clay bed and exist under confined condition.

Tubewells in the district are constructed tapping both unconfined and confined aquifers and are capable to yield 20 to 150 m3/hr with nominal drawdown of 4-5m. The yield of the shallow tubewells is about 20 to 40 m3/hr with a drawdown less than that 4m[16].

According to CGWB, the depth to water level in unconfined aquifers during pre-monsoon period (2006) varies from 2.00 to 13.60 mbgl whereas post monsoon it is from 1.64 to 10.66 mbgl. Piezometric head in confined aquifer during pre-monsoon period (2006) varies from 3.47 mbgl to 6.25 mbgl whereas post monsoon period (2006) it varies from 1.91 mbgl to 5.89 mbgl. From the long term monitoring of water level, declining depth (38cm/year pre-monsoon time) has been observed in some parts of district, especially in Amdanga block.

The dynamic groundwater resources of North 24 Parganas district have been estimated jointly by CGWB & SWID, following the Ground Water Estimation Committee (GEC 1997) methodology, on 31.03.2004 as shown in Table 4 below:

[15]Predictive Analysis Of Groundwater Trends In Five Blocks Of Sundarban Area In North 24 Parganas, Sayani Das, IOSR Journal of Engineering (IOSRJEN), Vol. 05, Issue 08 (August. 2015)
[16] Ground Water Information Booklet North 24 Parganas District, West Bengal

**Table 4: Summary of Groundwater Resource**

| Sl. No | Description | Data |
|---|---|---|
| 1 | Total Groundwater Resources | 157,640 ham |
| 2 | Net annual groundwater availability | 141,876 ham |
| 3 | Existing groundwater draft for all uses | 101,005 ham<br>For Irrigation: 94,066 ham<br>For domestic & industrial water supply : 6,939 ham |
| 4 | Stage of Groundwater development | 71.19% |
| 5 | Allocation for domestic and industrial water supply requirement upto 25 years | 10,859 ham |
| 6 | Net groundwater availability for future irrigation development | 36,951 ham |
| 7 | Categorisation of blocks | All the blocks are in the SAFE category |

The ground water potential of each block as per the Central Ground Water Board brochure is furnished in Table 1 of Annex 4 and can be summarised as follows[17]

**Table 5: Summary of Block-wise Groundwater Resource**

| Category of Water Reserve & Water Quality | Blocks | Total |
|---|---|---|
| Safe category | Swarupnagar | 1 |
| Safe with , Arsenic affected in down to depth of 80m bgl | Barasat II,Barrackpur I, Barrackpur II, Bashirhat I, Deganga, Habra I, Rajarhat, Haroa | 8 |
| Safe with water level declining | Amdanga, Baduria, Gaighata | 3 |
| Safe with water level declining, Arsenic affected upto depth of 80m bgl | Bagdah, Barasat I, Bongaon, Habra II, Bashirhat II | 5 |
| Confined aquifer, saline in nature | Hasnabad, Hingalganj, Minakhan, Sandeskhali I, Sandeskhali II | 5 |

It is observed that, though 17 blocks are falling under SAFE category, as many as 8 blocks are with declining water level and 13 blocks are affected by arsenic, as per the quality assessment by CGWB. The quality issue has been elaborated in more detail later. So despite availability of sufficient water, the quality of the ground water restricts its utilisation.

**Ground Water Development**

At present, the groundwater development of the district is mainly controlled by the shallow tubewells along with deep bore wells. As per the Groundwater Estimation Committee 1997, the total groundwater resources for 17 blocks (excluding the five blocks in the coastal area) are calculated as157, 640 ham. About 101,005 ham, or 71.19%, is being utilized for both irrigation and potable use.

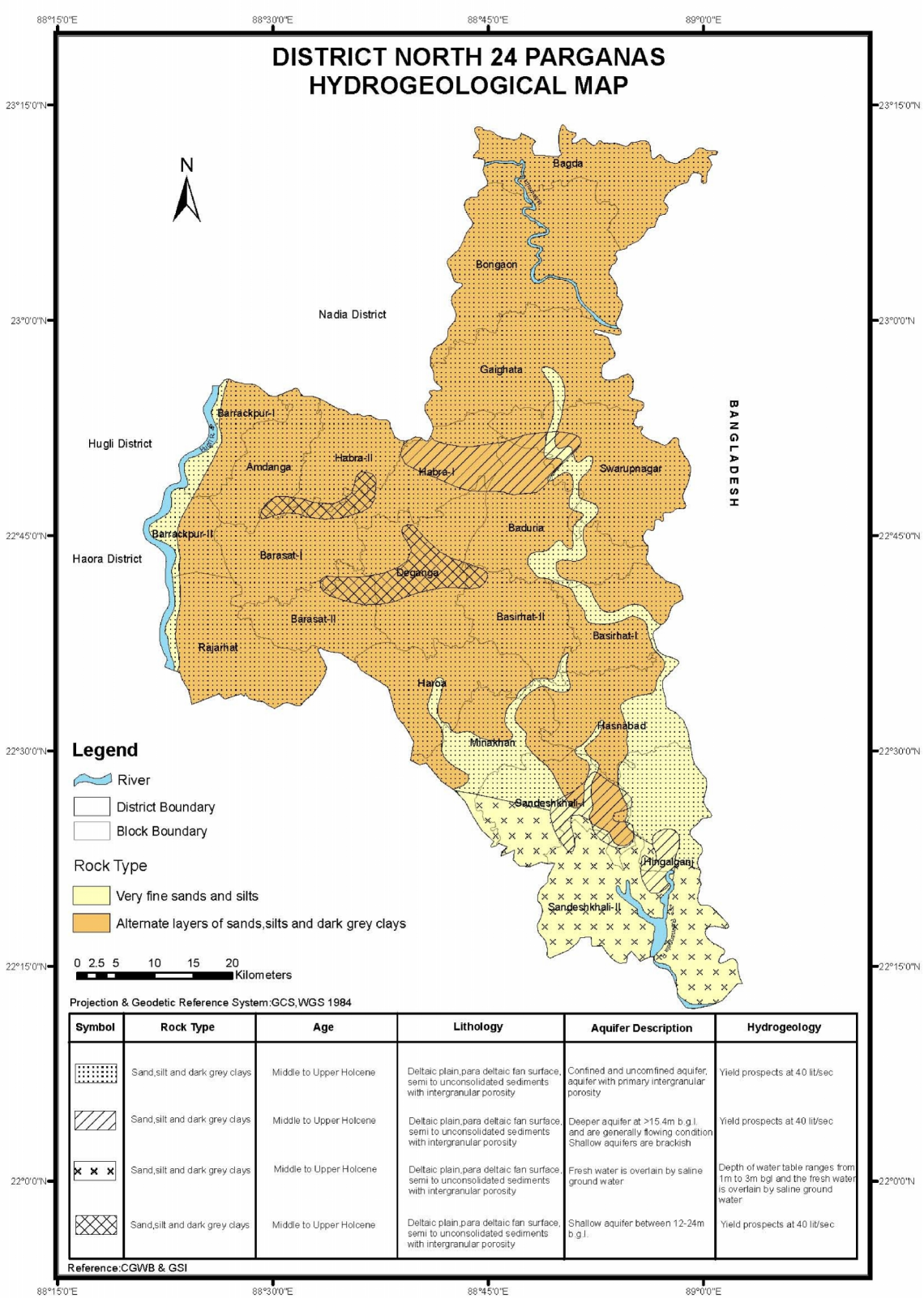
In all the 17 blocks belonging to the SAFE category, further groundwater development is feasible. In sixblocks (Hingalganj, Minakhan, Hasnabad, Sandeskhali I & II and part of Barasat II block) where groundwater occurs in confined condition as well as being brackish to saline at the upper level, deeper aquifers may be developed by low to medium duty tube wells ( 50-100 m3/hr discharge).

[17]based on data collected in 2004-2005

According to the available data[18], out of the total area irrigated, almost 4% is irrigated using high capacity deep tube well (as on 2012-2013). The number of high capacity deep tube wells, used for irrigation in the district is 263, while the number of shallow tube wells is 69,983.

The district falls under the category of “severely stressed" (Refer Table 2, Annex 4) considering the total average receipt of rainfall comparedwith the demand of water for agriculture and domestic purposes.

[18]District Statistical Handbook, North 24 Parganas, 2013




| Symbol | Rock Type | Age | Lithology | Aquifer Description | Hydrogeology |
|---|---|---|---|---|---|
| | Sand,silt and dark grey clays | Middle to Upper Holcene | Deltaic plain,para deltaic fan surface, semi to unconsolidated sediments with intergranular porosity | Confined and unconfined aquifer, aquifer with primary intergranular porosity | Yield prospects at 40 lit/sec |
| | Sand,silt and dark grey clays | Middle to Upper Holcene | Deltaic plain,para deltaic fan surface, semi to unconsolidated sediments with intergranular porosity | Deeper aquifer at >15.4m b.g.l. and are generally flowing condition. Shallow aquifers are brackish | Yield prospects at 40 lit/sec |
| | Sand,silt and dark grey clays | Middle to Upper Holcene | Deltaic plain,para deltaic fan surface, semi to unconsolidated sediments with intergranular porosity | Fresh water is overlain by saline ground water | Depth of water table ranges from 1m to 3m bgl and the fresh water is overlain by saline ground water |
| | Sand,silt and dark grey clays | Middle to Upper Holcene | Deltaic plain,para deltaic fan surface, semi to unconsolidated sediments with intergranular porosity | Shallow aquifer between 12-24m b.g.l. | Yield prospects at 40 lit/sec |

**Figure 14: Hydro-geological Map of North 24 Parganas**

## 2.5 Water Quality Status

### 2.5.1 Ground Water Quality

The water is mildly alkaline in nature with pH values ranging between 7.5 and 8.2. Total hardness (as CaCO3) ranges from 140 – 670 mg/l. Generally iron content is above the national permissible limit of 0.3 mg/l in all the blocks, ranging from 1.23 – 18.10 mg/l but in a few places it is lower, of the order of 0.09 – 0.56 mg/l (Refer Table 6, Annex 5).

Shallow aquifers within the depth range 20-80mbgl showarsenic concentration above the permissible limit (0.01 mg/l) in drinking water occurring in all 22 blocks of the district (Refer Figure 16). Deeper aquifers down to the depth of 350 m bgl are arsenic free.

The chemical quality of groundwater in the area in general is of bi-carbonate type. The chloride content in groundwater is low (18 – 234 mg/l) in the northern and central parts of the district. In the southern and south-eastern parts of the district (Basirhat, Haroa, Hasnabad, Hingalganj, Sandeshkhali, and Minakhan) the upper aquifers are brackish to saline in nature (Refer Figure 15), but fresh water aquifers underlie these saline aquifers.

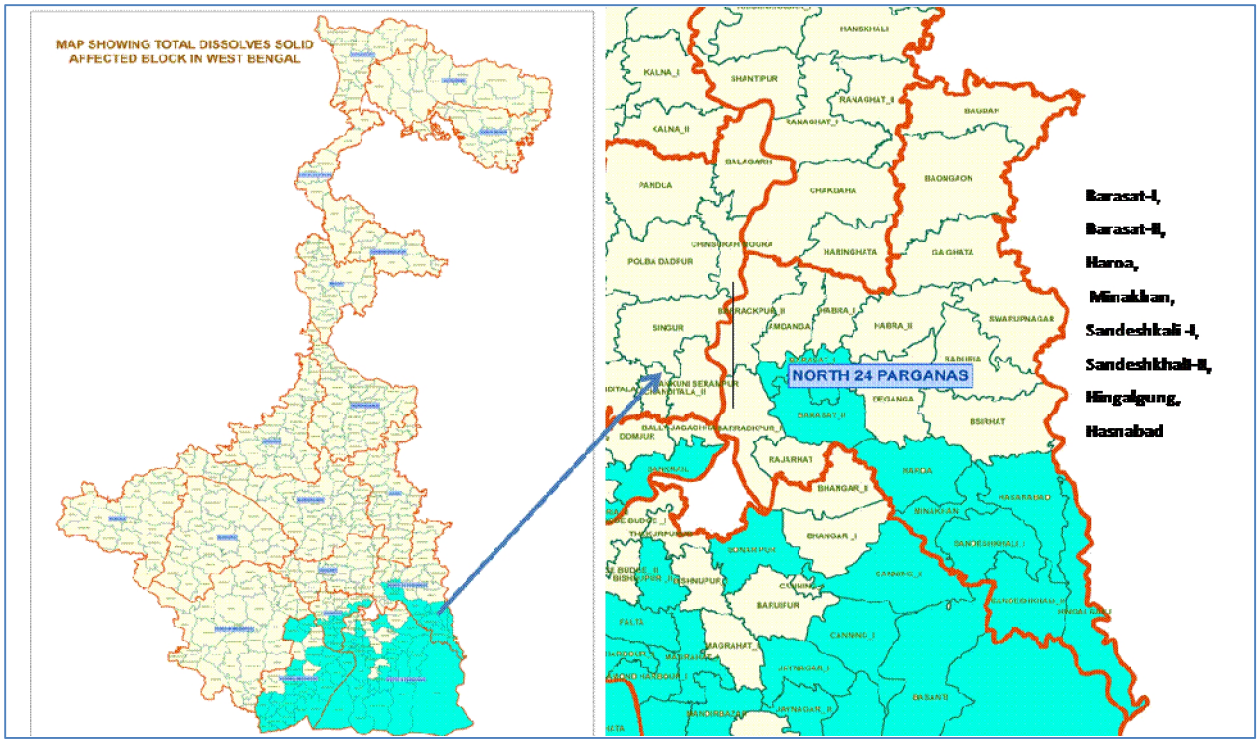



**Figure 15: Salinity affected Blocks in the District**

### 2.5.2 Blocks Affected By Arsenic Concentration

Based on the data obtained from PHED, it is observed that all the 5641 samples collected from the 22 blocks are containing arsenic above the permissible limit (see Table 1, Annex 5 for details). The blocks can be clustered based on the average arsenic concentration obtained from the samples tested (see Table 6 below). The maximum

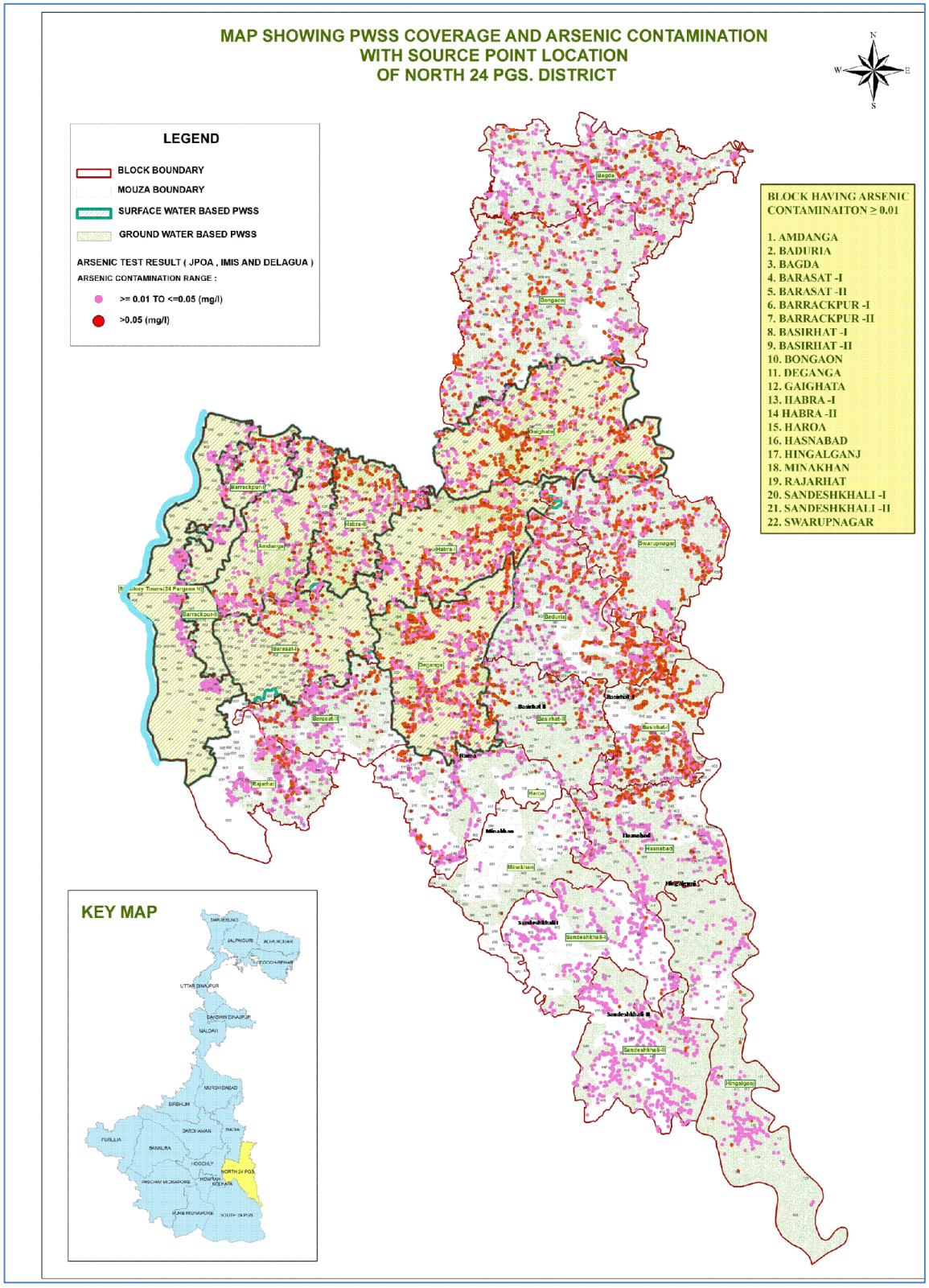



**Figure 16: Extent of Arsenic Contamination in Ground Water in the District**

Observed Arsenic concentrations are also indicated in the table to give an idea of the extent of contamination. The observed maximum concentration is more than 0.1 mg/l in all the 22 blocks. The

maximum observed arsenic concentration has the lowest value in Barrackpur II and the highest is observed in Habra II, Bongaon and Gaighata (1.0 mg/l) blocks. Relatively low average concentration between 0.01 and 0.5 mg/l is observed in five blocks, out of which three are in the coastal area, and an average concentration between 0.05 and 0.10 mg/l isobserved nine blocks. All the remaining eight blocks have an average concentration above 0.10 mg/l.

**Table 6: Categorisation based on Average Arsenic Concentration (PHED Data)**

| **Average Arsenic Concentration (in mg/l)** | **Name of Block (Max. observed Arsenic Conc. in mg./l)** |
|---|---|
| 0.01 - 0.05 | Barrackpur-I (0.97), Barrackpur-II (0.16), Haroa (0.73), Minakhan (0.5), Sandeshkhali I (0.77) |
| 0.05- 0.1 | Amdanga (0.57), Bagda (0.62), Barasat I (0.75), Barasat II (0.95), Basirhat II (0.63), Bongaon (1), Hasnabad (0.96), Hingalganj (0.46), Rajarhat (0.62) |
| > 0,1 | Baduria (0.96), Basirhat I (0.99), Deganga (0.69), Gaighata (1.0), Habra I (0.95), Habra II (1.0), Swarupnagar (0.72) |

The Integrated Management Information System (IMIS) provides an overview of the status of arsenic contamination in the habitations. Details of arsenic contamination during the period form 2014-17 are provided in Annex 5. (Tables 2, 3, and 4 in give a yearly summary and Table 5 gives a combined summary for the last 3 years).

The last three years IMIS data indicates that out of 47,062 water samples tested across the 22 blocks, arsenic concentration above 0.01 mg/l was observed in 8,609 samples (only 18.30%).More than 30% of the tested samples in Baduria, Gaighata, Habra I, Swarupnagar, Basirhat I have arsenic concentration more than the threshold limit (0.01 mg/l). However, such "positive" samples count for less than 1% of the samples tested in Barrackpur-II, Hingalganj, Minakhan, Sandeshkhali I. This clearly indicates that as per IMIS data, the extent of contamination is relatively less in these blocks. The samples tested were mainly from spot sources like tube-wells.

## 2.6 Sources of Arsenic

The arsenic contaminated zones in the Ganga-Brahmaputra fluvial plains mostly lie within the shallow aquifers (<100m bgl). The deep aquifers (>100 m bgl), underneath the contaminated shallow aquifers, are normally arsenic free. They are separated by a thick clay layer of appropriate composition from the shallow aquifer. From the isotopic studies carried out in West Bengal, it was observed that there was no hydraulic connection between the shallow and deep aquifers as they belong to different age. The main source of arsenic contamination is considered to be geogenic in nature (see Annex 3). There are various hypotheses about the original source of arsenic and the most probable one is transportation from the Himalayas with the fluvial sediments.

## 2.7 Assessment of Affected Habitation

The test data obtained from PHED show the number of affected habitations is 3,860, which is around 55.55% of the total habitations in the district. The block-wise number of affected habitations is provided in Table 1 of Annex 5. Depending on the number of affected habitations, blocks can be categorised as follows:

**Table 7**: Extent of Arsenic Affected Habitations (as per PHED Data)

| % of Habitation in the block affected by Arsenic conc.> 0.01 mg/l | Name of The Block | Total No. of Block |
|---|---|---|
| < 50% | Amdanga, Baduria, Bagda, Barasat I, Barrackpur-I, Bongaon, Gaighata, Sandeshkhali I | 8 |
| 50-75% | Barasat II, Barrackpur-II, Basirhat II, Deganga, Habra I, Habra II, Haroa, Hingalganj, Rajarhat, Swarupnagar | 10 |
| >75% | Basirhat I, Hasnabad, Minakhan, Sandeshkhali II | 4 |

However, the data from IMIS for the last three years show that only 2,315 habitations (33.31%) are affected by arsenic contamination exceeding the threshold limit. The block-wise categorisation summarised from the IMIS data (Refer Table 5, Annex 5) is as follows:

**Table 8**: Extent of Arsenic Affected Habitations (as per IMIS Data)

| % of Habitation in the block affected by Arsenic conc.> 0.01 mg/l | Name of The Block | Total No. of Block |
|---|---|---|
| < 50% | Bagda, Barasat I, Barrackpur-I, Barrackpur-II, Basirhat II, Bongaon, Gaighata, Haroa, Hasnabad, Hingalganj, Minakhan, Rajarhat, Sandeshkhali I, Sandeshkhali II | 16 |
| 50-75% | Barasat II, Deganga, Habra I, Habra II, Swarupnagar | 5 |
| >75% | Basirhat I | 1 |

From both the IMIS and PHED sets of data, it can be assumed that most of the blocks have 50-75% of their habitations affected by arsenic contamination. Only the blocks in the coastal areas are relatively less affected by arsenic contamination, according to the long term data from IMIS.

## 2.8 Surface Water Quality

River Hooghly is considered the only perennial river in this district, and presently serves as the major source for a number of water treatment plants in the West Bengal. Most of the other rivers are either fed by monsoon runoff or have high salinity due to their estuarine connection. Typical quality of the River Hooghly is furnished in Table 7 of Annex 5. It indicates high coliform contamination, which is probably due to discharges from all the habitations on both sides of the river. The turbidity goes up to 500 NTU during the monsoon. There have been no reports regarding chemical contamination, though this does not mean that none exists

## 2.9 Impact of Climate Change

Climate change may alter the distribution and quality of natural resources, enhance water insecurity, reduce agriculture productivity, enhance exposure to extreme weather events, and pose even unforeseen health risks. The observed effects of climate change on water services relate to:

- Reduction of water availability in the river basins;
- Reduction in dissolved oxygen content, mixing patterns and self-purification capacity; increase in algal blooms;
- Intrusion of salinity in coastal aquifers;
- Changes in water availability due to changes in precipitation and other related phenomena (evapo-transpiration, ground-water recharge);
- Increases in difficulty of flood control and reservoir utilisation during flood season;
- Floods affecting water quality and water infrastructure integrity; increased fluvial erosion; and drought affecting water availability and water quality.

### 2.9.1 Impact of Climate Change on Water Availability

In the North 24 Parganas district, the Hooghly river is the only perennial river. Until 1975, it was not perennial and the runoff arose from withinits own catchment basin.In 1975,the Farakka barrage was constructed on the River Ganga far upstream from Kolkata, for implementation of the Water Treaty between India and Bangladesh. This diverts about 98,000mld water from Ganga River to Hooghly River through a feeder canal of 40km, connecting the two rivers. There is not yet any definitive conclusion regarding the impact of climate change on the flow of Ganga Brahmaputra Meghna basin, which includes the Hooghly..

### 2.9.2 Impact of Climate Change on Water Quality

Effect on Salinity[19]

During high tides, salinity was a problem in the vicinity of Kolkata till 1975. Once Hooghly became a perennial river, fresh water increased and salinity levels decreased.Some figures from a study on salinity intrusion conducted by The Centre of Atmospheric Sciences, IIT Delhi.The salinity level at Haldia, even at high tide periods in winter, is 6 psu and at Sagar it is 22 psu (Practical Salinity Unit). Haldia is 80 km downstream of Kolkata and Sagar is at the mouth of Hooghly Riverin the Bay of Bengal. It may be concluded that salinity is not currently affecting the quality of raw water near Kolkata.

## 2.10 Socio-Economic Status including gender and Health

### 2.10.1 Demographic Profile

The total population in rural and urban community development (CD) blocks in North 24 Parganas district is 5.01 million, belonging to 1.17 million households. The average household size in the district is 4.3, and the sex ratio for the overall population of the CD blocks in the district is 949 females per 1,000 males. Sex ratio in the 0-6 age group is slightly higher, at 959 females per 1,000 males. For scheduled tribes the sex ratio is 975 per 1,000, and for scheduled castes it is 941 per 1,000. About 29% of the population in the CD blocks of the district comprises scheduled castes, while scheduled tribes comprise only 4.2% of the total population.[20]

### 2.10.2 Economic Profile

Workforce participation is about 36% in the district (Census 2011). As per published data of Government of West Bengal, in 2012-13, the Gross District Domestic Product (GDD) of North 24 Parganas was Rs. 44,705.65 crores. The district's contribution to the state domestic product of West

[19] KEEIP Report on Water Quality.

[20]There are no scheduled areas as defined by the Indian Constitution in the state of West Bengal. Tribal communities are present in all the districts of the State, with higher concentration of tribal population n districts like Darjeeling, Jalpaiguri, Alipurduar, DakshinDinajpur, PaschimMedinipur, Bankura and Purulia.

Bengal was estimated at 12.95%, the highest among all districts in the state. The district per capita income of Rs. 34,870.95 is higher than the state average of Rs. 33,889.

As per 2011 census there are 1.1 million people of North 24 Parganas, living in the coastal areas of Sunderbans. The population is economically backward and the area has very poor infrastructure like roads, jetties and electricity which render most of the places remote and inaccessible. The majority of the population is mainly dependent on monsoon basedagriculture, with sub-optimal yields. People without land ownership are dependent on alternative livelihoods like fishing and collection of tiger prawn "seeds". During April to May, local honey is garnered by collectors known as Mawalis..

### 2.10.3 **Health and Gender**

Available health and gender indicators from DLHS-4 indicate the level of development in the district. While institutional births in the district are close to 80%, they are only 68% in its rural areas. Percentages of children who received full vaccination are low at 56% in the overall district and 52% in rural areas. The mean age at marriage in rural areas is 17.6, while that in the overall district is 19.8 years. Awareness of HIV/AIDS among women in rural areas of the district is lowat 27.7%.

# Chapter 3 Present Coverage of Water Supply

The North 24 Parganas District has a predominantly urban profile with almost 50% of the people living in the 27 municipalities. According to the 74th Constitutional amendment, the urban local bodies are supposed to arrange their own water supply system, while the state PHED is responsible for rural water supply covering the blocks and the census towns within the blocks. Depending on the mode of delivery, the water supply in the rural area of the North 24 Parganas, can be categorised as:

- Piped water supply scheme
- Spot source-based schemes (like dugwells, shallow wells, deep borewells), fitted with handpump

It has been already discussed in Section1 that the target of NRDWP is to provide 100% coverage by piped water supply to be achieved

The piped water supply can be further subdivided into following categories

- surface water
- ground water
- Others (pond water, rainwater recharge schemes etc.).

Distribution of the sources (as obtained from the IMIS data)for the existing water supply schemes in the District as follows:

**Table 9**: Source wise Distribution of Water Supply Schemes

| Type of Source | Number of schemes | Habitation Covered |
|---|---|---|
| **Ground water based** | | |
| PWSS | 196 | 2857 |
| Spot sources (Hand pump/ borewell/ Tube well/ other spot sources) | 25403 | 6201 |
| **Surface water based** | | |
| PWSS | 3 | 352 |
| Other (Ponds, Rainwater harvesting etc). | 7 | 82 |

source: http://indiawater.gov.in/IMISReports/Reports/BasicInformation/rpt_SchemesSourcesGWSW_D.aspx?Rep=0

Approximately 4.9% of the habitations are covered by surfaceand other sources and still a substantial part is served by spot sources based on ground water. A block-wise distribution of the spot sources are presented in Table 1of Annex 8. In most of the blocks (16 out of 22) spot sources number more than 1000. The highest number of spot sources (2494) is in the Baduria block. Hingalgunj, Minakhan and Sandeshkhali-I blocks have very few spot sources (less than 50). This is likely to be due to non-availability of sweet water sources in the shallow water table. Majority of the PWSS schemes in the district, are still based on ground water sources.

The data obtained from PHED (Refer **Error! Reference source not found.**) indicate that the piped water supply schemes cover 61% rural populations.

## 3.1 Commissioned Piped Water Supply Schemes

As per the data available from the PHED sources, there are 181 commissioned PWSS in this district. Work is in progress for another 32 schemes (Refer Table 1 and Table 2 of Annex 9). The coverage by PWSS, is substantially above the target set by NRDWP (i.e., at last 45% rural coverage by 2017) for achieving complete coverage of rural area by 2022.

**Table 10: Summary of PWSS at Present in North 24 Parganas**

| Number of Schemes | | | Number of | | Number of | | Coverageby commissioned scheme |
|---|---|---|---|---|---|---|---|
| Commissioned | Ongoing | Total | Villages | Habitation | Town | Ward | |
| 181 | 32 | 213 | 1,812 | 7,250 | 7 | 85 | 61.38% |

*Source: http://app1.wbphed.gov.in/phed_v2_view/SVF00001/view.html?index=10&mN=1, http://app1.wbphed.gov.in/phed_v2_view/DWF00001/open.html?menuId=DWM00001&par1=19&par2=337*

It may be noted that the total number of covered habitation is more than the total number of habitations in the 22 blocks. This is due to overlapping of several schemes in same habitations.

### 3.1.1 Commissioned Water Based

Out of the 181 commissioned schemes 170 (i.e., almost 94%) are based on ground water and 11 are based on surface water. A considerable number of the schemes (77 nos, i.e., 45%) are older than 12 years and only 5 groundwater based PWSS have been sanctioned in the last 7 years. These data suggest the slow and planned phasing-out of the installation of ground water based schemes, following the recommendation of the Arsenic Master Plan and a preference towards surface water based schemes.

Groundwater is the only source for the PWSS in nine blocks, viz. Baduria, Bagda, Barasat - II, Bongaon, Haroa, Rajarhat, Sandeshkhali - I, Sandeshkhali - II, Swarupnagar (Refer Table 2 of Annex 8). Among the schemes, 64% of the PWS Schemes are small, each covering 10 or fewer habitations.

The typical groundwater based scheme comprises a borewell and pumping arrangement, supplying water to the households after disinfection through chlorination.

**PWSS fitted with ARP:** Where surface water sources are too far distant, groundwater based schemes fitted with Arsenic and Iron Removal Plant (ARP) are an option in the Arsenic Master Plan prepared by the WBPHED (Refer Section **Error! Reference source not found.** ). A number of existing schemes have been retrofitted with ARP and new schemes have been proposed with ARP. In North 24 Parganas, a total of 33 groundwater based PWSS has been considered for provision of ARPs. They are distributed over Baduria (7 no), Bagdah (5 no), Basirahat- I (5 no), Bangaon (10), Hasanabad (1 no), Swarupnagar (5 no) (Refer Table 1, Annex 14).

PHED has adopted two standard ARP modelsfor implementation with the groundwater based PWSS: a) Gobardaga model; and b) Sujapur-Sadpur model ;( Refer Annex 14 for details). These treatment systems are capable of reducing both Iron and Arsenic below the respective permissible limits with a water production rate of 5-20 m3/h.

Two other groundwater based PWSSare still under implementation stage (i.e., RO based desalination system and dual solar pump based PWSS). These are discussed later in this report. Commissioned Schemes Based on Surface / Sub-Surface Sources

### 3.1.2 Surface Water Based PWSS

At present the only one major operational surface water sourced PWSS in the District is the Surface water scheme for North 24 Parganas

This scheme, shown in Figure 17 below, covers mainly the four blocks of Amdanga (Part), Deganga, Barasat – I, Barrackpore – II, and a small portion of Basirhat I. It was commissioned in two phases (2006, 2008) with a project 2025design population of 0.768 million.

The raw water intake jetty is on the Hooghly River near Palta mechanised brick factory in Barrackpore, A 34 MLD conventional treatment plant, with clariflocculation and rapid gravity filtration, supplies treated water to the command area through a 220 km long transmission line via two booster

stations to 14 OHTs. These cover 227 mouzas spread over an area of 369 sq km. This scheme is designed for a supply of 40 lpcd at the user end so would require augmentation to meet the PHED vision of 70 lpcd. As it is reaching half of its design life, some replacement of mechanical and electrical equipment might be required at the same time.

Salient features of the scheme has been indicated in Annex 9A.

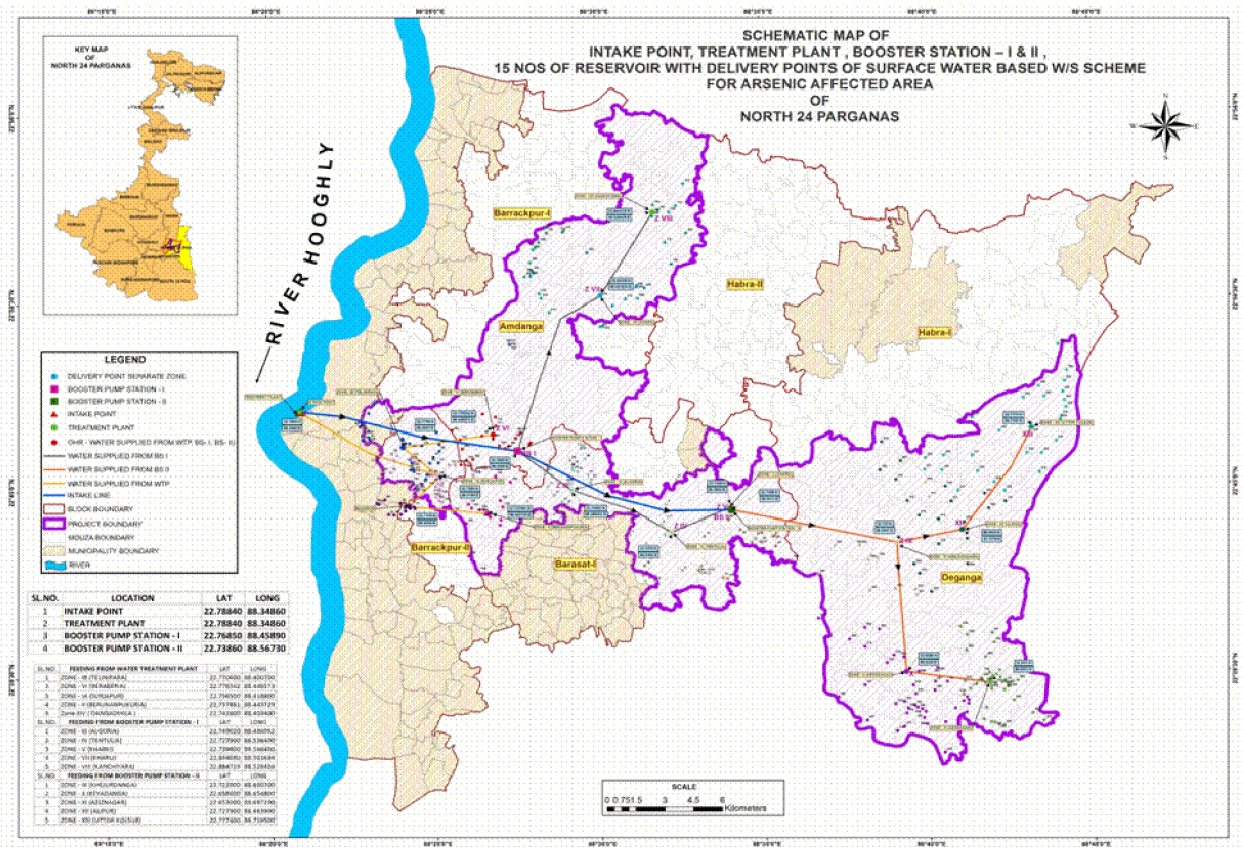



**Figure 17: Command area of Surface Water Scheme for North 24 Parganas**

### 3.1.1 Other PWSS

For some arsenic affected areas in the North 24 Parganas District, PHED has initiated using natural or constructed ponds situated nearby any habitation for storing rainwater that may be utilized as a water source. Water from the ponds is withdrawn by double stroke hand pump or electrical pump and is treated in a Horizontal Roughing Filter, having number of compartments, followed by a Slow Sand Filter unit.

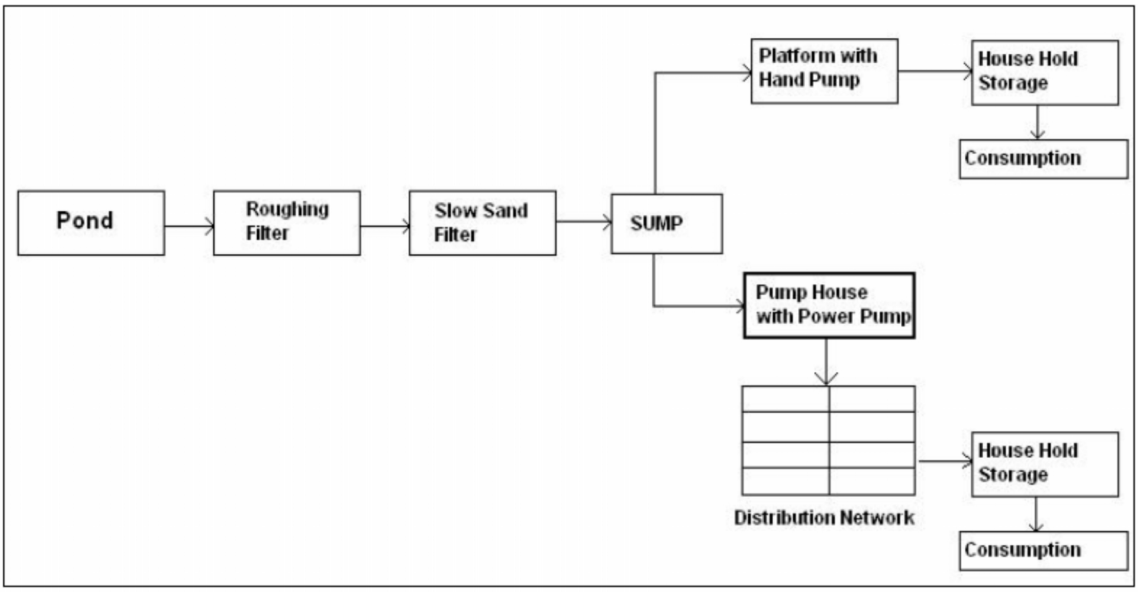



**Figure 18: Typical Scheme for Pond based PWSS**

The filtered water is supplied to the consumers after proper disinfection method. The number of people to benefit clearly depends on the volume of the pond. Generally, a moderate sized pond is capable of supplying drinking water to about 1000 people @ 10 ltr per capita per day. Already 10 pond based schemes has been completed in the Basirhat (1 no), Hingalganj (2 no), Hasnabad (6 no), and Minakhan (1 no) blocks (See Table 1, 99 Annex 9 for details). The population served by the schemes is around 2000,

## 3.2 On-going Piped Water Supply Schemes

At present there are 32 PWSS under implementation out of which

i. Two are surface water based piped water supply schemes;
ii. One is a pond water based scheme;
iii. One is a groundwater based dual solar pump scheme;
iv. One is a RO plant based groundwater scheme; and
v. Twenty seven are borewell groundwater based schemes

The schemes are discussed here briefly.

### 3.2.1 Surfaced Water Basecd Schemes

The two surface water based schemes use the River Hooghly as their source.

i. The Rajarhat Haroa Bhangar II scheme: This scheme is considered as ongoing as the laying of transmission mains has already been started. However, the construction of an intake pumping station, 22 MGD WTP, booster stations, GLRs, OHTs and the distribution network are still in the planning stage.This scheme is again considered under the proposed schemes for the District.
ii. Surface water based PWSS for arsenic affected areas of Habra - Gaighata: This scheme covers five blocks (Habra-I, Habra-II, Gaighata and Part of Amdanga, Barasat-I, Deganga, Barrackpore-I) and three municipalities (Habra, Gobardanga and Ashokenagar). The intake jettyis located onthe River Hooghly near the Jubilee Bridge of Barrackpore.The scheme covers 1635 habitations and three towns with a design capacity of 147 MLD, serving a design population of 1.99 million (2036). The WTP is conventional with clarifloculation, rapid sand filtration followed by chlorination and provision for recirculation of filter backwash. The

scheme is expected to be completed by 2018. The scheme also has been designed with a per capita flow of 61 lpcd (including losses) for the rural population and 70 lpcd for the urban population (municipalities). Both these are well below the adopted PHED standards for rural (70 lpcd) and urban (135 lpcd) water supplyand will require augmentation.

Salient features of these schemes are discussed in Annex 9A.

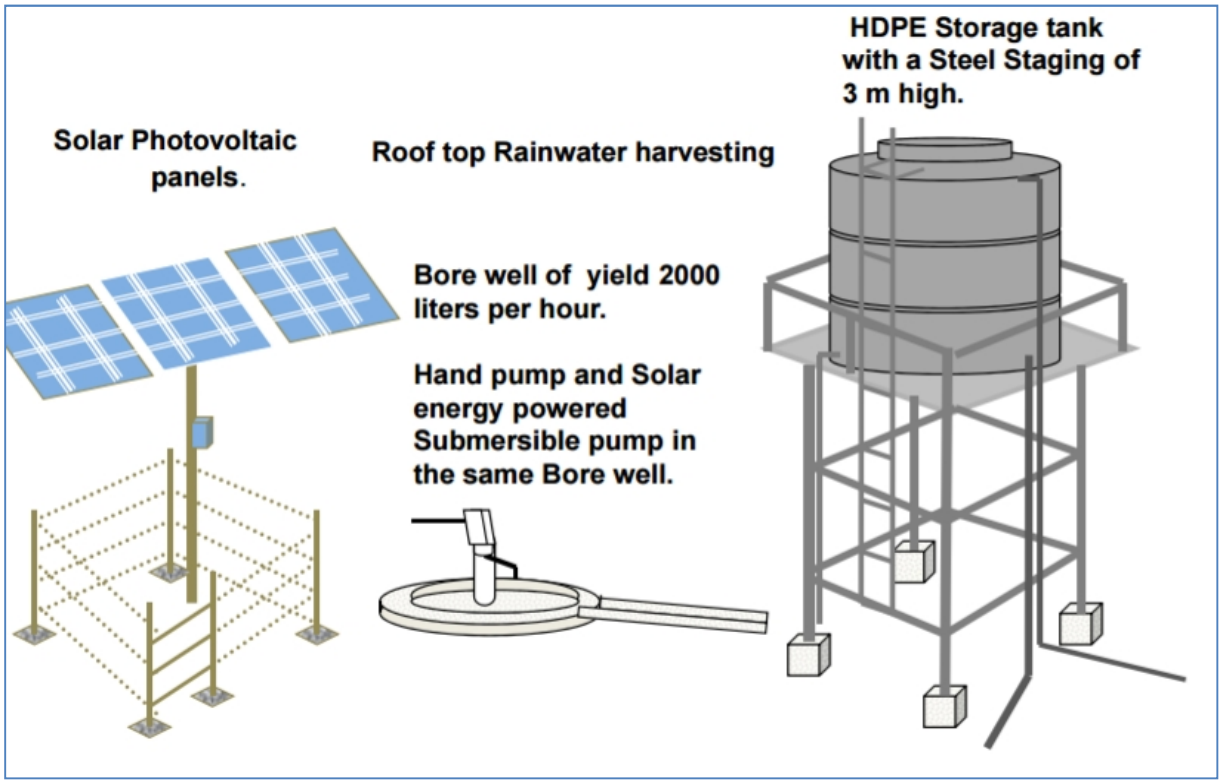



**Figure 19: Schematic for Solar Panel powered Dual Pump**

### 3.2.2 Pond Water based scheme

The Mathura bill water supply scheme utilizes a large water body stretching almost 8 km and touching both Nadia and North 24 Parganas districts. This is basically an ox-bow lake created out of a blocked tributary of the River Ganga. The scheme is designed to serve a population of 61,814 (design year 2034) with a per capita supply of 61 lpcd and total demand of 3.8 MLD. The treatment plant comprises baffled flocculator and tube settler followed by chlorination.

Salient features of the scheme are summarised in Annex 9A.

### 3.2.3 PWSS with Solar energy based dual pump system:

This scheme (introduced by MoDWS in 2013-14) includes a single phase solar pump fitted in a deep borewell which already has a hand pump. The Indian Mark II type hand pumps can lift water from a maximum depth of 45 m, thus limiting extraction when the water level goes down during the non-monsoon period. The solar powered dual pumps are useful in areas where normal electricity is not available. These can be operated both by solar power and normal electricity. The main component of this scheme is the Dual pump and the Solar Panel (PV). Following the approval of the MoDWS, 1000 such solar dual pump units are to be installed allover the state of West Bengal. 60 of these units will be installed in North 24 Parganas in the blocks of Amdanga, Baduria, Basirhat -I, II, Bongaon, Deganga, Gaighata, Habra I, II, Rajarhat, and Swarupnagar.

### 3.2.4 Reverse Osmosis (RO) based ground water supply scheme

In the five blocks in the Sunderban area, groundwater is only available in aconfined saline aquifer..Test results indicate that chloride content often exceeds 1000 mg/l. To utilise the saline water, the reverse osmosis technique has been adopted.One such scheme is presently ongoing to serve Shridhar Kati and 29 adjoiningmouzas in the Hingalhung block. In this scheme,some of the borewell water is treated in the desalination unit (comprising iron removal,softener, and reverse osmosis) and supplied to community water tanks for drinking and cooking purposes. Untreated water is also supplied direct to the users through stand posts for other purposes.

As there is no power on the island at present, all the electromechanical equipment will be operated using solar power but for only 6 hours/day. In this Shridhar Kati scheme, a per capita supply of 40 lpd is considered out of which 10 lpd is supplied for drinking and cooking. The drinking water is supplied through community water tanks and the remaining part is through stand posts.

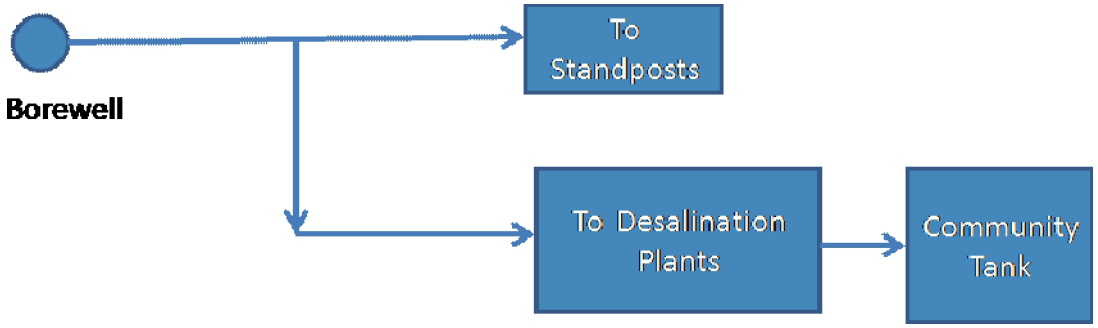



**Figure 20: Schematic diagram of RO based Groundwater PWSSS**

Discharge from each borewell varies between 11- 10 m3/hr. Salient features of the scheme are summarised in Annex 9A. The projected 2037 design population is 54,223 and the per capita capital cost is estimated at INR 11,717/-. This is relatively high compared to the average cost of INR 7000 to 8000 for a typical ground or surface water based PWSS.

## 3.3 Coverage by the Existing and Ongoing schemes

The extent of coverage of the two surface water based schemes, is summarised in Table 11.

Table 11: Block-wise Habitations covered by Existing Surface Water based PWSS

| Sl. No | Block | Total number of habitations covered by | | | Total No of Habitation in the block |
|---|---|---|---|---|---|
| | | North 24 Parganas surface water supply scheme | Habra Gaighata Surface water scheme | Combined | |
| 1 | Amdanga | 234 | 103 | 337 | 334 |
| 2 | Barasat- I | 361 | 135 | 496 | 525 |
| 3 | Barrackpore I | | 282 | 282 | 275 |
| 4 | Barrackpore II | 91 | | 91 | 178 |
| 5 | Basirhat I | 5 | | 5 | 210 |
| 6 | Deganga | 346 | 1 | 347 | 353 |
| 7 | Gaighata | | 440 | 440 | 440 |
| 8 | Habra I | | 296 | 296 | 296 |
| 9 | Habra II | | 354 | 354 | 354 |

The block-wise coverage by commissioned groundwater based PWSS, is summarised inTable 12.

Table 12: Coverage by Existing Ground water based PWSS

| Sl. No | Blocks | %Coverage by Ground Water Based PWSS | Sl. No. | Blocks | %Coverage by Ground Water based PWSS |
|---|---|---|---|---|---|
| 1 | Haroa | 23% | 8 | Bongaon | 55% |
| 2 | Minakhan | 31% | 9 | Hasnabad | 66% |
| 3 | Sandeshkhali I | 47% | 10 | Hingalganj | 41% |
| 4 | Sandeshkhali II | 47% | 11 | Rajarhat | 36% |
| 5 | Bagda | 68% | 12 | Baduria | 100% |
| 6 | Barasat II | 53% | 13 | Swarupnagar | 100% |
| 7 | Basirhat II | 92% | | | |

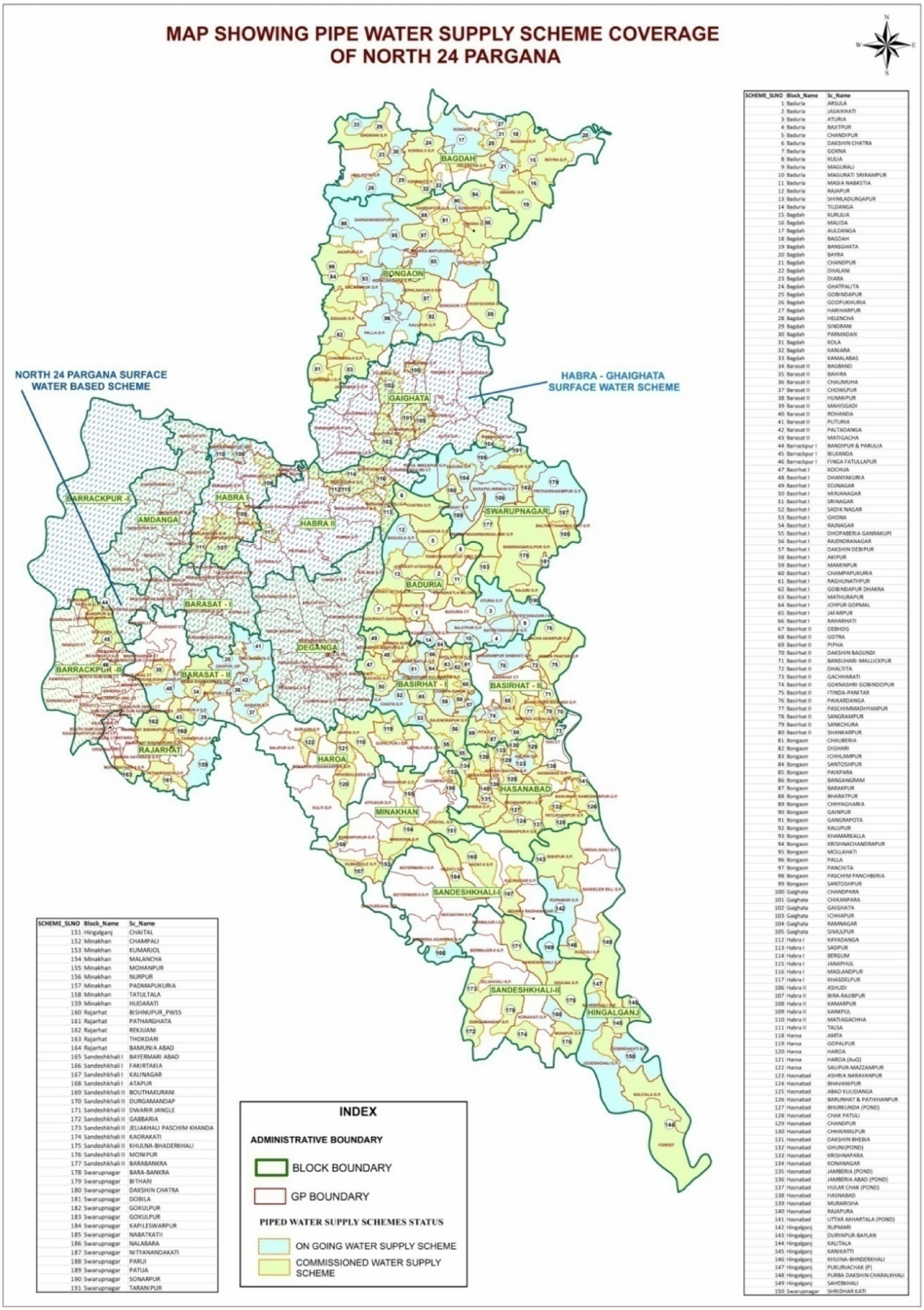
The coverage by all the existing and ongoing PWSS is elaborated in Figure 21.

### 3.4 Water Supply Coverage in Urban Areas

There are 27 municipalities, one Industrial Township and one Cantonment Board in the District, where respective local bodies have the primary responsibility for water supply. However,PHED is also supplying bulk supply to the seven municipalities of Ashoknagar Kalyangarh, Basirhat, Baduria, Bongaon, Gobordanga, Habra, and Taki.Of the 27 municipalities, 15 have a per capita supply of less than 100 lpcd (Annex 11, Table 1). The NRW in 24 municipalities is well above the permissible limit of 20%.

According to the data available from a study in 2009, out of the 107 urban centres (including 78 census town and 27 municipalities) only 12 urban centres get supply from sources other than groundwater. This substantial dependence on ground water in the urban areas is changing under the AMRUT21 scheme of the GOI Ministry of Urban Development, and the municipalities in this district are shifting towards surface water based sources.

[21] ***ATAL MISSION FOR REJUVENATION AND URBAN TRANSFORMATION*(*AMRUT*)**




| SCHEME_SLNO | Block_Name | Sc_Name |
|---|---|---|
| 1 | Baduria | ARSULA |
| 2 | Baduria | JASAIKHATI |
| 3 | Baduria | ATURIA |
| 4 | Baduria | BAJITPUR |
| 5 | Baduria | CHANDIPUR |
| 6 | Baduria | DAKSHIN CHATRA |
| 7 | Baduria | GOVNA |
| 8 | Baduria | KULIA |
| 9 | Baduria | MAGURALI |
| 10 | Baduria | MAGURATI SRIRAMPUR |
| 11 | Baduria | MASIA NABASTIA |
| 12 | Baduria | RAJAPUR |
| 13 | Baduria | SHYMLADURGAPUR |
| 14 | Baduria | TILDANGA |
| 15 | Bagdah | KURULIA |
| 16 | Bagdah | MALIDA |
| 17 | Bagdah | AULDANGA |
| 18 | Bagdah | BAGDAH |
| 19 | Bagdah | BANSGHATA |
| 20 | Bagdah | BAYRA |
| 21 | Bagdah | CHANDPUR |
| 22 | Bagdah | DHALANI |
| 23 | Bagdah | DIARA |
| 24 | Bagdah | GHATPALITA |
| 25 | Bagdah | GOBINDAPUR |
| 26 | Bagdah | GODPUKHURIA |
| 27 | Bagdah | HARIHARPUR |
| 28 | Bagdah | HELENCHA |
| 29 | Bagdah | SINDRANI |
| 30 | Bagdah | PARMADAN |
| 31 | Bagdah | KOLA |
| 32 | Bagdah | KANIARA |
| 33 | Bagdah | KAMALABAS |
| 34 | Barasat II | BAGBAND |
| 35 | Barasat II | BAHIRA |
| 36 | Barasat II | CHAUMUHA |
| 37 | Barasat II | CHOWLPUR |
| 38 | Barasat II | HUMAIPUR |
| 39 | Barasat II | MAHISGADI |
| 40 | Barasat II | ROHANDA |
| 41 | Barasat II | PUTURIA |
| 42 | Barasat II | PALTADANGA |
| 43 | Barasat II | MATIGACHA |
| 44 | Barrackpur I | BANDIPUR & PARULIA |
| 45 | Barrackpur I | BILKANDA |
| 46 | Barrackpur I | FINGA FATULLAPUR |
| 47 | Basirhat I | KOCHUA |
| 48 | Basirhat I | DHANYAKURIA |
| 49 | Basirhat I | ECHNAGAR |
| 50 | Basirhat I | MRIGANAGAR |
| 51 | Basirhat I | SRINAGAR |
| 52 | Basirhat I | SADIK NAGAR |
| 53 | Basirhat I | GHONA |
| 54 | Basirhat I | RAJNAGAR |
| 55 | Basirhat I | DHOPABERIA GANRAKUPI |
| 56 | Basirhat I | RAJENDRANAGAR |
| 57 | Basirhat I | DAKSHIN DEBIPUR |
| 58 | Basirhat I | AKIPUR |
| 59 | Basirhat I | MANINPUR |
| 60 | Basirhat I | CHAMPAPUKURIA |
| 61 | Basirhat I | RAGHUNATHPUR |
| 62 | Basirhat I | GOBINDAPUR DHAKRA |
| 63 | Basirhat I | MATHURAPUR |
| 64 | Basirhat I | JOYPUR GOPMAL |
| 65 | Basirhat I | JAFARPUR |
| 66 | Basirhat I | RAHARHATI |
| 67 | Basirhat II | DEBHOG |
| 68 | Basirhat II | GOTRA |
| 69 | Basirhat II | PIPHA |
| 70 | Basirhat II | DAKSHIN BAGUNDI |
| 71 | Basirhat II | BANSUHARI- MALLICKPUR |
| 72 | Basirhat II | DHALTITA |
| 73 | Basirhat II | GACHIMARATI |
| 74 | Basirhat II | GOKNASHRI GOBINDOPUR |
| 75 | Basirhat II | ITINDA-PANITAR |
| 76 | Basirhat II | PAIKARDANGA |
| 77 | Basirhat II | PASCHIMMADHYANPUR |
| 78 | Basirhat II | SANGRAMPUR |
| 79 | Basirhat II | SANKCHURA |
| 80 | Basirhat II | SHANKARPUR |
| 81 | Bongaon | CHAUBERIA |
| 82 | Bongaon | DIGHARI |
| 83 | Bongaon | ICHHLAMPUR |
| 84 | Bongaon | SANTOSHPUR |
| 85 | Bongaon | PAIKPARA |
| 86 | Bongaon | BANGANGRAM |
| 87 | Bongaon | BARAKPUR |
| 88 | Bongaon | BHARATPUR |
| 89 | Bongaon | CHHYAGHARIA |
| 90 | Bongaon | GAINPUR |
| 91 | Bongaon | GANGRAPOTA |
| 92 | Bongaon | KALUPUR |
| 93 | Bongaon | KHAMARKALLA |
| 94 | Bongaon | KRISHNACHANDRAPUR |
| 95 | Bongaon | MOLLAHATI |
| 96 | Bongaon | PALLA |
| 97 | Bongaon | PANCHTA |
| 98 | Bongaon | PASCHIM PANCHBERIA |
| 99 | Bongaon | SANTOSHPUR |
| 100 | Gaighata | CHANDPARA |
| 101 | Gaighata | CHIKANPARA |
| 102 | Gaighata | GAIGHATA |
| 103 | Gaighata | ICHHAPUR |
| 104 | Gaighata | RAMNAGAR |
| 105 | Gaighata | SIMULPUR |
| 112 | Habra I | KAYADANGA |
| 113 | Habra I | SADPUR |
| 114 | Habra I | BERGUM |
| 115 | Habra I | JANAPHUL |
| 116 | Habra I | MASLANDPUR |
| 117 | Habra I | KHASDELPUR |
| 106 | Habra II | ASHUDI |
| 107 | Habra II | BIRA-RAJBPUR |
| 108 | Habra II | KAMARPUR |
| 109 | Habra II | KANKPUL |
| 110 | Habra II | MATIAGACHHA |
| 111 | Habra II | TALSA |
| 118 | Haroa | AMTA |
| 119 | Haroa | GOPALPUR |
| 120 | Haroa | HAROA |
| 121 | Haroa | HAROA (AuG) |
| 122 | Haroa | SALIPUR-MAZZAMPUR |
| 123 | Hasnabad | ASHRIA NARAYANPUR |
| 124 | Hasnabad | BHAVANIPUR |
| 125 | Hasnabad | ABAD KULIDANGA |
| 126 | Hasnabad | BARUNHAT & PATIKHANPUR |
| 127 | Hasnabad | BHURUNDA (POND) |
| 128 | Hasnabad | CHAK PATULI |
| 129 | Hasnabad | CHANDPUR |
| 130 | Hasnabad | CHHIMMALPUR |
| 131 | Hasnabad | DAKSHIN BHEBIA |
| 132 | Hasnabad | GHUNI(POND) |
| 133 | Hasnabad | KRISHNAPARA |
| 134 | Hasnabad | KONANAGAR |
| 135 | Hasnabad | JAMBERIA (POND) |
| 136 | Hasnabad | JAMBERIA ABAD (POND) |
| 137 | Hasnabad | HULAR CHAK (POND) |
| 138 | Hasnabad | HASNABAD |
| 139 | Hasnabad | MURARISHA |
| 140 | Hasnabad | RAJAPURA |
| 141 | Hasnabad | UTTAR AKHARTALA (POND) |
| 142 | Hingalganj | RUPMARI |
| 143 | Hingalganj | DURIAPUR-BAYLAN |
| 144 | Hingalganj | KALITALA |
| 145 | Hingalganj | KANIKATTI |
| 146 | Hingalganj | KHUINA-BHINDERKHALI |
| 147 | Hingalganj | PUKURIACHAK (P) |
| 148 | Hingalganj | PURBA DAKSHIN CHARALKHALI |
| 149 | Hingalganj | SAHEBKHALI |
| 150 | Swarupnagar | SHRIDHAR KATI |

| SCHEME_SLNO | Block_Name | Sc_Name |
|---|---|---|
| 151 | Hingalganj | CHAITAL |
| 152 | Minakhan | CHAMPALI |
| 153 | Minakhan | KUMARJOL |
| 154 | Minakhan | MALANCHA |
| 155 | Minakhan | MOHANPUR |
| 156 | Minakhan | NURPUR |
| 157 | Minakhan | PADMAPUKURIA |
| 158 | Minakhan | TATULTALA |
| 159 | Minakhan | HUDARATI |
| 160 | Rajarhat | BISHNUPUR_PWSS |
| 161 | Rajarhat | PATHARGHATA |
| 162 | Rajarhat | REKJUANI |
| 163 | Rajarhat | THOKDARI |
| 164 | Rajarhat | BAMUNIA ABAD |
| 165 | Sandeshkhali I | BAYERMARI ABAD |
| 166 | Sandeshkhali I | FAKIRTAKIA |
| 167 | Sandeshkhali I | KALINAGAR |
| 168 | Sandeshkhali I | ATAPUR |
| 169 | Sandeshkhali II | BOUTHAKURANI |
| 170 | Sandeshkhali II | DURGAMANDAP |
| 171 | Sandeshkhali II | DWARIR JANGLE |
| 172 | Sandeshkhali II | GABBARIA |
| 173 | Sandeshkhali II | JELIAKHALI PASCHIM KHANDA |
| 174 | Sandeshkhali II | KAORAKATI |
| 175 | Sandeshkhali II | KHULNA-BHADERKHALI |
| 176 | Sandeshkhali II | MONEPUR |
| 177 | Sandeshkhali II | BARABANKRA |
| 178 | Swarupnagar | BARA-BANKRA |
| 179 | Swarupnagar | BITHARI |
| 180 | Swarupnagar | DAKSHIN CHATRA |
| 181 | Swarupnagar | DOBILA |
| 182 | Swarupnagar | GOKULPUR |
| 183 | Swarupnagar | GOKULPUR |
| 184 | Swarupnagar | KAPILESWARPUR |
| 185 | Swarupnagar | NABATKATI |
| 186 | Swarupnagar | NALABARA |
| 187 | Swarupnagar | NITYANANDAKATI |
| 188 | Swarupnagar | PARUI |
| 189 | Swarupnagar | PATUA |
| 190 | Swarupnagar | SONARPUR |
| 191 | Swarupnagar | TARANIPUR |

**Figure 21: Present Coverage of PWSS in North 24 Parganas**

# Chapter 4 Prevailing Sanitation System

## 4.1 Rural Sanitation Initiatives

The Government of India has taken initiatives for improvement of rural sanitation and hygiene for almost the last four decades.

The Central Rural Sanitation Programme (CRSP) was started in 1986primarily with the objectives of improving the quality of life of the rural people and to provide privacy and dignity to women. The Total Sanitation Campaign (TSC) was launched by Government of India in 1999to provide all households with sanitation facilities and promote hygiene behaviour. The concept of sanitation was expanded to include personal hygiene, home sanitation, safe water, garbage disposal, excreta disposal and waste water disposal. This demand driven approach emphasized more on Information, Education and Communication (IEC), Human Resource Development, Capacity Development activities to increase awareness among the rural people, and generation of demand for sanitary facilities. This enhanced people's capacity to choose appropriate options through alternate delivery mechanisms as per their economic condition. The Programme was implemented with focus on community-led and people centred initiatives. Financial incentives were provided to Below Poverty Line (BPL) households for construction and usage of individual household latrines (IHHL) in recognition of their achievements. Assistance was also extended for construction of school toilet units, Anganwadi toilets and Community Sanitary Complexes (CSC) apart from undertaking activities under Solid and Liquid Waste Management (SLWM).As part of this initiative, the Government started Nirmal Gram Puraskar (NGP) that sought to recognise the achievements and efforts made in ensuring full sanitation coverage in a Gram (Village).

TCS was renamed as 'Nirmal Bharat Abhiyan' (NBA) to accelerate sanitation coverage in rural areas to achieve the vision of Nirmal Bharat by 2022 with all village Panchayats in the Country attaining open defecation free (ODF) status. The unit cost was enhanced to Rs.10,000 inclusive of assistance through convergence with Mahatma Gandhi National Rural Employment Guarantee Scheme. In 2012, the incentive provided under the scheme for construction of Individual Household Latrines (IHHL) for Below Poverty Line (BPL) households was also extended to Above Poverty Line (APL) households, but restricted to people from SC/ST communities, small and marginal farmers, landless labourers with homestead, differently abled and women headed households.

The GOI launched Swachh Bharat Mission (Gramin) (SBM) on 2nd October 2014. This successor programme of NBA aims to accelerate the efforts to achieve universal sanitation coverage and to achieve Swachh Bharat by 2019 as a fitting tribute to the 150th Birth Anniversary of Mahatma Gandhi. The Mission aims to strive towards its stated goals by removing the bottlenecks that were hindering the progress and by focusing on critical issues affecting outcomes.

SBM is being implemented by the Ministry of Urban Development (MoUD) and by the Ministry of Drinking Water and Sanitation (MoDWS) for urban and rural areas respectively.

Under the SBM (G), the focus is to achieve ODF villages. The MoDWS has given the States the liberty todevelop their own mechanisms for ODF verification based on the guideline and framework laid by the Ministry. To have an uniform benchmark, ODF has been defined as the termination of fecal oral transmission, which requires:

i. No visible feces found in the environment/village;
ii. Every household, as well as public/community institutions, to be using safe technology options for disposal of feces. (Safe technology option means "no contamination of surface soil, ground water or surface water; excreta inaccessible to flies or animals; no handling of fresh excreta; and freedom from odour and unsightly condition")

The GoWB has set up a dedicated institution, 'Mission Nirmal Bangla' in the Panchayats & Rural Development Department, aimed at bringing positive changes in the physical quality of life in the

villages by promoting cleanliness, hygiene and elimination of open defecation. The specific goal of the Mission is to transform all the villages of West Bengal to ODF status by 2nd October 2019.

### 4.2 Toilet Coverage and Sanitation Scenario

As per the data available from the website of SBM rural , all the 200 gram panchayets in 22 blocks of the District have been confirmed as ODF verified and have been declared ODF (Refer Table 1 and 2: Annex 12). This verification is actually a multi layered process starting from the village, Gram Panchayet level, to the block and zilla parishad level and finally to the block and district level. A standard procedure is followed for ensuring ODF verification and independent third party review is done.

It is observed from the latest census data that pit latrines and pour flush latrines were predominant in the urban areas of the District (Table 2, Annex 11),. Around 6000 service latrines were noted during the civic amenities survey in 2009, most of them being located in the census towns of Swarupnagar, Gaighata and Barrackpore I. The Panchayet and Rural Development Department, GoWB has confirmed that the urban areas of the district havenow attained ODF status.

# Chapter 5 District Criticality Assessment

## 5.1 Critical Issues

The National Sub-mission for Arsenic and Fluoride has laid down a clear guideline for priority as follows:

- Habitations not covered by any other existing long term programme of central or state Government; and
- Habitations having higher degree of contamination as per IMIS Data.

The analysis of groundwater quality data indicates that at present 94% PWSS are groundwater based. Hydrogeological reports and groundwater quality analyses indicate that between 20 mbgl to 80 mbgl, the groundwater is affected by arsenic contamination in all the 22 blocks in the District (refer Section 2.5.1). Withdrawal of water from deeper aquifers beyond 350 mbgl is a possible option but in the absence (Section 2.4.1) of any impermeable layer separating the arsenic affected shallower aquifer and the deeper aquifer, the chances of cross contamination are quite high. So the ultimate solution to providing safe drinking water is to opt either for surface water sources or groundwater schemes fitted with ARP.

## 5.2 Criticality Assessment for Water Availibility

As per the CGWB assessment, all the blocks in the District are under safe category, so availability of ground water is not an issue. However, the ground water quality is not suitable for drinking without ARP treatment and surface water sources are the preferred option..The main source of surface water for this District is the River Hooghly. The other rivers of the District, like Ichhamati and Kalindi, are either not perennial or carry insignificant water during the non-monsoon season. Most of the rivers in the southern fringe of the district, which is part of the Sunderban area are saline in nature due to tidal effects. The water demand of the whole North 24 Parganas is around 1060 MLD22 at present, which is 1.2% of the available flow (Section 2.2.4) in the River Hooghly. A summary of the lean season flow data of River Hooghly is given below:

**Table 13: Lean Season flow data in river Hooghly (1996)23**

| Period | Flow ( in MLD) | Period | Flow ( in MLD) |
|---|---|---|---|
| Jan. 1- 10 | 97804.80 | Mar. 20-31 | 61776.00 |
| Jan. 11-20 | 92880.00 | April 1-10 | 58665.60 |
| Jan. 21-31 | 86832.00 | April 11-20 | 50716.80 |
| Feb. 1-10 | 80697.60 | April 21-30 | 50112.00 |
| Feb. 11-20 | 76377.60 | May 1-20 | 52531.20 |
| Feb. 21-28 | 75772.80 | May 11-20 | 59270.40 |
| Mar. 1-10 | 64800.00 | May 21-31 | 64800.00 |
| Mar. 11-20 | 62380.80 | | |

Clearly the total daily drinking water demand of the whole district is only 2.1% of the total daily discharge in the river Hooghly during the lean season.

[22]Considering @135 lpcd for urban and @70 lpcd for rural

[23]The Ganges water diversion: Environmental Effects and Implication, Water Sc. and Technology, edited M. Monirul Qader *Mirza* (2004)

### 5.2.1 Criticality Assessment of Arsenic Affected Blocks

The criticality of the habitations can be viewed on the basis of three criteria:

- Average arsenic concentration in the habitation
- Coverage by surface water based schemes
- Coverage by any groundwater based PWSS equipped with arsenic removal plant.

The criticality situation is assessed on the basis of each block in the District and the extent of habitations affected with arsenic contamination in the block. This assessment will be helpful as the large water supply schemes consider blocks as the basic unit for coverage.

The criticality of the arsenic contamination of a block can be defined on the basis of Table 6:

- 0.01-0.05 mg/l: Moderate,
- 0.05-0.10 mg/l: High,
- >0.10 mg/l: Very high

Similarly the extent of habitations affected in a block can be categorised as follows (Refer **Error! Reference source not found.**, **Error! Reference source not found.**):

- < 50% affected habitation : Moderate
- 50-75% affected habitation : High
- > 75% habitation : Very high

While assessing the criticality, the impact of the above two parameters are considered in conjunction with the extent of coverage by the surface water based scheme. Any block completely covered by the surface water scheme is considered as “Not critical".

**Table 14: Criticality Assessment of Arsenic Affected Blocks**

| Blocks | Degree of contamination | Extent of contamination (wrt Habitation) | Coverage by Surface Water schemes | %Coverage by PWSS with ARP | Overall |
|---|---|---|---|---|---|
| Barrackpur-I | Moderate | Moderate | Complete | | Not Critical |
| Barrackpur-II | Moderate | High | Complete | | Not Critical |
| Haroa | Moderate | High | None | | Critical |
| Minakhan | Moderate | Very High | None | | Critical |
| Sandeshkhali I | Moderate | Moderate | None | | Moderately Critical |
| Sandeshkhali II | Moderate | Very High | None | | Critical |
| Amdanga | Critical | Moderate | Complete | | Not Critical |
| Bagda | Critical | Moderate | None | 23% | Critical |
| Barasat I | Critical | Moderate | Complete | | Not Critical |
| Barasat II | Critical | High | None | | Critical |
| Basirhat II | Critical | High | None | 15% | Very Critical |
| Bongaon | Critical | Moderate | None | 54% | Critical |
| Hasnabad | Critical | Very High | None | 3% | Very Critical |
| Hingalganj | Critical | High | None | | Very Critical |

| Blocks | Degree of contamination | Extent of contamination (wrt Habitation) | Coverage by Surface Water schemes | %Coverage by PWSS with ARP | Overall |
|---|---|---|---|---|---|
| Rajarhat | Critical | High | None | | Very Critical |
| Baduria | very Critical | Moderate | None | 66% | Critical |
| Basirhat I | very Critical | Very High | Partial | | Critical |
| Deganga | very Critical | High | Complete | | Not Critical |
| Gaighata | very Critical | Moderate | Complete | | Not Critical |
| Habra I | very Critical | Very High | Complete | | Not Critical |
| Habra II | very Critical | Very High | Complete | | Not Critical |
| Swarupnagar | very Critical | High | None | 42% | Very Critical |

It is observed from, the following blocks need immediate attention:

Critical: Haroa,Minakhan, Sandeshkhali II, Bagda, Barasat II, Bongaon, Baduria, Basirhat I

Very Critical: Basirhat II, Hasnabad, Hingalganj, Rajarhat, Swarupnagar

# Chapter 6 Planning for Piped WS System

## 6.1 Piped WS Schemes- Under Arsenic Master Plan

The Arsenic Master Plan, prepared in 2006, had the provisions for implementing PWSS in the North 24 Parganas District shown in Table 15 below.

**Table 15: Future Provisions considered in the Arsenic Master Plan[24]**

| Future Action Plan | Surface water Based PWSS* | | New Ground Water based PWSS (with or without ARP) | | Existing Groundwater Based Schemes fitted with ARP | |
|---|---|---|---|---|---|---|
| | No. of schemes | Design Population | No. of schemes | Design Population (in million) | No. of schemes | Design Population (in million) |
| North 24 Parganas District | 1 | 1.804 | 83 | 1.517 | 57 | 1.016 |
| West Bengal | 8 | 5.8875 | 382 | 8.33 | 165 | 3.642 |

*with or without ARP

This Arsenic Master Plan and the recommendation of the Task Force (Section 1.1) have identified surface water based PWSS as the long term solution for North 24 Parganas.

## 6.2 PWSS Proposed under Vision 2020

The vision document of the WBPHED[25]has outlined the following long-term plan for implementing piped water supply scheme for covering the alluvial zone in the state of West Bengal, which includes the non-coastal (i.e., excluding the blocks of the district in Sunderban area) part of the North 24 Parganas district :

i. Surface water based piped water supply schemes with river as source: 50%
ii. Ground water based piped water supply scheme tapping uncontaminated aquifer where Available: 10%
iii. Ground water based piped water supply schemes with provision of Fluoride / Arsenic / Iron removal unit to treat contaminated ground water: 12%

The remaining 28% is proposed to be covered by pond based water supply schemes with suitable treatment (15%), rooftop rainwater harvesting schemes for individual household and institutions (2%) and through sinking of new hand pump based borewells (11%). In the coastal part of the State, which includes parts of the North 24 Parganas District (refer Section **Error! Reference source not found.**), the long term plan described in the vision document for coverage through piped water supply scheme is as follows:

i. Surface water based piped water supply schemes with ponds as source without R.O./desalination treatment unit: 15%
ii. Surface water based piped water supply schemes with river as source with R.O./desalination unit to treat saline water: 25%
iii. Groundwater based piped water supply schemes tapping sweet water aquifer, wherever available: 20%
iv. Groundwater based piped water supply scheme with provision of solar powered R.O./ desalination plants to treat brackish groundwater : 35%
v. Roof top rainwater harvesting schemes on institutions and individual households with provision of recharge well / shafts: 5%

[24]Master Plant to Tackle Arsenic Contamination of Groundwater in West Bengal, May 2006, WBPHED
[25]Vision Plan 2020, WBPHED, August, 2011

It has been already mentioned in Section 2.3, that a large number of sweet water ponds in the Sunderban area has been destroyed recently during the AILA. The sustainability of pond based water supply schemes, even without RO, is doubtful and the installation of RO will increase the investment cost. Fresh wateris available in confined aquifer at a depth in the range of 300-350 m (Section 2.4.3) but the possibility exists for arsenic cross contamination in that layer and furtherhydrogeological study is required before considering the confined aquifer as a possible source.

### 6.3 PWSS under National Sub-mission

With the formation of the National Water Quality submission for the Arsenic and Fluoride affected areas (Section **Error! Reference source not found.**), WBPHED has conceived four surface water based PWSS for approval from the sub-mission with financial assistance (on 50:50 sharing ratio). These four schemes are aiming to cover the 13 blocks of the District (ReferTable 12) not covered by any of the two existing surface water based schemes and mostly dependent on the ground water based PWSS and spot sources. These four schemes are:

i. Scheme covering Rajarjat, Haroa and Bhangar II ( 2 blocks of N 24 Parganas)
ii. Covering Bangaon and Bagda ( 2 blocks)
iii. Scheme covering Baduria, Barasat-I and II, Swarupnagar, Basirhat-I and II (6 blocks)
iv. Scheme covering Hingalganj (20%), Minakhan, Sandeshkhali-I and II (80%) (3 blocks)

Figure 16 gives an overview of the proposed schemes including the existing and ongoing ones. The coverage of the schemes is summarised in Table 16

Out of these 4 schemes, the detailed design and planning have been completed for the first two schemes, while the remaining two are still in conceptual stage. The cost estimates shown for the last two schemes are on lump sum basis. For the first two schemes, the electro-mechanical part has been estimated on the basis of prorata basis with total cost for civil works worked out in detail. The costs shown in Table 16include water metering and provision for house connections. However, all the scheme costs have assumed an 8 hour supply instead of the currently stipulated guideline for 24x 7 supply.

The NRDWP funding for these scheme will be on a 50:50 ratio (with state sharing) for the arsenic affected habitations and the cost of all the en-route non arsenic affected habitations are to be borne by the State government. The proposed schemes are discussed below in brief:

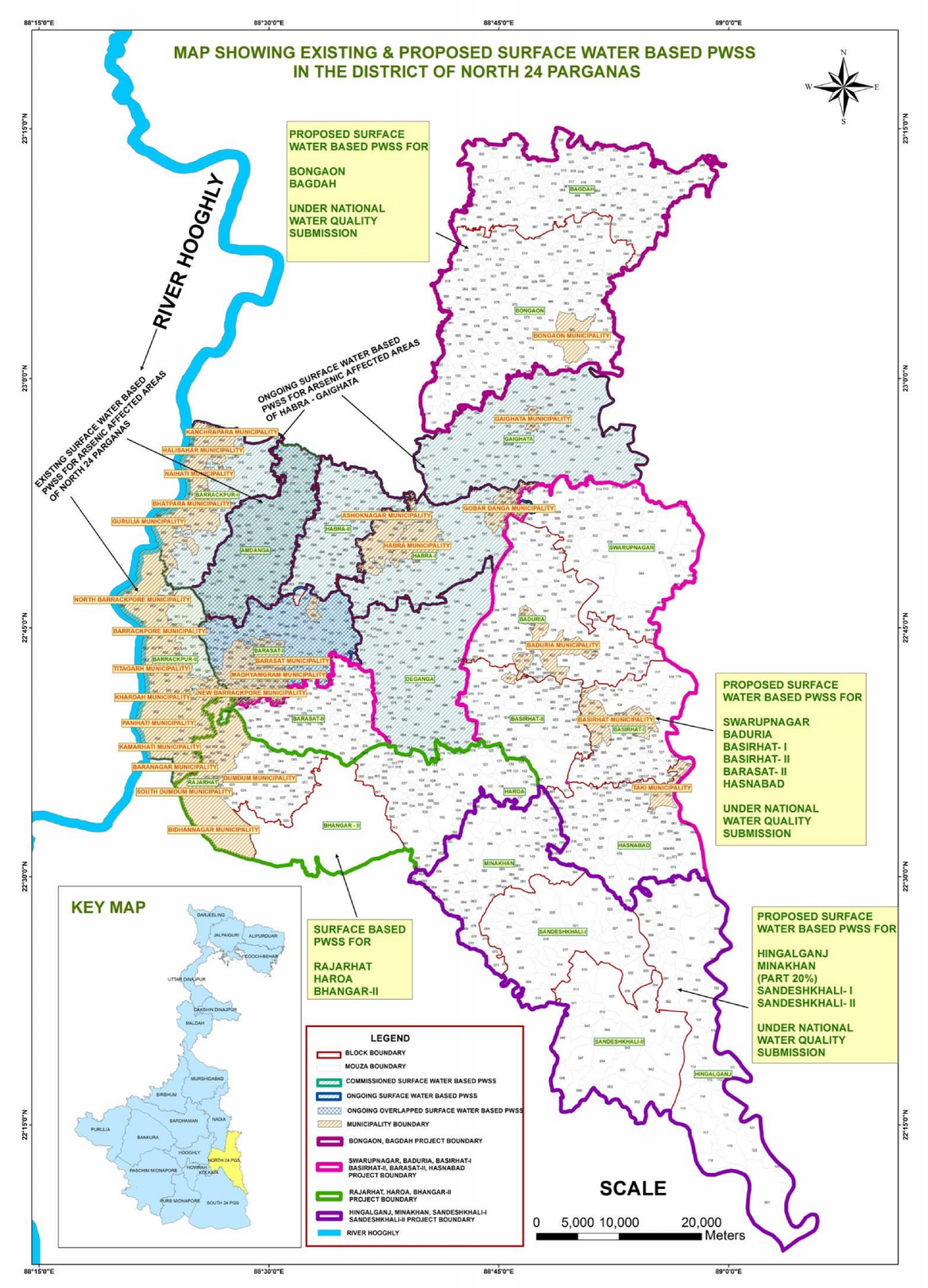



**Figure 22: Proposed Surface Water based Schemes under National Submission**

**Table 16: summary of Proposed Surface Water Based PWSS**

| Scheme Name | Blocks Covered | Source | Estimated Cost ( millions INR) | Number of Habitation Covered | Population (Census 2011) | Design Population (2046) | Arsenic affected Population | % of population affected |
|---|---|---|---|---|---|---|---|---|
| Surface Water based Piped Water Supply Schemes for Haroa, Rajarhat & Bhangar II | Haroa, Rajarhat and Bhangar-II | River Hooghly | 686.94 | 728 | 525644 | 806,588 | 447989 | 85.23% |
| Surface Water based Piped Water Supply Schemes for Bongaon, Bagda | Bongaon, Bagda | | 694.84 | 980 | 623877 | 842,234 | 519807 | 83.32% |
| Surface Water based Piped Water Supply Schemes for Swarupnagar,Baduria, Basirhat I & II, Hasnabad and Barasat-II | Baduria, Barasat-I and II, Swarupnagar, Basirhat-I and II | | 914.33 | 1724 | 1140055 | 1,539,074 | 1113176 | 97.64% |
| Surface Water based Piped Water Supply Schemes for Hingalganj, Minakhan Sandeshkhali | Hingalganj (20%) Minakhan, Sandeshkhali-I and II (80%) | | 594.08 | 1057 | 743065 | 960,135 | 734894 | 98.90% |

As per the information obtained from the PHED department.

**Haroa Rajarhat Bhangar II Scheme:**

This scheme aims to cover Haroa and Rajarhat blocks in the North 24 Parganas district and Bhangar II in the South 24 Parganas. The total coverage will be 728 habitations benefitting a design population of 0.806 million (2046) with a per capita supply of 70 lpcd. Rajarhat and Haroa has less than 50% of the habitations affected by arsenic contamination in the ground water (refer Section). However from the criticality viewpoint, Rajarhat falls under the category of Very Critical and Haroa under Critical (refer Table 14).

Initially the water for this project was to be supplied from the existing WTP in the Rajarhat area. Bhangar-II block was also considered as a part of the scheme and the total demand was around 100 MLD. It had been intended that WBPHED would buy this water from HIDCO. However, it has recently been decided to construct a separate WTP of capacity 100 MLD (22 MGD) with necessary clear water transmission mains and three GLRs with booster PS, under the ADB funding for this project. This design capacity now also includes the supply to the Bhangar I block of South 24 Parganas. The raw water supply will be from the already constructed 562 MLD (125 MGD) intake arrangement on the River Hooghly via a raw water transmission main feeding the settlement lagoons immediately upstream of the existing Rajarhat WTP.


**Figure 23: Coverage of Haroa-Rajarhat- Bhangar II Scheme**

Details of this scheme are given in Annex 13. With financial assistance from GoI, the scheme has already started with the laying of the transmission mains feeding the proposed booster stations and the overhead tanks, which are spread over 41 zones in the three blocks. Identification of land for all the major components of the scheme has been completed.

**Surface Water Scheme for Bangaon and Bagda**

The Bangaon and Bagda scheme will cover completely the rural areas of the two blocks, both of which fall under Critical category with respect to overall criticality assessment (refer Table 14). With less than 50% of the habitations affected with higher arsenic contamination in the ground water (refer Section 2.5.1), the proposed scheme will serve a design population of 1.235 million (2046) with a per capita supply of 70 lpcd. The total water demand for the scheme, including an allowance for system losses, is 107 MLD. The raw water for the scheme will come from the proposed intake over River Hooghly near Naihati and be treated at a conventional WTP located at a distance of 4.3 km, before the treated water is pumped to two booster stations located in Bangaon and Bagda.

The necessary clearance for the intake location has not yet been obtained and the identification of land for the different components of the scheme is yet to be started.

Details of the scheme are given in Annex 13.

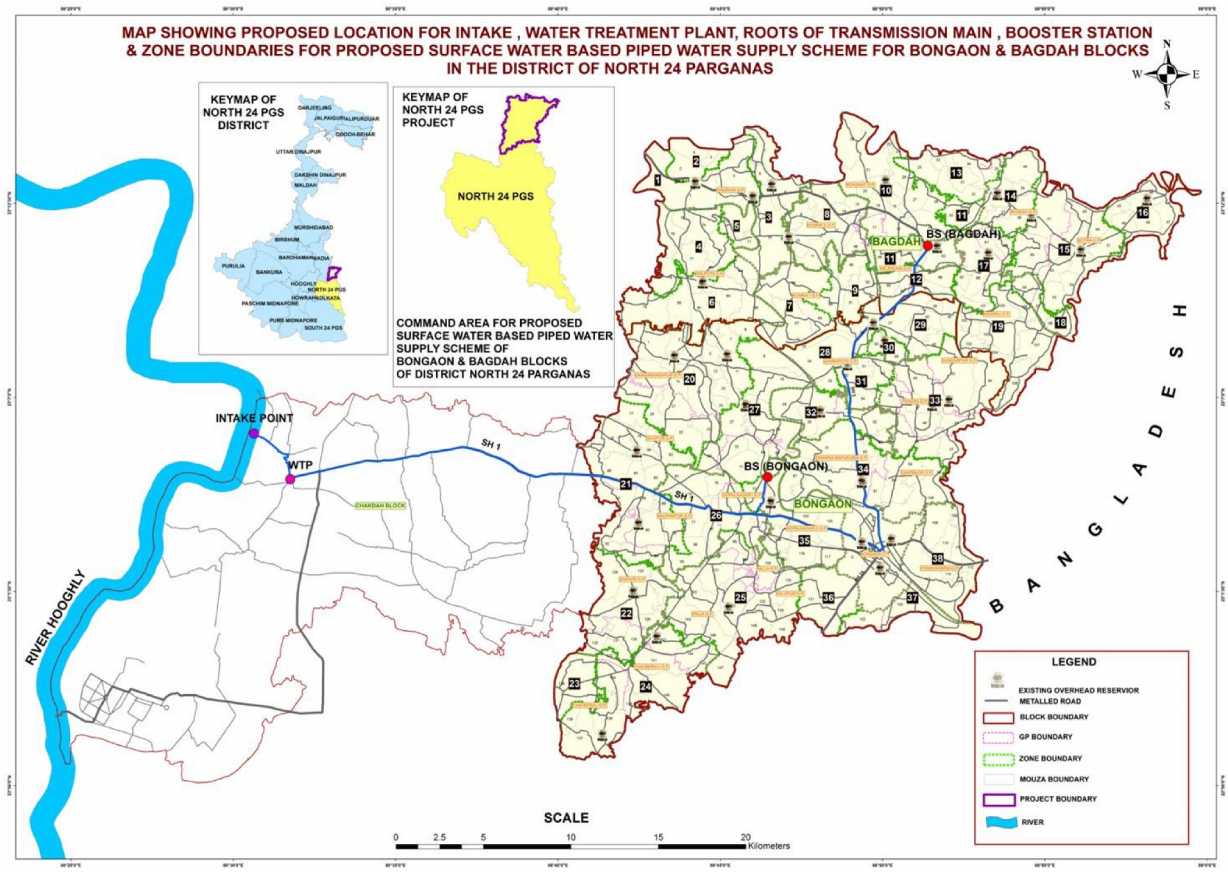



**Figure 24: Coverage of Bangaon Bagda Scheme**

**Surface Water Scheme for Swarupnagar, Baduria, Basirhat I & II, Hasnabad and Barasat-II**

This proposed scheme covering six blocks is still in the conceptual stage. Three of the six blocks (Basirhat II, Hasnabad and Swarupnagar) are falling under the Very Critical category for arsenic contamination and present availability of safe water, while the remaining three fall under Critical category (Refer Table 14).The scheme will serve a design population of 1.99 million (2046) with a total demand of 171 MLD, with a per capita supply of 70 lpcd. This demand will also include 15% system loss and 5% institutional demand. The 95 zones in the proposed project area will be served by 100 new OHRs and 54 existing OHRs, which are part of the existing ground water based PWSS schemes.

**Surface Water Scheme for Hingalganj (20%) Minakhan, Sandeshkhali-I and II (80%)**

This scheme is in the conceptual stage and considers only partial coverage in Hingalganj and Sandeshkhali. With numerous rivers creating many islands in these blocks (Section **Error! Reference source not found.**), provision of an integrated bulk water supply service to all the four blocks may not be possible.

## 6.4 PWS in the blocks located in Sunderbans Area

In the Vision 2020 document, the salinity affected coastal areas of Howrah, Purba Medinipur and North and South 24 Parganas are considered as a separate zone (Zone 5). A budgetary fund of INR30, 450 million has been allocated for covering 4.679 million

people with PWSS (INR 6,384per capita). Under the West Bengal Action Plan on Climate Change, the Sunderbans was identified as needing improved drinking water supply. The Sunderbans Development Board is now taking effective steps to develop water related infrastructure in the region. INR100 crore (US$15 million approx.) has been earmarked under each of the 12th and 13th GoI Plans for surface water treatment plants in Saline Coastal Zones.

The Sunderbans Water Supply Review committee was constituted in September, 2014 for identifying suitable technologies as well as sweet water aquifers to provide water supply to the island blocks (Refer Section 2.4) of Sunderbans. The committee decided that water supply level for drinking and cooking will be 10 lpcd and that for other uses will be 30 lpcd. Drinking and cooking water will be supplied through automated water dispensing units (water ATMs) while the rest will be through street standposts. Individual house connections are not considered. In case of non-availability of conventional power, solar power shall be used as an alternative source. This Committee has made the following recommendations:

- If there is any sweet water aquifer available at any spot then that aquifer may be tapped for water supply with 100 mm X 50 mm (newly bored) tube well covering a single habitation;
- If sweet water aquifer is not available, then the upper layer containing saline water may be tapped and RO to be provided to reduce TDS;
- RO-water will be supplied to the community @ 10 LPCD for drinking & cooking etc. and balance demand will be fulfilled from untreated water through piped water supply scheme;
- A ceramic membrane may be used with combination with RO to remove very fine suspended particles, organic matter and colloidal particles (e.g. in Hingalganj and North 24 Parganas where organic matter is present in the groundwater in some places); and
- Initial proposals may be made for I000-2000 person @l0lpcd supplied in a six hour period.

These recommendations suggest that it may not be achievable to provide 70 lpcd water in the Sunderbans areas of the blocks and the population may have to settle for a reduced supply of 40 lpcd

Recently the detailed planning and design of a desalination based surface water scheme with intake from Ichhamati river has been prepared by the WBPHED for Hasnabad (P) and Barunhat Rameswar (F) under the Hasnabad block. With a total demand 4.42 MLD, the scheme will supply to 14 villages with a design population of 0.05 million (2046) with a supply rate of 70 lpcd. The estimated per capita cost on design population INR 20,063 (US$306 approx.) which is quite high compared to the surface water based schemes with conventional treatment.

# Chapter 7 Identified Feasible Schemes

To cover those parts of the District not covered with existing surface water based piped water supply schemes, the four schemes mentioned in 6.3 above have been considered.

The feasibility of these schemes can be evaluated with respect to certain basic criteria:

**Water Source Sustainability:** All these schemes are withdrawing water from the Hooghly River and sufficiency and water quality issue of the Hooghly River has been already discussed in Section. 2.8

**Availability of Land:** For the Rajarhat-Haroa-Bhangar Scheme, no land acquisition is required for WTP and main Booster station. For other scheme components, land acquisition is in progress. With the implementation of Negotiable Purchase of Land for procurement of private lands, this is not expected to be a problem.

**Technical Feasibility:** All the schemes are based on the standard technology of water treatment based on flocculation with chemical dosing, clarification in tube/plate settler and chlorination before supplying to the user. The major pollutants requiring removal are turbidity and bacteriological contamination. Mechanical dewatering has been considered as a space saving option for large WTPs.

Other areas of the District, not covered by these four schemes, or the existing and ongoing schemes (surface water based scheme for North 24 Pargans and the Habra-Gaighata scheme) may have to be provided with water using more costly technology such as RO based desalination plant treating the saline water from the aquifer or from streams affected by tidal flows.

The coverage will not be 100% for the Sandeshkhali I and II and Minakhan blocks. It is already discussed in Section 2.4, that most parts of these blocks are crisscrossed by a number of rivers, also connectivity is not good with the state and National highways and there is lack of metalled roads. So alignment of pipe along the existing roads may not be possible and finding the right of the way for laying the pipes may be difficult. The option for these areas can be:

i) Pond based Schemes with necessary minimal treatment to supply users @40 lpcd. However, the sweet water ponds in these areas have been substantially destroyed following the devastation by AILA. An option may be to use the ponds with moderately saline water as source of water with necessary treatment in RO based desalination plants

ii) Ground water based schemes with treatment of drinking water part in RO based desalination plants and disinfection for the part supplied for other works. It has been already discussed that the confined aquifers can be tapped for ground water if salinity can be removed. The advantage of using RO based system is in future this will also eliminate the Arsenic contamination, if any, gets into the aquifer, from where water is extracted. Considering the scheme for Sridhar-kati and its mouza, it is observed that in case of an RO based scheme the per capita cost becomes slightly higher ( Rs 12000 compared to Rs 7000 for normal surface water based schemes)

# Chapter 8 Conservation and Demand Management

Considering the quality issue there is limited availability from ground water in the North 24 Parganas district due to geogenic reasons, aggravated by anthropogenic activities. A number of surface water sources (like Icchamati, Bidyadhari) have become impaired due to unplanned human activities (like siltation, improper encroachment of the river channel). In this context, Water Conservation and Demand Management are critical components. This is also the strategy adopted by NRDWP, for achieving its vision of supplying water to achieve its goal of enough safe water for drinking, cooking and other domestic needs for every rural person by 2022.

## 8.1 Water Conservation and Management

Water conservation involves adopting strategies for preservation, control and development of water resources (both ground and surface) by limiting or modifying the use of water by human beings, so that the use does not cause fluctuations of water quantity and quality within any cycle beyond that caused by natural events. Water Demand Management (WDM) refers to "any measure that aims to improve the efficiency of water used to achieve a specific task; adjust the nature of the task or the way it is accomplished so that less water or less high quality water is used; reduce losses in quantity and/or quality of water flows from source through use to disposal; and/or shift the timing of use from peak to off-peak periods". WDM also includes measures to increase the effectiveness of the water system to serve society during times when water is in short supply (e.g. drought)"[26]. Water conservation is more related to sustainable use of resources while Demand Management is more related to end usage / consumption and its control / regulation.

The NRDWP document on drinking water safety and security has proposed a layered approach from the national level to the district level through the state level. The national level emphasis is on policy issues like regulation of ground water development, the need to notify all over-exploited blocks, involving farmers in ground and drinking water management schemes and promotion of efficient irrigation system. The state's responsibility has been confined to sub-block levels, monitoring and regulating over-abstraction of ground water in over-exploited blocks, water efficient agricultural practices, recycling and reuse of wastewater, water treatment by industry, and environmental water protection from industrial effluents, fertilizers, pesticides and untreated sewage.

### 8.1.1 Ground water Recharge

In order to arrive at the suitability and appropriateness of the artificial re-charge structures, detailed study / information related to remote sensing techniques and through hydro-meteorological, hydrological, geophysical, hydro-geological and hydro-chemical investigations are required to ascertain the scope and feasibility of artificial recharge.

The Central Ground Water Board (CGWB) has recommended various artificial recharge methods and structures suitable for different slope categories, aquifer types and amount of precipitation received. These include percolation tanks, recharge pits, and recharge wells.

### 8.1.2 Rainwater Harvesting Initiatives by GoWB

***Jal Dharo-Jal Bharo***

It has been already discussed in Section 3 that PHED has initiated a number of Pond based water supply schemes.

[26] Water Demand Management, Poverty & Equity, Stephen Tyler, December 2007

The objective of the "Jal Dharo-Jal Bharo" programme is to harvest rain water in all kinds of water bodies viz, tanks, ponds, reservoirs, canals and underground artificial recharge through rooftop rain water harvesting. For conservation and storage, rain water/surface run-off is arrested in derelict/silted tanks after proper de-siltation mainly for irrigation purposes.

The Department of Water Resources Investigation & Development is not only executing water harvesting structures under a different plan fund but is also engaged in re-excavation of tanks and other water bodies under MGNREGA programme in convergence with P&RD Department, Govt of West Bengal. Different types of structures like Check Dams, Water harvesting Tanks and Surface Flow Minor Irrigation Schemes are being constructed for arresting surface run-off vis-a-vis utilisation of stored water for irrigation/other purpose

**Table 17: Waterbodies created under different schemes**

| District | Convergence with P&RD Total no of Water Bodies | Grand Total of water Bodies of P&RD and WRDD |
|---|---|---|
| 24 Parganas(N) | 15383 | 16046 |

### 8.1.3 Activities undertaken by PHED

During the year financial years 2011-12 to 2013-14, “Roof Top Rain Water Harvesting, Conservation and Artificial Recharge to Ground Water" schemes have been implemented in North 24-Parganas (out of 27 such Schemes in the state during that period). These are Post Graduate Govt. Institution for Physical Education Campus, Banipur and Jawahar Navodaya Vidlaya (Habra- I), and Amdanga Panchayat Samity (Amdanga Block).

### 8.1.4 Catchment Management Plans

**Hooghly River**

River Hooghly is the major source of surface water based drinking water supply systems in the District. So maintaining the water quality through development of catchment management plan is important.

As part of the "Namami Gange[27]" initiative under the National Mission for Clean Ganga, following interventions[28] will ensure better catchment management

i. Nirmal Dhara
   - Ensuring sustainable municipal sewage management for the urban areas
   - Managing sewage from Rural Areas to keep all Gram Panchayets along the blank clean. In West Bengal there are 224 such Gram Panchayets[29] and already 315,934 household level toilets has been constructed in these GPs
   - Managing Industrial discharge
   - Improvement of crematoriums

ii. Aviral Dahara comprising reinforcing River regulatory zones on Ganga banks, rational agricultural practices, efficient irrigation methods, restoration and conservation of wetlands

27An Integrated Ganges Conservation Mission called “Namami Gange” has been set up during 2014-15 budget session for Rejuvenation of the river Gangers, from its source near Haridwar to the outfall in Bay of Bengal, by consolidating the existing ongoing efforts and planning for a concrete action plan for future.

28http://nmcg.nic.in/NamamiGanges.aspx

29www.indiaatcop22.org

**Local catchment management**

Catchment ponds are also important water sources. To ensure better performance of pond based water supplies, the following points need to be considered30:

- Depth of the pond should be below the lowest water table (average during the lean period) for sustainability of water supply
- Preparation of earth fill material with optimum moisture needed
- Placement and compaction of earth in layers are to be provided
- Provision may be made for irrigation outlet and spillway
- The slopes should be trimmed to correct angle
- Protection of upstream and downstream slopes may be made
- Embankment round the pond should be made to prevent direct entry of water in the pond
- Maintenance requirements like prevention of surface erosion, wave action, damage by
- Cattle and human beings etc should be strictly controlled.

## 8.2 Demand Management Strategies

Water Demand Management relies on measuring water availability and supply (water budgeting); implementing measures to conserve, protect, enhance and manage surface and ground water resources (including construction of rainwater harvesting and ground water recharge structures); developing local self-regulation for water demand management; modifying agricultural practices and crop patterns and use of more efficient irrigation systems to ensure source sustainability. The broad heads under the demand management can be categorised as

i. Operational Measures
ii. Socio-political Measures and
iii. Economic Measures

The various adoptive strategies for Water Demand Management shall depend on:

- Increasing System Efficiency
- Increasing End Usage Efficiency and
- Providing for Distributed sources of Supply

We look at the various likely measures that could be adopted under the present scenario for the district of North 24 Parganas.

### 8.2.1 Operational Measures

The operational measures of demand management that can be undertaken to achieve better control and meet the demand management, may involve:

- Ensuring 24x7 supply: case studies indicate the total water consumption can be reduced in the rural water supply schemes by providing 24x7 supply. The present bulk water supply schemes in the district are all designed to supply for 8 hours and that needs to move towards 24x7.
- Providing household connection with metering: This ensures equitable distribution of resource and promotes efficiency. Most of the existing PWSS provide connections upto habitation level and not to the households. The cost of house connections should be included in the project cost. The relevance of water metering including flow regulating / restricting devices are a part of the efforts to monitor and regulate water consumption. All such measures add cost to the system and require careful understanding. Prevailing water supply system designs have been operative on standpost basis for the communities, and as

[30]Guideline for Water Safety plans for Rural Water supply Systems, Sulabh International Academy of Environmental Sanitation, Supported by WHO, india

such the need for metering never made economic sense. However, water metering can be exercised at a village / habitation level or even on commercial / institutional usage (Schools, Government Offices) etc depending on each situation.

- Implementation of SCADA: The NRDWP guidelines require the inclusion for SCADA (Supervisory Control and Data Acquisition) as part of the provisions to be considered for all schemes, to minimize water losses for mega schemes of more than INR 200 million. The emphasis is to have a comprehensive data acquisition and monitoring system (Flow and Pressure monitoring) which will allow operators to assess leakage losses.
- Recycle and Reuse of Water: As a part of the mandate, the NRDWP also places clear guidelines on the need for recycling / re-use of filter-bed washed water. Such, provisions are to be integrated for all surface water sourced Bulk Water Schemes so as to increase the available water and meet additional demand.

### 8.2.2 Socio-Political Measures

The socio-political means of demand management can be categorized as:

- Policies and Guidelines of the Centre / State Government to specify standards on Service level norms
- Effective Public / Stakeholder Awareness in reducing water wastage
- Judicious usage of Water Use restrictions during periods of water shortages.
- Limiting the per capita supply in the difficult regions
- Efficient Collection of Water Taxes and Operation of Water Supply Scheme by Women's Self Help Groups

In so far as the policies are concerned, the basic minimum service level of potable drinking water supply service in rural areas (In India) that was adhered to since the inception under ARWSP (Accelerated Rural Water Supply Program) was 40 lpcd. The vision in the larger context under 12th five year plan is to cover all rural households @ 70 Lpcd. However, in some regions 40 lpcd may still be the most feasible supply option.

The proposition of a water tariff has been suggested under the NRDWP guidelines. The tariff collection from every household and management of water supply scheme at the GP level shall be carried out by the Village and Water Sanitation Committee, (VWSC). The Public / Stakeholder Awareness to carry out awareness activities on water related issues are to be conducted by the VWSC.

### 8.2.3 Economic Measures

Economic techniques may depend on Incentives such as rebates, tax credits to allow for higher consumption and Disincentives such as real costs, penalties etc.

Based on the operational costs, there must be provisions though off to define adequate means to cover the recurring costs of operating and maintain the system. Water subsidy maybe an option, but there must be logical justification to support the subsidy in case the consumptions / usage are more.

The NRDWP guidelines advise the implementation of a suitable Water Tariff Plan which is socially and politically acceptable.

# Chapter 9 Water Quality Action Plan

The objectives described in Vision 2020 (refer Annex 17) document put emphasis on Water Security issues which treat the quality and quantity of the supplied water equally .A Water Quality Action Plan is an important means for translating the actions related to water security issues into reality. The NRDWP guideline has described district water security plan. This includes inter-village distribution, maintenance of water grid, etc. handled by the State Government and or its agencies/public utilities and other funding agencies. So the District Water Quality Action Plan has been prepared in line with that.

## 9.1 Source Sustainability and Participatory Planning

One of the key issues of the Water Quality Action Plan relates to water security and, as such, participatory planning based on source sustainability. Based on the available data/ information, the issue of ground water quality is the main reason behind over reliance on surface water sources despite sufficient availability of ground water. Other natural sources like ponds and rainwater harvesting structures need protection from natural calamities for being utilised as a long term sustainable source. Such sources at village level require local intervention and monitoring.

Hooghly River, the only perennial source of surface water without any major quality issues, is flowing along Western and South Western boundary of the District. Covering the whole district with supply from this source requires substantial investment in terms of treatment works, transmission mains, reservoirs and pumping stations.

For the blocks in the Sunderbans areas, it will be necessary to adopt a conjunctive use of groundwater and other sources like ponds, along with surface water sources, to achieve a complete coverage. Confined aquifers at greater depths (more than 300mbgl) can be utilised in these areas for abstraction of water for PWSS, but it will require careful and continuous monitoring to ensure the performance of deep borewells is maintained.

## 9.2 Water Quality Management

Following identification of arsenic in groundwater, the importance of groundwater quality monitoring was emphasised by the Arsenic Task force and was strongly recommended in the Arsenic Master Plan. As the first step towards establishing the level of arsenic contamination in groundwater, in 2005-06, a complete water quality survey of all the 132,267 public hand pump fitted tubewells in the 83 arsenic affected blocks was conducted under the Joint Plan of Action with UNICEF. The National Rural Water Quality Monitoring & Surveillance Programme launched in February 2005 with a specific guideline for carrying out the monitoring at the household level has now been merged with NRDWP31. Following the direction of the NRDWP's Drinking Water Quality Monitoring and Surveillance Programme, it is mandatory to carry out tests of 10 critical parameters for ensuring the quality of the source in district and state level laboratories. The Uniform Drinking Water Quality Monitoring Protocol, published by the MoDWS, advocates the need for improved monitoring and surveillance through effective Water Quality Testing, Mapping and Information Sharing, with emphasis on the WHO Guidelines for Drinking Water Quality, which state that *"The most effective means of consistently ensuring the safety of a drinking-water supply is through the use of a comprehensive risk assessment and risk management approach that encompasses all steps in water supply from catchment to consumer"*.

### 9.2.1 Existing Water Quality Monitoring and Surveillance System

The Department of Drinking Water and Sanitation had identified Water Quality Management as one of the Key Strategic objective to meet its goal of adequate and safe

[31] http://www.mdws.gov.in/water-quality-monitoring-surveillance-wqms-0

drinking water for every rural person. The basic premise of Water Quality Management was outlined on 4 fundamentals approaches (Refer Figure 25).

The NRDWP guideline has specified that *"A special monitoring cell and investigation unit at the State headquarters should be set up and headed by a well-qualified and senior officer with necessary supporting staff"*

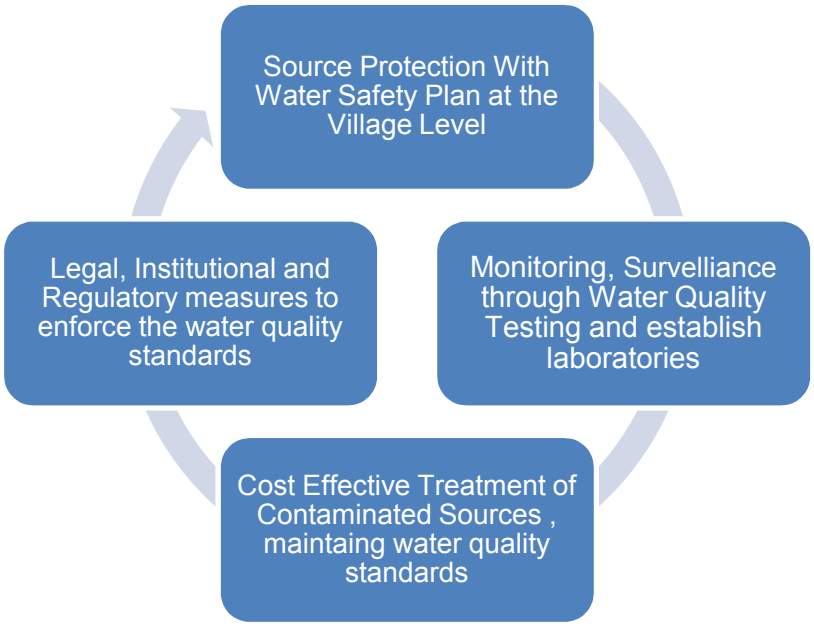



**Figure 25: Approach to Water Quality Management**

The Water and Sanitation Support Organization (WSSO) was thus formed within the PHE Department, GoWB to propagate and fulfill the overreaching objectives of National Rural Drinking Water Programme.WSSO Unit has performed exceedingly well in terms of Water Quality Monitoring and Surveillance including GIS based Mapping, it is felt that there is a need to address the various associated perceived risks in terms of drinking water supply system that could be effectively reduce / minimize contamination of the raw water sources. An Outline of the prevailing Water Quality Monitoring and Surveillance system is presented below.

### 9.2.2 Water Quality Monitoring Setup under PHED

The PHE Department, GoWB maintains 137 Laboratories across the State and has liaisons with another 81 Laboratories managed by Non-Governmental Organizations (NGO's) for performing water quality tests periodically, and maintaining a comprehensive record of water quality across the various Districts. In North 24 Parganas there are 18 laboratories each with a fixed jurisdiction (Refer Part B, Annex 10). All the laboratories have capability of testing Arsenic, Iron and bacteriological parameters. Each laboratory has the capacity to test 3,000-3,600 samples per year. Considering huge number of existing spot sources (in the range of 25,000) and ground water based PWSS, this may not be sufficient. For the laboratories serving the blocks of the Sunderbans and nearby areas in this District, testing for chloride shall be done regularly to assess intrusion of salinity.

In order to bring the water samples from the field, facilitators have been engaged for each Gram Panchayat and trained adequately. These facilitators also play a pivotal role towards sharing of test results with the GP and the users and also help towards creating awareness about water quality in the community. The detailed mechanism of collection of samples from different sources, photographing and geo-tagging of the sources, testing of

the sample and uploading of the test data to central server through smartphone based apps has been described in Part A of Annex 10.

Recently under UNICEF funding, a pilot project on Behaviour Change Communication (BCC) is being carried out in three villages, Bakrachandibaor, Gandharbapur, and Piyara under the Sayestanagar II GP of Baduria block of the district, with the aim of creating consciousness for using arsenic free water. One major step under this project is to create awareness regarding testing of private sources in laboratories for possible arsenic contamination. With the completion of the surface water based schemes, such initiatives will encourage people to take more house connections from PWSS.

## 9.3 Sustainable Service Delivery

Sustainable service delivery requires improved monitoring, and reduced operation and maintenance costs as well as service reliability. For surface water sources, the onus will be on the PHED to be responsible for maintaining the Bulk Water Supply Scheme and VWSC will look into the village level maintenance of the distribution network. In case of small scale ground water based scheme or pond based schemes serving just a few habitations (Refer Section 0), the VWSC is also responsible for creating awareness for source sustainability. Following measures are important for ensuring sustainable services:

### 9.3.1 24x7 Pressurized Water Supply System

In all water supply systems, water loss from reservoirs and pipelines and other non-revenue water is usual and must be minimised.

### 9.3.2 Introduction of SCADA

At present, the use of SCADA in different WBPHED projects is limited to controlling the WTP. This usage should be expanded to cover all the proposed large scale bulk supply schemes, which include more than 100 km of transmission lines and overhead reservoirs spread over more than 50 villages. Flow and pressure measurement is a basic minimum requirement at storage reservoirs and GLRs and measurement of online residual chlorine content at the outlet of OHTs and GLRs will help to achieve better control over safe water delivery. The SCADA system can also be used to remotely open and shut valves on the transmission pipelines and to operate the pumping stations.

### 9.3.3 House Level Service Connection

Prevailing practices of habitation level connections and utilisation of stand posts or community tanks for household level supplies result in water wastage, reduced serviceability and risk of contamination. In absence of house level connections, users may avail arsenic affected hand pumps or shallow wells within their premises as easy source of water. A household level service connection would imply ownership with the service connection and improved service reliability. House connections can ensure highest level of quality control for the supplied water. IEC campaigns can be very effective in this respect to create awareness among users

### 9.3.4 Conclusion and Way Forward

The Water Quality Action Plan is a basic guideline for implementation of the necessary activities required to ensure sustainable and uncontaminated water supplies are available to all the communities within the North 24 Parganas District and to ensure that the objectives as enshrined in “VISION 2020” are achieved.

Some of the select action areas that are deemed necessary under the backdrop of the District Water Quality Action Plan are discussed below:

**Table 18: Water Quality Action Plan**

| Sl. No | Activity / Component | Objective | Action Plan |
|---|---|---|---|
| 1 | Develop a comprehensive program to establish sustainability status of existing water sources | | |
| a | Assessment of ground water quality at habitations yet to be affected by Arsenic contamination | To assess the extent of propagation of contamination in the unaffected areas, particularly if the areas continue to depend on the ground water sources. | Review the sampling protocol at the sources, particularly for Ground water based PWSS and spot sources<br>Encourage people to get the private sources (like dug well, hand pump fitted borewell) regularly tested by carrying out awareness campaign<br>Regular monitoring of the data and development of a mechanism for immediate actions in case of any change in the Arsenic concentration in the sample |
| b | Continuous monitoring of water quality data of surface water bodies at locations used as intake for PWSS | Assess any sudden of long term change in the source quality and ensuring the source sustainability by taking preventive and proactive measures | Review the adequacy of existing protocol of sampling of the sources including parameters measured |
| c | Regular monitoring of Pond water quality data for the ponds used as water sources | Ensure sustainability of the sources for present use of | Review the adequacy of existing protocol of sampling of the sources including parameters measured (along with Arsenic, bacteriological parameters measurement of salinity as a critical parameter in the coastal blocks) and the frequency of sampling.<br><br>Review water quality time series data periodically to identify any change in the trend |
| d | Monitoring of the source data for the borewells continued to be used as source for PWSS with ARP | Ensure supply of safe water to the users | |
| 2 | Catchment Management plan for existing water sources: | | |
| a | Hooghly river: Coordination with different state/central Government | To identify the additional requirements (if any) for contamination of the surface source | i) Identifying the measures taken by WBPCB to prevent discharge of raw sewage from different towns/municipalities |

| Sl. No | Activity / Component | Objective | Action Plan |
|---|---|---|---|
| | authorities and parastatal bodies for identification of activities implemented under the comprehensive catchment management plan | | to the river and suggest additional measures<br>ii) Provide technical assistance/expertise to the relevant authorities (primarily Panchayet and Rural Development department) in implementing liquid waste management in rural areas |
| b | Ponds and similar Rainwater harvesting structure used as source for PWSS or individual schemes | To ensure their sustainability for long term use. | i) Ensuring ODF in the catchment and prepare a comprehensive sanitation plan with time line for implementation<br>ii) Ensuring protection against natural disasters to by analysing historical data and providing necessary embankment protections<br>iii) Prepare a comprehensive drainage plan to prevent direct discharge of storm runoff |
| c | Preparation of block wise master plan for identifying alternative sources for serving isolated/remote habitations | Provide supply to remote areas from local sources ensuring sustainability and cost effectiveness | i) Prepare lists from Panchayet and block level to identify sources and shortlist the feasible one through checking sustainability criteria by analysing hydrological data and sanitation conditions<br>ii) Identify risks involved with sources |
| 3 | Ensuring safe water to all by 2022 as per NRDWP target | | |
| a | Evaluate possibility of surface water based bulk schemes for covering the critical and very critical blocks identified in this WQAP and its implementation in effective manner | Providing safe water to the users on 24x 7 basis | i) Carry out cost benefit studies for different options for treatment (conventional clariflocculators, tube settlers, mechanical dewatering, use of desalination for streams in coastal areas)<br>ii) Feasibility of SCADA for continuous monitoring from central location to ensure optimal operation.<br>iii) Inclusion of extensive metering to ensure minimal system loss<br>iv) Implementation of house connection to maximise benefit of large investment |
| b | Sunderbans areas: Identify schemes for areas not possible to | Providing safe water to the users located in islands, remote | i) Implement the recommendation of the Sunderbans water supply |

| Sl. No | Activity / Component | Objective | Action Plan |
|---|---|---|---|
| | be | habitations and areas covered by mesh of streams making bulk supply schemes infeasible | review committees by developing standard modules for different alternatives like desalination based ground water schemes |
| c | Identify the augmentation required for existing surface water based schemes for longer run to ensure sufficient supply. | All the users in the district can avail the same level of supply (70 lpcd) | i) Identification of local schemes for supplementing the supply<br>ii) Identification of possibility of augmentation of the schemes through change of technology |
| 4 | Creating awareness among the users regarding sustainable use of water | Demand management and sustainable utilisation of sources | i) Carrying out IEC campaigns highlighting importance of house connections, metering and<br>ii) Assess willingness to pay through VWSC and make VWSC responsible for collection of the charges. |

# ANNEX-1:
# National and State-level Break-up of the Arsenic Affected Habitations

**Table 1: Arsenic affected Habitations as per IMIS-MoDWS (Across India)**
**(As on 18/08/2016)**

| Sl. No. | State | Total Habitation | Total Population | Habitations Affected | Affected population in such habitations | % of Total affected Population |
|---|---|---|---|---|---|---|
| 1 | Andaman and Nicobar | 400 | 264870 | 0 | 0 | 0.0% |
| 2 | Andhra Pradesh | 48342 | 36632785 | 0 | 0 | 0.0% |
| 3 | Arunachal Pradesh | 7577 | 1250535 | 343 | 22479 | 0.2% |
| 4 | Assam | 88099 | 29658323 | 3726 | 1236964 | 9.6% |
| 5 | Bihar | 110234 | 99454050 | 1077 | 1666039 | 12.9% |
| 6 | Chandigarh | 18 | 100183 | 0 | 0 | 0.0% |
| 7 | Chattisgarh | 74647 | 19795446 | 0 | 0 | 0.0% |
| 8 | Dadra & Nagar Haveli | 70 | 216227 | 0 | 0 | 0.0% |
| 9 | Daman & Diu | 21 | 83567 | 0 | 0 | 0.0% |
| 10 | Goa | 347 | 730923 | 0 | 0 | 0.0% |
| 11 | Gujarat | 36066 | 37117600 | 0 | 0 | 0.0% |
| 12 | Haryana | 7948 | 18407573 | 45 | 142944 | 1.1% |
| 13 | Himachal Pradesh | 53604 | 6686071 | 0 | 0 | 0.0% |
| 14 | Jammu and Kashmir | 15958 | 10216956 | 7 | 3642 | 0.0% |
| 15 | Jharkhand | 120067 | 26899888 | 130 | 115862 | 0.9% |
| 16 | Karnataka | 60248 | 40277798 | 21 | 47141 | 0.4% |
| 17 | Kerala | 11883 | 26874598 | 3 | 7651 | 0.1% |
| 18 | Lakshadweep | 9 | 51472 | 0 | 0 | 0.0% |
| 19 | Madhya Pradesh | 128067 | 52813783 | 0 | 0 | 0.0% |
| 20 | Maharashtra | 100066 | 64445038 | 1 | 87 | 0.0% |
| 21 | Manipur | 2868 | 2329245 | 0 | 0 | 0.0% |
| 22 | Meghalaya | 10475 | 2667743 | 1 | 169 | 0.0% |
| 23 | Mizoram | 738 | 523137 | 0 | 0 | 0.0% |
| 24 | Nagaland | 1530 | 1726992 | 0 | 0 | 0.0% |
| 25 | Odisha | 156468 | 35652623 | 2 | 42 | 0.0% |
| 26 | Puducherry | 266 | 438075 | 0 | 0 | 0.0% |
| 27 | Punjab | 15384 | 17989668 | 492 | 590103 | 4.6% |
| 28 | Rajasthan | 121648 | 50806731 | 3 | 0 | 0.0% |
| 29 | Sikkim | 2084 | 458838 | 0 | 0 | 0.0% |
| 30 | Tamil Nadu | 100204 | 39617768 | 0 | 0 | 0.0% |
| 31 | Telangana | 24582 | 22738920 | 0 | 0 | 0.0% |
| 32 | Tripura | 8723 | 4491866 | 1 | 1118 | 0.0% |
| 33 | Uttar Pradesh | 260801 | 168768908 | 262 | 159572 | 1.2% |
| 34 | Uttarakhand | 39209 | 7200799 | 0 | 0 | 0.0% |
| 35 | West Bengal | 105905 | 74637222 | 8066 | 8950460 | 69.1% |
| Total | | 1714556 | 902026221 | 14180 | 12944273 | 14180 |

**Table 2: Arsenic affected Habitations as per IMIS in West Bengal (As on 18/08/2016)**

| Sl. No | District | Total Habitation | Total Population | Affected Habitation | Affected Population | % of Affected Population |
|---|---|---|---|---|---|---|
| 1 | North 24 Parganas | 7334 | 5184365 | 2699 | 2196158 | 42.4% |
| 2 | Nadia | 3944 | 4248441 | 2448 | 3030716 | 71.3% |
| 3 | Murshidabad | 3105 | 6790427 | 1439 | 3895605 | 57.4% |
| 4 | Maldah | 7787 | 5717269 | 836 | 1156620 | 20.2% |
| 5 | Bardhaman | 5386 | 5271056 | 142 | 291224 | 5.5% |
| 6 | South 24 Parganas | 9039 | 7405677 | 322 | 252114 | 3.4% |
| 7 | Hooghly | 11762 | 3975186 | 178 | 98050 | 2.5% |
| 8 | Howrah | 2130 | 3116331 | 1 | 2876 | 0.1% |
| 9 | Bankura | 6638 | 3403362 | 1 | 3115 | 0.1% |
| **Total** | | 57125 | 45112114 | 8066 | 10926478 | 24.2% |

# ANNEX 2:

# Detailed Break-up of Urban and Rural Population of

# North 24 Parganas

**Table 1: Block-wise Administrative Composition of North 24 Parganas**

**(as per PHED data)**

| Blocks | Villages | Census Towns | Number of Panchayet | Number of Habitation | Total Pop | Number of House holds |
|---|---|---|---|---|---|---|
| Amdanga | 79 | 1 | 8 | 334 | 191,673 | 43,636 |
| Baduria | 96 | 1 | 14 | 372 | 285,319 | 67,671 |
| Bagda | 106 | 0 | 9 | 431 | 242,974 | 57,502 |
| Barasat - I | 70 | 12 | 9 | 525 | 294,628 | 67,898 |
| Barasat - II | 76 | 1 | 7 | 206 | 200,918 | 41,939 |
| Barrackpur - I | 38 | 11 | 8 | 275 | 182,845 | 43,871 |
| Barrackpur - II | 15 | 13 | 6 | 178 | 217,171 | 52,525 |
| Basirhat - I | 59 | 3 | 7 | 210 | 171,613 | 38,033 |
| Basirhat - II | 66 | 3 | 9 | 395 | 226,130 | 51,806 |
| Bongaon | 149 | 0 | 16 | 530 | 380,903 | 90,774 |
| Deganga | 107 | 1 | 13 | 353 | 319,213 | 72,770 |
| Gaighata | 100 | 7 | 13 | 440 | 330,287 | 79,503 |
| Habra - I | 55 | 6 | 7 | 296 | 225,200 | 54,120 |
| Habra - II | 76 | 4 | 8 | 354 | 176,490 | 42,344 |
| Haroa | 90 | 0 | 8 | 337 | 214,401 | 46,888 |
| Hasnabad | 73 | 1 | 9 | 273 | 203,262 | 47,739 |
| Hingalganj | 42 | 2 | 9 | 235 | 174,545 | 46,048 |
| Minakhan | 72 | 2 | 8 | 136 | 199,084 | 43,756 |
| Rajarhat | 30 | 9 | 6 | 221 | 189,893 | 42,910 |
| Sandeshkhali - I | 30 | 0 | 8 | 341 | 164,465 | 37,344 |
| Sandeshkhali - II | 24 | 0 | 8 | 197 | 160,976 | 37,771 |
| Swarupnagar | 65 | 1 | 10 | 311 | 256,075 | 61,611 |
| **Total** | **1,518** | **78** | **200** | **6,950** | **5,008,065** | **1,168,459** |

source: http://app1.wbphed.gov.in/phed_v2_view/CVF00001/back.html

**Table 2: Block-wise Administrative Composition of North 24 Parganas (as per IMIS data)**

| Sl. No. | Block | Panchayats | Villages | Habitations | House-Holds | Populations |
|---|---|---|---|---|---|---|
| 1 | Amdanga | 8 | 83 | 340 | 44086 | 195643 |
| 2 | Baduria | 14 | 122 | 424 | 70685 | 302725 |
| 3 | Bagda | 9 | 107 | 435 | 64502 | 279414 |
| 4 | Barasat-I | 9 | 90 | 500 | 62886 | 284877 |
| 5 | Barasat-Ii | 7 | 82 | 223 | 42915 | 205859 |
| 6 | Barrackpur-I | 8 | 54 | 276 | 38448 | 171545 |
| 7 | Barrackpur-Ii | 6 | 33 | 226 | 41266 | 195076 |
| 8 | Basirhat-I | 7 | 63 | 210 | 38402 | 174864 |
| 9 | Basirhat-Ii | 9 | 97 | 538 | 62376 | 283912 |
| 10 | Bongaon | 16 | 164 | 545 | 91198 | 384041 |
| 11 | Deganga | 13 | 129 | 436 | 77414 | 344124 |
| 12 | Gaighata | 13 | 112 | 439 | 78689 | 335942 |
| 13 | Habra-I | 7 | 62 | 310 | 51184 | 222483 |
| 14 | Habra-Ii | 8 | 99 | 367 | 44039 | 191307 |
| 15 | Haroa | 8 | 110 | 357 | 48507 | 222835 |
| 16 | Hasnabad | 9 | 74 | 265 | 48645 | 208507 |
| 17 | Hingalganj | 9 | 47 | 227 | 47811 | 185297 |
| 18 | Minakhan | 8 | 74 | 137 | 45191 | 206788 |
| 19 | Rajarhat | 6 | 43 | 212 | 42121 | 193402 |
| 20 | Sandeshkhali-I | 8 | 30 | 341 | 37055 | 164459 |
| 21 | Sandeshkhali-Ii | 8 | 24 | 197 | 37792 | 160980 |
| 22 | Swarupnagar | 10 | 66 | 329 | 64231 | 270285 |
| Total | | 200 | 1765 | 7334 | 1179443 | 5,184,365 |

Source:http://indiawater.gov.in/imisreports/Reports/BasicInformation/rpt_RWS_AbstractData_B.aspx?Rep=0&RP=Y&APP=IMIS, **as on 1.4.2016**

**Table 3: Block-wise Details of Census Towns**

| Name of town | Name of CD block | Area (sq. Km.) | Number of households including houseless households (2011 Census) | Population 2011 |
|---|---|---|---|---|
| Chandpara | Gaighata | 1.70 | 1,741 | 7,113 |
| Chhekati | | 1.87 | 1,196 | 4,995 |
| Sonatikiri | | 0.77 | 1,685 | 6,919 |
| Dhakuria | | 2.36 | 2,532 | 10,165 |
| Chikanpara | | 2.72 | 2,349 | 9,594 |
| Shimulpur | | 5.87 | 5,020 | 20,803 |
| Bara | | 1.74 | 1,201 | 5,172 |
| Deora | Swarupnagar | 1.59 | 1,076 | 4,360 |
| Nokpul | Habra I | 1.71 | 1,941 | 7,737 |
| Maslandapur | | 1.70 | 2,685 | 10,790 |
| Sadpur | | 1.63 | 1,999 | 7,773 |
| Betpuli | | 2.01 | 2,408 | 9,404 |
| Anarbaria | | 1.16 | 1,362 | 5,895 |
| Purba Narayanpur | | 2.47 | 1,942 | 7,950 |
| Guma | Habra II | 2.30 | 2,904 | 12,025 |
| Bara Bamonia | | 0.76 | 1,780 | 7,193 |
| Khorddabamonia | | 1.01 | 1,363 | 5,856 |
| Bira | | 3.91 | 2,534 | 10,741 |
| Dhania | Amdanga | 3.65 | 1,600 | 6,659 |
| Palladaha | Barrackpore I | 1.77 | 1,414 | 5,994 |
| Palashi | | 3.49 | 1,697 | 6,748 |
| Nagdaha | | 3.07 | 1,979 | 8,192 |
| Jetia | | 1.97 | 1,577 | 6,349 |
| Balibhara | | 1.82 | 1,968 | 8,521 |
| Dogachhia | | 2.20 | 1,369 | 5,705 |
| Garshyamnagar | | 1.08 | 1,956 | 7,611 |
| Noapara (P) | | 1.10 | 2,613 | 10,819 |
| Kaugachhi | | 1.83 | 4,202 | 17,001 |
| Paltapara | | 1.72 | 1,574 | 6,408 |
| Ichhapur Defence Estate | | 2.31 | 1,268 | 5,219 |
| Babanpur (P) | Barrackpore II | 1.43 | 2,158 | 8,942 |
| Jafarpur | | 1.98 | 4,983 | 19,062 |
| Mohanpur | | 1.45 | 2,372 | 9,096 |

| Name of town | Name of CD block | Area (sq. Km.) | Number of households including houseless households (2011 Census) | Population 2011 |
|---|---|---|---|---|
| Teleni Para | Barrackpore II | 7.81 | 4,208 | 17,781 |
| Chak Kanthalia | | 0.71 | 2,756 | 11,108 |
| Ruiya | | 1.98 | 4,116 | 17,661 |
| Patulia | | 1.10 | 4,000 | 16,979 |
| Bandipur | | 0.83 | 1,952 | 8,115 |
| Talbandha | | 1.00 | 4,246 | 17,802 |
| Bilkanda | | 0.53 | 1,532 | 6,081 |
| Muragachha | | 1.21 | 3,175 | 13,249 |
| Teghari | | 0.77 | 2,036 | 8,491 |
| Chandpur | | 0.62 | 2,736 | 10,930 |
| Kokapur | Barasat I | 1.48 | 1,507 | 6,317 |
| Shibalaya | | 2.12 | 1,410 | 5,830 |
| Gangapur | | 2.48 | 1,540 | 6,301 |
| Chandrapur | | 0.59 | 1,287 | 5,047 |
| Nebadhai Duttapukur | | 3.29 | 6,479 | 25,557 |
| Chatta Baria | | 2.34 | 2,901 | 12,537 |
| Joypul | | 5.60 | 3,586 | 16,134 |
| Digha | | 1.40 | 1,878 | 8,159 |
| Kulberia | | 0.52 | 1,680 | 6,993 |
| Bamangachhi | | 1.36 | 1,648 | 6,824 |
| Chak Barbaria | | 0.54 | 1,887 | 8,088 |
| Koyra | | 1.57 | 2,687 | 11,615 |
| Deara | Barasat II | 2.55 | 2,464 | 11,994 |
| Deulia | Deganga | 2.74 | 2,396 | 9,663 |
| Dakshin Chatra | Baduria | 2.26 | 1,813 | 7,275 |
| Itinda | Basirhat I | 1.33 | 1,804 | 8,679 |
| Dandirhat (P) | | 3.37 | 1,440 | 6,387 |
| Uttar Bagundi | | 2.36 | 1,372 | 6,027 |
| Dhanyakuria | Basirhat II | 1.46 | 1,306 | 5,148 |
| Mathurapur | | 2.12 | 1,635 | 6,803 |
| Raghunathpur (P) | | 2.08 | 1,294 | 5,339 |
| Raigachhi | Rajarhat | 1.57 | 1,644 | 8,245 |
| Rekjuani | | 6.31 | 3,800 | 16,553 |
| Bhatenda | | 1.11 | 1,597 | 6,349 |

| Name of town | Name of CD block | Area (sq. Km.) | Number of households including houseless households (2011 Census) | Population 2011 |
|---|---|---|---|---|
| Basina | | 1.32 | 1,189 | 5,413 |
| Bishnupur | | 3.85 | 2,654 | 12,660 |
| Chandapur Champagachhi | Rajarhat | 2.14 | 1,401 | 6,431 |
| Jatragachhi | | 2.91 | 1,550 | 6,890 |
| Ghuni | | 3.89 | 5,671 | 24,249 |
| Sulanggari | | 0.97 | 3,494 | 13,496 |
| Minakhan | Minakhan | 3.11 | 810 | 3,474 |
| Balihati | | 4.12 | 826 | 3,637 |
| Sadigachhi | Hasnabad | 2.17 | 1,439 | 6,248 |
| Hingalganj | Hingalganj | 5.92 | 2,118 | 8,179 |
| Bankra | | 3.15 | 1,813 | 6,897 |
| Total | | | | **730,446** |

## Table 4: Details of the population of the Municipalities in North 24 Parganas

| Sl. No | Name of Municipality/Township | Sub-Divison | Nature of Municipality | Number of Wards | Population (2011) | Number of Households |
|---|---|---|---|---|---|---|
| 1 | Ashoknagar Kalyangarh (M) | Barasat Sadar | Municipality | 22 | 121,592 | 30,232 |
| 2 | Baduria (M) | Basirhat | Municipality | 17 | 52,493 | 12,058 |
| 3 | Bangaon (M) | Bangaon | Municipality | 22 | 108,864 | 26,332 |
| 4 | Baranagar (M) | Barrackpur | Municipality | 34 | 245,213 | 63,387 |
| 5 | Barasat (M) | Barasat Sadar | Municipality | 32 | 278,435 | 69,506 |
| 6 | Barrackpur (M) | Barrackpur | Municipality | 24 | 152,783 | 37,312 |
| 7 | Barrackpur Cantonment (CB) | Barrackpur | Cantonment Board | 7 | 17,380 | 3,525 |
| 8 | Basirhat (M) | Basirhat | Municipality | 22 | 125,254 | 29,276 |
| 9 | Bhatpara (M + OG) | Barrackpur | Municipality | 36 | 386,019 | 87,645 |
| 10 | Bidhan Nagar (M) | Bidhan Nagar | Municipality | 25 | 215,514 | 48,919 |
| 11 | Dum Dum (M) | Barrackpur | Municipality | 22 | 114,786 | 27,702 |
| 12 | Garulia (M) | Barrackpur | Municipality | 20 | 85,336 | 18,122 |
| 13 | Gobardanga (M) | Barasat Sadar | Municipality | 17 | 45,377 | 11,502 |
| 14 | Habra (M) | Barasat Sadar | Municipality | 23 | 147,221 | 36,016 |
| 15 | Halisahar (M) | Barrackpur | Municipality | 23 | 124,939 | 30,381 |
| 16 | Kamarhati (M) | Barrackpur | Municipality | 35 | 330,211 | 70,107 |
| 17 | Kanchrapara (M + OG) | Barrackpur | Municipality | 27 | 129,576 | 27,976 |
| 18 | Khardaha (M) | Barrackpur | Municipality | 22 | 108,496 | 25,656 |
| 19 | Madhyamgram (M) | Barasat Sadar | Municipality | 25 | 196,127 | 48,942 |
| 20 | Nabadiganta Industrial Township (ITS) | | Municipality | 1 | 1,095 | 250 |
| 21 | Naihati (M) | Barrackpur | Municipality | 31 | 217,900 | 37,167 |
| 22 | New Barrackpur (M) | Barrackpur | Municipality | 20 | 76,846 | 19,307 |
| 23 | North Barrackpur (M) | Barrackpur | Municipality | 23 | 132,806 | 32,564 |
| 24 | North Dum Dum (M) | Barrackpur | Municipality | 31 | 249,142 | 63,256 |
| 25 | Panihati (M) | Barrackpur | Municipality | 35 | 377,347 | 85,985 |
| 26 | Rajarhat Gopalpur (M) | Barasat Sadar | Municipality | 35 | 402,844 | 100,698 |
| 27 | South Dum Dum (M) | Barrackpur | Municipality | 35 | 403,316 | 103,741 |
| 28 | Taki (M) | Basirhat | Municipality | 16 | 38,263 | 8,919 |
| 29 | Titagarh (M) | Barrackpur | Municipality | 23 | 116,541 | 23,741 |
| | **Total** | | | | **5,001,716** | **1,180,224** |

*Source: Census Databook, 2011*

OG: Outgrowth, ITS: Industrial Township, M: Municipality, CB: Cantonment Board

# ANNEX 3:

# Causes of Arsenic Contamination

# in West Bengal

# and

# Impact of Arsenic contamination

# on Human health

**Source of arsenic in Groundwater**

The source of arsenic in groundwater can be traced out by establishing the relations between the river system (drainage pattern), the area from where the rivers brought sediments i.s. parent materials. In this regard Geological Survey of India and Central Ground Water Board have done commendable job and come out with certain findings.

The problem of groundwater pollution by arsenic is found in the interfluvial region of the Bhagirathi-Hugli and the Jalangi-Ichamati rivers lying mostly in the eastern part of the Bhagirathi-Hugli river of West Bengal. The arsenic contamination in ground water beyond permissible limit of 0.05mg/l has been found within the shallow aquifer (20-60m below ground level). Apart from this area, other areas where higher incidence of Arsenic has been reported are four blocks (adjacent to the river Ganga) in Malda district, Purbasthali block of Bardhaman district and Balagarh block of Hugli district.

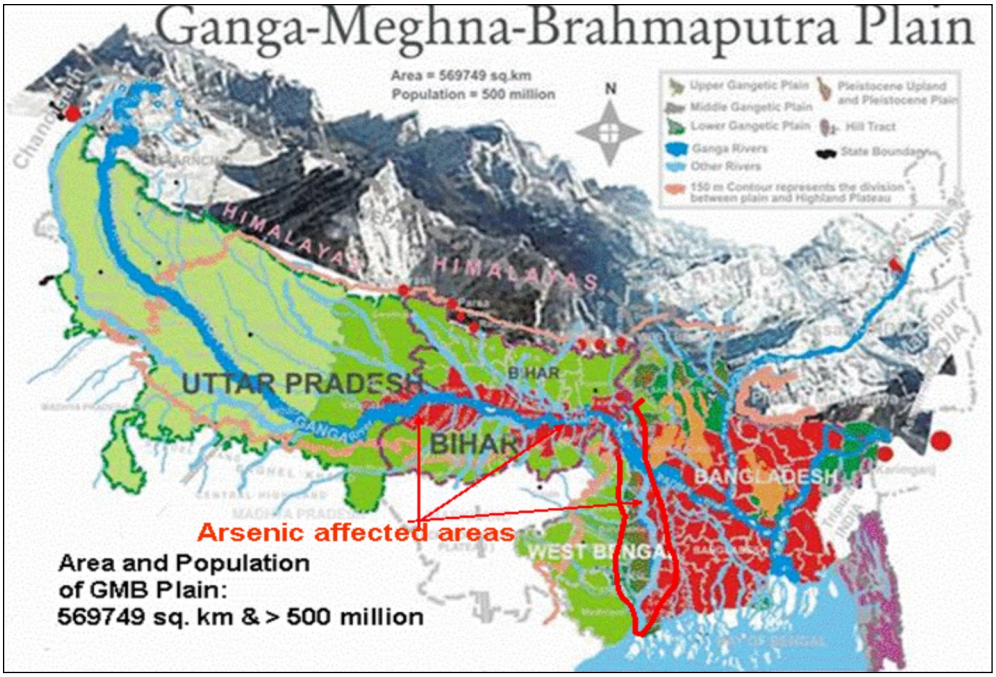



**Figure 1:Arsenic affected stretches in Ganga Plains in India with reference to Ganga-Meghna-Brahmaputra Plains.**

During the phases of deltaic sedimentation in the southeastern part of West Bengal, rest of the Bengal shelf was under the influence of fresh water sedimentation. The system of rivers responsible for this fresh water sedimentation could be the precursor of the Ganga, which might have been flowing into the Bengal plains through the . Garo-Rajmahal gap.. A number

of rivers like the Damodar, the Rupnarayan etc. flowing in the Bengal plains in a South-Easterly direction for a considerable distance turn sharply to the South in the Southern part of West Bengal. Thus the present drainage pattern responsible for sub recent to recent sedimentation in West Bengal might have been caused due to

1) a regional South-Easterly slope of the basin, caused to some extent, by movements on the hinge-zone located at the edge of the shelf and

2) an increasing rate of Southerly tilt of the West Bengal part of the basin due to relatively greater rate of subsidence of the southern part of the hinge through the Tertiary and recent times.

**The river system and its Sedimentation :** The affected area is a part of the Ganga Brahmaputra delta having succession of Quaternary sediments of varying thickness. The deltaic region of Bengal formed the seaward continuation of the Bengal basin, which is bounded on three sides west, north and northeast by pre-cambrian crystalline rocks and on the eastern side by tertiary hill ranges of the Assam-Burma arc. This erosional history of the rivers and their numerous tributaries undergoing changes in the position of their sources several times during the epoch valley alluviation. These changes left irregularities on the alluvial plain, which controlled hydrographic pattern and created environments in which the sediments were deposited.

With the beginning of the Himalayan orogeny crustal down wrapping along the northern margin of the peninsula and south of the newly formed mountain ranges gave rise to a basin in the nature of a foredeep where concomitantly with the formation of the mountain range extensive sedimentation took place. By middle Tertiary times the South Bengal basin was mainly getting sediments from Eastern part of the Peninsula comprising the Chotanagpur and the Assam Plateau. In he Tertiary period the sediments brought down from Chotanagpur plateau including Rajmahal hill area by Ajoy-Damodar system of rivers played the most important role in filling up the western margin of the Bengal basin. By the end ofthe Mid-Tertiary period the major uplifts of the Chotanagpur Plateau were over and the later movements were of much reduced magnitude. As a result, the rate of sedimentation during the Tertiary period was considerably reduced. The formation of Garo-Rajmahal gap in the Pleistocene completely changed the picture of sedimentation in the Bengal basin. A tremendous rate of growth started in south Bengal as a result sediments of northern rivers getting deposited there.

The source of sediments deposited within last 2000 years could be from northern Himalayan provinces, metamorphic terrain of the Chotanagpur plateau the meta-sedimentary rocks of Eastern Himalaya. In eastern Himalayan foothills, the existences of Arsenopyrite Veins were reported at the altitude 1200 m above mean sea level. The Tista, Torsa and other tributaries of the Brahmaputra river have cut across the Darjeeling Coalfields and could carry pyrites, arsenopyrites etc., from the exposed coal seams occurring all along the eastern Himalayan foothills. The basaltic rocks of Rajmahal area lying in the northwestern part of the delta might have also supplied sedimentary detritus. Again, all the easterly flowing river cutting across Raniganj and other coalfields might also be responsible for bringing arsenic minerals from the mine workings.

The heavy mineral assemblages from sub-surface sediments of Habra sediments of Habra block, North 24 Paraganas district in light grey micaceous fine to medium sand are kyanite-garnet-staurolite-biotite-tourmaline- Chlorite-Hornblende-Epidote and those in Reddish brown sand are staurolite-garnet-sillimaniteopaque tourmaline-kyanite-biotite-chloride-epidote. In both the cases the source materials denote highly metamorphosed rocks. XRD analysis of sediments also indicates major quantities of quartz and feldspar with illite and chlorite clay minerals. Arsenic was observed to have been deposited as adsorbed primary metal on sand grains of biotite and quartzwith a few scattered grains of arsenopyrite.

Both in Murshidabad and North 24 Paraganas district, concentration of arsenic in acid leachate (pH . 2.0) and alkali leachate (pH . 12) was highest in the clay followed by sandy clay and lowest in sand. A striking difference between the sediment samples of 24 Paraganas and that of Murshidabad district is that in the former alkali leachates are appreciably higher than in the acid leachates while in the later the acid leachates are higher than the alkali leachates.

It has been confirmed from  the presence of arsenic in Pyrite ($FeS_2$) in some samples of North 24 Paraganas district. The decomposition of arsenic rich pyrite results in the formation of $Fe^{3+}$ ion which act as catalyst for the further decomposition of pyrite.

**Causes of High incidence of Arsenic in Groundwater**

Some of the research workers believe that leaching of arsenic in groundwater seems to have been influenced by the number of interacting factors.

During the eighties there was a remarkable change in the minor irrigation sector due to rapid growth in Agro-commercialization. Cultivation of Summer Paddy (Boro). expanded in the seven districts of South Bengal with an unpredictable rate each year. The Boro cropping is almost dependent on the tubewell irrigation. Immediate manifestation of that agro practice was lowering of ground water level at alarming rate.

As discussed in preceding paragraphs, the ground water occurring mainly within the shallow zone (20-60m bgl) is characterized by high arsenic (>0.5 to 1 or above mg/l) and the principal source of arsenic is the arsenic sulphides minerals deposited alongwith clay, peat, with iron in the reducing environment. The lowering of groundwater at rapid rate during summer season causes aeration of aquifer oxidized the arsenic sulphides, makes it water soluble. It percolates from the subsoil into water table during monsoon.

However, the cause of arsenic contamination in groundwater is still a debatable topic. Hence, it is necessary to study extensively the groundwater reservoir condition, mode of recharge-discharge relationship, groundwater movement characteristics in time and space and to determine dissolved oxygen and oxidation .reduction potential in groundwater to appreciate the cause of such arsenic concentration in groundwater.

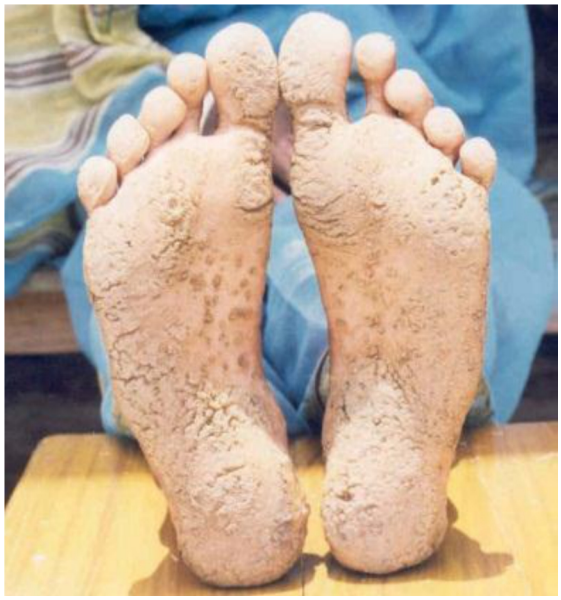
**Key facts**

- Arsenic is naturally present at high levels in the groundwater of a number of countries.
- Arsenic is highly toxic in its inorganic form.
- Contaminated water used for drinking, food preparation and irrigation of food crops poses the greatest threat to public health from arsenic.
- Long-term exposure to arsenic from drinking-water and food can cause cancer and skin lesions. It has also been associated with developmental effects, cardiovascular disease, neurotoxicity and diabetes.
- The most important action in affected communities is the prevention of further exposure to arsenic by provision of a safe water supply.

**Sources of exposure**

Arsenic is a natural component of the earth's crust and is widely distributed throughout the environment in the air, water and land. It is highly toxic in its inorganic form. People are exposed to elevated levels of inorganic arsenic through drinking contaminated water, using contaminated water in food preparation and irrigation of food crops, industrial processes, eating contaminated food and smoking tobacco.

Long-term exposure to inorganic arsenic, mainly through drinking of contaminated water, eating of food prepared with this water and eating food irrigated with arsenic-rich water, can lead to chronic arsenic poisoning. Skin lesions and skin cancer are the most characteristic effects.



**Drinking-water and food**

The greatest threat to public health from arsenic originates from contaminated groundwater. Inorganic arsenic is naturally present at high levels in the groundwater of a number of countries, including Argentina, Bangladesh, Chile, China, India, Mexico, and the United States of America. Drinking-water, crops irrigated with contaminated water and food prepared with contaminated water are the sources of exposure.

Fish, shellfish, meat, poultry, dairy products and cereals can also be dietary sources of arsenic, although exposure from these foods is generally much lower compared to

exposure through contaminated groundwater. In seafood, arsenic is mainly found in its less toxic organic form.

### Industrial processes

Arsenic is used industrially as an alloying agent, as well as in the processing of glass, pigments, textiles, paper, metal adhesives, wood preservatives and ammunition. Arsenic is also used in the hide tanning process and, to a limited extent, in pesticides, feed additives and pharmaceuticals.

### Tobacco

People who smoke tobacco can also be exposed to the natural inorganic arsenic content of tobacco because tobacco plants essentially take up arsenic naturally present in the soil. Also, in the past, the potential for elevated arsenic exposure was much greater when tobacco plants used to be treated with lead arsenate insecticide.

### Health effects

Arsenic occurs in inorganic and organic forms. Inorganic arsenic compounds (such as those found in water) are highly toxic while organic arsenic compounds (such as those found in seafood) are less harmful to health.

### Acute effects

The immediate symptoms of acute arsenic poisoning include vomiting, abdominal pain and diarrhoea. These are followed by numbness and tingling of the extremities, muscle cramping and death, in extreme cases.

### Long-term effects

The first symptoms of long-term exposure to high levels of inorganic arsenic (e.g. through drinking-water and food) are usually observed in the skin, and include pigmentation changes, skin lesions and hard patches on the palms and soles of the feet (hyperkeratosis). These occur after a minimum exposure of approximately five years and may be a precursor to skin cancer.

In addition to skin cancer, long-term exposure to arsenic may also cause cancers of the bladder and lungs. The International Agency for Research on Cancer (IARC) has classified arsenic and arsenic compounds as carcinogenic to humans, and has also stated that arsenic in drinking-water is carcinogenic to humans.

Other adverse health effects that may be associated with long-term ingestion of inorganic arsenic include developmental effects, neurotoxicity, diabetes, pulmonary disease and cardiovascular disease. Arsenic-induced myocardial infarction, in particular, can be a significant cause of excess mortality. In China (Province of Taiwan), arsenic exposure has been linked to “blackfoot disease”, which is a severe disease of blood vessels leading to gangrene. This disease has not been observed in other parts of the world however, and it is possible that malnutrition contributes to its development.
Arsenic is also associated with adverse pregnancy outcomes and infant mortality, with impacts on child health[1], and there is some evidence of negative impacts on cognitive development.

**Prevention and control**

The most important action in affected communities is the prevention of further exposure to arsenic by the provision of a safe water supply for drinking, food preparation and irrigation of food crops. There are a number of options to reduce levels of arsenic in drinking-water.

- Substitute high-arsenic sources, such as groundwater, with low-arsenic, microbiologically safe sources such as rain water and treated surface water. Low-arsenic water can be used for drinking, cooking and irrigation purposes, whereas high-arsenic water can be used for other purposes such as bathing and washing clothes.
- Discriminate between high-arsenic and low-arsenic sources. For example, test water for arsenic levels and paint tube wells or hand pumps different colours. This can be an effective and low-cost means to rapidly reduce exposure to arsenic when accompanied by effective education.
- Blend low-arsenic water with higher-arsenic water to achieve an acceptable arsenic concentration level.
- Install arsenic removal systems – either centralized or domestic – and ensure the appropriate disposal of the removed arsenic. Technologies for arsenic removal include oxidation, coagulation–precipitation, absorption, ion exchange and membrane

techniques. There is an increasing number of effective and low-cost options for removing arsenic from small or household supplies, though there is still limited evidence about the extent to which such systems are used effectively over sustained periods of time.

Long-term actions are also required to reduce occupational exposure from industrial processes.

Education and community engagement are key factors for ensuring successful interventions. There is a need for community members to understand the risks of high arsenic exposure and the sources of arsenic exposure, including the intake of arsenic by crops (e.g. rice) from irrigation water and the intake of arsenic into food from cooking water.

High-risk populations should also be monitored for early signs of arsenic poisoning – usually skin problems.

**WHO response**

Arsenic is one of WHO's 10 chemicals of major public health concern. WHO's work to reduce arsenic exposure includes setting guideline values, reviewing evidence, and providing risk management recommendations. WHO publishes a guideline value for arsenic in its *"Guidelines for drinking-water quality"*. The Guidelines are intended for use as the basis for regulation and standard setting worldwide.

The current recommended limit of arsenic in drinking-water is 10 µg/litre, although this guideline value is designated as provisional because of measurement difficulties and the practical difficulties in removing arsenic from drinking-water. Where it is difficult to achieve the guideline value, Member States may set higher values as standards taking into account local circumstances, resources and risks from low arsenic sources that are contaminated microbiologically.

The WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation monitors progress towards global targets on drinking water. Under the new 2030 Agenda for Sustainable Development, the proposed indicator of "safely managed drinking water services" calls for tracking the population accessing drinking water which is free of faecal contamination and priority chemical contaminants, including arsenic.

# ANNEX 4:

# Block-wise Details of

# Ground Water Storage

# and

# Water Resource Availability

## Table 1: Details of Ground water Storage of North 24 Parganas District

| Block | Occurrence of aquifer | Feasibility of - Groundwater Abstraction Structures | Groundwater Resource available and Stage of Development (SOD) | Remarks |
|---|---|---|---|---|
| **Amdanga** | Multiple aquifer systems occurs<br>**Depth span :**<br>36-54 m bgl<br>79-122 m bgl<br>146-179 m bgl | Low duty ( 20-40 $m^3$/hr) and Heavy duty **(**50-150 $m^3$/hr) tubewells are generally feasible | Net Groundwater availability : **6646 ham**<br><br>**SOD : 62.30%** | Safe Block<br><br>Water level Declining |
| **Baduria** | **Depth span :**<br>3-36 m bgl<br>42-83 m bgl<br>94 -115m bgl<br>127-152m bgl | | Net Groundwater availability : **10911 ham**<br><br>**SOD : 79.08%** | Safe Block<br><br>Water level Declining |
| **Bagdah** | **Depth span :**<br>4.00-86.06 m bgl<br>100 -184 m bgl<br>234 -240m bgl | | Net Groundwater availability : **12797 ham**<br><br>**SOD : 87.26%** | Safe Block<br>Water level Declining<br>Arsenic affected in down to depth of 80m bgl |
| **Barasat I** | **Depth span :**<br>5-30 m bgl<br>32-44 m bgl<br>46 -93 m bgl<br>100-195m bgl<br>223-259 m bgl<br>320-329m bgl<br>357-364m bgl | | Net Groundwater availability : **5757 ham**<br><br>**SOD : 56.25%** | Safe Block<br>Water level Declining<br>Arsenic affected in down to depth of 80m bgl |
| **Barasat II** | **Depth span :**<br>4-37 m bgl<br>43-48 m bgl<br>98-107 m bgl | | Net Groundwater availability : **6596 ham**<br>**SOD : 71.81%** | Safe Block<br>Arsenic affected in down to depth of 80m bgl |
| Barrackpore I | **Depth span :**<br>38-150 m bgl<br>164-205 m bgl<br>227-234 m bgl | | Net Groundwater availability : **4876 ham**<br><br>**SOD : 41.85%** | Safe Block<br>Arsenic affected in down to depth of 80m bgl. |
| Barrackpore II | **Depth span :**<br>33-43 m bgl<br>87-95 m bgl<br>100-118 m bgl | | Net Groundwater availability : **2218 ham** | Safe Block<br>Arsenic affected in down to depth of 80m bgl |

| Block | Occurrence of aquifer | Feasibility of - Groundwater Abstraction Structures | Groundwater Resource available and Stage of Development (SOD) | Remarks |
|---|---|---|---|---|
| | 131-153 m bgl<br>161-186 m bgl | | **SOD : 38.06%** | |
| Bashirhat I | **Depth span :**<br>2-26 m bgl<br>32-82 m bgl<br>89-115 m bgl<br>152-180 m bgl<br>220-262 m bgl | Low duty ( 20-40 $m^3$/hr) and Heavy duty **(**50-150 $m^3$/hr) tubewells are generally feasible | Net Groundwater availability : **5448 ham**<br><br>**SOD : 64.39%** | Safe Block<br>Arsenic affected in down to depth of 80m bgl |
| Bashirhat II | **Depth span :**<br>16-31 m bgl<br>39-91 m bgl<br>97-100 m bgl<br>125-163 m bgl | | Net Groundwater availability : **6468 ham**<br><br>**SOD : 61.76%** | Safe Block<br>Water level Declining<br>Arsenic affected in down to depth of 80m bgl |
| Bongaon | **Depth span :**<br>13-53 m bgl<br>56-73 m bgl<br>80-94 m bgl<br>122-192 m bgl<br>193-223 m bgl<br>251-254 m bgl | | Net Groundwater availability : **18206 ham**<br><br>**SOD : 79.43%** | Safe Block<br>Water level Declining<br>Arsenic affected in down to depth of 80m bgl |
| Deganga | **Depth span :**<br>6-20 m bgl<br>22-64 m bgl<br>74-110 m bgl<br>126-178 m bgl | | Net Groundwater availability : **10721 ham**<br><br>**SOD : 86.95%** | Safe Block<br>Arsenic affected in down to depth of 80m bgl |
| Gaighata | **Depth span :**<br>9-54 m bgl<br>197-215 m bgl | Low duty ( 20-40 $m^3$/hr) and Heavy duty **(**50-150 $m^3$/hr) tubewells are generally feasible | Net Groundwater availability : **13395 ham**<br><br>**SOD : 70.5%** | Safe Block<br>Water level Declining during both pre and post monsoon |
| Habra I | **Depth span :**<br>3-34 m bgl<br>37-40 m bgl<br>44-47 m bgl<br>56-104 m bgl<br>122-152 m bgl<br>158-182 m bgl<br>223-247m bgl | Low duty ( 20-40 $m^3$/hr) and Heavy duty **(**50-150 $m^3$/hr) tubewells are generally | Net Groundwater availability : **7169 ham**<br><br>**SOD : 66.41%** | Safe Block<br>Arsenic affected in down to depth of 80m bgl |

| Block | Occurrence of aquifer | Feasibility of - Groundwater Abstraction Structures | Groundwater Resource available and Stage of Development (SOD) | Remarks |
|---|---|---|---|---|
| | 260-278m bgl | feasible | | |
| Habra II | **Depth span :**<br>2-45 m bgl<br>49-82 m bgl<br>110-152 m bgl<br>167-174 m bgl<br>189-219 m bgl | | Net Groundwater availability : **6669 ham**<br><br>**SOD : 46.58%** | Safe Block<br>Water level Declining<br>Arsenic affected in down to depth of 80m bgl |
| Rajarhat | **Depth span :**<br>3-39 m bgl<br>40-57 m bgl<br>70-143 m bgl<br>189-219 m bgl | | Net Groundwater availability:**4722ham**<br><br>**SOD : 43.77%** | Safe Block<br>Arsenic affected in down to depth of 80m bgl |
| Haroa | **Depth span :**<br>2-27 m bgl<br>35-78 m bgl<br>122-161 m bgl | | Net Groundwater availability:**6960 ham**<br><br>**SOD : 40.98%** | Safe Block<br>Arsenic affected in down to depth of 80m bgl |
| Swarupnagar | **Depth span :**<br>2-17 m bgl<br>19-74 m bgl<br>90-146 m bgl | | Net Groundwater availability:**12318 ham**<br><br>**SOD : 89.30%** | Safe category |
| Hasnabad | **Depth span :**<br>24-60 m bgl | Low duty ( 20-40 $m^3$/hr) to Medium duty **(**50-100 $m^3$/hr) tubewells are generally feasible | - | Confined aquifer. In few places the aquifers down to 300 mbgl are brackish to saline in nature.<br>Fresh groundwater bearing confined aquifer occurs within 20 to 60 mbgl depth range. |
| Hingalganj | **Depth span :**<br>180-208 m bgl<br>250-280 m bgl | Low duty ( 20-40 $m^3$/hr) to Medium duty **(**50-100 $m^3$/hr) tubewells are generally feasible | - | Confined aquifer. Above 180 mbgl are saline in nature |
| Minakhan | **Depth span :**<br>115-125 m bgl<br>170-190 m bgl | | - | Confined aquifer. Above 125 mbgl are saline in nature |
| Sandeskhali I | **Depth span :**<br>150-160 m bgl<br>230-290 m bgl | | - | Confined aquifer. Above 150 mbgl are saline in nature |

| Block | Occurrence of aquifer | Feasibility of - Groundwater Abstraction Structures | Groundwater Resource available and Stage of Development (SOD) | Remarks |
|---|---|---|---|---|
| Sandeskhali II | **Depth span :** 150-160 m bgl 230-290 m bgl | | - | Confined aquifer. Above 150 mbgl are saline in nature |

Note: SOD: Stage of Development

Definition of Categorization:

The ground water resources are assessed in units i.e., blocks/ talukas/ mandals/ watersheds. These assessment units are categorized for ground water development based on two criteria -

a) stage of ground water development, and

b) long-term of pre and post monsoon water levels.

The long term ground water level trends are computed generally for the period of 10 years. The significant rate of water level decline is taken between 10 to 20 cm per year depending upon the local hydrogeological conditions.

There are four categories, namely[1] -

**'Safe'** areas which have ground water potential for development;

**'Semi-critical'** areas where cautious groundwater development is recommended;

**'Critical'** areas; and 'Over-exploited' areas, where there should be intensive monitoring and evaluation and future ground development be linked with water conservation measures. The details of criteria for categorization of assessment units are given in following table:

| Sl. No. | Stage of Ground water Development | Significant Long term Decline | | Categorisation |
|---|---|---|---|---|
| | | Pre-monsoon | Post-monsoon | |
| 1 | <= 70% | No | No | Safe |
| 2 | >70% and <=90% | No | No | Safe |
| | | Yes/No | No/Yes | Semi-critical |
| 3 | >90% and <=100% | Yes/No | No/ Yes | Semi-critical |
| | | Yes | Yes | Critical |
| 4 | >100% | Yes/No | No/Yes | Over-Exploited |
| | | Yes | Yes | Over-Exploited |

[1] http://www.cgwb.gov.in/faq.html

**Table 2:Overall Water Resource of West Bengal**

| | Monsoon rain fall (mm) | Non monsoon rainfall (mm) | Surface water (BCM) | Ground water (BCM) | Trans boundary water (BCM) | Per capita water availability as of 2001 CM/ capita |
|---|---|---|---|---|---|---|
| Darjeeling | 2224.0 | 527.8 | 5.78 | 0.52 | 16.25 | 3945.32 |
| Jalpaiguri | 2471.3 | 604.8 | 11.30 | 2.64 | 32.56 | 4130.27 |
| Koch Bihar | 2604.0 | 667.6 | 6.42 | 2.32 | 44.18 | 3552.65 |
| Uttar Dinajpur | 1902.3 | 504.6 | 3.31 | 1.68 | 16.86 | 2059.38 |
| Dakshin Dinajpur | 1469.9 | 458.4 | 1.55 | 0.95 | 18.64 | 1676.0 |
| Maldah | 1307.7 | 407.1 | 2.14 | 1.40 | 553.21 | 1084.15 |
| Murshidabad | 1167.4 | 385.6 | 0.54 | 2.52 | 561.88 | 525.63 |
| Birbhum | 1143.0 | 384.3 | 1.46 | 1.67 | 4.50 | 1047.02 |
| Nadia | 1175.3 | 432.2 | -0.27 | 2.17 | 48.25 | 415.8 |
| Bardhaman | 1174.0 | 425.6 | 1.84 | 3.34 | 45.54 | 757.02 |
| Bankura | 1159.7 | 387.5 | 2.06 | 2.09 | 13.35 | 1309.8 |
| Purulia | 1163.0 | 344.3 | 3.68 | 0.77 | 9.69 | 1767.9 |
| Paschim Medinipur | 1218.9 | 441.9 | 2.36 | 3.82 | 3.61 | 1199.1 |
| Purba Medinipur | 1240.3 | 457.6 | 3.27 | 0.83 | 76.68 | 820.5 |
| Haora | 1240.5 | 451.2 | 0.96 | 0.37 | 67.36 | 313.6 |
| Hugli | 1208.2 | 441.4 | 0.59 | 1.70 | 65.28 | 457.6 |
| Kolkata | 1245.9 | 454.7 | 0.25 | 0.00 | 50.07 | 55.0 |
| North 24 Parganas | 1231.0 | 452.3 | 1.91 | 1.58 | 50.33 | 393.6 |
| South 24 Parganas | 1266.7 | 461.9 | 1.86 | 3.84 | 81.03 | 831.6 |
| TOTAL[1] | | | 51.01 | 34.21 | 1759.27 | |

| Water sufficient : >1600 cum/capita | Water Stress: 1000-1600 cum/capita | Water scarcity: 500-1000 cum/capita | Severe scarcity: <500 cu m/capita | Districts experiencing annual water deficit wrt to total average receipt of rain fall |
|---|---|---|---|---|

*Source: Water Resources and its Quality in West Bengal, Status of Environment Report, West Bengal Pollution Control Board, 2009 (WBPCB, 2009).*

Falkenmark water stress index is defined as the fraction of the total annual runoff available for human use. According to the widely used, countries or basins with less than 1,700 cu.m per capita of renewable water are considered water-stressed, less than 1,000 cu.m per capita are considered water scarce and less than 500 cu.m per capita are considered to be facing absolute water scarcity.

# ANNEX 5

# Details of Water Quality Data

# and

# Affected Habitations

**Block-wise Analysis of Arsenic Samples :**

Based on the data provided by the PHED Department, the following analysis was carried out to assess the extent of arsenic contamination in the block

**Table 1: Summary of Arsenic Concentration in North 24 Parganas District (PHED Data)**

| Sl. No. | Name of Blocks | Total Number of Habitation | Total Number of Samples containing Arsenic > 0.01 mg/l | % of Samples containing Arsenic 0.01 mg/l | Number of Habitation affected by Arsenic conc. > 0.01 mg/l | Maximum Arsenic Conc. (mg/l) | Average Arsenic Conc. (mg/l) |
|---|---|---|---|---|---|---|---|
| 1 | Amdanga | 334 | 279 | 100 | 130 | 0.57 | 0.06 |
| 2 | Baduria | 372 | 337 | 100 | 155 | 0.96 | 0.15 |
| 3 | Bagda | 431 | 351 | 100 | 212 | 0.62 | 0.06 |
| 4 | Barasat I | 525 | 314 | 100 | 200 | 0.75 | 0.07 |
| 5 | Barasat II | 206 | 197 | 100 | 114 | 0.95 | 0.09 |
| 6 | Barrackpur-I | 275 | 153 | 100 | 132 | 0.97 | 0.04 |
| 7 | Barrackpur-II | 178 | 131 | 100 | 129 | 0.16 | 0.02 |
| 8 | Basirhat I | 210 | 198 | 100 | 194 | 0.99 | 0.24 |
| 9 | Basirhat II | 395 | 289 | 100 | 217 | 0.63 | 0.06 |
| 10 | Bongaon | 530 | 419 | 100 | 210 | 1.0 | 0.08 |
| 11 | Deganga | 353 | 317 | 100 | 238 | 0.69 | 0.11 |
| 12 | Gaighata | 440 | 315 | 100 | 187 | 1.0 | 0.13 |
| 13 | Habra I | 296 | 280 | 100 | 170 | 0.95 | 0.12 |
| 14 | Habra II | 354 | 324 | 100 | 216 | 1.0 | 0.11 |
| 15 | Haroa | 337 | 325 | 100 | 230 | 0.73 | 0.04 |
| 16 | Hasnabad | 273 | 247 | 100 | 239 | 0.96 | 0.08 |
| 17 | Hingalganj | 235 | 181 | 100 | 124 | 0.46 | 0.09 |
| 18 | Minakhan | 136 | 115 | 100 | 115 | 0.50 | 0.03 |
| 19 | Rajarhat | 221 | 173 | 100 | 138 | 0.62 | 0.07 |
| 20 | Sandeshkhali I | 341 | 225 | 100 | 169 | 0.77 | 0.04 |
| 21 | Sandeshkhali II | 197 | 195 | 100 | 176 | 0.83 | 0.05 |
| 22 | Swarupnagar | 311 | 276 | 100 | 165 | 0.72 | 0.18 |
| | | 6950 | **3860** | | **5641** | | |

**Analysis of Affected Habitation Based on IMIS Data**

An analysis was also done based on the basis of test data obtained from the IMIS (under the MoDWS) for arsenic affected habitations in the North 24 Parganas during the period over last three years.

**Year-wise Test Results of Arsenic Sample as per MoDWS data (IMIS)**

**Table 2: Block-wise Distribution of Arsenic Affected habitations based on Samples Tested on the Year 2014-2015 (IMIS)**

| Sl. No. | Name of Blocks | Number of Habitation affected by As concentration > 0.01 mg/l | Total no. of samples where Arsenic conc. > 0.01 mg/l | Maximum Arsenic Conc. (mg/l) | Total no. of samples Tested |
|---|---|---|---|---|---|
| 1 | Amdanga | 13 | 28 | 0.28 | 549 |
| 2 | Baduria | 36 | 115 | 0.2 | 848 |
| 3 | Bagda | 17 | 21 | 0.36 | 276 |
| 4 | Barasat I | 29 | 52 | 0.75 | 728 |
| 5 | Barasat II | 69 | 291 | 0.05 | 588 |
| 6 | Barrackpur-I | 2 | 3 | 0.13 | 237 |
| 7 | Barrackpur-II | 0 | 0 | - | 92 |
| 8 | Basirhat I | 82 | 253 | 4.88 | 872 |
| 9 | Basirhat II | 9 | 11 | 0.18 | 231 |
| 10 | Bongaon | 30 | 46 | 1 | 203 |
| 11 | Deganga | 27 | 57 | 0.41 | 449 |
| 12 | Gaighata | 31 | 59 | 0.9 | 333 |
| 13 | Habra I | 69 | 146 | 0.85 | 755 |
| 14 | Habra II | 92 | 168 | 1.2 | 793 |
| 15 | Haroa | 14 | 26 | 0.57 | 815 |
| 16 | Hasnabad | 21 | 34 | 0.58 | 968 |
| 17 | Hingalganj | 9 | 13 | 0.43 | 853 |
| 18 | Minakhan | 8 | 17 | 0.48 | 1285 |
| 19 | Rajarhat | 23 | 54 | 0.45 | 564 |
| 20 | Sandeshkhali I | 0 | 0 | - | 255 |
| 21 | Sandeshkhali II | 0 | 0 | - | 197 |
| 22 | Swarupnagar | 30 | 56 | 0.51 | 330 |
| **TOTAL** | | **611** | **1450** | | **12221** |

**Table 3: Block-wise Distribution of Arsenic Affected habitations based on Samples Tested on the Year 2015-2016 (IMIS)**

| Sl. No. | Name of Blocks | Number of Habitation affected by Arsenic concentration > 0.01 mg/l | Total no. of samples where Arsenic conc. > 0.01 mg/l | Maximum As Conc. (mg/l) | Total no. of samples Tested |
|---|---|---|---|---|---|
| 1 | Amdanga | 33 | 146 | 0.28 | 1929 |
| 2 | Baduria | 102 | 1207 | 0.2 | 3350 |
| 3 | Bagda | 114 | 400 | 0.36 | 1951 |
| 4 | Barasat I | 74 | 138 | 0.75 | 1649 |
| 5 | Barasat II | 59 | 198 | 0.05 | 1513 |
| 6 | Barrackpur-I | 27 | 47 | 0.13 | 887 |
| 7 | Barrackpur-II | 2 | 3 | - | 854 |
| 8 | Basirhat I | 152 | 878 | 4.88 | 1787 |
| 9 | Basirhat II | 79 | 149 | 0.18 | 1663 |
| 10 | Bongaon | 135 | 533 | 1 | 1853 |
| 11 | Deganga | 151 | 535 | 0.41 | 1836 |
| 12 | Gaighata | 142 | 745 | 0.9 | 1761 |
| 13 | Habra I | 119 | 551 | 0.85 | 1501 |
| 14 | Habra II | 91 | 229 | 1.2 | 1138 |
| 15 | Haroa | 47 | 97 | 0.57 | 1322 |
| 16 | Hasnabad | 57 | 176 | 0.58 | 1442 |
| 17 | Hingalganj | 0 | 0 | 0.43 | 565 |
| 18 | Minakhan | 2 | 4 | 0.48 | 905 |
| 19 | Rajarhat | 61 | 120 | 0.45 | 1203 |
| 20 | Sandeshkhali-I | 1 | 1 | - | 454 |
| 21 | Sandeshkhali-II | 4 | 4 | - | 1430 |
| 22 | Swarupnagar | 142 | 752 | 0.51 | 1834 |
| **TOTAL** | | **1594** | **6913** | | **32827** |

**Table 4: Block-wise Distribution of Arsenic Affected habitations based on Samples Tested on the Year 2016-2017 (IMIS data)**

| Sl. No. | Name of Blocks | Number of Habitation affected by Arsenic concentration > 0.01 mg/l | Total no. of samples where Arsenic conc. > 0.01 mg/l | Maximum Arsenic Conc. (mg/l) | Total no. of samples Tested |
|---|---|---|---|---|---|
| 1 | Amdanga | 12 | 31 | 1 | 198 |
| 2 | Baduria | 17 | 44 | 0.18 | 339 |
| 3 | Bagda | 9 | 13 | 0.41 | 85 |
| 4 | Barasat I | 3 | 4 | 0.15 | 84 |
| 5 | Barasat II | 7 | 21 | 0.11 | 150 |
| 6 | Barrackpur-I | 1 | 1 | 1.24 | 44 |
| 7 | Barrackpur-II | - | - | - | - |
| 8 | Basirhat I | | 26 | 0.26 | 103 |
| 9 | Basirhat II | - | - | - | - |
| 10 | Bongaon | 2 | 4 | 0.1 | 26 |
| 11 | Deganga | 3 | 7 | 0.61 | 69 |
| 12 | Gaighata | 1 | 1 | 0.1 | 19 |
| 13 | Habra I | 10 | 17 | 0.1 | 81 |
| 14 | Habra II | 9 | 17 | 0.1 | 113 |
| 15 | Haroa | 0 | 0 | - | 33 |
| 16 | Hasnabad | 0 | 0 | - | 50 |
| 17 | Hingalganj | 0 | 0 | - | 29 |
| 18 | Minakhan | 0 | 0 | - | 150 |
| 19 | Rajarhat | 3 | 1 | 0.11 | 77 |
| 20 | Sandeshkhali I | - | - | - | - |
| 21 | Sandeshkhali II | - | - | - | - |
| 22 | Swarupnagar | 33 | 59 | 0.18 | 364 |
| | Total | 110 | **246** | | **2014** |

**Table 5: Three Years Summary of Pattern of Distribution of Arsenic in Groundwater in the Affected Blocks of North 24 Parganas District (2014-15 ; 2015-16; 2016-17)**

**[source: IMIS data]**

| Sl. No. | Name of Blocks | Number of Habitation affected by Arsenic conc. > 0.01 mg/l | % of Samples Containing Arsenic Conc. > 0.01 mg/l | Total no. of samples Tested | Total no. of samples where Arsenic conc. > 0.01 mg/l |
|---|---|---|---|---|---|
| 1 | Amdanga | 58 | 7.66 | 2676 | 205 |
| 2 | Baduria | 155 | 30.11 | 4537 | 1366 |
| 3 | Bagda | 140 | 18.77 | 2312 | 434 |
| 4 | Barasat I | 106 | 7.88 | 2461 | 194 |
| 5 | Barasat II | 135 | 22.66 | 2251 | 510 |
| 6 | Barrackpur-I | 30 | 4.37 | 1168 | 51 |
| 7 | Barrackpur-II | 2 | 0.32 | 946 | 3 |
| 8 | Basirhat I | 234 | 41.89 | 2762 | 1157 |
| 9 | Basirhat II | 88 | 8.45 | 1894 | 160 |
| 10 | Bongaon | 167 | 28.00 | 2082 | 583 |
| 11 | Deganga | 181 | 25.45 | 2354 | 599 |
| 12 | Gaighata | 174 | 38.10 | 2113 | 805 |
| 13 | Habra I | 198 | 30.55 | 2337 | 714 |
| 14 | Habra II | 192 | 20.25 | 2044 | 414 |
| 15 | Haroa | 61 | 5.67 | 2170 | 123 |
| 16 | Hasnabad | 78 | 8.54 | 2460 | 210 |
| 17 | Hingalganj | 9 | 0.90 | 1447 | 13 |
| 18 | Minakhan | 10 | 0.90 | 2340 | 21 |
| 19 | Rajarhat | 87 | 9.49 | 1844 | 175 |
| 20 | Sandeshkhali I | 1 | 0.14 | 709 | 1 |
| 21 | Sandeshkhali II | 4 | 0.25 | 1627 | 4 |
| 22 | Swarupnagar | 205 | 34.30 | 2528 | 867 |
| **TOTAL** | | **2315** | 18.29 | **47062** | **8609** |

**Table 6: Summary of Pattern of Distribution of Some Major Parameters in Groundwater of North 24 Parganas District**

**(as per IMIS data)**

| Sl. No. | Year | Number of Samples Tested | No. of Samples with Fe > 0.3 (mg/l) | No. of Samples with Total Coliform >[0 MPN/100ml] | No. of Samples E-Coli >[0 MPN/100ml] | No. of Samples with Hardness Concentration >600 (mg/l) |
|---|---|---|---|---|---|---|
| **1** | **2013-14** | **16742** | 7644 [0.31 – 8.82 mg/l] | 617 [1 MPN/100ml – 240 MPN/100 ml] | 527 [1 MPN/100ml – 130 MPN/100 ml] | 36 [606.0 – 4156.0 mg/l] |
| **2** | **2014-15** | **12221** | 8096 [0.31 – 9.24 mg/l] | 1409 [1 MPN/100ml – 840 MPN/100 ml] | 894 0.09 MPN/100ml – 90 MPN/100 ml] | 168 [612.0 – 2640.0 mg/l] |
| **3** | **2015-16** | **32827** | 6081 [0.31 – 9.0 mg/l] | 1934 [1 MPN/100ml – 430 MPN/100 ml] | 932 [1 MPN/100ml – 96 MPN/100 ml] | 24 [603.0 – 2398.0 mg/l] |
| **4** | **2016-17** | **2014** | 1496 [0.31 – 5.88 mg/l] | 713 [0.05 MPN/100ml – 496 MPN/100 ml] | 7 [1 MPN/100ml – 30 MPN/100 ml] | 40 [615.0 – 920.0 mg/l] |
| **TOTAL** | | **63804** | **23317** | **4583** | **2450** | **268** |
| **Percentage (%) of total samples** | | | **36.5** | **7.18** | **3.83** | **0.42** |

**Table 7: Water Quality Data of Hoogly River, within the North 24 Parganas District**

**Station: Ganga at Palta, West Bengal**

**Depth: 9 m below**

| Date | BOD (mg/l) | COD (mg/l) | DO (mg/l) | Fecal Coliform (MPN/100 ml) | Total Coliform (MPN/100 ml) | TSS (mg/l) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|
| 1.12.2016 | 5.5 | 12.98 | 7.0 | 220,000 | 280,000 | 32 | 42.5 |
| 9.9.2016 | 1.5 | 7.22 | 6.50 | 170,000 | 220,000 | 120 | 146 |
| 4.8.2016 | 2.80 | 10.34 | 4.70 | 170,000 | 220,000 | 216 | 140 |
| 10.6.2016 | 3.05 | 7.91 | 7.10 | 220,000 | 280,000 | 108 | 84.3 |
| 5.7.2016 | 2.10 | 7.18 | 5.50 | 170,000 | 220,000 | 92 | 90 |
| 25.10.2016 | 1.90 | 8.29 | 5.70 | 140,000 | 170,000 | 56 | 72 |
| 8.9.2015 | 2.10 | 14.71 | 5.10 | 80,000 | 110,000 | 132 | 119 |
| 4.8.2015 | 2,20 | 17.98 | 4.10 | 50,000 | 70,000 | 286 | 268 |
| 8.6.2015 | 1.75 | 9.15 | 6.30 | 110,000 | 140,000 | 256 | 84 |
| 3.7.2015 | 3.10 | 8.32 | 7.0 | 110,000 | 170,000 | 242 | 475 |
| 4.8.2014 | 2.1 | 10.2 | 4.9 | 80,000 | 110,000 | 482 | 484 |
| 7.7.2014 | 2.25 | 6.5 | 5.5 | 4,000 | 8,000 | 368 | 505 |

Souce: West Bengal Pollution Control Board

http://emis.wbpcb.gov.in/waterquality/showwqprevdatachoosedist.do

# ANNEX 6:

# Details of Sunderbans

# Biosphere Reserve with North 24 Parganas

**Coverage of Sunderban Biosphere Reserve**

Sunderbans is part of the world's largest deltaic plain of fluvio-marine deposit formed by the Ganges and the Brahmaputra at the confluence of the Bay of Bengal. The Sunderbans spread across 9,630 sq km in India and 16,370 sq km in Bangladesh. The geographical limit of Indian Sunderbans can be demarcated by the Dampier and Hodges line (an intaginary line drawn in 1831), in the North West, the river Hooghly in the West, the rivers lchhamati-Kalindi-Muriganga in the East which is incidentally the international boundary between India and Bangladesh, and the Bay of Bengal in the south. Indian Sunderbans extends over parts of the districts of South 24 Parganas and Southern parts of the North 24 Parganas. This delta consists of 10,200 sq km of mangrove forests spread over India (4,200 sq km) and Bangladesh (6,000 sq km) forests areas.

The Indian Sunderban region consists of 4,200 sq km of reserved forests along with 5,400 sq km of non forest area i.e., a total of 9600 sq. km. Of this the Sunderbans Tiger Reserve is spread over 2585 sq. km. The entire area is a conglomeration of river channels, creeks and 102 island. Of these 54 islands are inhabited and the rest 48 islands are forested. The islands are low, marshy, alluvial plains that are still in the process of being formed through siltation and powerful tidal currents, a continuous process of erosion and accretion.

The Sundebans delta is characterised by beaches, mudflats, coastal dunes, sand flats, estuaries, creeks, inlets and mangrove swamps. The maze of rivers, estuaries and creeks carry saline water nearly 300 km inlands from the Bay of Bengal. Approximately 2,069 sq km area is occupied by the region’s seven main tidal river systems or estuaries, which finally end up in the Bay of Bengal

In 1973, the first conservation effort took off, with the setting up of the Sunderbans Tiger Reserve. Subsequently in 1987, UNESCO recognised the Sunderbans as a World Heritage Site. Finally in 1989, Government of India constitutes the Sunderbans Biosphere Reserve. In 2001, The UNESCO recognises the sunderbans under its Man and Biosphere (MAB) Programme also nominated it as a Ramsar site

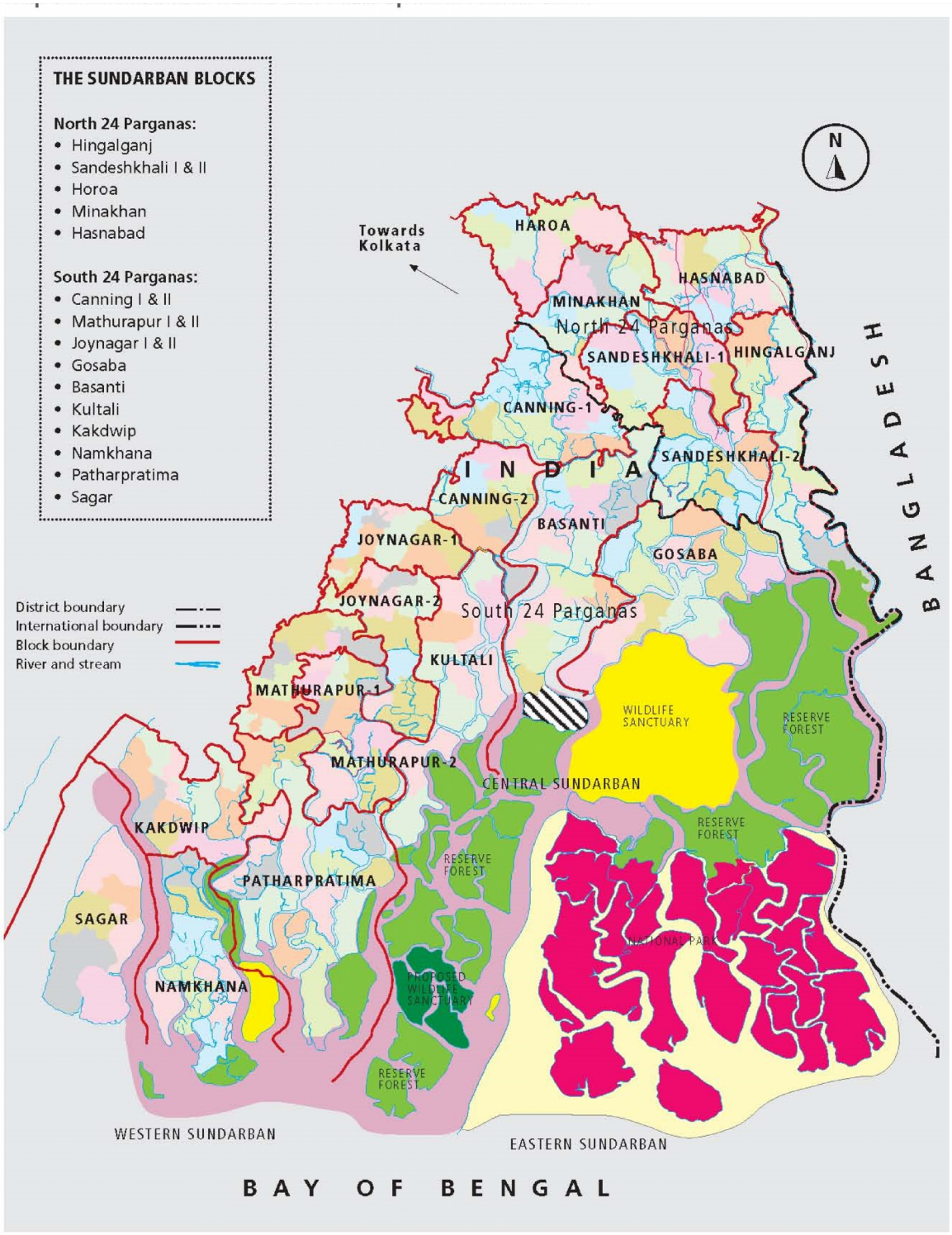



**Figure 1: Administrative Divisions of Sunderbans**

**Source:** Living with changing climate Impact, vulnerability and adaptation challenges in Indian Sunderbans, centre for Science and Environment,

**Zonation of Sunderbans**

The total area of theBiosphere Reserve has been divided into three inter-related zones[1], described below.

**The core zone** is a compact block of Reserve Forest covering approximately 1700 sq. km. lying in the eastern portion of Sunderbans adjoining the Bangladesh border and is bounded by the Matla river in the west and butts into Bay of Bengal . This fully protected area containing the Sunderbans National Park is devoted to conservation of bio-diversity. Nearly 40% of the Reserve Forest area has been brought under Protected Area (PA) network, as follows:-

- Area of Sunderbans National Park = 1330 sq km
- Area of Sajnekhali Wildlife Sanctuary = 362 sq km
- Area of Lothian Wildlife Sanctuary = 38 sq km
- Area of Haliday Wildlife Sanctuary = 6 sq km

Recently the core areas have been notified as the Critical Tiger Habitat having an inviolate area of 1699.62 sq. km

**Buffer zone:** This zone comprises majority of mangrove areas (885.72 sq. km) including areas adjoining to reserved forests areas and surrounding the above Core Zone and includes portion of the buffer zone of tiger reserve, Sajnakhali Wild Life Sanctuary and compact reserve Forest blocks lying between Matla and Thakuran under 24-Parganas (South) Forest Division. This area serves as the manipulation zone where tourists can visit.

**Transition zone :** Covers the balance of the Biosphere Reserve area, which contains mangrove areas mostly in non-forest areas and reclaimed areas with agriculture.

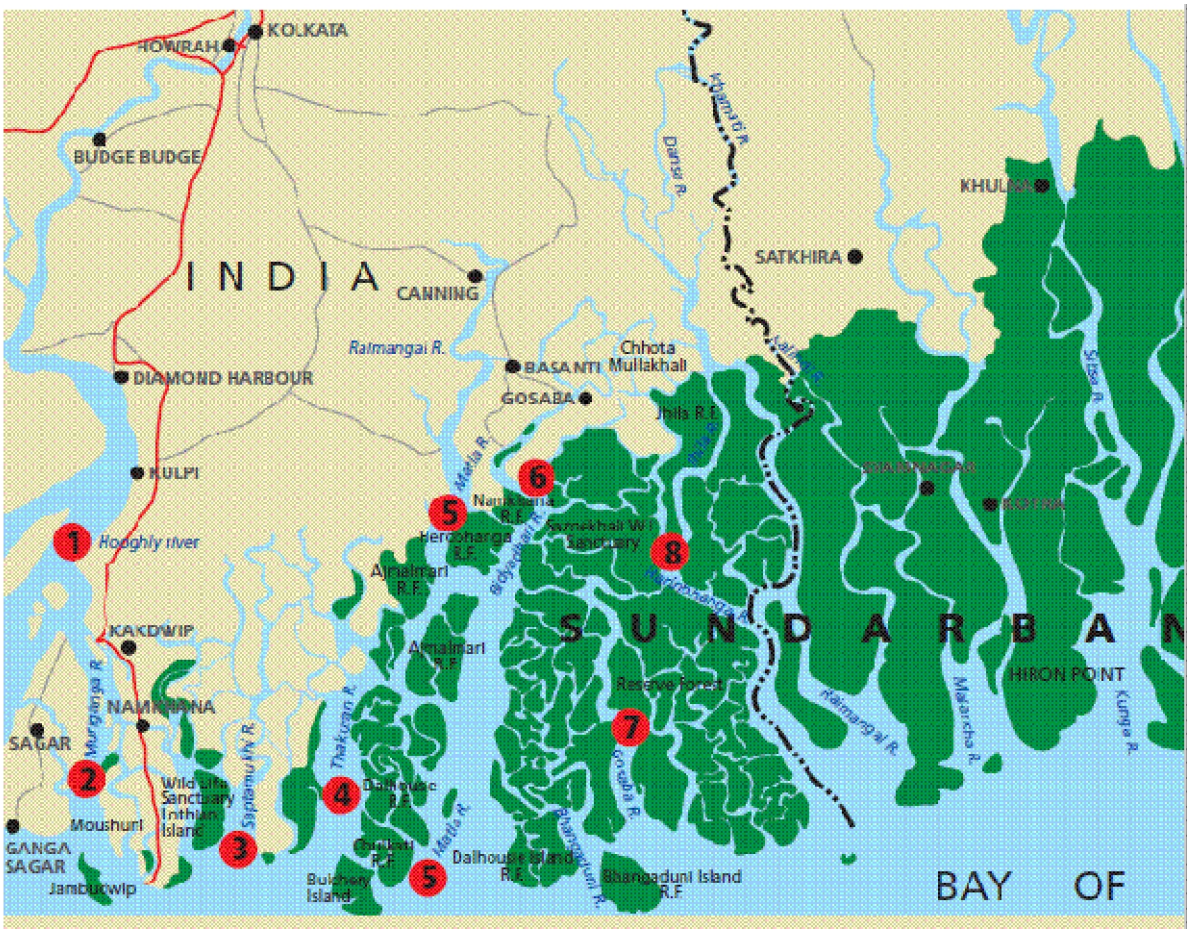
The area-wise zonation of the Sunderbans is given in Table 1.3 below[2]:

**Table 1.3** Areawise zonation of Indian Sunderbans

| Zone | Area lying between | Forestry ($km^2$) | Agriculture ($km^2$) | Restoration zone ($km^2$) | Total area ($km^2$) |
|---|---|---|---|---|---|
| I | Sagar-Mohisani Ghoramara-Sand Heads etc. | – | 75 | 15 | 90 |
| II | Mohisani Island and Thakuran River | – | 700 | 200 | 900 |
| III | Thakuran and Matla River | 1,370 | 200 | 30 | 1,600 |
| IV | Core area of biosphere resource | | | | 1,692 |
| | North of buffer area | 1,692 | | | |
| V | Buffer zone of Tiger Reserve | 893 | – | – | 893 |
| VI | Settlement area north of forest area of Tiger Reserve | – | 4,455 | – | 4,455 |
| | Total area in $km^2$ | 3,955 | 5,430 | 245 | **9,630** |

[1] http://www.sundarbanbiosphere.org/html_files/management_indian_sunderban.htm

[2] Estuarine morphodynamics of the Sunderbans, Goutam Kumar Das. Springer, 2015




**1- Hooghly river, 2- Muriganga River, 3- Saptamukhi River, 4- Thakuran river, 5-Matla River, 6- Bidhyadhari river, 7- Gosaba River, 8-Harinbhanga river**

**Figure 2: Rivers of Sunderbans**

# ANNEX 7 :

# Break-up of Road Lengths

# in the

# North 24 Parganas District

**Table 1: Length of Roads maintained by different agencies in the Blocks of North 24-Parganas for the year 2012-13**

| Sl. No. | Name of Block | Length in km | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | P.W.D. | | Zilla Parishad | | Gram Panchayat & Panchayat Samity | | Pradhan Mantri Gram Sadak Yojana | | Total | |
| | | Surfaced | Un-surfaced | Surfaced | Un-surfaced | Surfaced | Un-surfaced | Surfaced | Un-surfaced | Surfaced | Un-surfaced |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | | |
| 1 | Bagdah | 52.00 | | 25.00 | | 18.80 | 502.30 | 21.00 | | 116.80 | 502.30 |
| 2 | Bongaon | 87.00 | | 1.94 | 4.97 | 845.00 | 55.00 | 30.00 | | 963.94 | 59.97 |
| 3 | Gaighata | | | 4.70 | 4.97 | 511.00 | 355.00 | 6.02 | | 521.72 | 359.97 |
| 4 | Habra-I | 41.50 | | 11.70 | 1.00 | 41.00 | 154.00 | | | 94.20 | 155.00 |
| 5 | Habra-II | 53.00 | | 12.90 | 3.00 | 2.10 | 120.00 | | | 68.00 | 123.00 |
| 6 | Barasat-I | 44.80 | | 11.97 | 2.00 | 159.00 | 184.00 | | | 215.77 | 186.00 |
| 7 | Barasat-II | 47.00 | | 27.97 | 11.90 | 42.00 | 155.00 | 4.88 | | 121.85 | 166.90 |
| 8 | Amdanga | 46.00 | | 10.50 | 63.00 | 122.00 | 70.00 | | | 178.50 | 133.00 |
| 9 | Deganga | 60.00 | | 5.00 | | 230.00 | 72.00 | 11.33 | | 306.33 | 72.00 |
| 10 | Rajarhat | 53.00 | | 8.90 | | 167.00 | 93.00 | | | 228.90 | 93.00 |
| 11 | Barrackpur-I | 42.30 | | 61.50 | | 160.50 | 201.45 | 30.50 | | 294.80 | 201.45 |
| 12 | Barrackpur-II | 28.50 | | 3.20 | | 76.50 | 59.00 | 1.50 | | 109.70 | 59.00 |

| Sl. No. | Name of Block | Length in km | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | P.W.D. | | Zilla Parishad | | Gram Panchayat & Panchayat Samity | | Pradhan Mantri Gram Sadak Yojana | | Total | |
| | | Surfaced | Un-surfaced | Surfaced | Un-surfaced | Surfaced | Un-surfaced | Surfaced | Un-surfaced | Surfaced | Un-surfaced |
| 13 | Baduria | 75.00 | | 10.00 | | 185.00 | 110.00 | 10.00 | | 280.00 | 110.00 |
| 14 | Haroa | 40.00 | | 5.35 | | | 107.00 | 8.06 | | 53.41 | 107.00 |
| 15 | Minakhan | 26.00 | | 2.00 | | 2.50 | 150.00 | | | 30.50 | 150.00 |
| 16 | Swarupnagar | 68.00 | | 19.02 | | 62.00 | 300.00 | 9.00 | | 158.02 | 300.00 |
| 17 | Hasnabad | 39.00 | | 6.00 | | 32.00 | 51.00 | | | 77.00 | 51.00 |
| 18 | Hingalganj | 43.00 | | 23.00 | | 643.00 | 268.00 | 14.22 | | 723.22 | 268.00 |
| 19 | Sandeshkhali-I | 45.00 | | 3.80 | | 383.00 | 148.00 | | | 431.80 | 148.00 |
| 20 | Sandeshkhali-II | 25.00 | | | | 6.00 | 172.00 | | | 31.00 | 172.00 |
| 21 | Basirhat-I | 21.40 | | 7.20 | | 46.00 | 48.00 | | | 74.60 | 48.00 |
| 22 | Basirhat-II | 24.00 | | 9.70 | | 167.50 | | | | 201.20 | 0.00 |

Sources :1) Block Development Officers, North 24-Parganas

2) Zilla Parishad, North 24-Parganas

**Table 2: Length of National Highway (as on 2012-13)**

| | |
|---|---|
| NH2 | 7.94 |
| NH34 | 33.6 |
| NH35 | 59.4 |
| Total | 100.94 |

Source: district Handbook of North 24 Parganas

**Table 3: Length of State Highway (as on 2012-13)**

***State Highway***

| | |
|---|---|
| SH 1 | 1. Bongaon - Chakdah (0 - 16)<br>2. Chakdah - Blrohi via NH- 34 (0 - 0)<br>3. Birohi - Madanpur - Kalyani (16 - 30)<br>4. Kalyani - Barrackpore (30 - 57)<br>5. Barrackpore - Kolkata (57 - 75)<br>6. Garia - Mathurapur - Kulpi nh (75 - 135) |
| SH 2 | 1. Bankura - Khatra (0 - 30)<br>2. Khatra more - Taldangra - Thenchuria (30 - 52)<br>3. Chenchuna - Bishnupur (52 - 76)<br>4. Bishnupur by-pass (76 - 81)<br>5. Bishnupur - Kotulpur - Arambagh (81 - 117)<br>6. Kotulpur- Arambagh (117 - 135)<br>7. Arambagh - Pursurah - Champadanga (135 - 156)<br>8. Champadanga - Tarakeswar - Baidyabati (156 - 196)<br>9. Baidyabati - Uttarpara (196 - 214)<br>10. Uttarpara - Dakshineswar - Dunlop - Bkp (214 - 226)<br>11. Barrackpore - Barasat (226 - 239)<br>12. Barasat - Basirhal - Hasnabad (239 - 301)<br>13. Hasnabad - Chaital - Maiancha (301 - 323) |
| SH 3 | 1. Krishnagar - Hanskhah - Dattafulia (0 - 32)<br>2. Kholapota - Sikra - Kulingram via SH 2 (0 - 0)<br>3. Bongaon - Gaighata via NH 35 (0 - 0)<br>4. Dattafulia - Bagda - Bongaon (32 - 68)<br>5. Gaighata - Maslandpur - Kholapota (68 - 102)<br>6. Sikra - Kulingram - Haroa (102 - 118)<br>7. Haroa - Lowhati - Kaikhali (118 - 147)<br>8. Kaikholi - Ultadanga via VIP (147 - 155)<br>9. Uliadanga - Dhapa Via Em By-Pass (155 - 164)<br>10. Dhapa - Bhangar - Minakhan - Bansanti - Gosaba (164 - 260) |
| Total | 178 Km. |

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# ANNEX 8:

# Block-wise Distribution

# of

# Existing Water Supply Schemes

# in the North 24 Parganas (Rural)

**Table 1: Block-wise distribution of Spot Sources in North 24 Parganas**

| Sl. No. | Block | Number of spot sources |
|---|---|---|
| 1 | Amdanga | 1490 |
| 2 | Baduria | 2494 |
| 3 | Bagda | 1685 |
| 4 | Barasat I | 1835 |
| 5 | Barasat II | 939 |
| 6 | Barrackpur-I | 943 |
| 7 | Barrackpur-II | 477 |
| 8 | Basirhat I | 1380 |
| 9 | Basirhat II | 1246 |
| 10 | Bongaon | 1793 |
| 11 | Deganga | 1672 |
| 12 | Gaighata | 1216 |
| 13 | Habra I | 1164 |
| 14 | Habra II | 800 |
| 15 | Haroa | 1262 |
| 16 | Hasnabad | 1097 |
| 17 | Hingalganj | 21 |
| 18 | Minakhan | 25 |
| 19 | Rajarhat | 1436 |
| 20 | Sandeshkhali I | 24 |
| 21 | Sandeshkhali II | 868 |
| 22 | Swarupnagar | 1536 |
| | **TOTAL** | 25403 |

Source: IMIS data, http://indiawater.gov.in/IMISReports/Reports/BasicInformation/rpt_SchemesSourcesGWSW_List.aspx?RP=Y&TY=D

**Spot Sources:** Those water supply systems where the source of water and the supply/delivery system are both at the same point location, are called spot sources. Eg. Hand humps, wells, ponds etc

Piped Water Supply Scheme (PWSS): Such water supply systems provide water to various points away from the source of water through a pumping or gravity system and connections through pipelines.

## Table 2: Block-wise distribution of PWSS Schemes[1]

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| Amdanga | SM/00701 | Bodai Water Supply Scheme | 1989-1990 | FC | GW | 17 | 98 | 0 | 10.61 | New |
| | SM/00986 | Surface Water Based W/S Scheme For Arsenic Affected Area of North 24 Parganas | 2001-2002 | FC | SW | 261 | 1034 | 0 | 3.10 | New |
| | SM/02350 | Reju of Bodai W/S Scheme | 2012-2013 | Og | GW | 16 | 94 | 0 | 18.64 | Rejuvenation |
| | SM/03840 | Rejuvenation of Bodai Water Supply Scheme Zone - I & II | 2012-2013 | Og | GW | 17 | 98 | 0 | 18.64 | Rejuvenation |
| | SM/04126 | Improvement of Surface Based Water Supply Scheme For Arsenic Affected Areas of North 24 Parganas. | 2012-2013 | Og | SW | 142 | 693 | 0 | 12.56 | Improvement |
| | SM/04457 | Surface Water Based Water Supply Scheme For Arsenic Affected Areas of Habra-Gaighata & Adjoining Mouzas | 2013-2014 | Og | SW | 352 | 1614 | 3 | 5777.20 | New |
| | | | | | | | | | 0.00 | |
| Baduria | SM/00491 | Chandipur Water Supply Scheme | 1995-1996 | FC | GW | 6 | 21 | 0 | 6.42 | New |
| | SM/00558 | Dakshin Chatra Water Supply Scheme | 1981-1982 | C | GW | 10 | 24 | 0 | 4.42 | New |
| | SM/00559 | Gokna Water Supply Scheme | 1981-1982 | C | GW | 13 | 53 | 0 | 3.18 | New |
| | SM/00578 | Arsula Water Supply Scheme | 1989-1990 | C | GW | 7 | 32 | 0 | 5.02 | New |
| | SM/00822 | Masia & Nabastya Water | 2005- | FC | GW | 2 | 9 | 0 | 9.41 | New |

[1] Source: MIS data from PHED website www.wbphed.gov.in

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Supply Scheme | 2006 | | | | | | | |
| | SM/00845 | Kulia Water Supply Scheme | 2005-2006 | FC | GW | 1 | 4 | 0 | 8.44 | New |
| | SM/00982 | Bajitpur Water Supply Scheme | 2005-2006 | C | GW | 6 | 30 | 0 | 53.13 | New |
| | SM/01212 | Magurali & Its Adj. Mouzas Water Supply Scheme | 2007-2008 | C | GW | 9 | 20 | 0 | 28.41 | New |
| | SM/01364 | Aturia And Adjoining Mouzas Water Supply Scheme | 2007-2008 | FC | GW | 6 | 32 | 0 | 37.89 | New |
| | SM/01511 | Tildanga & Adjoing Water Supply Scheme | 2007-2008 | C | GW | 9 | 21 | 0 | 23.56 | New |
| | SM/01520 | Magurati Srirampur Water Supply Scheme | 2007-2008 | C | GW | 1 | 3 | 0 | 8.98 | New |
| | SM/01720 | Reju of Dakshin Chatra Water Supply Scheme | 2007-2008 | C | GW | 10 | 47 | 0 | 2.41 | Rejuvenation |
| | SM/01769 | Rajapur Water Supply Scheme | 2007-2008 | Og | GW | 9 | 25 | 0 | 39.53 | New |
| | SM/01770 | Shimla Durgapur Water Supply Scheme | 2007-2008 | C | GW | 10 | 38 | 0 | 54.72 | New |
| | SM/01869 | Jasaikhati Water Supply Scheme | 2007-2008 | C | GW | 11 | 50 | 0 | 73.61 | New |
| | SM/01908 | Reju of Arsula Water Supply Scheme | 2008-2009 | Og | GW | 7 | 32 | 0 | 6.16 | Rejuvenation |
| | SM/02218 | Reju of Masia-Nabastia W/S Scheme | 2008-2009 | Og | GW | 2 | 9 | 0 | 1.91 | Rejuvenation |
| | SM/02260 | Reju of Kulia W/S Scheme | 2008-2009 | C | GW | 1 | 4 | 0 | 1.69 | Rejuvenation |
| | SM/02369 | Reju of Gokna W/S Scheme | 2008-2009 | Og | GW | 13 | 53 | 0 | 5.47 | Rejuvenation |
| | SM/03386 | Rejuvenation of Masia Nabastia Water Supply Scheme &Adj Mouzas | 2011-2012 | Og | GW | 2 | 9 | 0 | 2.62 | Rejuvenation |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | SM/04283 | Revised Estimate For The Works Under Ground Water Based Piped Water Supply Schemes At Shimla Durgapur & Adj. Mouzas Under Arsenic Sub-Mission | 2013-2014 | Og | GW | 10 | 38 | 0 | 16.94 | Revised Estimate for AIRP |
| | SM/04293 | Revised Estimate For The Works Under Ground Water Based Piped Water Supply Schemes At Rajapur & Adjoining Under Arsenic Sub-Mission | 2013-2014 | Og | GW | 9 | 25 | 0 | 12.19 | Revised Estimate for AIRP |
| | SM/04379 | Revised Estimate For Ground Water Based Piped Water Supply Scheme At Magurali & Adjoining Mouzas. Arsenic Sub-Mission | 2013-2014 | Og | GW | 9 | 20 | 0 | 12.75 | Revised Estimate for AIRP |
| | SM/04380 | Revised Estimate For Ground Water Based Piped Water Supply Schemes At Aturia & Adjoining Mouzas Under Arsenic Sub-Mission | 2013-2014 | Og | GW | 6 | 32 | 0 | 12.12 | Revised Estimate for AIRP |
| | SM/04393 | Revised Estimate In Connection With Implementation of Iarp For Jashaikati (Zone-Ii) & Its Adj. Mouzas Ground Water Based Water Supply Scheme. | 2013-2014 | Og | GW | 11 | 50 | 0 | 16.19 | Revised Estimate for AIRP |
| | SM/04432 | Revised Estimate For Ground Water Based Piped Water Supply Schemes At Bajitpur & Adj. Mouzas Under Arsenic Sub-Mission | 2013-2014 | Og | GW | 6 | 30 | 0 | 21.25 | Revised Estimate for AIRP |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | SM/05007 | Revised Estimate For Implementation of Iep For Jasaikhati (Zone-I) Water Supply Scheme | 2014-2015 | Og | GW | 11 | 50 | 0 | 2.19 | Revised Estimate for IEP |
| | SM/05011 | Revised Estimate For Implementation of Iep For Tildanga Water Supply Scheme | 2014-2015 | Og | GW | 9 | 21 | 0 | 1.70 | Revised Estimate for IEP |
| | SM/05013 | Revised Estimate For Implementation of Iep For Magurahati Srirampur Water Supply Scheme | 2014-2015 | Og | GW | 1 | 3 | 0 | 0.80 | |
| | | | | | | | | | 0.00 | |
| Bagda | SM/00490 | Bansghata Water Supply Scheme | 1995-1996 | FC | GW | 6 | 33 | 0 | 5.29 | New |
| | SM/00514 | Bagdah Water Supply Scheme | 1977-1978 | C | GW | 5 | 28 | 0 | 1.83 | New |
| | SM/00516 | Helencha Water Supply Scheme | 1977-1978 | C | GW | 5 | 24 | 0 | 1.55 | New |
| | SM/00529 | Sindrani Water Supply Scheme | 1978-1979 | C | GW | 2 | 17 | 0 | 2.73 | New |
| | SM/00555 | Ghatpatila Water Supply Scheme | 1980-1981 | C | GW | 9 | 29 | 0 | 2.32 | New |
| | SM/00575 | Kaniara Water Supply Scheme | 1986-1987 | C | GW | 1 | 7 | 0 | 0.86 | New |
| | SM/00688 | Kurulia Water Supply Scheme | 1978-1979 | C | GW | 9 | 40 | 0 | 4.19 | New |
| | SM/01230 | Reju of Sindrani Water Supply Scheme | 2006-2007 | C | GW | 2 | 17 | 0 | 3.51 | Rejuvenation |
| | SM/01233 | Reju of Bansghata Water Supply Scheme | 2006-2007 | C | GW | 6 | 33 | 0 | 2.34 | Rejuvenation |
| | SM/01235 | Reju of Ghatpatila Water Supply Scheme | 2006-2007 | C | GW | 9 | 29 | 0 | 3.96 | Rejuvenation |
| | SM/01276 | Reju of Kaniara Water | 2007- | C | GW | 1 | 7 | 0 | 1.15 | Rejuvenation |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Supply Scheme | 2008 | | | | | | | |
| | SM/01419 | Kola Water Supply Scheme | 2007-2008 | C | GW | 1 | 4 | 0 | 9.78 | New |
| | SM/01420 | Kamlabas Water Supply Scheme | 2007-2008 | C | GW | 3 | 8 | 0 | 12.18 | New |
| | SM/01426 | Dhalani Water Supply Scheme | 2007-2008 | C | GW | 1 | 5 | 0 | 9.31 | New |
| | SM/01428 | Diara Water Supply Scheme | 2007-2008 | C | GW | 2 | 5 | 0 | 10.87 | New |
| | SM/01429 | Malidah Water Supply Scheme | 2011-2012 | C | GW | 5 | 20 | 0 | 19.82 | New |
| | SM/01430 | Hariharpur Water Supply Scheme | 2007-2008 | C | GW | 2 | 6 | 0 | 9.92 | New |
| | SM/01442 | Bayra Water Supply Scheme | 2007-2008 | C | GW | 2 | 8 | 0 | 16.65 | New |
| | SM/01447 | Auldanga Water Supply Scheme | 2007-2008 | Og | GW | 11 | 39 | 0 | 49.29 | New |
| | SM/01519 | Parmadan Water Supply Scheme | 2007-2008 | Og | GW | 2 | 13 | 0 | 21.89 | New |
| | SM/01525 | Chandpur Water Supply Scheme | 2007-2008 | C | GW | 6 | 19 | 0 | 25.51 | New |
| | SM/01771 | Godpukuria Water Supply Scheme | 2007-2008 | C | GW | 7 | 28 | 0 | 34.79 | New |
| | SM/01804 | Gobindapur & Adjoing Mouza Water Supply Scheme | 2007-2008 | C | GW | 3 | 14 | 0 | 24.74 | New |
| | SM/02351 | Reju of Kurulia W/S Scheme | 2008-2009 | Og | GW | 9 | 40 | 0 | 5.39 | Rejuvenation |
| | SM/03075 | Rejuvenation of Auldanga And Adj. Mouzas Piped Water Supply Scheme | 2010-2011 | Og | GW | 2 | 8 | 0 | 1.93 | Rejuvenation |
| | SM/03841 | Rejuvenation of Helencha Water Supply Scheme | 2012-2013 | C | GW | 5 | 24 | 0 | 9.37 | Rejuvenation |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | SM/04285 | Revised Estimate In Connection With Implementation of Iarp For Auldanga & Its Adj. Mouzas Ground Water Based Water Supply Scheme. | 2013-2014 | Og | GW | 11 | 34 | 0 | 17.17 | Revised Estimate for AIRP |
| | SM/04395 | Revised Estimate For Ground Water Based Piped Water Supply Scheme At Dhalani & Adj. Mouzas. Arsenic Sub-Mission | 2013-2014 | C | GW | 1 | 5 | 0 | 9.58 | Revised Estimate for AIRP |
| | SM/04435 | Revised Estimate For Ground Water Based Piped Water Supply Scheme At Kola Mouza. Arsenic Sub-Mission | 2013-2014 | C | GW | 1 | 4 | 0 | 8.95 | Revised Estimate for AIRP |
| | SM/04436 | Revised Estimate For Ground Water Based Piped Water Supply Schemes At Hariharpur & Adjoining Mouzas Under Arsenic Sub-Mission | 2013-2014 | C | GW | 2 | 6 | 0 | 9.59 | Revised Estimate for AIRP |
| | SM/04440 | Revised Estimate For Ground Water Based Piped Water Supply Scheme At Gadpukuriya & Adj. Mouzas.Arsenic Sub-Mission | 2013-2014 | Og | GW | 7 | 28 | 0 | 11.45 | Revised Estimate for AIRP |
| | SM/04872 | Augmentation of Kaniara Piped Water Supply Scheme | 2014-2015 | Og | GW | 1 | 0 | 0 | 5.09 | Augmented |
| | | | | | | | | | 0.00 | |
| Barasat I | SM/00486 | Kasimpur Water Supply Scheme | 1987-1988 | C | GW | 1 | 9 | 0 | 1.29 | New |
| | SM/00573 | Bamangachi Water Supply Scheme | 1986-1987 | C | GW | 1 | 6 | 0 | 0.72 | New |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | SM/00981 | Chandrapur Water Supply Scheme | 1995-1996 | C | GW | 6 | 39 | 0 | 8.92 | New |
| | SM/00986 | Surface Water Based W/S Scheme For Arsenic Affected Area of North 24 Parganas | 2001-2002 | FC | SW | 261 | 1034 | 0 | 3.10 | New |
| | SM/01058 | Sibalaya Water Supply Scheme | 2003-2004 | FC | GW | 2 | 17 | 0 | 8.58 | New |
| | SM/03318 | Rejuvenation of Bamangachi Water Supply Scheme | 2010-2011 | C | GW | 1 | 6 | 0 | 10.02 | Rejuvenation |
| | SM/04126 | Improvement of Water Based Water Supply Scheme For Arsenic Affected Areas of North 24 Parganas. | 2012-2013 | Og | SW | 142 | 693 | 0 | 12.56 | Improvement |
| | SM/04235 | Rejuvenation of Nebadhai Duttapukur Water Supply Scheme Zone-I & Ii. | 2013-2014 | C | GW | 1 | 0 | 0 | 13.76 | Rejuvenation |
| | SM/04252 | Nebadhai Duttapukur Water Supply Scheme | 1990-1991 | C | GW | 1 | 0 | 0 | 0.00 | New |
| | SM/04457 | Surface Water Based Water Supply Scheme For Arsenic Affected Areas of Habra-Gaighata & Adjoining Mouzas | 2013-2014 | Og | SW | 352 | 1614 | 3 | 5777.20 | New |
| | SM/05045 | Improvement of Barbaria & Adj. Mouzas Piped Water Supply Scheme Under Surface Water Based Water Supply Scheme In North 24 Parganas Arsenic Area | 2014-2015 | Og | GW | 3 | 13 | 0 | 67.33 | Improvement |
| | | | | | | | | | 0.00 | |
| | | | | | | | | | 0.00 | |
| Barasat II | SM/00484 | Matiagacha Water Supply | 1987- | C | GW | 1 | 8 | 0 | 1.38 | New |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Scheme | 1988 | | | | | | | |
| | SM/00493 | Humaipur Water Supply Scheme | 1994-1995 | C | GW | 7 | 17 | 0 | 8.49 | New |
| | SM/00574 | Deara Water Supply Scheme | 1987-1988 | C | GW | 1 | 5 | 0 | 1.13 | New |
| | SM/01452 | Puturia Water Supply Scheme | 2007-2008 | Og | GW | 9 | 27 | 0 | 43.58 | New |
| | SM/01453 | Rohanda Water Supply Scheme | 2007-2008 | C | GW | 10 | 18 | 0 | 30.64 | New |
| | SM/01477 | Bahira & Adjoing Water Supply Scheme | 2007-2008 | Og | GW | 8 | 22 | 0 | 30.72 | New |
| | SM/01510 | Chowlpur Water Supply Scheme | 2007-2008 | C | GW | 6 | 12 | 0 | 22.44 | New |
| | SM/01514 | Mahishgadi Water Supply Scheme | 2007-2008 | C | GW | 3 | 11 | 0 | 24.52 | New |
| | SM/01518 | Chaumuha Water Supply Scheme | 2007-2008 | C | GW | 3 | 8 | 0 | 23.85 | New |
| | SM/01763 | Bagband Water Supply Scheme | 2007-2008 | C | GW | 11 | 31 | 0 | 48.41 | New |
| | SM/01876 | Paltadanga Water Supply Scheme | 2011-2012 | Og | GW | 7 | 18 | 0 | 35.87 | New |
| | SM/02348 | Reju of Matiagacha W/S Scheme | 2008-2009 | Og | GW | 1 | 8 | 0 | 3.82 | Rejuvenation |
| | SM/02349 | Reju of Deara W/S Scheme | 2008-2009 | C | GW | 1 | 5 | 0 | 3.99 | Rejuvenation |
| | SM/04473 | Ground Water Based Piped Water Supply Scheme For Donnagar & Adj. Mouza. | 2013-2014 | Og | GW | 2 | 8 | 0 | 24.04 | New |
| | SM/04948 | Revised Estimate For Implementation of Iep For Rohanda & Its Adjoining Mouzas Ground Water Based Water Supply Scheme | 2014-2015 | Og | GW | 10 | 18 | 0 | 0.41 | Revised Estimate for IEP |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | SM/04949 | Revised Estimate For Implementation of Iep For Bahira & Its Adjoining Mouzas Ground Water Based Water Supply Scheme | 2014-2015 | Og | GW | 8 | 22 | 0 | 0.07 | Revised Estimate for IEP |
| | SM/04950 | Revised Estimate For Implementation of Iep For Choumuha & Its Adjoining Mouzas Ground Water Based Water Supply Scheme | 2014-2015 | Og | GW | 3 | 8 | 0 | 0.84 | Revised Estimate for IEP |
| | SM/04951 | Revised Estimate For Implementation of Iep For Puturia & Its Adjoining Mouzas Ground Water Based Water Supply Scheme | 2014-2015 | Og | GW | 9 | 27 | 0 | 2.82 | Revised Estimate for IEP |
| | SM/04952 | Revised Estimate For Implementation of Iep For Bagband Saiberia & Its Adjoining Mouzas Ground Water Based Water Supply Scheme | 2014-2015 | Og | GW | 11 | 31 | 0 | 2.51 | Revised Estimate for IEP |
| | SM/04953 | Revised Estimate For Implementation of Iep For Paltadanga & Its Adjoining Mouzas Ground Water Based Water Supply Scheme | 2014-2015 | Og | GW | 7 | 18 | 0 | 0.92 | Revised Estimate for IEP |
| | SM/04996 | Revised Estimate For Implementation of Iep For Mahisgadi Water Supply Scheme | 2014-2015 | Og | GW | 3 | 5 | 0 | 1.48 | Revised Estimate for IEP |
| | | | | | | | | | 0.00 | |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 0.00 | |
| | | | | | | | | | 0.00 | |
| Barrackpore I | SM/02941 | Pond Based Rain Water Harvesting W/S Scheme Using Mathurabil In North 24 Prgs | 2009-2010 | Og | PW | 15 | 86 | 0 | 119.26 | New |
| | SM/04457 | Surface Water Based Water Supply Scheme For Arsenic Affected Areas of Habra-Gaighata & Adjoining Mouzas | 2013-2014 | Og | SW | 352 | 1614 | 3 | 5777.20 | New |
| | SM/05315 | Improvement of Dogachia Piped Water Supply Scheme | 2015-2016 | Og | GW | 2 | 11 | 0 | 33.62 | Improvement |
| | | | | | | | | | 0.00 | |
| | SM/00471 | Finga Fatullapur Water Supply Scheme | 1992-1993 | C | GW | 3 | 0 | 0 | 8.41 | New |
| | SM/00852 | Bandipur & Patulia Water Supply Scheme | 2005-2006 | FC | SW | 6 | 35 | 0 | 52.69 | New |
| | SM/00986 | Surface Water Based W/S Scheme For Arsenic Affected Area of North 24 Parganas | 2001-2002 | FC | SW | 261 | 1034 | 0 | 3.10 | New |
| | SM/01524 | Bil Kanda & Adjoing Water Supply Scheme | 2007-2008 | C | GW | 10 | 41 | 0 | 97.45 | New |
| | SM/03108 | Aug of Mohanpur And Adj. Mouzas Water Supply Scheme | 2010-2011 | C | GW | 3 | 19 | 0 | 43.36 | Augmented |
| | SM/03383 | Rejuvenation of Bandipur & Patulia Gram Panchayet Water Supply Scheme | 2011-2012 | C | GW | 6 | 44 | 0 | 69.79 | Rejuvenation |
| | SM/03974 | Improvement of Ground Water Based Piped Water Scheme In Arsenic Affected Areas of Bilkanda & | 2012-2013 | Og | GW | 10 | 42 | 0 | 36.71 | Improvement |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Adjoining Mouzas | | | | | | | | |
| | SM/04126 | Improvement of Water Based Water Supply Scheme For Arsenic Affected Areas of North 24 Parganas. | 2012-2013 | Og | SW | 142 | 693 | 0 | 12.56 | Improvement |
| | SM/05066 | Augmentation of Water Supply Scheme At Bandipur Patulia Water Supply Scheme (Danga Dighila Mouza) | 2014-2015 | Og | SW | 6 | 44 | 0 | 2.52 | Augmented |
| | | | | | | | | | 0.00 | |
| | | | | | | | | | 0.00 | |
| Basirhat I | SM/00479 | Dhaltita Water Supply Scheme | 1988-1989 | C | GW | 1 | 1 | 0 | 1.59 | New |
| | SM/00503 | Paschim Madhyampur Water Supply Scheme | 1996-1997 | FC | GW | 8 | 22 | 0 | 7.63 | New |
| | SM/00714 | Itinda Panitar Water Supply Scheme | 1994-1995 | C | GW | 2 | 17 | 0 | 11.44 | New |
| | SM/00719 | Sankchura Water Supply Scheme | 2000-2001 | C | GW | 5 | 23 | 0 | 15.97 | New |
| | SM/00907 | Debhog Water Supply Scheme | 2000-2001 | FC | GW | 4 | 12 | 0 | 10.40 | New |
| | SM/00909 | Pipha Water Supply Scheme | 2000-2001 | C | GW | 3 | 17 | 0 | 11.59 | New |
| | SM/00910 | Bansjhari-Manikpur Water Supply Scheme | 2000-2001 | C | GW | 3 | 14 | 0 | 10.69 | New |
| | SM/00921 | Gotra Water Supply Scheme | | C | GW | 3 | 9 | 0 | 9.60 | New |
| | SM/00986 | Surface Water Based W/S Scheme For Arsenic Affected Area of North 24 | 2001-2002 | FC | SW | 261 | 1034 | 0 | 3.10 | New |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Parganas | | | | | | | | |
| | SM/01160 | Goknashri Gobindopur And Adj. Mouzas Piped Water Supply Scheme | 2008-2009 | C | GW | 4 | 15 | 0 | 20.39 | New |
| | SM/01167 | Paikardanga Water Supply Scheme | 2007-2008 | FC | GW | 6 | 22 | 0 | 27.79 | New |
| | SM/01362 | Rejuv of Itinda Panitar Water Supply Scheme | 2007-2008 | Og | GW | 2 | 17 | 0 | 2.72 | Rejuvenation |
| | SM/01476 | Sangrampur & Adjoing Water Supply Scheme | 2007-2008 | Og | GW | 9 | 18 | 0 | 35.24 | New |
| | SM/01515 | Gachharati Water Supply Scheme | 2007-2008 | Og | GW | 2 | 3 | 0 | 11.38 | New |
| | SM/01517 | Dakshin Bagundi Water Supply Scheme | 2008-2009 | C | GW | 3 | 5 | 0 | 11.13 | New |
| | SM/01699 | Nalkora Water Supply Scheme | 2007-2008 | C | GW | 1 | 2 | 0 | 9.12 | New |
| | SM/01873 | Shankarpur Water Supply Scheme | 2008-2009 | C | GW | 10 | 30 | 0 | 36.22 | New |
| | SM/04280 | Revised Estimate For The Works Under Ground Water Based Piped Water Supply Schemes At Nalkora & Adjoining Under Arsenic Sub-Mission | 2013-2014 | Og | GW | 1 | 2 | 0 | 3.35 | Revised Estimate for AIRP |
| | SM/04392 | Revised Estimate For Ground Water Based Piped Water Supply Schemes At Gachharati & Adjoining Mouzas Under Arsenic Sub-Mission | 2013-2014 | Og | GW | 2 | 4 | 0 | 10.03 | Revised Estimate for AIRP |
| | SM/04394 | Revised Estimate For Ground Water Based Piped Water Supply Schemes At Goknashri Gobindapur & | 2013-2014 | Og | GW | 4 | 15 | 0 | 10.08 | Revised Estimate for AIRP |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Adj. Mouzas Under Arsenic Sub-Mission | | | | | | | | |
| | SM/04434 | Revised Estimate For Ground Water Based Piped Water Supply Schemes At Sangrampur & Adjoining Mouzas Under Arsenic Sub-Mission | 2013-2014 | Og | GW | 9 | 18 | 0 | 11.96 | Revised Estimate for AIRP |
| | SM/04630 | Improvement of Sankchura Water Supply Scheme | 2013-2014 | C | GW | 5 | 23 | 0 | 5.09 | Improvement |
| | | | | | | | | | 0.00 | |
| | | | | | | | | | 0.00 | |
| | SM/00480 | Rajendrapur Water Supply Scheme | 1987-1988 | C | GW | 1 | 15 | 0 | 0.00 | New |
| | SM/00483 | Joypul Water Supply Scheme | 1987-1988 | C | GW | 1 | 4 | 0 | 1.56 | New |
| | SM/00520 | Eojnagar Water Supply Scheme | 1998-1999 | C | GW | 3 | 25 | 0 | 6.79 | New |
| | SM/00549 | Dhanyakuria Water Supply Scheme | 1979-1980 | C | GW | 7 | 48 | 0 | 4.50 | New |
| | SM/00844 | Champapukuria Water Supply Scheme | 2005-2006 | FC | GW | 2 | 13 | 0 | 9.35 | New |
| | SM/00856 | Raghunathpur Water Supply Scheme | 2005-2006 | FC | GW | 2 | 11 | 0 | 7.57 | New |
| | SM/00872 | Dhopaberia-Ganrakupi Water Supply Scheme | 2005-2006 | FC | GW | 3 | 19 | 0 | 11.02 | New |
| | SM/00915 | Mirjanagar Water Supply Scheme | 2001-2002 | FC | GW | 5 | 22 | 0 | 7.62 | New |
| | SM/00916 | Raharhati Water Supply Scheme | 2001-2002 | FC | GW | 3 | 18 | 0 | 8.68 | New |
| Basirhat II | SM/00918 | Jafarpur Water Supply Scheme | 2003-2004 | FC | GW | 1 | 24 | 0 | 7.13 | New |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | SM/00919 | Mathurapur Water Supply Scheme | 2002-2003 | FC | GW | 4 | 18 | 0 | 8.58 | New |
| | SM/00920 | Tyantra Neora (Pond) Water Supply Scheme | 2001-2002 | FC | SW | 2 | 9 | 0 | 2.91 | New |
| | SM/01057 | Kachua Swarupnagar Water Supply Scheme | 2003-2004 | FC | GW | 5 | 18 | 0 | 9.12 | New |
| | SM/01160 | Goknashri Gobindopur And Adj. Mouzas Piped Water Supply Scheme | 2008-2009 | C | GW | 4 | 15 | 0 | 20.39 | New |
| | SM/01496 | Rajnagar Water Supply Scheme | 2007-2008 | C | GW | 1 | 9 | 0 | 11.93 | New |
| | SM/01521 | Maminpur Water Supply Scheme | 2007-2008 | C | GW | 3 | 13 | 0 | 18.13 | New |
| | SM/01523 | Akipur Water Supply Scheme | 2007-2008 | C | GW | 2 | 8 | 0 | 17.67 | New |
| | SM/01526 | Dakshin Debipur Water Supply Scheme | 2007-2008 | C | GW | 4 | 7 | 0 | 14.60 | New |
| | SM/01528 | Gobindapur Dhokra Water Supply Scheme | 2007-2008 | C | GW | 7 | 24 | 0 | 25.39 | New |
| | SM/01665 | Ghona Water Supply Scheme | 2007-2008 | C | GW | 2 | 4 | 0 | 13.87 | New |
| | SM/01767 | Srinagar Water Supply Scheme | 2007-2008 | Og | GW | 3 | 32 | 0 | 33.24 | New |
| | SM/01874 | Sadik Nagar Water Supply Scheme | 2008-2009 | FC | GW | 8 | 43 | 0 | 49.07 | New |
| | SM/02247 | Reju of Rajendrapur Water Supply Scheme | 2008-2009 | C | GW | 1 | 15 | 0 | 4.43 | Rejuvenation |
| | SM/02261 | Reju of Raghunathpur Water Supply Scheme | 2008-2009 | C | GW | 2 | 11 | 0 | 1.79 | Rejuvenation |
| | SM/02262 | Reju of Champapukur W/S Scheme | 2008-2009 | C | GW | 2 | 13 | 0 | 1.87 | Rejuvenation |
| | SM/02263 | Reju of Dhopaberia-Garakupi Water Supply Scheme | 2008-2009 | Og | GW | 3 | 19 | 0 | 2.49 | Rejuvenation |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | SM/03137 | Ground Water Based Piped Water Supply Scheme For Joypur Gopmal & Adj. Mouzas | 2010-2011 | C | GW | 1 | 4 | 0 | 13.31 | New |
| | SM/04394 | Revised Estimate For Ground Water Based Piped Water Supply Schemes At Goknashri Gobindapur & Adj. Mouzas Under Arsenic Sub-Mission | 2013-2014 | Og | GW | 4 | 15 | 0 | 10.08 | Revised Estimate for AIRP |
| | SM/04433 | Revised Estimate For Ground Water Based Piped Water Supply Schemes At Sadiknagar Zone-Ii & Adjoining Under Arsenic Sub-Mission | 2013-2014 | Og | GW | 8 | 43 | 0 | 9.33 | Revised Estimate for AIRP |
| | SM/04509 | Improvement of Dhanyakuria & Its Adj. Mouzas Water Supply Scheme | 2013-2014 | Og | GW | 7 | 48 | 0 | 20.60 | Improvement |
| | | | | | | | | | 0.00 | |
| | | | | | | | | | 0.00 | |
| | | | | | | | | | 0.00 | |
| Bongaon | SM/00465 | Chayageria Water Supply Scheme | 1992-1993 | C | GW | 7 | 23 | 0 | 8.81 | New |
| | SM/00481 | Kalupur Water Supply Scheme | 1988-1989 | C | GW | 1 | 11 | 0 | 2.09 | New |
| | SM/00482 | Chauberia Water Supply Scheme | 1987-1988 | FC | GW | 1 | 6 | 0 | 1.42 | New |
| | SM/00518 | Gangrapota Water Supply Scheme | 1977-1978 | C | GW | 4 | 17 | 0 | 2.10 | New |
| | SM/00527 | Krishnachandrapur Water Supply Scheme | 1978-1979 | C | GW | 5 | 12 | 0 | 1.89 | New |
| | SM/00543 | Panchita Water Supply Scheme | 1979-1980 | C | GW | 3 | 17 | 0 | 1.99 | New |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | SM/00576 | Bharatpur Water Supply Scheme | 1987-1988 | C | GW | 1 | 8 | 0 | 1.28 | New |
| | SM/01278 | Reju of Panchita Water Supply Scheme | 2007-2008 | C | GW | 3 | 17 | 0 | 1.93 | Rejuvenation |
| | SM/01478 | Dighari & Adjoing Water Supply Scheme | 2007-2008 | C | GW | 9 | 32 | 0 | 40.39 | New |
| | SM/01527 | Gainpur Water Supply Scheme | 2007-2008 | C | GW | 2 | 4 | 0 | 8.61 | New |
| | SM/01655 | Mollahati Water Supply Scheme | 2007-2008 | Og | GW | 9 | 32 | 0 | 43.16 | New |
| | SM/01762 | Barakpur Water Supply Scheme | 2007-2008 | C | GW | 9 | 36 | 0 | 55.38 | New |
| | SM/01764 | Khamarkalla Water Supply Scheme | 2007-2008 | Og | GW | 6 | 41 | 0 | 54.22 | New |
| | SM/01831 | Reju of Chauberia Water Supply Scheme | 2007-2008 | C | GW | 1 | 6 | 0 | 1.47 | Rejuvenation |
| | SM/01871 | Paschim Panchberia Water Supply Scheme | 2008-2009 | C | GW | 18 | 51 | 0 | 71.55 | New |
| | SM/02201 | Palla W/S Scheme | 2008-2009 | Og | GW | 12 | 44 | 0 | 68.65 | New |
| | SM/02203 | Paikpara W/S Scheme | 2008-2009 | Og | GW | 10 | 32 | 0 | 65.19 | New |
| | SM/02243 | Ichhlampur Water Sub-Mission Scheme | 2008-2009 | C | GW | 11 | 37 | 0 | 71.96 | New |
| | SM/02245 | Santoshpur Water Sub-Mission Scheme | 2008-2009 | C | GW | 14 | 36 | 0 | 62.49 | New |
| | SM/02246 | Bangangram Water Quality Sub-Mission Scheme | 2008-2009 | Og | GW | 9 | 22 | 0 | 64.30 | New |
| | SM/03289 | Laying of Pipe Line For 1 (One) No. Additional Mouza Beyond Command Area of Ground Water Based Water Supply Scheme For Palla & Adj. Mouzas | 2010-2011 | C | GW | 13 | 46 | 0 | 4.56 | Augmented |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | SM/04281 | Revised Estimate In Connection With Implementation of Iarp For Paschim Panchberia (Zone-I & Ii) & Adj. Mouzas Ground Water Based Water Supply Scheme. | 2013-2014 | Og | GW | 18 | 51 | 0 | 24.56 | Revised Estimate for AIRP |
| | SM/04282 | Revised Estimate In Connection With Implementation of Iarp For Santoshpur (Zone-I & Ii) & Adj. Mouzas Ground Water Based Water Supply Scheme. | 2013-2014 | Og | GW | 14 | 48 | 0 | 21.69 | Revised Estimate for AIRP |
| | SM/04284 | Revised Estimate In Connection With Implementation of Iarp For Dighari & Its Adjoining Mouzas Ground Water Based Water Supply Scheme. | 2013-2014 | Og | GW | 9 | 32 | 0 | 13.58 | Revised Estimate for AIRP |
| | SM/04286 | Revised Estimate In Connection With Implementation of Iarp For Khamarkalla & Its Adjoining Mouzas Ground Water Based Water Supply Scheme | 2013-2014 | Og | GW | 6 | 41 | 0 | 21.40 | Revised Estimate for AIRP |
| | SM/04294 | Revised Estimate In Connection With Implementation of Iarp For Mollahati & Its Adjoining Mouzas Ground Water Based Water Supply Schemne | 2013-2014 | Og | GW | 9 | 32 | 0 | 16.77 | Revised Estimate for AIRP |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | SM/04383 | Revised Estimate In Connection With Implementation of Iarp For Ichhlampur (Zone-I & Ii) & Adj. Mouzas Ground Water Based Water Supply Scheme. | 2013-2014 | Og | GW | 11 | 37 | 0 | 25.65 | Revised Estimate for AIRP |
| | SM/04396 | Revised Estimate In Connection With Implementation of Iarp For Palla & Its Adjoining Mouzas Ground Water Based Water Supply Scheme. | 2013-2014 | Og | GW | 12 | 44 | 0 | 23.02 | Revised Estimate for AIRP |
| | SM/05641 | Installation of Iron And Arsenic Removal Plant (Iarp) For Barakpur Piped Waer Supply Scheme | 2016-2017 | Og | GW | 9 | 36 | 0 | 27.52 | Improvement |
| | | | | | | | | | 0.00 | |
| | | | | | | | | | 0.00 | |
| | | | | | | | | | 0.00 | |
| Deganga | SM/00704 | Swetpur Water Supply Scheme | 1998-1999 | FC | GW | 16 | 29 | 0 | 8.49 | New |
| | SM/00905 | Berachampa Water Supply Scheme | 2000-2001 | C | GW | 7 | 19 | 0 | 33.43 | New |
| | SM/00986 | Surface Water Based W/S Scheme For Arsenic Affected Area of North 24 Parganas | 2001-2002 | FC | SW | 261 | 1034 | 0 | 3.10 | New |
| | SM/01234 | Reju of Swetpur Water Supply Scheme | 2006-2007 | C | GW | 16 | 29 | 0 | 4.53 | Rejuvenation |
| | SM/04457 | Surface Water Based Water Supply Scheme For Arsenic Affected Areas of Habra-Gaighata & Adjoining | 2013-2014 | Og | SW | 352 | 1614 | 3 | 5777.20 | New |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Mouzas | | | | | | | | |
| | | | | | | | | | 0.00 | |
| Gaighata | SM/00470 | Ichhapur Water Supply Scheme | 1993-1994 | FC | GW | 7 | 19 | 0 | 5.25 | New |
| | SM/00478 | Ramnagar Water Supply Scheme | 1987-1988 | FC | GW | 1 | 8 | 0 | 1.12 | New |
| | SM/00902 | Shimulpur Water Supply Scheme | 2000-2001 | FC | GW | 4 | 28 | 0 | 17.79 | New |
| | SM/00903 | Chandpara Water Supply Scheme | 2000-2001 | FC | GW | 3 | 15 | 0 | 15.03 | New |
| | SM/00904 | Chikanpara Water Supply Scheme | 2000-2001 | FC | GW | 5 | 33 | 0 | 19.50 | New |
| | SM/00906 | Gaighata Water Supply Scheme | 2000-2001 | FC | GW | 4 | 17 | 0 | 15.37 | New |
| | SM/01236 | Rej of Gaighata Water Supply Scheme | 2006-2007 | C | GW | 4 | 17 | 0 | 0.65 | Rejuvenation |
| | SM/04457 | Surface Water Based Water Supply Scheme For Arsenic Affected Areas of Habra-Gaighata & Adjoining Mouzas | 2013-2014 | Og | SW | 352 | 1614 | 3 | 5777.20 | New |
| | | | | | | | | | 0.00 | |
| Habra I | SM/00466 | Bergum Water Supply Scheme | 1994-1995 | C | GW | 7 | 50 | 0 | 5.25 | New |
| | SM/00475 | Janaphul Water Supply Scheme | 1987-1988 | C | GW | 1 | 16 | 0 | 1.84 | New |
| | SM/00476 | Sadpur Water Supply Scheme | 1987-1988 | FC | GW | 1 | 0 | 0 | 1.13 | New |
| | SM/00577 | Keyadanga Water Supply Scheme | 1989-1990 | C | GW | 5 | 0 | 0 | 5.28 | New |
| | SM/00709 | Maslandapur Water Supply | 1989- | C | GW | 9 | 34 | 0 | 7.89 | New |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Scheme | 1990 | | | | | | | |
| | SM/01656 | Reju of Maslandapur Water Supply Scheme | 2007-2008 | C | GW | 9 | 34 | 0 | 16.96 | Rejuvenation |
| | SM/04457 | Surface Water Based Water Supply Scheme For Arsenic Affected Areas of Habra-Gaighata & Adjoining Mouzas | 2013-2014 | Og | SW | 352 | 1614 | 3 | 5777.20 | New |
| | SM/05500 | Improvement of Maslandapur (Zone-I & Ii) Piped Water Supply Scheme Due To Widening And Strengthening of PW Roads | 2015-2016 | Og | GW | 11 | 28 | 0 | 15.05 | Improvement |
| | SM/05501 | Improvement of Bergum Piped Water Supply Scheme Due To Widening And Strengthening of Pw Roads | 2015-2016 | Og | GW | 7 | 50 | 0 | 9.15 | Improvement |
| | SM/05502 | Improvement of Janaphul Piped Water Supply Scheme Due To Widening And Strengthening of Pw Roads | 2015-2016 | Og | GW | 1 | 16 | 0 | 6.68 | Improvement |
| | | | | | | | | | 0.00 | |
| Habra II | SM/00568 | Bira Rajibpur Water Supply Scheme | 1987-1988 | C | GW | 10 | 40 | 0 | 5.37 | New |
| | SM/00710 | Talsa Water Supply Scheme | 1994-1995 | C | GW | 7 | 30 | 0 | 6.30 | New |
| | SM/00980 | Kankpul Water Supply Scheme | 1995-1996 | C | GW | 4 | 29 | 0 | 9.47 | New |
| | SM/01237 | Rej of Kankpul Water Supply Scheme | 2006-2007 | C | GW | 4 | 29 | 0 | 2.19 | Rejuvenation |
| | SM/01238 | Rej of Talsa Water Supply Scheme | 2006-2007 | C | GW | 7 | 30 | 0 | 1.41 | Rejuvenation |
| | SM/01239 | Rej of Bira Rajibpur Water Supply Scheme | 2006-2007 | C | GW | 10 | 40 | 0 | 1.45 | Rejuvenation |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | SM/03186 | Kamarpur & Adj. Mouzas Water Supply Scheme | 2010-2011 | C | GW | 3 | 14 | 0 | 29.20 | New |
| | SM/03497 | Ground Water Based Piped Water Supply Scheme For Khasdelpur And Adjoining Mouzas | 2011-2012 | FC | GW | 1 | 3 | 1 | 34.57 | New |
| | SM/03596 | Ground Water Based Piped Water Supply Scheme For Ashudi & Adj. Mouzas | 2011-2012 | Og | GW | 3 | 11 | 0 | 22.65 | New |
| | SM/03656 | Ground Water Based Piped Water Supply Scheme For Matiagachha & Adjoining Mouza | 2011-2012 | Og | GW | 2 | 16 | 0 | 23.05 | New |
| | SM/04042 | Improvement of Piped Water Suply Scheme For Talsa & Adj. Mouzas (Part). | 2012-2013 | C | GW | 4 | 17 | 0 | 41.23 | Improvement |
| | SM/04457 | Surface Water Based Water Supply Scheme For Arsenic Affected Areas of Habra-Gaighata & Adjoining Mouzas | 2013-2014 | Og | SW | 352 | 1614 | 3 | 5777.20 | New |
| | | | | | | | | | 0.00 | |
| Haroa | SM/00499 | Salipur Majjampur Water Supply Scheme | 1994-1995 | C | GW | 2 | 18 | 0 | 5.56 | New |
| | SM/00517 | Haroa Water Supply Scheme | 1977-1978 | C | GW | 5 | 18 | 0 | 0.79 | New |
| | SM/00519 | Amta Water Supply Scheme | 1977-1978 | C | GW | 4 | 18 | 0 | 0.77 | New |
| | SM/00522 | Gopalpur Water Supply Scheme | 1977-1978 | C | GW | 8 | 24 | 0 | 1.86 | New |
| | SM/00901 | Haroa Augmentation Water Supply Scheme | 2003-2004 | FC | GW | 6 | 21 | 0 | 14.68 | Augmented |
| | SM/01359 | Rejuv of Amta Water Supply Scheme | 2007-2008 | Og | GW | 4 | 18 | 0 | 0.64 | Rejuvenation |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | SM/01716 | Reju of Gopalpur W/S Scheme | 2007-2008 | Og | GW | 8 | 24 | 0 | 2.18 | Rejuvenation |
| | SM/02217 | Reju of Haroa W/S Scheme | 2008-2009 | Og | GW | 5 | 18 | 0 | 2.69 | Rejuvenation |
| | SM/05302 | Improvement For Haroa Piped Water Supply Scheme | 2015-2016 | Og | GW | 5 | 18 | 0 | 5.53 | Improvement |
| | SM/05622 | Surface Water Based Water Supply Scheme For Arsenic Affected Areas of Haroa, Rajarhat & Bhangar-Ii | 2016-2017 | Og | SW | 170 | 723 | 0 | 6869.31 | New |
| | | | | | | | | | 0.00 | |
| Hasnabad | SM/00500 | Barunhat Patlikhanpur Water Supply Scheme | 1994-1995 | FC | GW | 2 | 3 | 0 | 11.87 | New |
| | SM/00515 | Bhawanipur Water Supply Scheme | 1977-1978 | C | GW | 5 | 40 | 0 | 1.35 | New |
| | SM/00708 | Dakshin Bhebia Water Supply Scheme | 1993-1994 | C | GW | 12 | 27 | 0 | 24.27 | New |
| | SM/00843 | Abad Kuliadanga (Desal) Water Supply Scheme | 2005-2006 | C | GW | 1 | 7 | 0 | 4.23 | New |
| | SM/00863 | Chhaimalpur Water Supply Scheme | 2005-2006 | FC | GW | 3 | 3 | 0 | 4.97 | New |
| | SM/00908 | Murarisha Water Supply Scheme | 2000-2001 | FC | GW | 4 | 12 | 0 | 12.75 | New |
| | SM/00917 | Chandpur Water Supply Scheme | 2002-2003 | FC | GW | 4 | 22 | 0 | 2.93 | New |
| | SM/00989 | Hasnabad Piped Water Supply Scheme | 1998-1999 | C | GW | 6 | 18 | 0 | 5.90 | New |
| | SM/01204 | Bhurkunda Water Supply Scheme | 2007-2008 | C | SW | 1 | 8 | 0 | 1.28 | New |
| | SM/01206 | Jamberia Abad & Par Bhabanipur Water Supply Scheme | 2007-2008 | FC | SW | 1 | 1 | 0 | 0.81 | New |
| | SM/01207 | Hular Chak Water Supply Scheme | 2007-2008 | C | SW | 1 | 11 | 0 | 0.93 | New |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | SM/01208 | Ghuni Water Supply Scheme | 2007-2008 | C | SW | 1 | 9 | 0 | 1.03 | New |
| | SM/01209 | Jamberia Water Supply Scheme | 2007-2008 | C | SW | 1 | 4 | 0 | 0.64 | New |
| | SM/01427 | Asharia Narayanpur Water Supply Scheme | 2007-2008 | Og | GW | 5 | 7 | 0 | 20.99 | New |
| | SM/01474 | Chak Patli Water Supply Scheme | 2007-2008 | C | GW | 7 | 28 | 0 | 25.35 | New |
| | SM/01508 | Krishnapara Water Supply Scheme | 2007-2008 | C | GW | 3 | 7 | 0 | 15.39 | New |
| | SM/01509 | Konanagar Water Suply Scheme | 2007-2008 | C | GW | 5 | 7 | 0 | 21.93 | New |
| | SM/01513 | Rajapura Water Supply Scheme | 2007-2008 | C | GW | 3 | 7 | 0 | 18.43 | New |
| | SM/02372 | Reju of Bhabanipur W/S Scheme | 2008-2009 | C | GW | 5 | 40 | 0 | 9.28 | Rejuvenation |
| | SM/02747 | Permanent Restoration of Aila Affected Baurunhat Paltikhanpur Water Supply Scheme | 2009-2010 | C | GW | 2 | 32 | 0 | 0.75 | Rejuvenation |
| | SM/02760 | Permanent Restoration of Aila Affected Dakshin Bhebia W/S Scheme | 2009-2010 | C | GW | 36 | 98 | 0 | 5.92 | Rejuvenation |
| | SM/02761 | Permanent Restoration of Aila Affected Bhabanipur W/S Scheme | 2009-2010 | C | GW | 5 | 40 | 0 | 3.44 | Rejuvenation |
| | SM/02836 | Permanent Restoration of Aila Affected Barunhat Patlikhanpur W/S Scheme | 2009-2010 | C | GW | 2 | 32 | 0 | 0.75 | Rejuvenation |
| | SM/02853 | Permanent Restoration-Hasnabad W/S Scheme | 2009-2010 | C | GW | 6 | 18 | 0 | 1.77 | Repairing |
| | SM/03222 | Rejuvenation of Barunhat-Patlikhanpur Water Supply Scheme | 2010-2011 | Og | GW | 2 | 32 | 0 | 4.91 | Rejuvenation |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | SM/03314 | Rejuvenation of Dakshin Bhebia Water Supply Scheme. | 2010-2011 | C | GW | 12 | 46 | 0 | 14.90 | Rejuvenation |
| | SM/03315 | Rejuvenation of Murarisha Water Supply Scheme. | 2010-2011 | Og | GW | 4 | 12 | 0 | 5.79 | Rejuvenation |
| | SM/04438 | Revised Estimate For Ground Water Based Piped Water Supply Schemes At Asharianarayanpur & Adj. Mouzas Under Arsenic Sub-Mission | 2013-2014 | Og | GW | 5 | 7 | 0 | 9.24 | Revised Estimate for AIRP |
| | SM/05008 | Revised Estimate For Implementation of Iep For Konanagar Water Supply Scheme | 2014-2015 | Og | GW | 5 | 9 | 0 | 0.55 | Revised Estimate for IEP |
| | SM/05012 | Revised Estimate For Implementation of Iep For Krishnapara Water Supply Scheme | 2014-2015 | Og | GW | 3 | 7 | 0 | 0.59 | Revised Estimate for IEP |
| | SM/05317 | Augmentation of Chak Patli & Its Adjoining Mouzas Piped Water Supply Scheme | 2015-2016 | Og | GW | 7 | 29 | 0 | 30.61 | Augmented |
| | | | | | | | | | 0.00 | |
| Hingalganj | SM/00497 | Durgapur Baylani Water Supply Scheme | 1994-1995 | FC | GW | 8 | 26 | 0 | 16.69 | New |
| | SM/00702 | Kalitala Water Supply Scheme | 1989-1990 | C | GW | 3 | 27 | 0 | 14.00 | New |
| | SM/00820 | Purba And Dakshin Charalkhali Water Supply Scheme | 2005-2006 | C | SW | 1 | 5 | 0 | 0.25 | New |
| | SM/00821 | Kanaikathi-Kathalberia Water Supply Scheme | 2005-2006 | FC | GW | 5 | 18 | 0 | 22.46 | New |
| | SM/00987 | Sahebkhali Piped Water Supply Scheme | 1998-1999 | C | GW | 4 | 25 | 0 | 6.54 | New |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | SM/01159 | Pukuriachak(P) Rural Pond Based Water Supply Scheme | 2006-2007 | C | SW | 1 | 5 | 0 | 0.26 | New |
| | SM/01830 | Reju of Kalitala Water Supply Scheme | 2007-2008 | C | GW | 3 | 27 | 0 | 9.57 | Rejuvenation |
| | SM/02352 | Reju of Durgapur Baylani W/S Scheme | 2008-2009 | C | GW | 8 | 26 | 0 | 10.11 | Rejuvenation |
| | SM/02762 | Permanent Restoration of Aila Affected Kalitala W/S Scheme | 2009-2010 | C | GW | 3 | 27 | 0 | 2.89 | Rejuvenation |
| | SM/02763 | Permanent Restoration of Aila Affected Sahebkhali W/S Scheme | 2009-2010 | C | GW | 10 | 47 | 0 | 5.29 | Rejuvenation |
| | SM/02764 | Permanent Restoration of Aila Affected Kanaikathi-Kanthalberia W/S Scheme | 2009-2010 | C | GW | 14 | 67 | 0 | 2.47 | Rejuvenation |
| | SM/04565 | Ground Water Based Piped Water Supply Scheme For Rupmari & Adjoining Mouzas [Sundarban Island - 168 (Northern Part)] | 2013-2014 | Og | GW | 4 | 16 | 0 | 49.19 | New |
| | SM/04775 | Ground Water Based Piped Water Supply Scheme For Shridhar Kati & Adjoining Mouzas With Solar Power System (Sundarban Island - 61) | 2014-2015 | Og | GW | 32 | 0 | 0 | 635.33 | New |
| | SM/04930 | Augmentation of Kalitala Piped Water Supply Scheme & Its Adjoining Mouzas | 2014-2015 | Og | GW | 3 | 27 | 0 | 24.16 | Augmented |
| | SM/05393 | Hingalganj Piped Water Supply Scheme | 2015-2016 | Og | GW | 7 | 33 | 0 | 297.96 | New |
| | | | | | | | | | 0.00 | |
| | | | | | | | | | 0.00 | |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| Minakhan | SM/00472 | Mohanpur Water Supply Scheme | 1987-1988 | C | GW | 1 | 6 | 0 | 2.30 | New |
| | SM/00712 | Kumarjol Water Supply Scheme | 1994-1995 | C | GW | 3 | 9 | 0 | 7.85 | New |
| | SM/00804 | Padmapukuria Water Supply Scheme | 2010-2011 | FC | GW | 7 | 14 | 0 | 16.00 | New |
| | SM/00911 | Nurpur Water Supply Scheme | 2000-2001 | C | GW | 3 | 3 | 0 | 7.15 | New |
| | SM/00914 | Champali Water Supply Scheme | 2000-2001 | C | GW | 2 | 4 | 0 | 6.37 | New |
| | SM/00988 | Chaital Piped Water Supply Scheme | 1998-1999 | C | GW | 1 | 5 | 0 | 4.88 | New |
| | SM/01205 | Uttar Akhratala Water Supply Scheme | 2007-2008 | FC | SW | 1 | 1 | 0 | 0.62 | New |
| | SM/02368 | Reju of Champali W/S Scheme | 2008-2009 | C | GW | 2 | 4 | 0 | 4.42 | Rejuvenation |
| | SM/02370 | Reju of Chaital W/S Scheme | 2008-2009 | C | GW | 1 | 5 | 0 | 6.28 | Rejuvenation |
| | SM/02751 | Permanent Restoration of Aila Affected Mohanpur Water Supply Scheme | 2009-2010 | C | GW | 1 | 6 | 0 | 2.10 | Rejuvenation |
| | SM/02834 | Permanent Restoration of Aila Affected Kumarjole W/S Scheme | 2009-2010 | C | GW | 3 | 9 | 0 | 1.48 | Rejuvenation |
| | SM/02835 | Permanent Restoration of Aila Affected Padmapukuria W/S Scheme | 2009-2010 | C | GW | 7 | 14 | 0 | 1.24 | Rejuvenation |
| | SM/03220 | Rejuvenation of Mohonpur Water Supply Scheme | 2010-2011 | Og | GW | 1 | 6 | 0 | 4.37 | Rejuvenation |
| | SM/03288 | Water Supply Scheme For Tatultala Mouza | 2010-2011 | C | GW | 1 | 1 | 0 | 1.48 | New |
| | SM/03498 | Ground Water Based Piped Water Supply Scheme For Malancha And Adjoining Mouzas | 2011-2012 | Og | GW | 9 | 18 | 0 | 59.68 | New |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | SM/05049 | Ground Water Based Piped Water Supply Scheme For Sultanpur | 2014-2015 | Og | GW | 5 | 5 | 0 | 38.92 | New |
| | | | | | | | | | 0.00 | |
| | | | | | | | | | 0.00 | |
| | | | | | | | | | 0.00 | |
| Rajarhat | SM/00707 | Rekhjuani Water Supply Scheme | 1981-1982 | C | GW | 4 | 30 | 0 | 2.66 | New |
| | SM/00717 | Bishnupur Water Supply Scheme | 1996-1997 | FC | GW | 5 | 22 | 0 | 13.39 | New |
| | SM/00912 | Patharghata Water Supply Scheme | 2000-2001 | C | GW | 2 | 12 | 0 | 8.87 | New |
| | SM/00913 | Thokdari Water Supply Scheme | 2000-2001 | Partially Commissioned | GW | 3 | 15 | 0 | 8.45 | New |
| | SM/04491 | Ground Water Based Piped Water Supply Scheme For Hudarait & Adj. Mouzas. | 2013-2014 | Og | GW | 7 | 16 | 0 | 65.69 | New |
| | SM/05622 | Surface Water Based Water Supply Scheme For Arsenic Affected Areas of Haroa, Rajarhat & Bhangar-Ii | 2016-2017 | Og | SW | 170 | 723 | 0 | 6869.31 | New |
| | | | | | | | | | 0.00 | |
| Sandeshkhali I | SM/00498 | Khulna & Bhanderkhali Water Supply Scheme | 1994-1995 | FC | GW | 6 | 9 | 0 | 19.51 | New |
| | SM/00713 | Durgamandap Water Supply Scheme | 1994-1995 | FC | GW | 1 | 10 | 0 | 7.69 | New |
| | SM/00716 | Korakati Water Supply Scheme | 1996-1997 | C | GW | 1 | 10 | 0 | 9.73 | New |
| | SM/01690 | Atapur Water Supply Scheme | 2007-2008 | C | GW | 1 | 8 | 0 | 21.90 | New |
| | SM/01766 | Dwarir Jangle Water Supply Scheme | 2007-2008 | C | GW | 1 | 16 | 0 | 37.41 | New |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | SM/01768 | Jeliakhali Paschim Khanda Water Supply Scheme | 2007-2008 | C | GW | 1 | 10 | 0 | 31.43 | New |
| | SM/02371 | Reju of Khulna & Bhanderkhali W/S Scheme | 2008-2009 | C | GW | 3 | 29 | 0 | 5.84 | Rejuvenation |
| | SM/02748 | Permanent Restoration of Aila Affected Durgamandop Water Supply Scheme | 2009-2010 | C | GW | 1 | 10 | 0 | 1.26 | Rejuvenation |
| | SM/02749 | Permanent Restoration of Aila Affected Korakati Water Supply Scheme | 2009-2010 | C | GW | 1 | 10 | 0 | 1.71 | Rejuvenation |
| | SM/02750 | Permanent Restoration of Aila Affected Khulna Banderkhali Water Supply Scheme | 2009-2010 | C | GW | 3 | 29 | 0 | 3.47 | Rejuvenation |
| | SM/02753 | Restoration of Damaged Pipeline Due To Aila For Atapur W/S Scheme | 2009-2010 | C | GW | 1 | 8 | 0 | 0.68 | Repairing |
| | SM/02812 | Monipur Abad Water Supply Scheme | 2000-2001 | C | GW | 3 | 26 | 0 | 8.42 | New |
| | SM/02814 | Permanent Restoration of Aila Affected Monipur Abad W/S Scheme | 2009-2010 | C | GW | 3 | 26 | 0 | 2.94 | Rejuvenation |
| | SM/03115 | Ground Water Based Piped Water Supply Scheme For Gabbaria Mouzas | 2010-2011 | FC | GW | 1 | 4 | 0 | 28.17 | New |
| | SM/03221 | Rejuvenation of Korakati Water Supply Scheme | 2010-2011 | Og | GW | 1 | 10 | 0 | 7.60 | Rejuvenation |
| | SM/03227 | Rejuvenation of Durgamondop Water Supply Scheme | 2010-2011 | Og | GW | 1 | 10 | 0 | 4.10 | Rejuvenation |
| | SM/04522 | Improvement of Gabbaria Water Supply Scheme (Pump House No. I & Ii) By Providing Grid Power Replacing The Diesel | 2013-2014 | Og | GW | 1 | 4 | 0 | 2.38 | Improvement |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Generator Set. | | | | | | | | |
| | SM/04551 | Ground Water Based Piped Water Supply Scheme For Bouthakurani & Adjoining Mouzas [Sundarban Island - 168 (Southern Part)] | 2013-2014 | Og | GW | 3 | 10 | 0 | 35.00 | New |
| | SM/04997 | Revised Estimate For Implementation of Iep & Allied Works For Jeliakhali Paschimkhanda Water Supply Scheme | 2014-2015 | Og | GW | 1 | 10 | 0 | 3.09 | Revised Estimate for IEP |
| | SM/04998 | Revised Estimate For Implementation of Iep For Dwarir Jungle Water Supply Scheme | 2014-2015 | Og | GW | 1 | 16 | 0 | 3.44 | Revised Estimate for IEP |
| | SM/05092 | Imrovement of Jeliakhali Paschimkhanda Piped Water Supply Scheme (Island Based) (Providing Grid Power Replacing The Diesel Generator Set) | 2014-2015 | Og | GW | 1 | 10 | 0 | 2.85 | Improvement |
| | SM/05193 | Ground Water Based Piped Water Supply Scheme For Bermajur | 2015-2016 | Og | GW | 1 | 15 | 0 | 77.88 | New |
| | | | | | | | | | 0.00 | |
| | | | | | | | | | 0.00 | |
| Sandeshkhali II | SM/00498 | Khulna & Bhanderkhali Water Supply Scheme | 1994-1995 | FC | GW | 6 | 9 | 0 | 19.51 | New |
| | SM/00713 | Durgamandap Water Supply Scheme | 1994-1995 | FC | GW | 1 | 10 | 0 | 7.69 | New |
| | SM/00716 | Korakati Water Supply Scheme | 1996-1997 | C | GW | 1 | 10 | 0 | 9.73 | New |
| | SM/01690 | Atapur Water Supply Scheme | 2007-2008 | C | GW | 1 | 8 | 0 | 21.90 | New |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | SM/01766 | Dwarir Jangle Water Supply Scheme | 2007-2008 | C | GW | 1 | 16 | 0 | 37.41 | New |
| | SM/01768 | Jeliakhali Paschim Khanda Water Supply Scheme | 2007-2008 | C | GW | 1 | 10 | 0 | 31.43 | New |
| | SM/02371 | Reju of Khulna & Bhanderkhali W/S Scheme | 2008-2009 | C | GW | 3 | 29 | 0 | 5.84 | Rejuvenation |
| | SM/02748 | Permanent Restoration of Aila Affected Durgamandop Water Supply Scheme | 2009-2010 | C | GW | 1 | 10 | 0 | 1.26 | Rejuvenation |
| | SM/02749 | Permanent Restoration of Aila Affected Korakati Water Supply Scheme | 2009-2010 | C | GW | 1 | 10 | 0 | 1.71 | Rejuvenation |
| | SM/02750 | Permanent Restoration of Aila Affected Khulna Banderkhali Water Supply Scheme | 2009-2010 | C | GW | 3 | 29 | 0 | 3.47 | Rejuvenation |
| | SM/02753 | Restoration of Damaged Pipeline Due To Aila For Atapur W/S Scheme | 2009-2010 | C | GW | 1 | 8 | 0 | 0.68 | Repairing |
| | SM/02812 | Monipur Abad Water Supply Scheme | 2000-2001 | C | GW | 3 | 26 | 0 | 8.42 | New |
| | SM/02814 | Permanent Restoration of Aila Affected Monipur Abad W/S Scheme | 2009-2010 | C | GW | 3 | 26 | 0 | 2.94 | Rejuvenation |
| | SM/03115 | Ground Water Based Piped Water Supply Scheme For Gabbaria Mouzas | 2010-2011 | FC | GW | 1 | 4 | 0 | 28.17 | New |
| | SM/03221 | Rejuvenation of Korakati Water Supply Scheme | 2010-2011 | Og | GW | 1 | 10 | 0 | 7.60 | Rejuvenation |
| | SM/03227 | Rejuvenation of Durgamondop Water Supply Scheme | 2010-2011 | Og | GW | 1 | 10 | 0 | 4.10 | Rejuvenation |
| | SM/04522 | Improvement of Gabbaria Water Supply Scheme (Pump House No. I & Ii) By | 2013-2014 | Og | GW | 1 | 4 | 0 | 2.38 | Improvement |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Providing Grid Power Replacing The Diesel Generator Set. | | | | | | | | |
| | SM/04551 | Ground Water Based Piped Water Supply Scheme For Bouthakurani & Adjoining Mouzas [Sundarban Island - 168 (Southern Part)] | 2013-2014 | Og | GW | 3 | 10 | 0 | 35.00 | New |
| | SM/04997 | Revised Estimate For Implementation of Iep & Allied Works For Jeliakhali Paschimkhanda Water Supply Scheme | 2014-2015 | Og | GW | 1 | 10 | 0 | 3.09 | Revised Estimate for IEP |
| | SM/04998 | Revised Estimate For Implementation of Iep For Dwarir Jungle Water Supply Scheme | 2014-2015 | Og | GW | 1 | 16 | 0 | 3.44 | Revised Estimate for IEP |
| | SM/05092 | Imrovement of Jeliakhali Paschimkhanda Piped Water Supply Scheme (Island Based) (Providing Grid Power Replacing The Diesel Generator Set) | 2014-2015 | Og | GW | 1 | 10 | 0 | 2.85 | Improvement |
| | SM/05193 | Ground Water Based Piped Water Supply Scheme For Bermajur | 2015-2016 | Og | GW | 1 | 15 | 0 | 77.88 | New |
| | | | | | | | | | 0.00 | |
| | | | | | | | | | 0.00 | |
| Swarupnagar | SM/00488 | Bara Bankra Water Supply Scheme | 1994-1995 | FC | GW | 6 | 33 | 0 | 6.23 | New |
| | SM/00558 | Dakshin Chatra Water Supply Scheme | 1981-1982 | C | GW | 10 | 24 | 0 | 4.42 | New |
| | SM/00705 | Banglani Water Supply Scheme | 1991-1992 | C | GW | 2 | 8 | 0 | 6.50 | New |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | SM/00900 | Nityananda Kati Bari Water Supply Scheme | 1994-1995 | C | GW | 2 | 15 | 0 | 5.96 | New |
| | SM/00979 | Gobindapur Water Supply Scheme | 1995-1996 | C | GW | 3 | 19 | 0 | 10.97 | New |
| | SM/00983 | Taranipur Water Supply Scheme | 2005-2006 | FC | GW | 7 | 20 | 0 | 27.10 | New |
| | SM/01015 | Deora (Nm) Water Supply Scheme | 2001-2002 | FC | GW | 1 | 4 | 0 | 9.83 | New |
| | SM/01211 | Patua & Adj.Mouzas Water Supply Scheme | 2007-2008 | FC | GW | 5 | 27 | 0 | 21.99 | New |
| | SM/01213 | Kapileswarpur & Adj.Mouzas Water Supply Scheme | 2007-2008 | Og | GW | 5 | 12 | 0 | 17.96 | New |
| | SM/01224 | Parui & Adj.Mouzas Water Supply Scheme | 2007-2008 | FC | GW | 10 | 33 | 0 | 37.19 | New |
| | SM/01363 | Rejuv of Gobindapur Water Supply Scheme | 2007-2008 | Og | GW | 3 | 19 | 0 | 2.72 | Rejuvenation |
| | SM/01463 | Dobila Water Supply Scheme | 2007-2008 | C | GW | 1 | 4 | 0 | 9.24 | New |
| | SM/01487 | Nabatkati Water Supply Scheme | 2007-2008 | C | GW | 4 | 18 | 0 | 23.71 | New |
| | SM/01516 | Gakulpur & Adjoing Water Supply Scheme | 2007-2008 | C | GW | 3 | 17 | 0 | 25.94 | New |
| | SM/01702 | Sonpur Water Supply Scheme | 2007-2008 | C | GW | 1 | 3 | 0 | 6.11 | New |
| | SM/01710 | Gokulpur Water Supply Scheme | 2007-2008 | C | GW | 3 | 17 | 0 | 25.94 | New |
| | SM/01765 | Nalabara Water Supply Scheme | 2007-2008 | C | GW | 7 | 39 | 0 | 53.80 | New |
| | SM/02242 | Bithari Water Quality Sub-Mission Scheme | 2008-2009 | FC | GW | 6 | 44 | 0 | 80.71 | New |
| | SM/03219 | Improvement of Banglani Water Supply Scheme | 2010-2011 | Og | GW | 2 | 8 | 0 | 7.72 | Improvement |
| | SM/04306 | Revised Estimate For The Works Under Ground Water | 2013-2014 | Og | GW | 5 | 27 | 0 | 6.52 | Revised Estimate for |

| Name of Block | Code | Name | Sanction Year | Status | Nature of Source | Number of Villages | Number of Hab | Number of Town | Cost (in million) Rs. | Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Based Piped Water Supply Scheme At Patua & Adjoining Mouzas. Arsenic Sub-Mission | | | | | | | | AIRP |
| | SM/04381 | Revised Estimate For Ground Water Based Piped Water Supply Scheme At Sonpur & Adjoining Mouzas. Arsenic Sub-Mission | 2013-2014 | Og | GW | 1 | 3 | 0 | 3.28 | Revised Estimate for AIRP |
| | SM/04382 | Revised Estimate For Ground Water Based Piped Water Supply Schemes At Taranipur Zone-Ii & Adjoining Mouzas Under Arsenic Sub-Mission | 2013-2014 | Og | GW | 7 | 22 | 0 | 9.35 | Revised Estimate for AIRP |
| | SM/04412 | Revised Estimate For The Works Under Ground Water Based Piped Water Supply Schemes At Bithari & Adj. Mouzas Under Arsenic Sub-Mission | 2013-2014 | Og | GW | 6 | 44 | 0 | 23.97 | Revised Estimate for AIRP |
| | SM/04437 | Revised Estimate For Ground Water Based Piped Water Supply Scheme At Parui & Adjoining Mouzas. Arsenic Sub-Mission | 2013-2014 | Og | GW | 10 | 34 | 0 | 13.03 | Revised Estimate for AIRP |

**Source: PHED MIS**

**Note:**

Og: Ongoing  C: Completed, FC: Fully commissioned, GW: Ground water, SW: Surface water

For considering the present coverage, only the schemes marked NEW are considered.

# ANNEX 9:

# List of Commissioned and Ongoing

# Piped Water Supply

# Schemes in North 24 Parganas (Rural)

## Table 1: List of PWSS Completed and Commissioned (As per PHED site)

### A) Groundwater based

| Sl No | Scheme Name | Block | Code | Sanctioned Year | Sanctioned Cost (million INR) | Design Population |
|---|---|---|---|---|---|---|
| 1 | Abad Kuliadanga (Desal) Water Supply Scheme | Hasnabad | SM/00843 | 2005 | 4.23 | 4281 |
| 2 | Akipur Water Supply Scheme | Basirhat - II | SM/01523 | 2008 | 17.67 | 7872 |
| 3 | Amta Water Supply Scheme | Haroa | SM/00519 | 1978 | 0.77 | 11218 |
| 4 | Arsula Water Supply Scheme | Baduria | SM/00578 | 1989 | 5.02 | 23280 |
| 5 | Atapur Water Supply Scheme | Sandeshkhali - II | SM/01690 | 2008 | 21.90 | 7237 |
| 6 | Aturia And Adjoining Mouzas Water Supply Scheme | Baduria | SM/01364 | 2008 | 37.89 | 33640 |
| 7 | Bagband Water Supply Scheme | Barasat - II | SM/01763 | 2008 | 48.41 | |
| 8 | Bagdah Water Supply Scheme | Bagda | SM/00514 | 1977 | 1.83 | 14000 |
| 9 | Bajitpur Water Supply Scheme | Baduria | SM/00982 | 2006 | 53.13 | 39874 |
| 10 | Bamangachi Water Supply Scheme | Barasat - I | SM/00573 | 1987 | 0.72 | |
| 11 | Banglani Water Supply Scheme | Swarupnagar | SM/00705 | 1991 | 6.50 | 29907 |
| 12 | Bansghata Water Supply Scheme | Bagda | SM/00490 | 1995 | 5.29 | 15585 |
| 13 | Bansjhari-Manikpur Water Supply Scheme | Basirhat - I | SM/00910 | 2000 | 10.69 | 8594 |
| 14 | Bara Bankra Water Supply Scheme | Swarupnagar | SM/00488 | 1994 | 6.23 | 24887 |
| 15 | Barakpur Water Supply Scheme | Bongaon | SM/01762 | 2008 | 55.38 | |
| 16 | Barunhat Patlikhanpur Water Supply Scheme | Hasnabad | SM/00500 | 1995 | 11.87 | 17790 |
| 17 | Basirhat Municipal Water Supply Scheme | * | SM/02969 | | 0.00 | |
| 18 | Baunia Abad Water Supply Scheme | Sandeshkhali - I | SM/00711 | 1995 | 11.09 | 10900 |
| 19 | Bayermari Abad Water Supply Scheme | Sandeshkhali - I | SM/00474 | 1988 | 2.36 | |
| 20 | Bayra Water Supply Scheme | Bagda | SM/01442 | 2008 | 16.65 | 6915 |
| 21 | Berachampa Water Supply Scheme | Deganga | SM/00905 | 2000 | 33.43 | 47500 |
| 22 | Bergum Water Supply Scheme | Habra - I | SM/00466 | 1994 | 5.25 | 22250 |
| 23 | Bharatpur Water Supply Scheme | Bongaon | SM/00576 | 1987 | 1.28 | 4400 |
| 24 | Bhawanipur Water Supply Scheme | Hasnabad | SM/00515 | 1977 | 1.35 | 27912 |
| 25 | Bil Kanda & Adjoing Water Supply Scheme | Barrackpur - II | SM/01524 | 2008 | 97.45 | 38617 |
| 26 | Bira Rajibpur Water Supply Scheme | Habra - II | SM/00568 | 1988 | 5.37 | 25987 |

| Sl No | Scheme Name | Block | Code | Sanctioned Year | Sanctioned Cost (million INR) | Design Population |
|---|---|---|---|---|---|---|
| 27 | Bishnupur Water Supply Scheme | Rajarhat | SM/00717 | 1997 | 13.39 | 19350 |
| 28 | Bithari Water Quality Sub-Mission Scheme | Swarupnagar | SM/02242 | 2008 | 80.71 | 55488 |
| 29 | Bodai Water Supply Scheme | Amdanga | SM/00701 | 1989 | 10.61 | 50657 |
| 30 | Chaital Piped Water Supply Scheme | Minakhan | SM/00988 | | 4.88 | |
| 31 | Chak Patli Water Supply Scheme | Hasnabad | SM/01474 | 2008 | 25.35 | 24344 |
| 32 | Champali Water Supply Scheme | Minakhan | SM/00914 | 2001 | 6.37 | 6574 |
| 33 | Champapukuria Water Supply Scheme | Basirhat - II | SM/00844 | 2005 | 9.35 | |
| 34 | Chandipur Water Supply Scheme | Baduria | SM/00491 | 1995 | 6.42 | 21979 |
| 35 | Chandpara Water Supply Scheme | Gaighata | SM/00903 | 2000 | 15.03 | 25300 |
| 36 | Chandpur Water Supply Scheme | Hasnabad | SM/00917 | | 2.93 | 4516 |
| 37 | Chandpur Water Supply Scheme | Bagda | SM/01525 | 2008 | 25.51 | 12766 |
| 38 | Chandrapur Water Supply Scheme | Barasat - I | SM/00981 | | 8.92 | 34609 |
| 39 | Chauberia Water Supply Scheme | Bongaon | SM/00482 | 1988 | 1.42 | 8039 |
| 40 | Chaumuha Water Supply Scheme | Barasat - II | SM/01518 | 2008 | 23.85 | 14310 |
| 41 | Chayageria Water Supply Scheme | Bongaon | SM/00465 | 1992 | 8.81 | 24620 |
| 42 | Chhaimalpur Water Supply Scheme | Hasnabad | SM/00863 | 2006 | 4.97 | 3218 |
| 43 | Chikanpara Water Supply Scheme | Gaighata | SM/00904 | 2000 | 19.50 | 20650 |
| 44 | Chowlpur Water Supply Scheme | Barasat - II | SM/01510 | 2008 | 22.44 | 16197 |
| 45 | Dakshin Bagundi Water Supply Scheme | Basirhat - I | SM/01517 | 2008 | 11.13 | 2734 |
| 46 | Dakshin Bhebia Water Supply Scheme | Hasnabad | SM/00708 | 1993 | 24.27 | 42517 |
| 47 | Dakshin Chatra Water Supply Scheme | Baduria,Swarupnagar | SM/00558 | 1982 | 4.42 | 38087 |
| 48 | Dakshin Debipur Water Supply Scheme | Basirhat - II | SM/01526 | 2008 | 14.60 | 6888 |
| 49 | Deara Water Supply Scheme | Barasat - II | SM/00574 | 1987 | 1.13 | 11994 |
| 50 | Debhog Water Supply Scheme | Basirhat - I | SM/00907 | 2000 | 10.40 | 10363 |
| 51 | Deora (Nm) Water Supply Scheme | Swarupnagar | SM/01015 | | 9.83 | |
| 52 | Dhalani Water Supply Scheme | Bagda | SM/01426 | 2007 | 9.31 | 3944 |
| 53 | Dhaltita Water Supply Scheme | Basirhat - I | SM/00479 | 1988 | 1.59 | 3047 |
| 54 | Dhanyakuria Water Supply Scheme | Basirhat - II | SM/00549 | 1979 | 4.50 | 33827 |
| 55 | Dhopaberia-Ganrakupi Water Supply Scheme | Basirhat - II | SM/00872 | 2005 | 11.02 | |
| 56 | Diara Water Supply Scheme | Bagda | SM/01428 | 2007 | 10.87 | 4869 |
| 57 | Dighari & Adjoing Water Supply Scheme | Bongaon | SM/01478 | 2008 | 40.39 | 25964 |

| Sl No | Scheme Name | Block | Code | Sanctioned Year | Sanctioned Cost (million INR) | Design Population |
|---|---|---|---|---|---|---|
| 58 | Dobila Water Supply Scheme | Swarupnagar | SM/01463 | 2008 | 9.24 | 2968 |
| 59 | Durgamandap Water Supply Scheme | Sandeshkhali - II | SM/00713 | 1995 | 7.69 | 8932 |
| 60 | Durgapur Baylani Water Supply Scheme | Hingalganj | SM/00497 | 1994 | 16.69 | 24214 |
| 61 | Dwarir Jangle Water Supply Scheme | Sandeshkhali - II | SM/01766 | 2008 | 37.41 | |
| 62 | Eojnagar Water Supply Scheme | Basirhat - II | SM/00520 | 1998 | 6.79 | 15300 |
| 63 | Fakirtakia Water Supply Scheme | Sandeshkhali - I | SM/01328 | 2007 | 12.88 | 11709 |
| 64 | Finga Fatullapur Water Supply Scheme | Barrackpur - II | SM/00471 | 1992 | 8.41 | 14110 |
| 65 | Gaighata  Water Supply Scheme | Gaighata | SM/00906 | 2000 | 15.37 | 18150 |
| 66 | Gainpur Water Supply Scheme | Bongaon | SM/01527 | 2008 | 8.61 | 2400 |
| 67 | Gakulpur & Adjoing Water Supply Scheme | Swarupnagar | SM/01516 | 2008 | 25.94 | 16960 |
| 68 | Gangrapota Water Supply Scheme | Bongaon | SM/00518 | 1977 | 2.10 | 18000 |
| 69 | Ganti Mouza W/S Scheme | * | SM/02629 | 2009 | 20.86 | 12935 |
| 70 | Ghatpatila Water Supply Scheme | Bagda | SM/00555 | 1981 | 2.32 | 20629 |
| 71 | Ghona Water Supply Scheme | Basirhat - II | SM/01665 | 2008 | 13.87 | 9389 |
| 72 | Gobindapur & Adjoing Mouza Water Supply Scheme | Bagda | SM/01804 | 2007 | 24.74 | 16205 |
| 73 | Gobindapur Dhokra Water Supply Scheme | Basirhat - II | SM/01528 | 2008 | 25.39 | 16119 |
| 74 | Gobindapur Water Supply Scheme | Swarupnagar | SM/00979 | 1995 | 10.97 | 16047 |
| 75 | Godpukuria Water Supply Scheme | Bagda | SM/01771 | 2008 | 34.79 | |
| 76 | Gokna Water Supply Scheme | Baduria | SM/00559 | 1982 | 3.18 | 33331 |
| 77 | Goknashri Gobindopur And Adj. Mouzas Piped Water Supply Scheme | Basirhat - I,Basirhat - II | SM/01160 | 2007 | 20.39 | 13347 |
| 78 | Gokulpur Water Supply Scheme | Swarupnagar | SM/01710 | 2008 | 25.94 | 16960 |
| 79 | Gopalpur Water Supply Scheme | Haroa | SM/00522 | 1978 | 1.86 | 10769 |
| 80 | Gotra Water Supply Scheme | Basirhat - I | SM/00921 | | 9.60 | 16000 |
| 81 | Ground Water Based Piped Water Supply Scheme For Gabbaria Mouzas | Sandeshkhali - II | SM/03115 | 2010 | 28.17 | 5526 |
| 82 | Ground Water Based Piped Water Supply Scheme For Joypur Gopmal  & Adj. Mouzas | Basirhat - II | SM/03137 | 2010 | 13.31 | 3324 |
| 83 | Ground Water Based Piped Water Supply Scheme For Khasdelpur And Adjoining Mouzas | Habra - II | SM/03497 | 2011 | 34.57 | 18974 |
| 84 | Hariharpur Water Supply Scheme | Bagda | SM/01430 | 2007 | 9.92 | 4013 |

| Sl No | Scheme Name | Block | Code | Sanctioned Year | Sanctioned Cost (million INR) | Design Population |
|---|---|---|---|---|---|---|
| 85 | Haroa Water Supply Scheme | Haroa | SM/00517 | 1977 | 0.79 | 15000 |
| 86 | Hasnabad Piped Water Supply Scheme | Hasnabad | SM/00989 | | 5.90 | |
| 87 | Helencha Water Supply Scheme | Bagda | SM/00516 | 1977 | 1.55 | 14837 |
| 88 | Humaipur Water Supply Scheme | Barasat - II | SM/00493 | 1995 | 8.49 | 26080 |
| 89 | Ichhapur Water Supply Scheme | Gaighata | SM/00470 | 1993 | 5.25 | 15163 |
| 90 | Ichhlampur Water Sub-Mission Scheme | Bongaon | SM/02243 | 2008 | 71.96 | 41286 |
| 91 | Itinda Panitar Water Supply Scheme | Basirhat - I | SM/00714 | 1995 | 11.44 | 22626 |
| 92 | Jafarpur Water Supply Scheme | Basirhat - II | SM/00918 | 2003 | 7.13 | |
| 93 | Janaphul Water Supply Scheme | Habra - I | SM/00475 | 1988 | 1.84 | 9515 |
| 94 | Jasaikhati Water Supply Scheme | Baduria | SM/01869 | 2008 | 73.61 | 47092 |
| 95 | Jeliakhali Paschim Khanda Water Supply Scheme | Sandeshkhali - II | SM/01768 | 2008 | 31.43 | |
| 96 | Joypul Water Supply Scheme | Basirhat - II | SM/00483 | 1988 | 1.56 | 2334 |
| 97 | Kachua Swarupnagar Water Supply Scheme | Basirhat - II | SM/01057 | 2003 | 9.12 | 16262 |
| 98 | Kalitala Water Supply Scheme | Hingalganj | SM/00702 | 1989 | 14.00 | |
| 99 | Kalupur Water Supply Scheme | Bongaon | SM/00481 | 1988 | 2.09 | 10413 |
| 100 | Kamarpur & Adj. Mouzas Water Supply Scheme | Habra - II | SM/03186 | 2010 | 29.20 | 11404 |
| 101 | Kamlabas Water Supply Scheme | Bagda | SM/01420 | 2007 | 12.18 | 5256 |
| 102 | Kanaikathi-Kathalberia Water Supply Scheme | Hingalganj | SM/00821 | 2005 | 22.46 | 29543 |
| 103 | Kaniara Water Supply Scheme | Bagda | SM/00575 | 1987 | 0.86 | 2790 |
| 104 | Kankpul Water Supply Scheme | Habra - II | SM/00980 | | 9.47 | 10659 |
| 105 | Kasimpur Water Supply Scheme | Barasat - I | SM/00486 | 1988 | 1.29 | 5427 |
| 106 | Keyadanga Water Supply Scheme | Habra - I | SM/00577 | 1989 | 5.28 | 10675 |
| 107 | Khulna & Bhanderkhali Water Supply Scheme | Sandeshkhali - II | SM/00498 | 1994 | 19.51 | 35119 |
| 108 | Kola Water Supply Scheme | Bagda | SM/01419 | 2007 | 9.78 | 3307 |
| 109 | Konanagar Water Suply Scheme | Hasnabad | SM/01509 | 2008 | 21.93 | 13791 |
| 110 | Korakati Water Supply Scheme | Sandeshkhali - II | SM/00716 | 1997 | 9.73 | 8410 |
| 111 | Krishnachandrapur Water Supply Scheme | Bongaon | SM/00527 | 1979 | 1.89 | 11230 |
| 112 | Krishnapara Water Supply Scheme | Hasnabad | SM/01508 | 2008 | 15.39 | 8933 |
| 113 | Kulia Water Supply Scheme | Baduria | SM/00845 | 2006 | 8.44 | 5658 |
| 114 | Kumarjol Water Supply Scheme | Minakhan | SM/00712 | 1995 | 7.85 | 9575 |
| 115 | Kurulia Water Supply Scheme | Bagda | SM/00688 | 1979 | 4.19 | 25000 |

| Sl No | Scheme Name | Block | Code | Sanctioned Year | Sanctioned Cost (million INR) | Design Population |
|---|---|---|---|---|---|---|
| 116 | Magurali & Its Adj. Mouzas Water Supply Scheme | Baduria | SM/01212 | 2007 | 28.41 | 24762 |
| 117 | Magurati Srirampur Water Supply Scheme | Baduria | SM/01520 | 2008 | 8.98 | 2947 |
| 118 | Mahishgadi Water Supply Scheme | Barasat - II | SM/01514 | 2008 | 24.52 | 15959 |
| 119 | Malidah Water Supply Scheme | Bagda | SM/01429 | 2007 | 19.82 | 10620 |
| 120 | Maminpur Water Supply Scheme | Basirhat - II | SM/01521 | 2008 | 18.13 | 9245 |
| 121 | Masia & Nabastya Water Supply Scheme | Baduria | SM/00822 | 2005 | 9.41 | 7429 |
| 122 | Maslandapur Water Supply Scheme | Habra - I | SM/00709 | 1989 | 7.89 | 24345 |
| 123 | Mathurapur Water Supply Scheme | Basirhat - II | SM/00919 | 2003 | 8.58 | |
| 124 | Matiagacha Water Supply Scheme | Barasat - II | SM/00484 | 1988 | 1.38 | 8223 |
| 125 | Mirjanagar Water Supply Scheme | Basirhat - II | SM/00915 | 2002 | 7.62 | 13388 |
| 126 | Mohanpur Water Supply Scheme | Minakhan | SM/00472 | 1988 | 2.30 | 12451 |
| 127 | Monipur Abad Water Supply Scheme | Sandeshkhali - II | SM/02812 | | 8.42 | |
| 128 | Murarisha Water Supply Scheme | Hasnabad | SM/00908 | 2000 | 12.75 | 12930 |
| 129 | Nabatkati Water Supply Scheme | Swarupnagar | SM/01487 | 2008 | 23.71 | 15375 |
| 130 | Nalabara Water Supply Scheme | Swarupnagar | SM/01765 | 2008 | 53.80 | |
| 131 | Nalkora Water Supply Scheme | Basirhat - I | SM/01699 | 2008 | 9.12 | 2552 |
| 132 | Nebadhai Duttapukur Water Supply Scheme | Barasat - I | SM/04252 | | 0.00 | |
| 133 | Nityananda Kati Bari Water Supply Scheme | Swarupnagar | SM/00900 | 1995 | 5.96 | 8597 |
| 134 | Nurpur Water Supply Scheme | Minakhan | SM/00911 | 2001 | 7.15 | 8520 |
| 135 | Padmapukuria Water Supply Scheme | Minakhan | SM/00804 | 2002 | 16.00 | 18484 |
| 136 | Paikardanga Water Supply Scheme | Basirhat - I | SM/01167 | 2006 | 27.79 | 27677 |
| 137 | Panchita Water Supply Scheme | Bongaon | SM/00543 | 1979 | 1.99 | 10337 |
| 138 | Parui & Adj.Mouzas Water Supply Scheme | Swarupnagar | SM/01224 | 2007 | 37.19 | 37810 |
| 139 | Paschim Madhyampur Water Supply Scheme | Basirhat - I | SM/00503 | 1997 | 7.63 | 15850 |
| 140 | Paschim Panchberia Water Supply Scheme | Bongaon | SM/01871 | 2008 | 71.55 | 40204 |
| 141 | Patharghata Water Supply Scheme | Rajarhat | SM/00912 | 2001 | 8.87 | 14200 |
| 142 | Patua & Adj.Mouzas Water Supply Scheme | Swarupnagar | SM/01211 | 2007 | 21.99 | 19388 |
| 143 | Pipha Water Supply Scheme | Basirhat - I | SM/00909 | 2000 | 11.59 | 11750 |
| 144 | Pws Scheme For Ward 15 (Kadihati)-North Dum Dum | * | SM/02909 | 2009 | 16.82 | 6087 |
| 145 | Raghunathpur Water Supply Scheme | Basirhat - II | SM/00856 | 2005 | 7.57 | 8560 |
| 146 | Raharhati Water Supply Scheme | Basirhat - II | SM/00916 | 2002 | 8.68 | 15678 |

| Sl No | Scheme Name | Block | Code | Sanctioned Year | Sanctioned Cost (million INR) | Design Population |
|---|---|---|---|---|---|---|
| 147 | Rajapura Water Supply Scheme | Hasnabad | SM/01513 | 2008 | 18.43 | 11141 |
| 148 | Rajendrapur Water Supply Scheme | Basirhat - II | SM/00480 | 1988 | 0.00 | 10417 |
| 149 | Rajnagar Water Supply Scheme | Basirhat - II | SM/01496 | 2008 | 11.93 | 4463 |
| 150 | Ramnagar Water Supply Scheme | Gaighata | SM/00478 | 1988 | 1.12 | 4521 |
| 151 | Rekhjuani Water Supply Scheme | Rajarhat | SM/00707 | 1981 | 2.66 | 33214 |
| 152 | Rohanda Water Supply Scheme | Barasat - II | SM/01453 | 2008 | 30.64 | 22502 |
| 153 | Sadik Nagar Water Supply Scheme | Basirhat - II | SM/01874 | 2008 | 49.07 | 29981 |
| 154 | Sadpur Water Supply Scheme | Habra - I | SM/00476 | 1988 | 1.13 | |
| 155 | Sahebkhali Piped Water Supply Scheme | Hingalganj | SM/00987 | | 6.54 | |
| 156 | Salipur Majjampur Water Supply Scheme | Haroa | SM/00499 | 1995 | 5.56 | 8607 |
| 157 | Sankchura Water Supply Scheme | Basirhat - I | SM/00719 | 2000 | 15.97 | 16600 |
| 158 | Santoshpur Water Sub-Mission Scheme | Bongaon | SM/02245 | 2008 | 62.49 | 40954 |
| 159 | Shankarpur Water Supply Scheme | Basirhat - I | SM/01873 | 2008 | 36.22 | 21966 |
| 160 | Shimla Durgapur Water Supply Scheme | Baduria | SM/01770 | 2008 | 54.72 | |
| 161 | Shimulpur Water Supply Scheme | Gaighata | SM/00902 | 2000 | 17.79 | 23400 |
| 162 | Sibalaya Water Supply Scheme | Barasat - I | SM/01058 | 2003 | 8.58 | 8458 |
| 163 | Sindrani Water Supply Scheme | Bagda | SM/00529 | 1979 | 2.73 | |
| 164 | Sonpur Water Supply Scheme | Swarupnagar | SM/01702 | 2008 | 6.11 | 1165 |
| 165 | Swetpur Water Supply Scheme | Deganga | SM/00704 | 1989 | 8.49 | 32111 |
| 166 | Talsa Water Supply Scheme | Habra - II | SM/00710 | 1995 | 6.30 | 17973 |
| 167 | Taranipur Water Supply Scheme | Swarupnagar | SM/00983 | 2006 | 27.10 | 20693 |
| 168 | Tildanga & Adjoing Water Supply Scheme | Baduria | SM/01511 | 2008 | 23.56 | 16061 |
| 169 | Water Supply Scheme For Tatultala Mouza | Minakhan | SM/03288 | 2011 | 1.48 | 2300 |

**B) Pond based Scheme**

| Sl No | Scheme Name | Block | Code | Sanctioned Year | Sanctioned Cost (million INR) | Design Population |
|---|---|---|---|---|---|---|
| 1 | Bandipur & Patulia Water Supply Scheme | Barrackpur - II | SM/00852 | 2005 | 52.687 | 53658 |
| 2 | Bhurkunda Water Supply Scheme | Hasnabad | SM/01204 | 2007 | 1.282 | 1740 |
| 3 | Ghuni Water Supply Scheme | Hasnabad | SM/01208 | 2007 | 1.03 | 1310 |
| 4 | Hular Chak Water Supply Scheme | Hasnabad | SM/01207 | 2007 | 0.928 | 1160 |
| 5 | Jamberia Abad & Par Bhabanipur Water Supply Scheme | Hasnabad | SM/01206 | 2007 | 0.812 | 1050 |
| 6 | Jamberia Water Supply Scheme | Hasnabad | SM/01209 | 2007 | 0.642 | 760 |
| 7 | Pukuriachak(P) Rural Pond Based Water Supply Scheme | Hingalganj | SM/01159 | 2007 | 0.264 | 1000 |
| 8 | Purba And Dakshin Charalkhali Water Supply Scheme | Hingalganj | SM/00820 | 2005 | 0.253 | 1764 |
| 9 | Tyantra Neora (Pond) Water Supply Scheme | Basirhat - II | SM/00920 | 2002 | 2.907 | |
| 10 | Uttar Akhratala Water Supply Scheme | Minakhan | SM/01205 | 2007 | 0.62 | 740 |
| **C) Surface Water based Scheme** | | | | | | |
| 1 | Surface Water Based W/S Scheme For Arsenic Affected Area Of North 24 Parganas | Amdanga,Barasat - I,Barrackpur - II,Basirhat - I,Deganga | SM/00986 | | 31016.54 | NA |

## Table 2: Ongoing and Proposed PWS Scheme (Approved by State level Steering Committee)

| Sl. No. | Scheme Name | Code | Sanction Year | Sanction Cost ( in million INR) |
|---|---|---|---|---|
| **A) Ground Water Based** | | | | |
| 1 | Ground Water Based Piped Water Supply Scheme For Rupmari & Adjoining Mouzas [Sundarban Island - 168 (Northern Part)] | SM/04565 | 2013-2014 | 49.19 |
| 2 | Asharia Narayanpur Water Supply Scheme | SM/01427 | 2007-2008 | 20.99 |
| 3 | Ground Water Based Piped Water Supply Scheme For Ashudi & Adj. Mouzas | SM/03596 | 2011-2012 | 22.65 |
| 4 | Auldanga Water Supply Scheme | SM/01447 | 2007-2008 | 49.29 |
| 5 | Bahira & Adjoing Water Supply Scheme | SM/01477 | 2007-2008 | 30.72 |
| 6 | Bangangram Water Quality Sub-Mission Scheme | SM/02246 | 2008-2009 | 64.30 |
| 7 | Ground Water Based Piped Water Supply Scheme For Bermajur | SM/05193 | 2015-2016 | 77.88 |
| 8 | Ground Water Based Piped Water Supply Scheme For Bouthakurani & Adjoining Mouzas [Sundarban Island - 168 (Southern Part)] | SM/04551 | 2013-2014 | 35.00 |
| 9 | Ground Water Based Piped Water Supply Scheme For Donnagar & Adj. Mouza. | SM/04473 | 2013-2014 | 24.04 |
| 10 | Gachharati Water Supply Scheme | SM/01515 | 2007-2008 | 11.38 |
| 11 | Hingalganj Piped Water Supply Scheme | SM/05393 | 2015-2016 | 297.96 |
| 12 | Ground Water Based Piped Water Supply Scheme For Hudarait & Adj. Mouzas. | SM/04491 | 2013-2014 | 65.69 |
| 13 | Kapileswarpur & Adj.Mouzas Water Supply Scheme | SM/01213 | 2007-2008 | 17.96 |
| 14 | Khamarkalla Water Supply Scheme | SM/01764 | 2007-2008 | 54.22 |
| 15 | Ground Water Based Piped Water Supply Scheme For Malancha And Adjoining Mouzas | SM/03498 | 2011-2012 | 59.68 |
| 16 | Ground Water Based Piped Water Supply Scheme For Matiagachha & Adjoining Mouza | SM/03656 | 2011-2012 | 23.05 |

| | | | | |
|---|---|---|---|---|
| 17 | Mollahati Water Supply Scheme | SM/01655 | 2007-2008 | 43.16 |
| 18 | Paikpara W/S Scheme | SM/02203 | 2008-2009 | 65.19 |
| 19 | Palla W/S Scheme | SM/02201 | 2008-2009 | 68.65 |
| 20 | Paltadanga Water Supply Scheme | SM/01876 | 2011-2012 | 35.87 |
| 21 | Parmadan Water Supply Scheme | SM/01519 | 2007-2008 | 21.89 |
| 22 | Puturia Water Supply Scheme | SM/01452 | 2007-2008 | 43.58 |
| 23 | Rajapur Water Supply Scheme | SM/01769 | 2007-2008 | 39.53 |
| 24 | Ground Water Based Piped Water Supply Scheme For Rajbari | SM/05194 | 2015-2016 | 48.30 |
| 25 | Sangrampur & Adjoing Water Supply Scheme | SM/01476 | 2007-2008 | 35.24 |
| 26 | Ground Water Based Piped Water Supply Scheme For Shridhar Kati & Adjoining Mouzas With Solar Power System (Sundarban Island - 61) | SM/04775 | 2014-2015 | 635.33 |
| 27 | Srinagar Water Supply Scheme | SM/01767 | 2007-2008 | 33.24 |
| 28 | Ground Water Based Piped Water Supply Scheme For Sultanpur | SM/05049 | 2014-2015 | 38.92 |
| 29 | Implementation Of Solar Energy Based Dual Pump Piped Water Supply Scheme [60 Nos] In The District Of North 24 Parganas | SM/05218 | 2015-2016 | 54.99 |
| **B) Surface Water Based** | | | | |
| **1** | Surface Water Based Water Supply Scheme For Arsenic Affected Areas Of Haroa, Rajarhat & Bhangar-Ii | SM/05622 | 2013-2014 | 5777.20 |
| **c) Pond based Scheme** | | | | |
| **1** | Hular Chak Water Supply Scheme | SM/01207 | 2016-2017 | 0.98 |

Source: http://app1.wbphed.gov.in/phed_v2_view/DWF00002/back.html

# Annex 9A

# Summary of

# Major Piped Water Supply Schemes

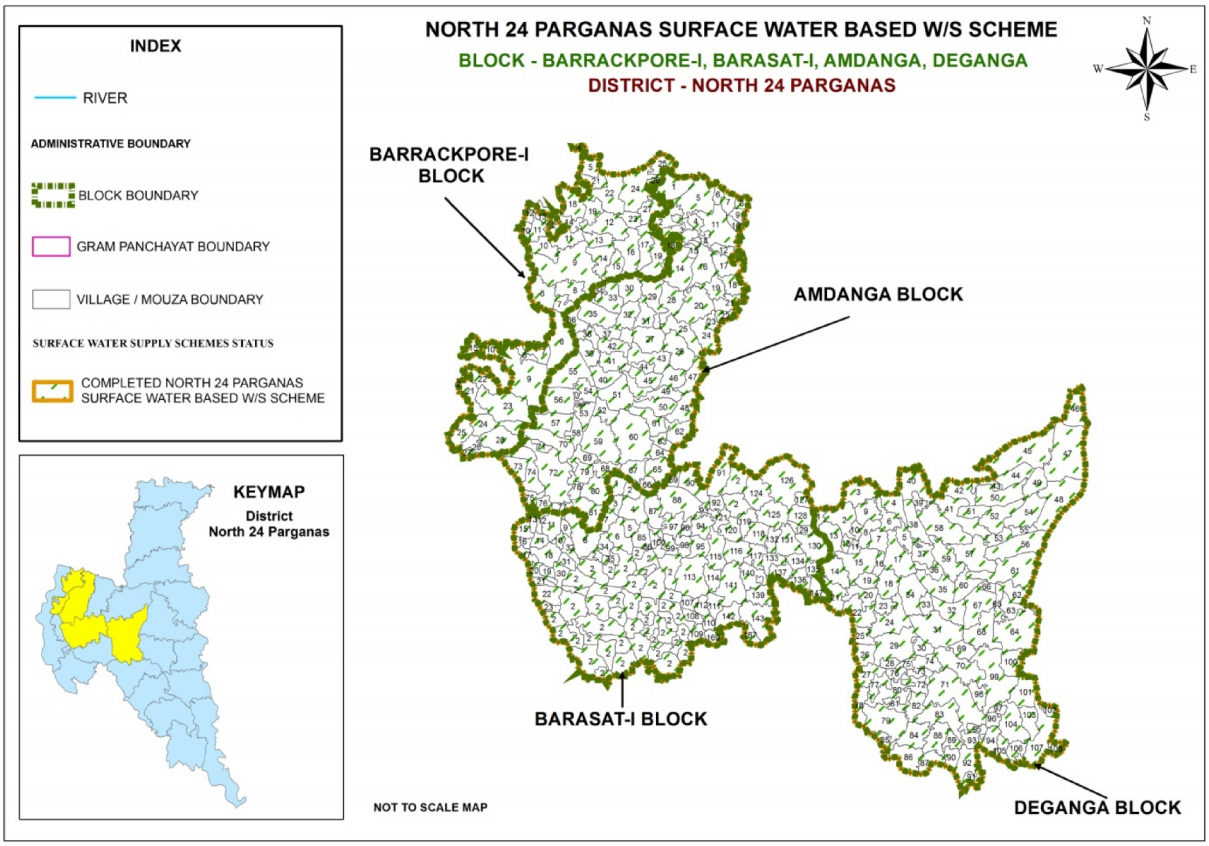
# in

# North 24 Parganas:

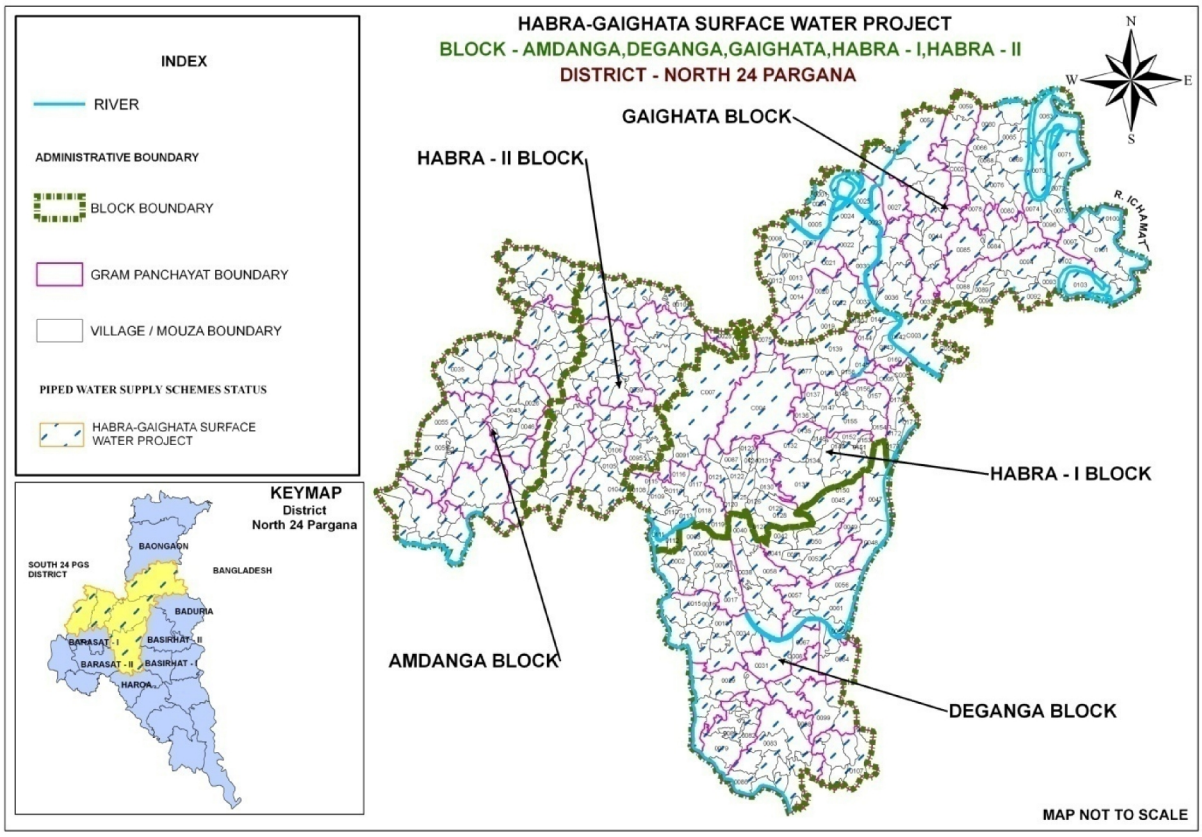
# Existing and Ongoing

| | | |
|---|---|---|
| 1 | Name of Scheme | **North 24 Pgns. Surface water based W/S Scheme** |
| 2 | Name of District | North 24 Parganas |
| 3 | Name of Block | North Barrackpore Municipality |
| 4 | Source of water | River Hooghly |
| 5 | Location | Strand Road, Palta, North Barrackpore Municipality, P.O. - Barrackpore, P.S. Noapara, Dist. North 24-Parganas. |
| 6 | Justification of the Scheme | To fulfill drinking water need of Arsenic affected Blocks of Amdanga, Deganga, Barasat - I & Barrackpore - II. |
| 7 | Number of Mouzas / Villages covered | 234 nos. |
| 8 | Census population (2011) covered | 719555 |
| 9 | Year of Commissioning | January'2006 (Phase – I) & July'2008 (Phase – II) |
| 10 | Design Year | 2025 |
| 11 | Present per capita service level | 40 lpcd |
| 12 | Treatment plant capacity (if WTP is provided) | 7.5 MGD (34 MLD) |
| 13 | Period of Treatment and supply | 22 hrs. and 8 hrs. |
| 14 | Treatment process in brief | Conventional Treatment<br>(Clariflocculation ® RSF ® Chlorination ® Supply) |
| 15 | Length of Rising Main(both raw and clear water) in km | 110 Km. (700 mm dia. to 200 mm dia.)<br>(C.I., D.I. & M.S. Pipe) |
| 16 | Length of Distribution System pipelines (in km) | 1045.0 Km. (400 mm dia. to 75 mm dia.)<br>(A.C., UPVC & D.I. Pipe) |
| 17 | No of water Reservoirs with capacity | Boosting Station - I (Madhabpur) - CWR - 1600 cu.m.<br>Boosting Station - II (Naksa) - CWR - 900 cu.m. |
| 18 | No of Over head Reservoirs with capacity | **Phase - I**<br>Zone - IA (Surjapur) -- 550 cu.m.<br>Zone - IB (Telinipara) -- 1000 cu.m.<br>Zone - II (Berunanpukuria) -- 800 cu.m.<br>Zone - III (Algoria) -- 600 cu.m.<br>Zone - IV (Tentulia) -- 1200 cu.m.<br>Zone - V (Kharki) -- 1200 cu.m.<br>Zone - VI (Beraberia) -- 600 cu.m.<br>Zone - VII (Kharu) -- 950 cu.m. |

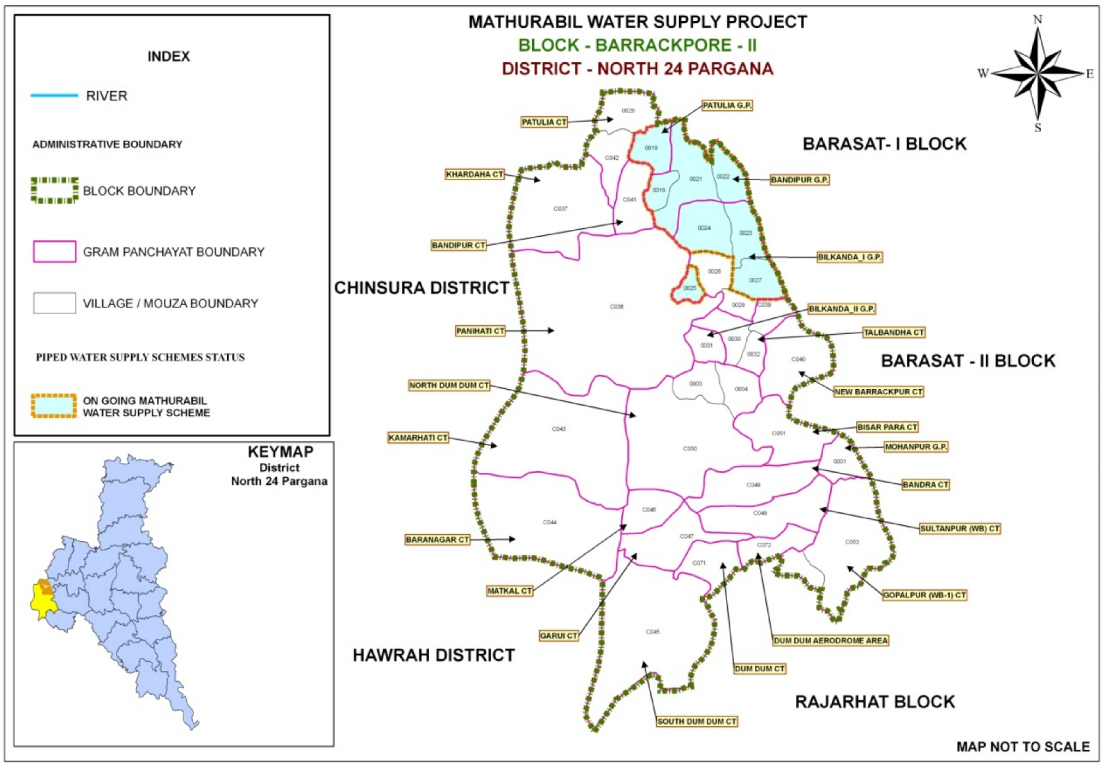
| | | |
|---|---|---|
| | | Zone - VIII (Kanchiyara) -- 1350 cu.m.<br>**<u>Phase - II</u>**<br>Zone - IX (Khejurdanga) -- 1000 cu.m.<br>Zone - X (Keyadanga) -- 1250 cu.m.<br>Zone - XI (Aziznagar) -- 900 cu.m.<br>Zone - XII (Alipur) -- 1200 cu.m.<br>Zone - XIII (Uttor Kolsur) -- 1000 cu.m. |
| 19 | Any Special feature of scheme if any:- | NA |



| | | |
|---|---|---|
| 1 | Name of Scheme | **Habra-Gaighata** |
| 2 | Name of District | North 24 Parganas |
| 3 | Name of Block | Habra-I, Habra-II, Gaighata, Amdanga (part), Barasat-I (part), Deganga (part), Barrackpore-I (Rural KMD Portion) |
| 4 | Source of Water | River Hoogly |
| 5 | Location and justification of the Scheme | a) Intake:- Jubilee Bridge in Barrackpore Block-I |
| | | b) WTP:- Malancha Mouza of Barrackpore-I Block<br>Arsenic affected area so surface water selected as source |
| 6 | Number of Mouzas / Villages to be covered | Rural :- 327 nos.<br>NMU:- 8 nos. |
| 7 | Census population(2011) to be covered | Total 1.1854 million<br>Rural: 0.8309 million<br>NMU : 0.737<br>Mun: 0.2808 millon<br>SC: 0.357 million, ST: 0.024 million |
| 8 | Expected date of Commissioning | April 2016 |
| 9 | Design Year | 2036 |
| 10 | Present percapita service lavel | Rural : 61 lpcd<br>urban NMU - 61 lpcd<br>Municipal- 70 lpcd |
| 11 | Treatment plant capacity (if WTP is provided) | 32.35 MGD (147.07 MLD) |
| 12 | Period of Treatment and supply(Proposed) | 20 (twenty) hours |
| 13 | Treatment process in brief(Proposed) | Conventional Treatment (flash mixing, coagulation, Flocculation, clarification, Rapid gravity filtration and adequate disinfection) |
| 14 | Proposed Length of Rising Main(both raw and clear water) in km | Raw main - 4.25 Km.<br>clear water - 167 km |
| 15 | Proposed Length of Distribution System pipelines (in KM) | Approx - 2000 km |
| 16 | Proposed No of water Reservoirs with capacity | 2 nos. - a) 2831 $m^3$, b) 1731 $m^3$ |
| 17 | Proposed No of Over head Reservoirs with capacity | 23 nos,<br>a) 8 nos. 1250$m^3$, b)1 no. 1400$m^3$, c) 1 no. 1600$m^3$, d) 8 nos. 1000 $m^3$, e) 5 nos. 750$m^3$ |
| 18 | Any Special feature of scheme if any | Nil |


INDEX
RIVER
ADMINISTRATIVE BOUNDARY
BLOCK BOUNDARY
GRAM PANCHAYAT BOUNDARY
VILLAGE / MOUZA BOUNDARY
PIPED WATER SUPPLY SCHEMES STATUS
HABRA-GAIGHATA SURFACE WATER PROJECT
KEYMAP
District
North 24 Pargana
BAONGAON
SOUTH 24 PGS DISTRICT
BANGLADESH
BADURIA
BARASAT - I
BASIRHAT - II
BARASAT - II
BASIRHAT - I
HAROA
HABRA-GAIGHATA SURFACE WATER PROJECT
BLOCK - AMDANGA,DEGANGA,GAIGHATA,HABRA - I,HABRA - II
DISTRICT - NORTH 24 PARGANA
N
W
E
S
GAIGHATA BLOCK
HABRA - II BLOCK
R. ICHAMATI
HABRA - I BLOCK
AMDANGA BLOCK
DEGANGA BLOCK
MAP NOT TO SCALE

| | | |
|---|---|---|
| 1 | Name of Scheme | **Mathurabill Piped Water Supply Scheme** |
| 2 | Name of District | North 24 Parganas |
| 3 | Name of Block | Barrackpur-II |
| 4 | Source of Water | Mathura Bill |
| 5 | Location and justification of the Scheme | Barrackpore-I, 24-Pgs.(N) Dist., Arsenic affected area so surface water selected as source |
| 6 | Number of Mouzas / Villages to be covered | Z-I : 7 nos., Z-II : 8 nos. |
| 7 | Census population(2011) to be covered | Z-I : 23544., Z-II : 38270 |
| 8 | Expected date of Commissioning | December 2015 |
| 9 | Design Year | 2034 |
| 10 | Present percapita service lavel | 61 lpcd |
| 11 | Treatment plant capacity (if WTP is provided) | 3.8 MLD |
| 12 | Period of Treatment and supply(Proposed) | 20 hours, 8 hours |
| 13 | Treatment process in brief(Proposed) | Inlet well, Parshall flume, flash mixing, flocculation by, baffled flocculator , clarification by tube settlers R.G. filter, chemical house, chlorinator, sludge pump, sludge disposal, CWR |
| 14 | Proposed Length of Rising Main(both raw and clear water) in km | Raw water main 0.10 km, Clear water main - 6.190km |
| 15 | Proposed Length of Distribution System pipelines (in KM) | 84.559 km |
| 16 | Proposed No of water Reservoirs with capacity | CWR : 190 $m^3$ |
| 17 | Proposed No of Over head Reservoirs with capasity | Z-I : 700 $m^3$, Z-II : 450 $m^3$ |
| 18 | Any Special feature of scheme if any | Nil |


MATHURABIL WATER SUPPLY PROJECT
BLOCK - BARRACKPORE - II
DISTRICT - NORTH 24 PARGANA
INDEX
RIVER
ADMINISTRATIVE BOUNDARY
BLOCK BOUNDARY
GRAM PANCHAYAT BOUNDARY
VILLAGE / MOUZA BOUNDARY
PIPED WATER SUPPLY SCHEMES STATUS
ON GOING MATHURABIL WATER SUPPLY SCHEME
KEYMAP
District
North 24 Pargana
N
W
E
S
BARASAT- I BLOCK
BARASAT - II BLOCK
RAJARHAT BLOCK
CHINSURA DISTRICT
HAWRAH DISTRICT
PATULIA CT
PATULIA G.P.
KHARDAHA CT
BANDIPUR G.P.
BANDIPUR CT
BILKANDA_I G.P.
BILKANDA_II G.P.
PANIHATI CT
TALBANDHA CT
NEW BARRACKPUR CT
NORTH DUM DUM CT
BISAR PARA CT
KAMARHATI CT
MOHANPUR G.P.
BANDRA CT
SULTANPUR (WB) CT
BARANAGAR CT
GOPALPUR (WB-1) CT
MATKAL CT
GARUI CT
DUM DUM AERODROME AREA
DUM DUM CT
SOUTH DUM DUM CT
MAP NOT TO SCALE

| | | |
|---|---|---|
| 1 | Name of Scheme | **Sridhar-kati Piped Water Supply Scheme** |
| 2 | Name of District | North 24 Parganas |
| 3 | Name of Block | |
| 4 | Source of Water | Ground Water |
| 5 | Location and justification of the Scheme | Hingalganj Block, Scarcity of sweet water in Island |
| 6 | Number of Mouzas / Villages to be covered | 6 No village, 29 mouzas |
| 7 | Census population(2011) to be covered | 37823 |
| 8 | Expected date of Commissioning | 2015 |
| 9 | Design Year | 2037 |
| 10 | Present per capita service level | 40 LPCD |
| 11 | Treatment plant capacity (if WTP is provided) | Desalination plant |
| 12 | Period of Treatment and supply(Proposed) | 6 hours |
| 13 | Treatment process in brief(Proposed) | R.O. filter |
| 14 | Proposed Length of Rising Main(both raw and clear water) in km | 1595 |
| 15 | Proposed Length of Distribution System pipelines (in km) | 195.072 km |
| 16 | Proposed No of water Reservoirs with capacity | Nil |
| 17 | Proposed No of Over head Reservoirs with capacity | Nil, 31 community tanks and 252 stand posts. |
| 18 | Any Special feature of scheme if any | 29 nos. desalination plant |

# ANNEX 10:
# Water Quality Monitoring Framework
# in
# North 24 Parganas

## Part A: Water Quality Monitoring and Surveillance

(as prepared by WBPHED)

## Establishment of laboratories

West Bengal state initially tested free residual chlorine in piped water supplies understanding the importance of chlorine residual in treated water. Later in the 1980s when Arsenic was detected in groundwater in the state it was added as one of the critical parameters to be tested considering its chronic health effects. For monitoring Arsenic in water sources PHE Department with the support of UNICEF came together in the Joint Plan of Action to establish about 20 water testing laboratories across the State.

After that it was established that many parts of West Bengal is affected by high levels of Arsenic in groundwater sources. During the same decade other geogenic water quality problems were also identified in different States of the country. To address this issue, in the year 2006 under the National Rural Drinking Water Quality Monitoring and Surveillance Programme it was mandated that all the States must have district and sub-district laboratories to monitor the drinking water quality for 10 critical parameters. West Bengal was the pioneer in setting up a block level laboratory along with the district and sub-district laboratories. In total West Bengal established 118 laboratories managed by PHE (37) and NGOs (81).

However, with the increasing number of tapping water sources in the State and emergence of new contaminated areas lead to the need for establishment of additional 100 more laboratories to the existing number to cope with the sample load. Now the State has 218 functional Water Testing Laboratories spread across all districts (Table 1 includes the number of laboratories based on the water quality issue under the lab jurisdiction). The location of these 218 water testing laboratories has been mapped and is provided as Annexure I.

Table 1 **Contaminant wise laboratory categorization**

| Laboratory Type | PHED | NGO |
|---|---|---|
| **Arsenic** | 29 | 21 |
| **Fluoride** | 27 | 18 |
| **Salinity** | 16 | 10 |
| **Arsenic & Fluoride** | 10 | 0 |
| **Arsenic & Salinity** | 8 | 10 |
| **Arsenic, Fluoride & Salinity** | 3 | 0 |
| **General** | 44 | 22 |
| **Total** | 137 | 81 |
| **Grand total** | 218 | |

## State level referral laboratory - NABL Accreditation status

Each laboratory is entrusted is to achieve the target of testing atleast 260 samples per month. It means the number of samples tested per year will be close to 56680. As these laboratories test for critical parameters which have significant health impact the accuracy of results gains more importance. Therefore, in order to move forward with a referral system to check the reliability

and accuracy of the tested samples it is necessitated that a referral laboratory should be available in the State. Therefore, the State has a two tier referral testing in place – one at the district level, the district labs test for the referral samples and second these samples are sent to the State level referral laboratories. West Bengalnow has an ISO IEC 17025: 2005 NABL accredited State referral laboratoryat Dakshin Raipur, for referral testing. It is also in the process of seeking NABL accreditation for four (4) additional water quality testing laboratories in the State.

## Water Quality Monitoring

### Water quality parameters

Routine water quality testing in a **general laboratory** for a **spot source** involves the measurement of the following parameters:

**pH**, **Turbidity**, **Total hardness**, **Iron**, **Manganese,Total coliforms** and **Thermotolerant coliforms/ *E. coli***.

However, depending on the quality affected area mandatory parameters such as **Arsenic**, **Fluoride**, **TDS** and **Chloride** are tested in addition to these parameters in the respective category type laboratory. Testing of **onsite residual free chlorine** is done for all Piped Water Supply Scheme (PWSS) samples collected from the distribution network.

Water Testing Laboratories associated with the Water Treatment Plants (WTPs) need to analyse some more parameters in addition to those mentioned above. They are **Colour, Odour, Taste, Alkalinity, Jar test, Calcium, Magnesium, Sulphate, Nitrate, Aluminium, Boron, Cadmium, Lead, Chromium, Copper, Phenols, Cyanide, Mineral oil and grease, BOD, COD, Standard Plate Count, test for Sulphite Reducing Bacteria etc.** The frequency of testing these parameters is according to the recommended schedule followed at the laboratory. For testing some of these additional parameters the WTP laboratories (3) are equipped with **Atomic Absorption Spectrophotometer (AAS).**

### Introduction of Smart Phones in water quality monitoring

A unique strategy adopted in the State is the introduction of Smart phones in the water quality monitoring mechanism. Every water testing laboratory is equipped with Android based Smart phones loaded with survey app to facilitate sanitary survey, geo-tag sampling location and take photographs of the spot source. Verification of sources is ensured in two ways by (1) Taking the GPS location (2) Taking source photographs.

### Survey app

The source details for each of the districts is saved in the form of drop-down menus and segregated into different categories, into these Smart phones to reduce the burden on facilitator,

who otherwise may need to type the information each time. However, if the source information is not already installed in the phone then, the facilitator has to fill it manually. Sanitary survey is performed for all sources using the survey app. Hazards are identified by referring to the hazard indicators of each source type through visual inspection. Each hazard is designated as a ‘yes’ and each ‘yes’equals to a risk score of 1. So, the combined score for the source is provided as the sanitary risk score for the source. There may be either 9 or moresanitary survey questions for each source type. The source photograph can be taken and hazard can be pointed out with some customized features.

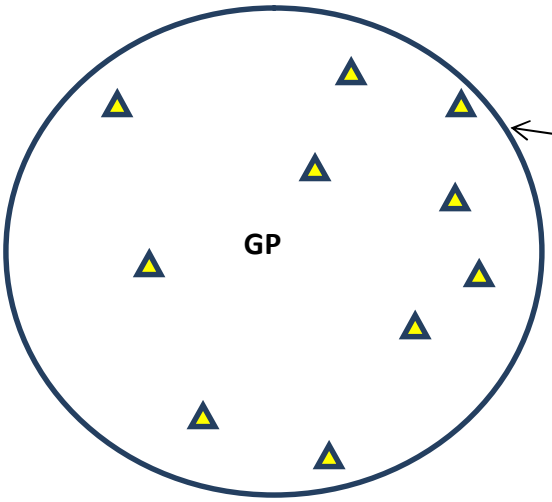
**Water Quality Data entry**

The water quality results are input into the application in real time creating a paperless and instant database of results. The app is connected to a secure server through internet where the water quality, sanitary survey results and source photographs along with the GPS coordinates is uploaded real-time on the water quality dashboard. The data from the Smart phones and laboratory is combined and processed to provide a range of data which can inform decision makers and assist in prioritizing remedial action.

Fig. 1:Water Quality Monitoring and Surveillance _ Mechanism

Facilitator
(water sample collector)

1. Drinking water sample collection
2. GPS tagging of source
3. Source Photograph
4. Sanitary survey using survey app

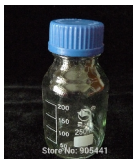



water source

Red marked Handpump Tubewell

1 Facilitator/ GP

**Laboratory(PHED / NGO Managed)**



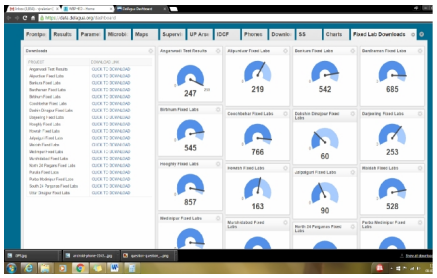
- Arsenic
- Fluoride
- Iron
- Salinity
- Total and Thermotolerant coliforms

Input

Water Quality Data

Upload

Water Quality Report



Water Quality Dashboard

**Other stakeholders**

**GP Pradhan**

Disinfection

- Red marking of As affected tubewells (in process- N.24.Pgs)
- Provide alternate safe source
- Piped Water Supply Scheme

**PHED**

**Uploaded in the IMIS**

In addition to the online dashboard the full data set is available to download from the secure server via the download link on the dashboard. The downloaded data in the form of an excel file for offline use. The water quality monitoring mechanism followed in static laboratories has been illustrated in the fig. 1

+

## Part B: List of Laboratories for Testing of Water Samples

| Sl. No | Division | Laboratory | Lab Category | Lab Type | Testing Parameters | New Jurisdiction |
|---|---|---|---|---|---|---|
| 1 | Barasat Division | North 24 Parganas District Lab, Barasat | PHED | Arsenic, Salinity | As, TDS, Fe, pH, Hardness, Turbidity, Manganese, TC, FC | Habra II |
| 2 | Barasat Division | Asesh Roy WTL, Taki | PHED | Arsenic, Salinity | As, TDS, Fe, pH, Hardness, Turbidity, Manganese, TC, FC | Minakhan |
| 3 | Barasat Division | Bishnupur Sub District Lab, Rajarhat | PHED | Arsenic, Salinity | As, TDS, Fe, pH, Hardness, Turbidity, Manganese, TC, FC | Rajarhat |
| 4 | Barasat Division | Bodai Sub District Lab, Amdanga | PHED | Salinity | TDS, Fe, pH, Hardness, Turbidity, Manganese, TC, FC | Amdanga |
| 5 | Barasat Division | Habra Sub District Lab, Habra I | PHED | Arsenic | As, Fe, pH, Hardness, Turbidity, Manganese, TC, FC | Habra I |
| 6 | Barasat Division | Bagda Sub District Lab, Bagda | PHED | Arsenic, Salinity | As, TDS, Fe, pH, Hardness, Turbidity, Manganese, TC, FC | Bagda |
| 7 | Barasat Division | Haroa Sub District Lab, Haroa | PHED | Arsenic, Salinity | As, TDS, Fe, pH, Hardness, Turbidity, Manganese, TC, FC | Haroa |
| 8 | Barasat Division | Basirhat Sub District Lab, Basirhat I | PHED | Arsenic, Salinity | As, TDS, Fe, pH, Hardness, Turbidity, Manganese, TC, FC | Basirhat I |
| 9 | Barasat Division | Gokhna Sub District Lab, Baduria | PHED | Arsenic, Salinity | As, TDS, Fe, pH, Hardness, Turbidity, Manganese, TC, FC | Baduria |
| 10 | Barasat Division | Chandpara Sub District Lab, Gaighata | PHED | Arsenic | As, Fe, pH, Hardness, Turbidity, Manganese, TC, FC | Gaighata |
| 11 | North 24-Parganas W/S Division-I | Mangal Pandey WTP site, Palta | PHED | Arsenic | As, Fe, pH, Hardness, Turbidity, | Barrackpore II |

| Sl. No | Division | Laboratory | Lab Category | Lab Type | Testing Parameters | New Jurisdiction |
|---|---|---|---|---|---|---|
| | | | | | Manganese, TC, FC | |
| 12 | Barasat Division | Forum of Scientists, Engineers and Technologists (FOSET) | NGO | Arsenic | As, Fe, pH, Hardness, Turbidity, Manganese, TC, FC | Barrackpur-I, Barasat-I |
| 13 | Barasat Division | WBCADC Deganga Project | NGO | Arsenic, Salinity | As, TDS, Fe, pH, Hardness, Turbidity, Manganese, TC, FC | Deganga, Basirhat II |
| 14 | Barasat Division | Paschim Banga Vigyan Mancha | NGO | Arsenic, Salinity | As, TDS, Fe, pH, Hardness, Turbidity, Manganese, TC, FC | Barasat II |
| 15 | Barasat Division | Sarbik Vivekananda Gram Seva Sanstha | NGO | Arsenic, Salinity | As, TDS, Fe, pH, Hardness, Turbidity, Manganese, TC, FC | Hasnabad, Hingalganj |
| 16 | Barasat Division | Youth Devolpment Centre | NGO | Arsenic, Salinity | As, TDS, Fe, pH, Hardness, Turbidity, Manganese, TC, FC | Sandeshkhali - I, Sandeshkhali - II |
| 17 | Barasat Division | Pather Panchali Seva Samity | NGO | Arsenic | As, Fe, pH, Hardness, Turbidity, Manganese, TC, FC | Bongaon |
| 18 | Barasat Division | Bithari Disha | NGO | Arsenic | As, Fe, pH, Hardness, Turbidity, Manganese, TC, FC | Swarupnagar |

# ANNEX 11

# Urban Civic Amenities Data

Table 1: Water Supply status of the Municipalities in the North 24 Parganas*

| | **Per capita Available of water at consumer end (lpcd)** | | **Extent of Non Revenue Water (% of total production)** | | **Quality of water Supply (% conforming to standard)** | |
|---|---|---|---|---|---|---|
| Name of Municipality | ***Improved status during 2014- 2015*** | ***Reliability*** | ***Improved status during 2014- 2015*** | ***Reliability*** | ***Improved status during 2014- 2015*** | ***Reliability*** |
| **Service level Bennchmark as per MoUD guideline** | ***135*** | | ***20%*** | | ***100%*** | |
| Ashoknagar Kalyangarh (M) | 70 | D | 20 | D | 10 | C |
| Baduria (M) | 55 | D | 60 | C | 100 | C |
| Bangaon (M) | 75 | C | 100 | C | 100 | C |
| Baranagar (M) | 110 | D | 85 | D | 10 | C |
| Barasat (M) | 110 | D | 11 | D | 10 | C |
| Barrackpur (M) | 130 | C | 18 | D | 100 | A |
| Basirhat (M) | 75 | D | 20 | B | 10 | C |
| Bhatpara (M + OG) | 135 | C | 20 | C | 95 | C |
| Bidhan Nagar (M) | 125 | D | 70 | D | 90 | C |
| Dum Dum (M) | 135 | C | 70 | C | 85 | C |
| Garulia (M) | 125 | C | 70 | D | 100 | C |
| Gobardanga (M) | 45 | C | 15 | D | 100 | C |
| Habra (M) | 40 | C | 70 | D | 70 | C |
| Halisahar (M) | 135 | C | 70 | D | 10 | D |
| Kamarhati (M) | 120 | D | 0 | D | 100 | C |
| Kanchrapara (M + OG) | 125 | C | 70 | D | 100 | C |
| Khardaha (M) | 135 | C | 45 | D | 10 | D |
| Madhyamgram (M) | 120 | C | 70 | D | 0 | C |
| Naihati (M) | 105 | C | 75 | D | 10 | C |
| New Barrackpur (M) | 120 | C | 80 | D | 80 | C |
| North Barrackpur (M) | 80 | C | 70 | D | 100 | D |
| North Dum Dum (M) | 90 | C | 70 | D | 0 | C |
| Panihati (M) | 135 | C | 20 | D | 95 | C |
| Rajarhat Gopalpur (M) | 40 | D | 50 | D | 70 | C |
| South Dum Dum (M) | 135 | D | 90 | D | 10 | C |
| Taki (M) | 15 | C | 70 | D | 0 | C |
| Titagarh (M) | 135 | D | 0 | D | 10 | C |

* As avaialble from Gazetter of Municipal Engineering Directorate

A indicates highest level of reliable data while D indicates most unreliable data

## Table 2

## Civic and other Amenities in Urban Area of North 24 Parganas , (2009)

| Sr. No. | Name of Town | System of drainage | | | | Number of latrines | | | | Protected water supply | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Open (OD) | Closed (CD) | Both - Open & Closed (BD) | Nil | Pit System | Flush/ Pour Flush (Water borne) | Service | Others | Source of supply (Codes) * | System of storage with capacity in kilo litres (along with Codes)* |
| 1 | 2 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 1 | Chandpara (CT) | | | BD | | 0 | 1721 | 0 | 0 | BWT, | TW/B() |
| 2 | Chhekati (CT) | | | | Nil | 0 | 0 | 0 | 850 | BWT, | TW/B() |
| 3 | Sonatikiri (CT) | | | BD | | 0 | 1668 | 0 | 0 | BWT, | TW/B() |
| 4 | Dhakuria (CT) | | | BD | | 0 | 2471 | 0 | 0 | BWT, | TW/B() |
| 5 | Chikanpara (CT) | | | | Nil | 1586 | 793 | 780 | 0 | BWT, | TW/B() |
| 6 | Shimulpur (CT) | | | BD | | 5812 | 0 | 0 | 0 | BWT, | HP() |
| 7 | Bara (CT) | | | | Nil | 2284 | 1142 | 1040 | 0 | BWT, | HP() |
| 8 | Deora (CT) | | | BD | | 96 | 116 | 2000 | 3125 | OHT, | TT(150000) |
| 9 | Nokpul (CT) | | | | Nil | 1121 | 15 | 0 | 0 | BWT, | HP(),TK/P/L() |
| 10 | Maslandapur (CT) | | CD | | | 2500 | 78 | 0 | 0 | BWT, | HP(),TK/P/L() |
| 11 | Sadpur (CT) | OD | | | | 2032 | 75 | 0 | 0 | BWT, | HP(),TK/P/L() |
| 12 | Betpuli (CT) | | | | Nil | 2315 | 50 | 0 | 0 | BWT, | HP(),TK/P/L() |
| 13 | Anarbaria (CT) | | | | Nil | 11533 | 45 | 0 | 0 | BWT, | HP(),TK/P/L() |
| 14 | Purbba Narayanpur (CT) | | | | Nil | 1331 | 75 | 0 | 0 | BWT, | HP(),TK/P/L() |
| 15 | Guma (CT) | OD | | | | 2974 | 0 | 0 | 0 | BWT, | TU(),HP() |
| 16 | Bara Bamonia (CT) | | | | Nil | 445 | 0 | 0 | 223 | BWT, | HP(),HP() |
| 17 | Khorddabamonia (CT) | OD | | | | 341 | 0 | 0 | 171 | BWT, | HP(),HP() |
| 18 | Bira (CT) | OD | | | | 634 | 0 | 0 | 317 | BWT, | TU(),HP() |
| 19 | Dhania (CT) | OD | | | | 400 | 0 | 0 | 200 | OHT, | TT(),HP() |
| 20 | Palladaha (CT) | OD | | | | 1000 | 0 | 0 | 445 | BWT, | TT(),HP() |
| 21 | Palashi (CT) | OD | | | | 220 | 1418 | 0 | 0 | BWT, | HP(),HP() |
| 22 | Nagdaha (CT) | OD | | | | 150 | 1450 | 0 | 0 | BWT, | HP(),HP() |
| 23 | Jetia (CT) | | | BD | | 89 | 1452 | 0 | 0 | BWT, | TU() |
| 24 | Balibhara (CT) | | | BD | | 70 | 1812 | 0 | 0 | OHT, | TW/B(),O() |
| 25 | Dogachhia (CT) | OD | | | | 300 | 800 | 0 | 0 | OHT, | TU(),TW/B() |
| 26 | Garshyamnagar (CT) | | | | Nil | 0 | 0 | 0 | 2200 | OHT, | TU(),HP() |
| 27 | Noapara (P) (CT) | | | | Nil | 0 | 0 | 0 | 2600 | OHT, | TU(),HP() |
| 28 | Kaugachhi (CT) | | | | Nil | 0 | 0 | 0 | 4500 | OHT, | TU(),HP() |
| 29 | Paltapara (CT) | | | | Nil | 830 | 680 | 0 | 0 | OHT, | HP(),TK/P/L() |

| Sr. No. | Name of Town | System of drainage | | | | Number of latrines | | | | Protected water supply | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Open (OD) | Closed (CD) | Both - Open & Closed (BD) | Nil | Pit System | Flush/ Pour Flush (Water borne) | Service | Others | Source of supply (Codes) * | System of storage with capacity in kilo litres (along with Codes)* |
| 30 | Ichhapur Defence Estate (CT) | | | BD | | 0 | 1 | 0 | 0 | BWT, | OHT(16550) |
| 31 | Babanpur (P) (CT) | OD | | | | 900 | 200 | 0 | 700 | PT, | HP(),TK/P/L() |
| 32 | Jafarpur (CT) | OD | | | | 3200 | 600 | 0 | 200 | PT, | HP(),TK/P/L() |
| 33 | Mohanpur (CT) | OD | | | | 950 | 1240 | 0 | 410 | PT, | TU(),HP() |
| 34 | Teleni Para (CT) | OD | | | | 2085 | 1389 | 0 | 0 | OHT, | TT(1382),HP() |
| 35 | Chak Kanthalia (CT) | OD | | | | 1140 | 120 | 0 | 1100 | PT, | TU(),HP() |
| 36 | Ruiya (CT) | OD | | | | 0 | 3487 | 0 | 278 | OHT, | TT(900000),HP() |
| 37 | Patulia (CT) | OD | | | | 0 | 3579 | 0 | 121 | OHT, | TT(900000),HP() |
| 38 | Bandipur (CT) | | | BD | | 488 | 0 | 0 | 244 | OHT, | TT(),O() |
| 39 | Talbandha (CT) | | | BD | | 1200 | 100 | 0 | 0 | OHT, | HP(),O() |
| 40 | Bilkanda (CT) | OD | | | | 383 | 0 | 0 | 192 | OHT, | HP(),O() |
| 41 | Muragachha (CT) | OD | | | | 2400 | 300 | 0 | 0 | OHT, | HP(),TU() |
| 42 | Teghari (CT) | | | BD | | 400 | 1700 | 0 | 0 | BWT, | TU(100),HP() |
| 43 | Chandpur (CT) | OD | | | | 2400 | 100 | 0 | 0 | BWT, | HP(),TK/P/L() |
| 44 | Kokapur (CT) | OD | | | | 613 | 804 | 211 | 22 | OHT, | TT(),HP() |
| 45 | Shibalaya (CT) | OD | | | | 1204 | 160 | 0 | 40 | BWT, | HP(),HP() |
| 46 | Gangapur (CT) | OD | | | | 318 | 80 | 1193 | 0 | BWT, | O(16000),HP() |
| 47 | Chandrapur (CT) | OD | | | | 390 | 150 | 0 | 730 | BWT, | HP(),HP() |
| 48 | Nebadhai Duttapukur (CT) | OD | | | | 5158 | 1290 | 0 | 0 | BWT, | O(28000),HP() |
| 49 | Chatta Baria (CT) | OD | | | | 1395 | 1237 | 433 | 0 | BWT, | HP(),HP() |
| 50 | Joypul (CT) | OD | | | | 555 | 3745 | 235 | 0 | BWT, | HP(),HP() |
| 51 | Digha (CT) | OD | | | | 1400 | 0 | 0 | 455 | BWT, | HP(),HP() |
| 52 | Kulberia (CT) | | | | Nil | 420 | 0 | 0 | 210 | BWT, | TT(),HP() |
| 53 | Bamangachhi (CT) | | | | Nil | 412 | 0 | 0 | 206 | BWT, | TT(),HP() |
| 54 | Chak Barbaria (CT) | OD | | | | 1126 | 751 | 0 | 0 | OHT, | TT(),HP() |
| 55 | Koyra (CT) | OD | | | | 600 | 300 | 0 | 0 | BWT, | TT(),HP() |
| 56 | Deara (CT) | OD | | | | 420 | 25 | 0 | 0 | OHT,SR | TW/B(),OHT() |
| 57 | Deulia (CT) | | | BD | | 0 | 2291 | 0 | 0 | SR,BWT | TW/B(),TT() |
| 58 | Dakshin Chatra (CT) | OD | | | | 454 | 0 | 0 | 227 | SR,BWT | OHT(45000),TU() |
| 59 | Itinda (CT) | | | BD | | 451 | 0 | 0 | 226 | OHT,SR | TT(),TU() |
| 60 | Dandirhat (P) (CT) | | | BD | | 0 | 1434 | 0 | 0 | OHT,SR | TU(),TW/B() |

| Sr. No. | Name of Town | System of drainage | | | | Number of latrines | | | | Protected water supply | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Open (OD) | Closed (CD) | Both - Open & Closed (BD) | Nil | Pit System | Flush/ Pour Flush (Water borne) | Service | Others | Source of supply (Codes) * | System of storage with capacity in kilo litres (along with Codes)* |
| 61 | Uttar Bagundi (CT) | | | BD | | 0 | 1372 | 0 | 0 | OHT,SR | TU(),TW/B() |
| 62 | Dhanyakuria (CT) | OD | | | | 1000 | 500 | 0 | 50 | OHT,BWT | TT(),HP() |
| 63 | Mathurapur (CT) | OD | | | | 409 | 0 | 0 | 205 | OHT,BWT | TU(),TW/B() |
| 64 | Raghunathpur (P) (CT) | OD | | | | 324 | 0 | 0 | 162 | OHT,BWT | TU(),TW/B() |
| 65 | Raigachhi (CT) | OD | | | | 80 | 10 | 40 | 0 | SR,BWT | TW/B(),HP() |
| 66 | Rekjuani (CT) | OD | | | | 950 | 0 | 0 | 475 | SR,BWT | TW/B(),HP() |
| 67 | Bhatenda (CT) | | | BD | | 400 | 0 | 0 | 200 | BWT,BWT | TT(),TK/P/L() |
| 68 | Basina (CT) | OD | | | | 900 | 0 | 0 | 350 | BWT,BWT | TU(),HP() |
| 69 | Bishnupur (CT) | OD | | | | 0 | 700 | 0 | 0 | SR,BWT | TU(),HP() |
| 70 | Chandapur Champagachhi (CT) | OD | | | | 700 | 0 | 0 | 100 | OHT,BWT | TT(),HP() |
| 71 | Jatragachhi (CT) | OD | | | | 1600 | 0 | 0 | 200 | OHT,BWT | TW/B(),HP() |
| 72 | Ghuni (CT) | OD | | | | 5000 | 0 | 0 | 500 | OHT,BWT | TW/B(),HP() |
| 73 | Sulanggari (CT) | OD | | | | 3000 | 0 | 0 | 100 | OHT,BWT | TW/B(),HP() |
| 74 | Minakhan (CT) | | | BD | | 203 | 0 | 0 | 102 | , | O() |
| 75 | Balihati (CT) | | | | Nil | 207 | 0 | 0 | 104 | , | O() |
| 76 | Sadigachhi (CT) | OD | | | | 360 | 0 | 0 | 180 | , | TT(),HP() |
| 77 | Hingalganj (CT) | OD | | | | 530 | 0 | 0 | 265 | OHT,BWT | TT(),HP() |
| 78 | Bankra (CT) | OD | | | | 454 | 0 | 0 | 227 | OHT,BWT | TT(),TW/B() |
| 79 | Bongaon (M) | | | BD | | 6583 | 0 | 0 | 3292 | BWT, | HP(),HP() |
| 80 | Halisahar (M) | OD | | | | 4670 | 0 | 0 | 10340 | OHT,BWT | TT(364),HP() |
| 81 | Kanchrapara (M + OG) | | | BD | | 1167 | 8146 | 55 | 104 | OHT, | TW/B() |
| 82 | Naihati (M) | OD | | | | 0 | 450 | 0 | 0 | OHT,PT | O(),TW/B() |
| 83 | Bhatpara (M + OG) | | | BD | | 10000 | 5500 | 0 | 36500 | BWT,PT | TW/B(),TU() |
| 84 | Gobardanga (M) | OD | | | | 1503 | 300 | 0 | 0 | OHT,PT | TT(),HP() |
| 85 | Habra (M) | OD | | | | 2000 | 2300 | 0 | 1210 | OHT,PT | TU(238350),TW/B() |
| 86 | Ashokenagar Kalyangarh (M) | OD | | | | 7442 | 18369 | 0 | 0 | OHT,BWT | TU(8208),HP() |
| 87 | Garulia (M) | | | BD | | 1000 | 10000 | 0 | 0 | OHT, | OHT(101250) |
| 88 | North Barrackpore (M) | OD | | | | 4988 | 162 | 0 | 16600 | OHT,BWP | TW/B(810),TT() |
| 89 | Barrackpur Cantonment (CB) | OD | | | | 882 | 0 | 0 | 441 | OHT,BWT | TT(),HP() |
| 90 | Barrackpore (M) | OD | | | | 0 | 850 | 0 | 12600 | OHT,BWT | OHT(918750), O() |

| Sr. No. | Name of Town | System of drainage | | | | Number of latrines | | | | Protected water supply | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Open (OD) | Closed (CD) | Both - Open & Closed (BD) | Nil | Pit System | Flush/ Pour Flush (Water borne) | Service | Others | Source of supply (Codes) * | System of storage with capacity in kilo litres (along with Codes)* |
| 91 | Titagarh (M) | | | BD | | 4500 | 13750 | 0 | 0 | BWT,OHT | TT(125000),TU (7500) |
| 92 | Khardah (M) | | | BD | | 0 | 375 | 0 | 27800 | SR,OHT | HP(1000),TU() |
| 93 | Panihati (M) | | | BD | | 0 | 62000 | 0 | 0 | OHT,PT | TU(),HP() |
| 94 | Baduria (M) | OD | | | | 1840 | 5173 | 0 | 0 | BWT, | TU(),HP() |
| 95 | Barasat (M) | | | BD | | 1332 | 51708 | 0 | 0 | BWT,PT | TW/B(100000), TU() |
| 96 | Madhyamgram (M) | | | BD | | 19252 | 15748 | 0 | 0 | BWT, | PT() |
| 97 | New Barrackpore (M) | OD | | | | 5100 | 11050 | 0 | 850 | OHT, | TW/B() |
| 98 | North DumDum (M) | | | BD | | 15814 | 0 | 0 | 7907 | BWT, | TT(),TW/B() |
| 99 | Kamarhati (M) | | | BD | | 17527 | 0 | 0 | 8764 | SR, | TT(),TW/B() |
| 100 | Baranagar (M) | | | BD | | 15847 | 0 | 0 | 7924 | OHT,SR | TT(),CW() |
| 101 | Dum Dum (M) | OD | | | | 1000 | 26923 | 0 | 247 | OHT,BWT | OHT(30000), TW/B() |
| 102 | South DumDum (M) | | | BD | | 85800 | 20700 | 0 | 0 | OHT,PT | TT(145000), TU() |
| 103 | Rajarhat Gopalpur (M) | | | BD | | 0 | 41359 | 0 | 0 | BWT,BWT | TW/B(),HP() |
| 104 | Bidhannagar (M) | | CD | | | 1000 | 500 | 0 | 1 | OHT, | TK/P/L(40000), OHT() |
| 105 | Nabadiganta Industrial Township (ITS) | | CD | | | 0 | 200 | 0 | 0 | SR,SR | TT(3000000), OHT() |
| 106 | Basirhat (M) | | | BD | | 3650 | 0 | 0 | 0 | BWT,PT | TT(100000), TW/B() |
| 107 | Taki (M) | | | BD | | 1300 | 4700 | 0 | 0 | BWT,PT | TU(),HP() |

*In case this service is not available in the town, the name of the nearest place and its distance from the town where facility is available has been given
*Two major source only

**Abbreviation**

**TT:** Tap water from treated source
**TU:**Tap water from un-treated source
**CW:** Covered well
**UW:** Un-covered well
**HP:** Hand pump
**TW/B:**Tubewell /Borehole
**RW:** Rainwater
**S:**Spring
**TK/P/L:**Tank/Pond/Lake
**O:**Others
**OHT:** Over head Tank
**SR:** Service Reservoir
**RIG:** River Infiltration Gallery
**BWP:** Bore Well Pumping system
**PT:** Pressure Tank
**N\A,NA,N.A.:** Not Available

# ANNEX 12:

# Block-wise Sanitation Status of North 24 Parganas (Rural area)

Table 1: Status of Declared and Verified ODF: District and State Level

| Sr. No. | District Name | Block | | | Gram Panchayat | | | Village | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total | Declared ODF | Verified ODF | Total | Declared ODF | Verified ODF | Total | No. of Not Exist / Unin-habited Villages | Declared ODF | | | Verified ODF | | | Not Declared ODF | Not Verified ODF |
| | | | | | | | | | | 2015-2016 | 2016-2017 | Total | 2015-2016 | 2016-2017 | Total | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13=11+12 | 14 | 15 | 16=14+15 | 17=9-10-13 | 18=9-10-16 |
| 16 | North 24 Paraganas | 22 | 22 | 22 | 200 | 200 | 200 | 1809 | 41 | 1768 | 0 | 1768 | 0 | 1768 | 1768 | 0 | 0 |
| West Bengal | | 341 | 104 | 83 | 3349 | 1620 | 856 | 42959 | 398 | 7956 | 10871 | 18822 | 1338 | 7299 | 8637 | 23739 | 33924 |

Source: http://sbm.gov.in/sbmreport/Report/Physical/SBM_VillageODFMarkStatus.aspx

## Table 2: Block-wise details of Verified and Declared ODF

| Sl. No. | Block Name | Gram Panchayat | | | | Village | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total | Declared ODF | Verified ODF | Not Declared ODF | Total | Declared ODF | | | Verified ODF | | | Not Declared ODF | Not Verified ODF |
| | | | | | | | 2015-16 | 2016-17 | Total | 2015-16 | 2016-17 | Total | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 9 | 10 | 11= 9+10 | 12 | 13 | 14= 12+13 | 15= 7-8-11 | 16= 7-8-14 |
| 1 | Amdanga | 8 | 8 | 8 | 0 | 83 | 82 | 0 | 82 | 0 | 82 | 82 | 0 | 0 |
| 2 | Baduria | 14 | 14 | 14 | 0 | 127 | 125 | 0 | 125 | 0 | 125 | 125 | 0 | 0 |
| 3 | Bagda | 9 | 9 | 9 | 0 | 108 | 108 | 0 | 108 | 0 | 108 | 108 | 0 | 0 |
| 4 | Barasat-I | 9 | 9 | 9 | 0 | 91 | 91 | 0 | 91 | 0 | 91 | 91 | 0 | 0 |
| 5 | Barasat-II | 7 | 7 | 7 | 0 | 83 | 82 | 0 | 82 | 0 | 82 | 82 | 0 | 0 |
| 6 | Barrackpur-I | 8 | 8 | 8 | 0 | 56 | 54 | 0 | 54 | 0 | 54 | 54 | 0 | 0 |
| 7 | Barrackpur-II | 6 | 6 | 6 | 0 | 33 | 30 | 0 | 30 | 0 | 30 | 30 | 0 | 0 |
| 8 | Basirhat-I | 7 | 7 | 7 | 0 | 63 | 61 | 0 | 61 | 0 | 61 | 61 | 0 | 0 |
| 9 | Basirhat-II | 9 | 9 | 9 | 0 | 118 | 103 | 0 | 103 | 0 | 103 | 103 | 0 | 0 |
| 10 | Bongaon | 16 | 16 | 16 | 0 | 164 | 164 | 0 | 164 | 0 | 164 | 164 | 0 | 0 |
| 11 | Deganga | 13 | 13 | 13 | 0 | 130 | 128 | 0 | 128 | 0 | 128 | 128 | 0 | 0 |
| 12 | Gaighata | 13 | 13 | 13 | 0 | 112 | 110 | 0 | 110 | 0 | 110 | 110 | 0 | 0 |
| 13 | Habra-I | 7 | 7 | 7 | 0 | 63 | 62 | 0 | 62 | 0 | 62 | 62 | 0 | 0 |
| 14 | Habra-II | 8 | 8 | 8 | 0 | 103 | 99 | 0 | 99 | 0 | 99 | 99 | 0 | 0 |
| 15 | Haroa | 8 | 8 | 8 | 0 | 110 | 110 | 0 | 110 | 0 | 110 | 110 | 0 | 0 |
| 16 | Hasnabad | 9 | 9 | 9 | 0 | 74 | 71 | 0 | 71 | 0 | 71 | 71 | 0 | 0 |
| 17 | Hingalganj | 9 | 9 | 9 | 0 | 48 | 46 | 0 | 46 | 0 | 46 | 46 | 0 | 0 |
| 18 | Minakhan | 8 | 8 | 8 | 0 | 74 | 74 | 0 | 74 | 0 | 74 | 74 | 0 | 0 |
| 19 | Rajarhat | 6 | 6 | 6 | 0 | 49 | 48 | 0 | 48 | 0 | 48 | 48 | 0 | 0 |

| Sl. No. | Block Name | Gram Panchayat | | | | Village | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total | Declared ODF | Verified ODF | Not Declared ODF | Total | Declared ODF | | | Verified ODF | | | Not Declared ODF | Not Verified ODF |
| | | | | | | | 2015-16 | 2016-17 | Total | 2015-16 | 2016-17 | Total | | |
| 20 | Sandeshkhali-I | 8 | 8 | 8 | 0 | 30 | 30 | 0 | 30 | 0 | 30 | 30 | 0 | 0 |
| 21 | Sandeshkhali-II | 8 | 8 | 8 | 0 | 24 | 24 | 0 | 24 | 0 | 24 | 24 | 0 | 0 |
| 22 | Swarupnagar | 10 | 10 | 10 | 0 | 66 | 66 | 0 | 66 | 0 | 66 | 66 | 0 | 0 |
| Total :- | | 200 | 200 | 200 | 0 | 1809 | 1768 | 0 | 1768 | 0 | 1768 | 1768 | 0 | 0 |

Source: http://sbm.gov.in/sbmreport/Report/Physical/SBM_VillageODFMarkStatus.aspx

# ANNEX 13

# Summary of Proposed

# Surface Water Supply Scheme

## Surface Water Supply Scheme for Haroa, Rajarhat and bhangar II.

The scheme has been conceived for Haroa and Rajarhat bocks in the North 24 Parganas District and Bhangar II block in the South 24 Parganas District. covering a total population of 806,588 (in the year 2046) and 161,319 households. Present population of the project area is 525,644 in 728 habitations.

**Water Source**: Source of water is the River Ganges. An intake jetty has been constructed on River Ganges at Rani Debendra Bala Ghat near Baghbajar. Already 11.5 km transmission main (1829 mm dia MS pipe) has been laid for conveyance of raw water from the Ganges to the location of WTP at Rajarhat[1]. It was informed by the PHED officials that though the design capacity of the raw water conveyance main is 100 MGD, considering the total capacity of the installed pumping station at the intake jetty and the pipeline, upto 110 MGD water can be conveyed to the WTP location. The raw water is delivered to the pond no 2 & 3 of the existing 5 no ponds located just outside the boundary of WTP site at Rajarhat

**WTP**: The present WTP is located near Tank No 1, in New Town Area, Rajarhat. The planned capacity is 110 MGD (498.3 MLD), to be constructed in phases. Out of this 110 MGD, 60 MGD is to be executed by HIDCO (20 each in three phases) and 50 MGD (22 +28, in two phases) by WBPHED. in the first phase, 20 MGD plant has been already constructed and has been functional since February, 2016. Construction work is going for the second phase for 20 MGD plant. Under the ADB funding a new WTP of 22 MGD will be constructed by PHED to serve Haroa Rajarhat


[1] The route of the pipe line is as follows: The pipeline, after moving along the Chitpore, RG Kar and Gajnabi bridges on BT Road, will cross Kolkata station and move towards Ultadanga crossing and Lalpole railway bridge near Bidhannagar rail station before entering Salt Lake's AA Block. It will then move parallel to Kestopur canal crossing the Lake Town footbridge, Baisakhi footbridge, 206 number footbridge and Nayapatti Bazar to enter Rajarhat New Town and move towards Kestopur Mission Bazar and Pass Khal.

The bulk distribution of flow to the command area from the WTP is as follows:

| | |
|---|---|
| Newtown area | 60.0 MGD |
| Adjacent urban area Nabadiganta area) | 28.0 MGD (part of Salt Lake city and South Dumdum, |
| Haroa Rajarhat Bhangar II area | 22.0 MGD |
| **Total** | **110.0 MGD (499.54 MLD)** |

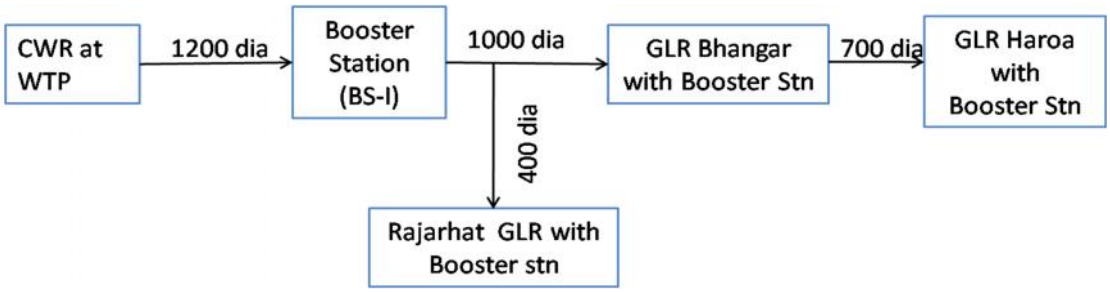
The water demand of Haroa-Rajarhat-Bhangar II for the final design year (2046), is 22 MGD (100 MLD). The WTP receives water in the intake sump from the pre-settlement ponds by gravity. Pumps at the intake pump house conveys the water to the inlet collection chamber. The treatment plant settlement unit comprises flash mixers with flocculation chamber followed by clarification in the tube settler modules. The settled water is then passed through rapid sand filters and the filtered water is stored in the clear water reservoir after chlorination. Alum and lime dosing is done to assist settlement depending on the inlet TSS concentration. The WTP is equipped with SCADA arrangement for central control. The sludge generated from the tube settlers and the backwash water from the sand filters is proposed to be transferred to sludge handling system and there from , disposal to nearby places as landfill. However, at present sludge and backwash water is discharged direct to the raw water pre-settlement ponds.

**Transmission Main:**

From the clear water reservoir, a 1200 mm dia transmission main will convey water to the Booster Pumping station BS-I located in the Action Area III. From BS-I, transmission mains will supply to the three ground level reservoirs (GLRs) in Rajarhat, Bhangar II and Haroa. A 1000 dia transmission main from BS- I goes to Bhangar II GLR From a booster station at the Bhanghar II GLR location, a 700 mm dia pipe supplies water to Haroa GLR. A 400 mm dia branch line from the 1000mm transmission main supplying to Bhangar II GLR, feeds the GLR serving Rajarhat. Secondary transmission lines from the three booster stations supply to the respective zonal overhead tanks.

A Contract for laying the transmission mains has been already awarded for a value of 45 million INR (US$672,000), with the pipeline materials supplied direct by PHED.

The transmission mains can be depicted from the following picture.




**Distribution system:**

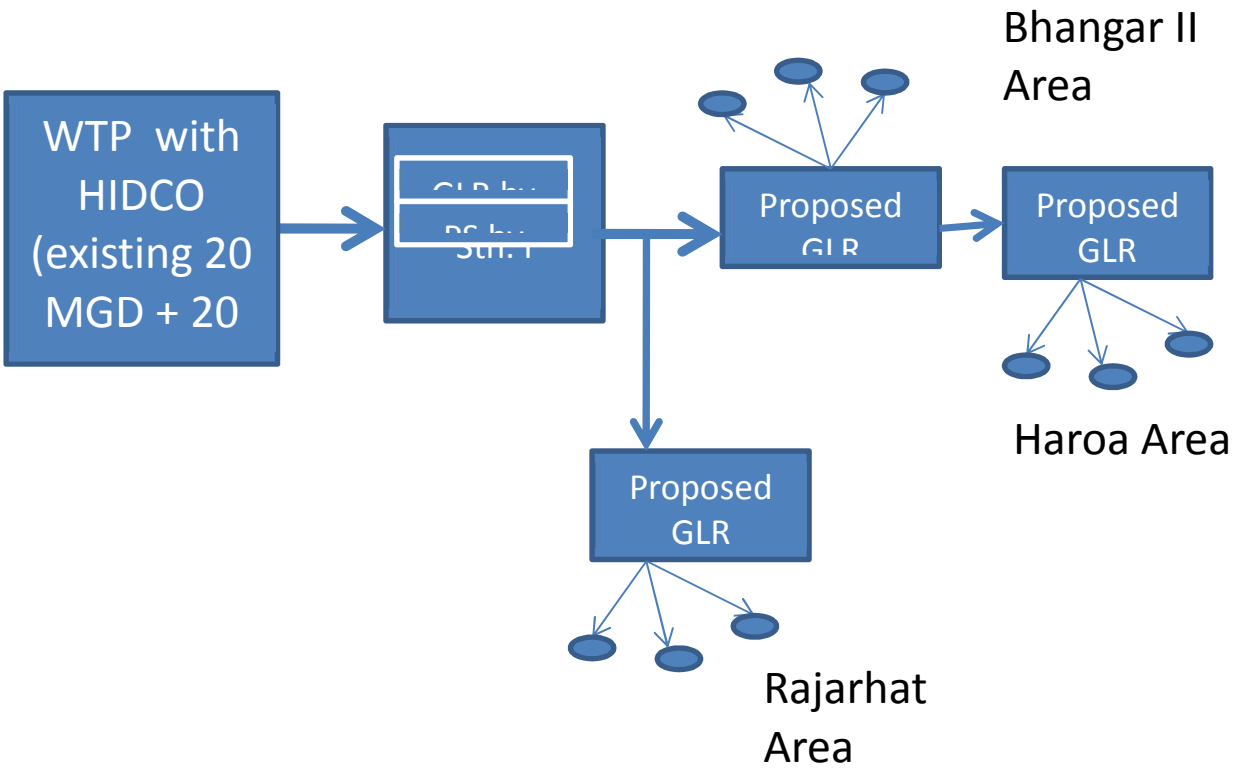
In total, 45 no overhead tanks are planned for the complete project area covering 43 zones covering 170 villages, with the following distribution:

OHTs of Rajarhat : 4 no

OHTs of Bhangar II: 18 no

OHTs of Haroa : 21 no

Land for all the OHTs are identified and initial consent from the owners has been taken.



| Sl . No. | | Description | Details | |
|---|---|---|---|---|
| 1 | | Name of the Project | Surface water based Piped Water Supply Scheme for the Arsenic Affected Areas of Haroa , Rajarhat & Bhangar- II | |
| 2 | | Name of the District | North 24 Parganas & South 24 Parganas | |
| 3 | | Block | Haroa , Rajarhat & Bhangar- II | |
| 4 | a | Number of Village | 170 Nos. | |
| | b | Number of Habitation | 728 | |
| 6 | a | Population of Proposed Village (2011) | 593844 | |
| | b | No of Households (2011) | 105130 | |
| 7 | a | Population of Proposed Village Present (Year -2016) | 649820 | |
| | b | No of Households Present (Year - 2016) | 113154 | |
| 8 | | Proposed Execution Period ( After Administrative Approval and placement of funds) | 36 months | |
| 9 | | Design village Population / No of Households expected date of commissioning | Population – | |
| | | | Households – 117,973 | |
| 10 | | Design village Population / No of Households after 15 Years ,(year 2031) | Population – 755641 | |
| | | | Households – 137240 | |
| 11 | | Design village Population / No of Households after 30 Years (year 2046) | Population – 905975 | |
| | | | Households – 161,319 | |
| 12 | | Total Clear water Demands for all purpose for Village(s) | | |
| | a | Immediately after completion (KLD) Year 2021 | 49032 | |
| | b | After 15 Years (year 2031) | 55388 | |
| | c | After 30 Years (year 2046) | 66738 | |
| 13 | | Proposed water Supply System | PWSS | |
| 14 | a | Availability Three Phase Electricity in Hours | 22 Hrs in general | |
| | b | Pumping Hours | 22 Hrs | |
| | c | Supply Hours | 24Hrs | |
| 15 | | Source of water | Surface | |
| 16 | a | Tubewell Details | Type | N.A |
| | | | Nos | N.A |
| | | | Size | N.A |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | Depth | N.A | | |
| | | | Yield | N.A | | |
| | b | Type of Pump Proposed | Centrifugal & electric driven | | | |
| | c | No of Pump used | To be decided during execution | | | |
| | d | Head (TDH) & discharge (LPM) for each proposed pump at GLR sites | Rajarhat | Head = 82m & Q= 400 $m^3$/hr | | |
| | | | Harao | Head = 101m & Q= 1140 $m^3$/hr | | |
| | | | Bhangar - II | Head = 89m & Q= 1500 $m^3$/hr | | |
| | e | No of pump house at three GLR sites | 3 Nos | | | |
| 17 | | Details of Clear water Pumping Main | Material | Length | Dia | Class |
| | | | DI | 12520 | 1000 | K-9 |
| | | | DI | 24488 | 700 | K-9 |
| | | | DI | 3771 | 600 | K-9 |
| | | | DI | 1336 | 500 | K-9 |
| | | | DI | 3248 | 450 | K-9 |
| | | | DI | 6850 | 400 | K-9 |
| | | | DI | 20316 | 350 | K-9 |
| | | | DI | 14376 | 300 | K-9 |
| | | | DI | 18473 | 250 | K-9 |
| | | | DI | 35705 | 200 | K-9 |
| | | | DI | 47267 | 150 | K-9 |
| 18 | | STORAGE Reservoir (s) – Capacity / Staging Height | Capacity | 43 Nos of Different capacity | | |
| | | | Staging Height | 20 m | | |
| 19 | | Capacity of CWR / GLR | Haroa Block | 3200 Cum. | | |
| | | | Rajarhat Block | 1000 Cum. | | |
| | | | Bhangar- II Block | 4100 Cum. | | |
| 20 | | Water Distribution network details | Material | Length | Dia | Class |
| | | | To be taken after detail Survey | | | |
| 21 | | Raw Water Quality monitoring | Not required as treated water from HIDCO WTP at Newtown will be available as source | | | |
| 22 | | Total Estimated Cost | Rs. 6869.4 million | | | |
| 23 | | Per Capita cost on present population (year – 2016) | Rs 12142 | | | |
| 24 | | Per Capita cost on present population (year – 2046) | Rs 8517 | | | |
| 25 | | Proposed tariff | Policy under process & will be finalised later on as per provision of G.O then in vogue | | | |
| | | Domestic | -do- | | | |
| | | Commercial | -do- | | | |
| 26 | | Proposed Water Supply at different Stages – No of domestic connection / stand posts | Year | Domestic Connection | Stand Post | |
| | | | 2021 | 48199 | 472 | |
| | | | 2031 | 56060 | 549 | |

| | | | | | |
|---|---|---|---|---|---|
| | | | 2046 | 65929 | 646 |
| 27 | | Anticipated Revenue at different Stages | Will be finalised later on as per Government Policy | | |
| 28 | | Agency for O & M | Initially by PHED then by VWSC/local authority from OHR to distribution including disinfection.<br>Sources, Rising main will remain under PHED | | |
| 29 | | Amount for awareness generation and Capacity Building of GP/ VWSC | Rs 500,000 /- only | | |
| 30 | | " ALL the cost thus arrived is based on departmental design, drawing and schedule of guideline of Planning Wing of PHED in general. Changes are not acceptable unless sound technical requirement of site conditions demand without the written approval of planning wing of PHE directorate. | Ref. :- Memo No. PHE/31/SS/13/o_21/2011 dt. 27-02-2013 of Engineer-in-Chief, PHE Deptt. | | |

*Source:* As obtained from the DPR of Haroa, Rajarhat, Bhangar-I

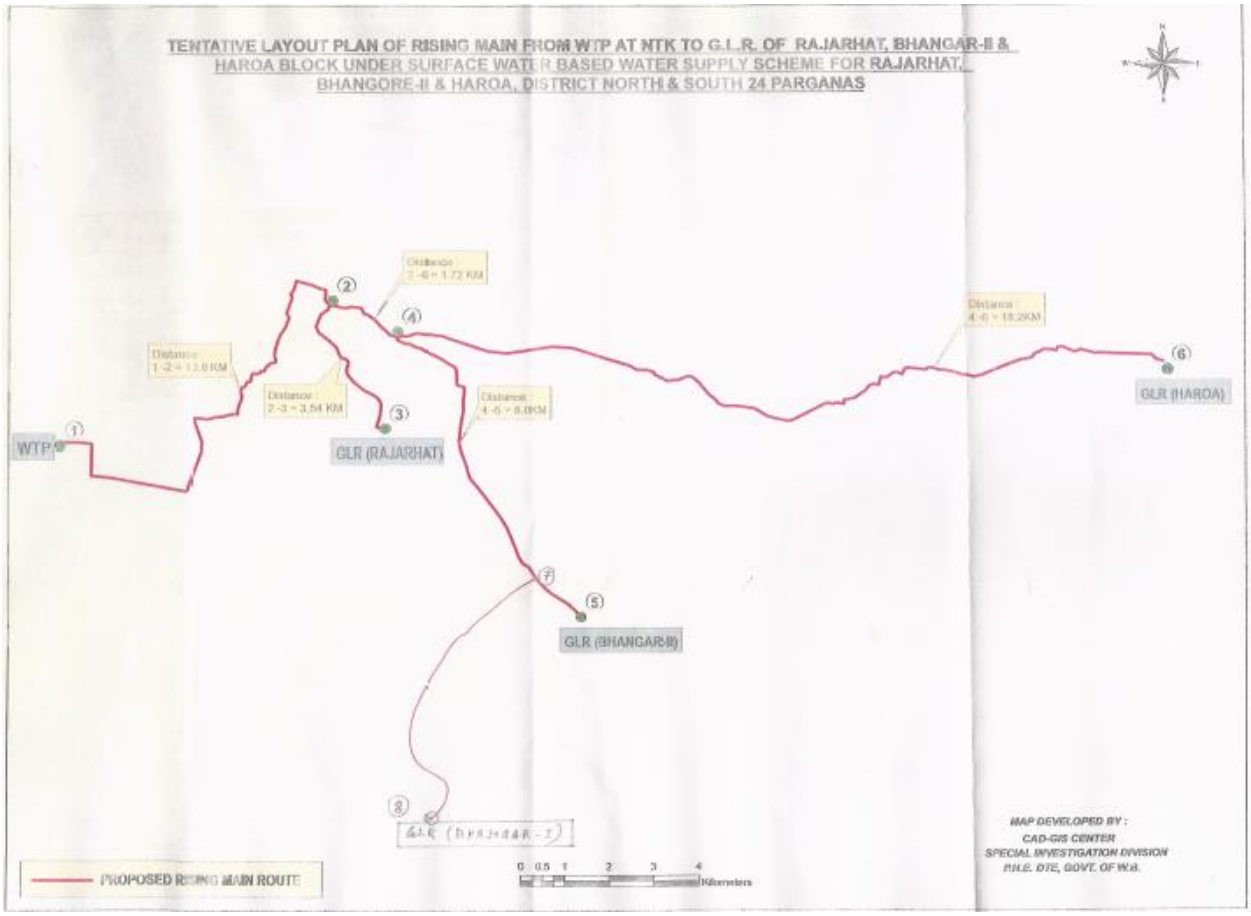



**Figure 1: proposed Layout of the Transmission Main for the Haroa-Rajarhat- Bhangar II**

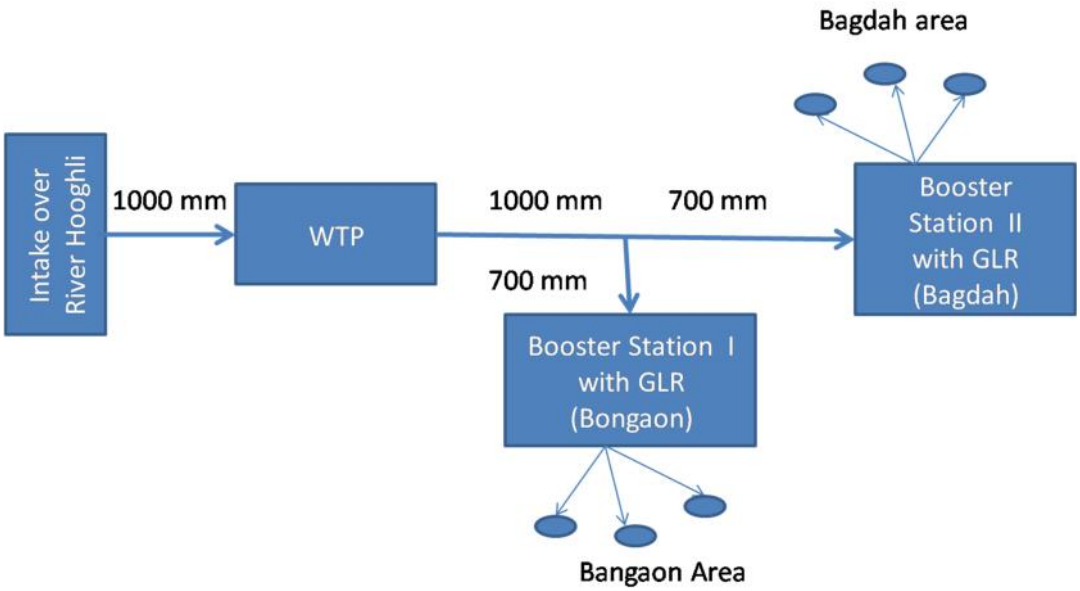
## Piped Water Supply Scheme for Bongaon and Bagda Blocks

The proposed scheme comprises of 38 zones covering 1.235 million people in the design year (2046). Total 39 no OHTs (21 in Bagda and 18 in Bangaon) through a network of clear water transmission main of length 289 km. Present population is 0.623 million, indicating a steep growth rate during the next 30 years period. The scheme has been designed with a demand of 70 lpcd with an additional demand of 10% to cater to the institutional demand and 12% overall system loss

Mechanical dewatering of sludge is considered.

The area is presently served by

- 35 nos. of groundwater based piped water supply scheme, covering the two blocks
- 1,177 Nos. of Hand pump fitted small dia. public Tubewell
- A considerable number of privately owned hand pump fitted small diameter TW




.

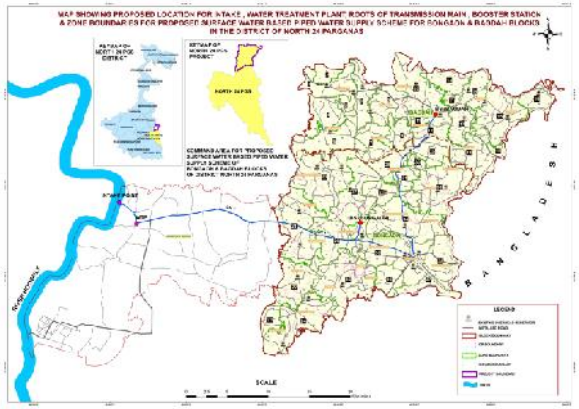
Land acquisition / purchase requirement of private land included in the report. It is noted that for construction of WTP, 2 nos. Booster pumping stations and 20 nos. OHRs (out of 31 nos.) private land acquisition is necessary

| | | | |
|---|---|---|---|
| 1 | Name of the Project | Surface water based Piped Water Supply Scheme for the Arsenic Affected Areas of Bagda and Bongaon Blocks | |
| 2 | Name of the District | North 24 Parganas | |
| 3 | Location | The command area comprises of 257 nos. of Mouzas details of which has already been provided in the project report . | |
| 4 | Name of the Block | Bagda | Bongaon |
| 5 | Number of Mouzas | 108 | 149 |
| 6 | Habitation | 545 | 435 |
| 7 | Census Population (2011) | 242974 | 380903 |
| 8 | Design population (2046) | 413312 | 821912 |
| 9 | Command Area | 23347 Ha | 33670.50 Ha |
| 10 | No. of Zones | 19 | 19 |
| 11 | Raw water Demand | 35.99 MLD | 71.59 MLD |
| 12 | Clear Water Demand | 35.27 MLD | 70.16 MLD |
| 13 | Net Water Demand | 34.22 MLD | 68.05 MLD |
| 14 | GLR | 3150 M3 | 2 Nos 3100 M3 |
| 15 | Capacity of WTP | 105.43 MLD | |
| 16 | Source of Water | Surface water of River Hooghly | |
| 17 | Quality aspect of Surface Source | Required proper and usual treatment before use. | |
| 18 | Quantity aspect of source | Adequate to meet future demand | |
| 19 | Location of Intake. | Naihati (tentative) | |
| 20 | Location of WTP. | Naihati (tentative) | |
| 21 | Daily supply Hours | Initially 8 (Eight) Hours. (Final Time and duration of supply to be decided by the Department.) | |
| 22 | Period of Treatment | 20 ( Twenty ) Hours. | |

| | | |
|---|---|---|
| 23 | Proposed Treatment | Conventional Treatment (Coagulation and Flocculation, Clarification, Rapid Gravity Filtration and Disinfection) |
| 24 | Raw Water Pumping Main | 1200 mm Dia. DICML(K9) |
| 25 | Primary Clear Water Rising Main | 1200 mm dia., 700 mm dia. DICML(K9) |
| 26 | Secondary Clear Water Rising Main | 750 mm to 100 mm Dia. DICML(K9) |
| 27 | Distribution System | Upto 200 mm – Suitable class nonmetal pipe and above 200 DICML(K7) pipe |
| 28 | Total Capital Cost of the scheme | Rs. 900.71 Cr. |
| 29 | Operation & Maintenance cost for two year | Rs. 76.81 Cr |
| 30 | Per Capita cost | Rs 6,670.09 |
| 31 | Cost of Production of Water per KL | Rs.9.98 |
| 32 | Recovery of Annual O&M cost | Recovery to be made through monthly water consumption charges and one time deposit charges of house connection to be decided by Competent Authority |
| 33 | Executing Agency | Public Health Engineering Department, Govt. of West Bengal |
| 34 | Strategy of O&M | PHED. to carry out O&M activities at Intake, Raw Water Rising Main, Water Treatment Plant, Intermediate Boosting Station , Clear water rising main terminating at OHR. Panchayat/Local Bodies will be involved for O&M Activities for Distribution Zones in their respective jurisdiction |
| 35 | Sustainability of Project | Provision of house connection has been kept in the scheme. Cost towards annual operation and maintenance of the scheme would be mostly met through collection of suitable tariff and one time deposit of connection charges against house connection |

Source: *Advnced DPR of Piped Water Supply Scheme for Bongaon and Bagda Blocks*


BAGDAH
BOOSTING STATION (BONGAON)
BONGAON CT
BONGAON
SCALE
0 1 2 4 6 8
Kilometers



# ANNEX 14

# Details of Arsenic Removal Plant (ARP)

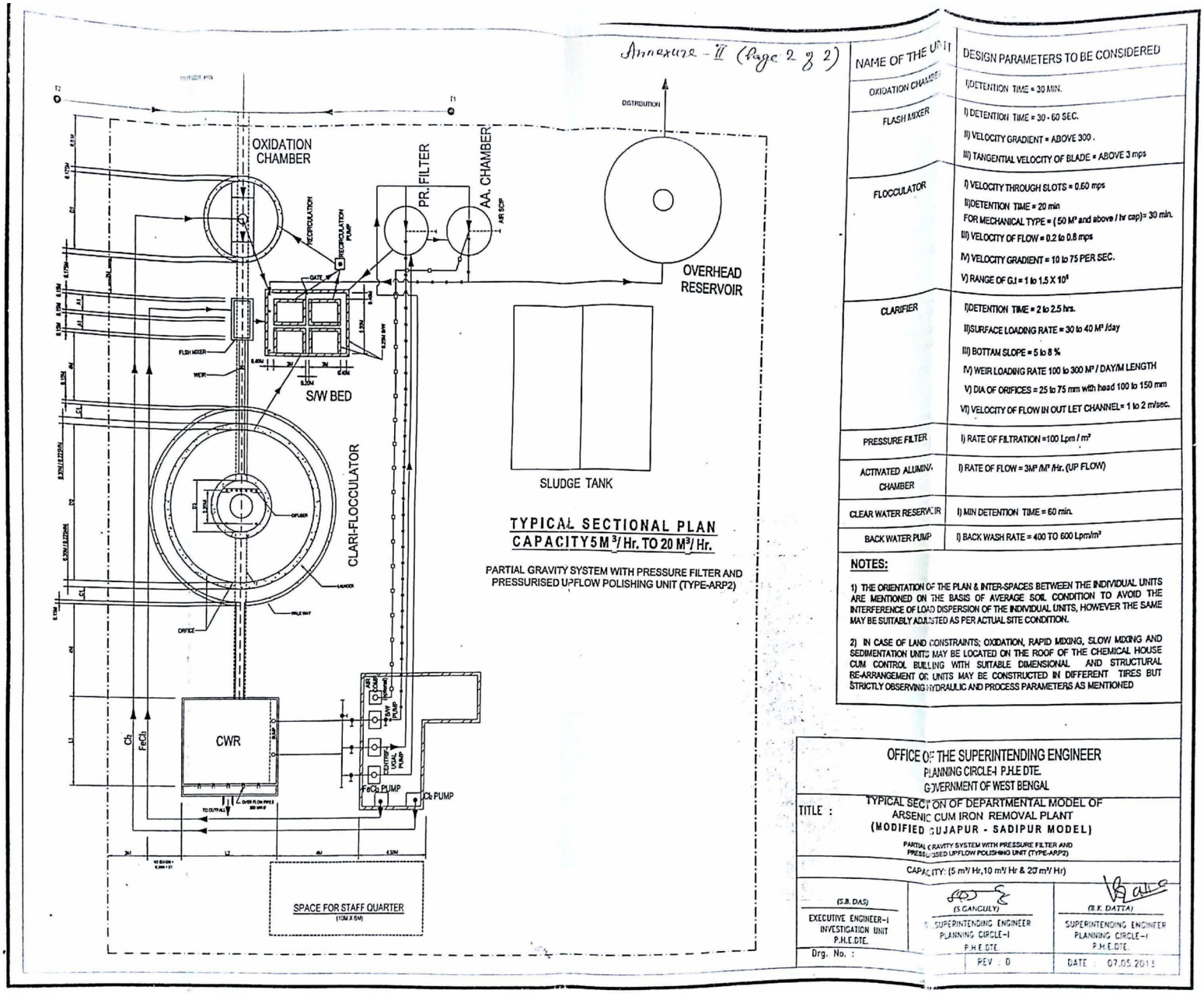
**Table 1: Block wise Distribution of Arsenic removal Plant (ARP)**

| Block | Division | Piped Water Supply Scheme | AIRP |
|---|---|---|---|
| Baduria | Barasat Arsenic Division | Jasaikathi PWSS | 1 |
| Baduria | Barasat Division | Aturia | 1 |
| Baduria | Barasat Division | Bajitpur | 2 |
| Baduria | Barasat Division | Magurali | 1 |
| Baduria | Barasat Division | Rajapur | 1 |
| Baduria | Barasat Division | Simla Durgapur | 1 |
| **Total** | | | **7** |
| Bagdah | Barasat Division | Dhalani | 1 |
| Bagdah | Barasat Division | Gadpukuria | 1 |
| Bagdah | Barasat Division | Hariharpur | 1 |
| Bagdah | Barasat Division | Kola | 1 |
| Bagdah | North 24 Pgs w/s Divn-I | Auldanga | 1 |
| **Total** | | | **5** |
| Basirhat-I | Barasat Division | Gachharati | 1 |
| Basirhat-I | Barasat Division | Goknasree Gobindapur | 1 |
| Basirhat-I | Barasat Division | Nalkora | 1 |
| Basirhat-I | Barasat Division | Sangrampur | 1 |
| Basirhat-II | Barasat Division | Sadiknagar | 1 |
| **Total** | | | **5** |
| Bongaon | North 24 Pgs w/s Divn-I | Dighari | 1 |
| Bongaon | North 24 Pgs w/s Divn-I | Ichhlampur | 2 |
| Bongaon | North 24 Pgs w/s Divn-I | Kharmarkalla | 1 |
| Bongaon | North 24 Pgs w/s Divn-I | Mollahati | 1 |
| Bongaon | North 24 Pgs w/s Divn-I | Palla | 1 |
| Bongaon | North 24 Pgs w/s Divn-I | Paschim Panchberia | 2 |
| Bongaon | North 24 Pgs w/s Divn-I | Santoshpur | 2 |
| **Total** | | | **10** |

| Block | Division | Piped Water Supply Scheme | AIRP |
|---|---|---|---|
| Hasnabad | Barasat Division | Asharianarayanpur | 1 |
| **Total** | | | |
| Swarupnagar | Barasat Division | Bithari | 2 |
| Swarupnagar | Barasat Division | Parui | 1 |
| Swarupnagar | Barasat Division | Sonpur | 1 |
| Swarupnagar | Barasat Division | Taranipur | 1 |
| **Total** | | | **5** |
| **Total for All blocks** | | | **33** |

**Sujapur-Sadpur Model of ARP**

Technology based on oxidation followed by coagulation floculation, clarification filtration and finally adsorption through activated alumina chamber, solid/liquid separation of sludge as mortar block. Arsenic concentration can be brought down to 10 ppb from 200 ppb before entry to activated alumina clolumn and after that it remains bdl.




| NAME OF THE UNIT | DESIGN PARAMETERS TO BE CONSIDERED |
|---|---|
| OXIDATION CHAMBER | I)DETENTION TIME = 30 MIN. |
| FLASH MIXER | I) DETENTION TIME = 30 - 60 SEC.<br>II) VELOCITY GRADIENT = ABOVE 300 .<br>III) TANGENTIAL VELOCITY OF BLADE = ABOVE 3 mps |
| FLOCCULATOR | I) VELOCITY THROUGH SLOTS = 0.60 mps<br>II)DETENTION TIME = 20 min<br>FOR MECHANICAL TYPE = ( 50 M³ and above / hr cap)= 30 min.<br>III) VELOCITY OF FLOW = 0.2 to 0.8 mps<br>IV) VELOCITY GRADIENT = 10 to 75 PER SEC.<br>V) RANGE OF G.t = 1 to 1.5 X 10⁵ |
| CLARIFIER | I)DETENTION TIME = 2 to 2.5 hrs.<br>II)SURFACE LOADING RATE = 30 to 40 M³ /day<br>III) BOTTAM SLOPE = 5 to 8 %<br>IV) WEIR LOADING RATE 100 to 300 M³ / DAY/M LENGTH<br>V) DIA OF ORIFICES = 25 to 75 mm with head 100 to 150 mm<br>VI) VELOCITY OF FLOW IN OUT LET CHANNEL= 1 to 2 m/sec. |
| PRESSURE FILTER | I) RATE OF FILTRATION =100 Lpm / m² |
| ACTIVATED ALUMINA CHAMBER | I) RATE OF FLOW = 3M³ /M² /Hr. (UP FLOW) |
| CLEAR WATER RESERVOIR | I) MIN DETENTION TIME = 60 min. |
| BACK WATER PUMP | I) BACK WASH RATE = 400 TO 600 Lpm/m² |

**NOTES:**

1) THE ORIENTATION OF THE PLAN & INTER-SPACES BETWEEN THE INDIVIDUAL UNITS ARE MENTIONED ON THE BASIS OF AVERAGE SOIL CONDITION TO AVOID THE INTERFERENCE OF LOAD DISPERSION OF THE INDIVIDUAL UNITS, HOWEVER THE SAME MAY BE SUITABLY ADJUSTED AS PER ACTUAL SITE CONDITION.

2) IN CASE OF LAND CONSTRAINTS; OXIDATION, RAPID MIXING, SLOW MIXING AND SEDIMENTATION UNITS MAY BE LOCATED ON THE ROOF OF THE CHEMICAL HOUSE CUM CONTROL BUILLING WITH SUITABLE DIMENSIONAL AND STRUCTURAL RE-ARRANGEMENT OF UNITS MAY BE CONSTRUCTED IN DIFFERENT TIRES BUT STRICTLY OBSERVING HYDRAULIC AND PROCESS PARAMETERS AS MENTIONED

OFFICE OF THE SUPERINTENDING ENGINEER
PLANNING CIRCLE-I P.H.E DTE.
GOVERNMENT OF WEST BENGAL

TITLE : TYPICAL SECTION OF DEPARTMENTAL MODEL OF ARSENIC CUM IRON REMOVAL PLANT (MODIFIED SUJAPUR - SADIPUR MODEL)

PARTIAL GRAVITY SYSTEM WITH PRESSURE FILTER AND PRESSURISED UPFLOW POLISHING UNIT (TYPE-ARP2)

CAPACITY: (5 m³/ Hr,10 m³/ Hr & 20 m³/ Hr)

| (S.B. DAS) | (S.GANGULY) | (B.K. DATTA) |
|---|---|---|
| EXECUTIVE ENGINEER-I INVESTIGATION UNIT P.H.E.DTE. | SUPERINTENDING ENGINEER PLANNING CIRCLE-I P.H.E.DTE. | SUPERINTENDING ENGINEER PLANNING CIRCLE-I P.H.E.DTE. |

Drg. No. : REV : 0 DATE : 07.05.2013

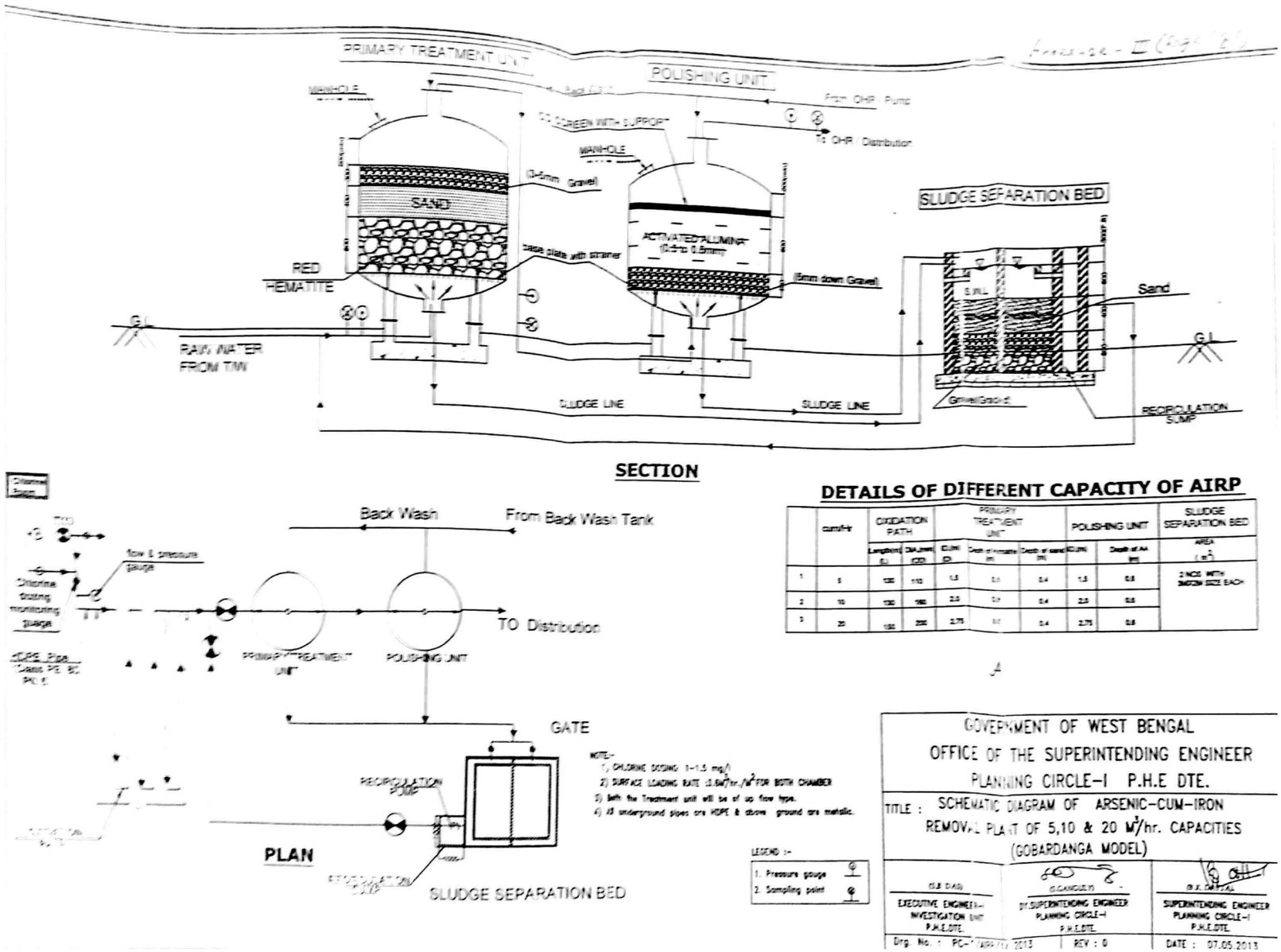
**Figure 1: Typical Detail of Arsenic Removal Plant based on Sujapur Sadpur Model**

**Gobordanaga model of ARP**

Oxidation by chlorination in a designed path- adsorption through naturally available red mematite green sand- polishing throuh Activated Alumina. Entire system is made close pressurised Container.

Both Arsenic and Iron removal was BDL flow 5- 20 m3/h

**Figure 2: Typical Details of Gobordanga Model ARP**




**DETAILS OF DIFFERENT CAPACITY OF AIRP**

| | cum/hr | OXIDATION PATH | | | PRIMARY TREATMENT UNIT | | | POLISHING UNIT | | SLUDGE SEPARATION BED |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length (L) | Dia (mm) (OD) | Cu.m (D) | Depth of Aeration (m) | Depth of sand (m) | Cu.m | Depth of AA (m) | | AREA ($m^2$) |
| 1 | 5 | 1200 | 110 | 1.5 | 0.1 | 0.4 | 1.5 | 0.8 | | 2 NOS WITH DIAMETER SIZE EACH |
| 2 | 10 | 1200 | 160 | 2.5 | 0.1 | 0.4 | 2.5 | 0.8 | | |
| 3 | 20 | 1200 | 200 | 2.75 | 0.1 | 0.4 | 2.75 | 0.8 | | |

GOVERNMENT OF WEST BENGAL
OFFICE OF THE SUPERINTENDING ENGINEER
PLANNING CIRCLE-I P.H.E DTE.

TITLE : SCHEMATIC DIAGRAM OF ARSENIC-CUM-IRON REMOVAL PLANT OF 5,10 & 20 $m^3$/hr. CAPACITIES (GOBARDANGA MODEL)

| (S.B DAS) | (S.GANGULY) | (B.K.DATTA) |
|---|---|---|
| EXECUTIVE ENGINEER-I INVESTIGATION UNIT P.H.E.DTE. | DY.SUPERINTENDING ENGINEER PLANNING CIRCLE-I P.H.E.DTE. | SUPERINTENDING ENGINEER PLANNING CIRCLE-I P.H.E.DTE. |

Drg. No. : PC-[illegible]/2013 | REV : 0 | DATE : 07.05.2013

# ANNEX 15

# Relevant Administrative Terms for Rural and Urban Governance

**District and Sub division**

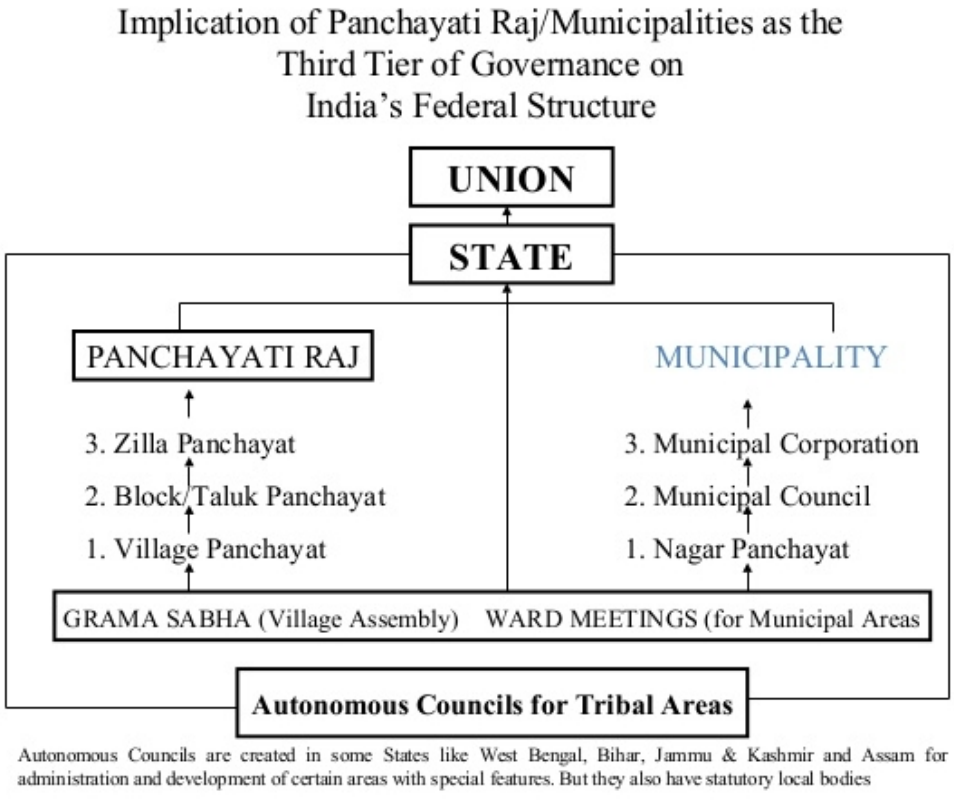
States and the union territories in India are divided into **Districts**. Each district is further divided in to sub-districts, which are known differently in different parts in the country (e.g., tahsil, taluka, community development (CD) block, Police station, Mandal, revenue circle, etc.).

In some of the states of India, including Assam, Bihar, Sikkim, Manipur and West Bengal, as well as in the union territory of Lakshadweep, the administrative entities below the districts are named **"Sub-Divisions"**

**Block:** The jurisdiction of a block is generally limited to rural parts of a district. Thereis usually more than one block within a district.

**Village:** A village is a clustered human settlement or community, usually larger than a habitation with the population ranging from a few hundred to a few thousand (sometimes tens of thousands). Historically, in India, villages were a usual form of community for societies that depend on agriculture for subsistence.

**Habitation:** It is a term used to define a group of families living in proximity to each other, within a village. It could have either heterogeneous or homogenous demographic pattern. There can be more than one habitation in a village but not vice versa.




**Census:** . Population census is the total process of collecting, compiling, analyzing or otherwise disseminating demographic, economic and social data pertaining, at a specific time, to all

persons in a country or a well defined part of a country. As such, the census provides a snapshot of the country's population and housing at a given point of time.

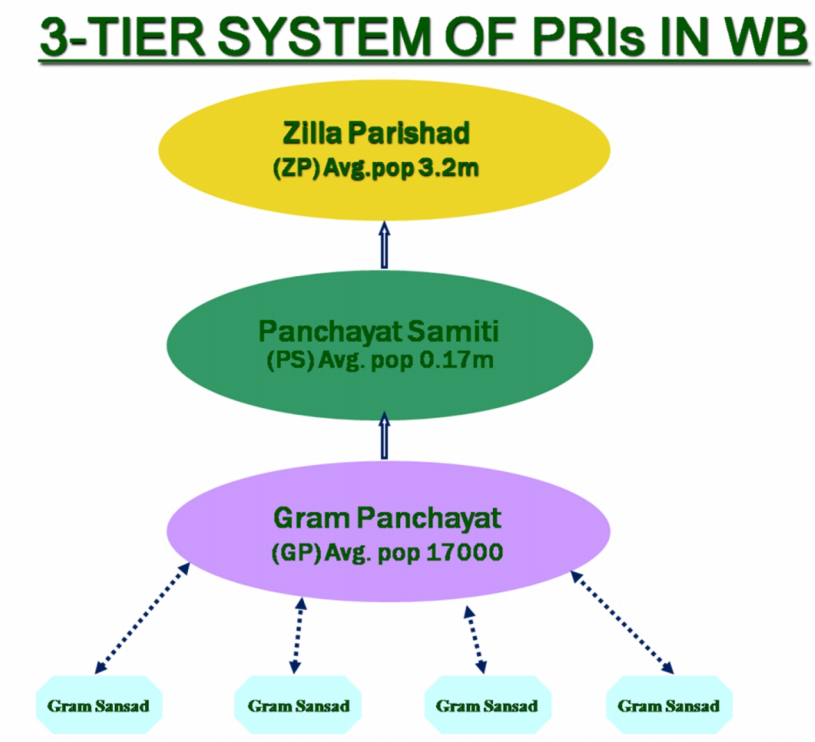
**Classification of Area:** For Census purposes, total geographical area is broadly classified into Rural and Urban.
**Urban**: Constituents of urban area are Statutory Towns, Census Towns and Outgrowths.
**Rural:** All area other than urban are rural. The basic unit for rural areas is the revenue village.

In India, a **census town** is one which is not statutorily notified and administered as a **town**, but nevertheless whose population has attained urban characteristics. They are characterized by the following: Population exceeds 5,000. At least 75% of main working population is employed outside the agricultural sector

**Statutory Town (ST**): All places with a municipality, corporation, cantonment board or notified town area committee etc.
**Census Town (CT):** Places that satisfy the following criteria are termed as Census Towns (CTs). (a) A minimum population of 5000 (b) At least 75% of the male main working population engaged in non-agricultural pursuits (c) A density of population of at least 400 per sq.km
**Out Growth (OG):** Out Growth should be a viable unit such as a village or part of a village contiguous to a statutory town and possess the urban features in terms of infrastructure and amenities such as pucca roads, electricity, taps, drainage system, education institutions, post offices, medical facilities, banks,etc. Examples of OGs are Railway colonies, University campuses, Port areas, that may come up near a city or statutory towns outside its statutory limits but within the revenue limit of a village or villages contiguous to the town or city.

**Urban Agglomeration (UA):** It is a continuous urban spread constituting a town and its adjoining urban outgrowths (OGs) or two or more physically contiguous towns together and any adjoining urban out- growths of such towns.

**The three tier Panchayet Raj system in the state of West Bengal can be depicted by the diagram**




**Gram Sabha** has been envisaged as the foundation of the Panchayati Raj system. A Gram Sabha consists of members that include every adult of the village or Gram. It is

generally formed in villages with population at least exceeding 1500 people. “Gram Sabha” means a body consisting of persons registered in the electoral rolls pertaining to a Gram

**“Gram Sansad”** means a body consisting of persons registered at any time in the electoral rolls pertaining to a constituency of a Gram Panchayat delimited for the purpose of last preceding general election to the Gram Panchayat;

**Gram Panchayat** is the organization of elected panchas by the members of Gram Sabha of the village. It is a self-government organization. The number of members in a Gram Panchayat depends upon the population of the village.
Generally, the number of elected panchas in a Gram Panchayat varies between seven and seventeen members. However, it may vary from state to state. There is provision for reservation of Scheduled Castes, Scheduled Tribes and Women candidates. The head of the Panchayat is known as “Savapati”.

**The Panchayat Samiti** is the tehsil or taluka or block level of rural local-self government system in India. They form the middle level of the Panchayati Raj Institutions in India. It acts as a link between Village Panchayats (Gram Panchayats) and Zila Parishad (District council). According to the West Bengal Panchayat Act of 1973 the Panchayat Samiti is the second layer of the three-tier Panchayat system. each district is divided into a number of blocks and each block will consist of a number of adjoining villages. For each block again there is a Panchayat Samiti.

The **Zilla Parishad** is basically a Local Body is formed through election in Panchayati Raj System to develop and to provide various facilities to the public of rural areas in the concerned district. The various Rural Development Works carried at the Villages, Gram Panchayats, Block and District levels are planned, implemented, monitored and maintained by the Zilla Parishad. These works are monitored on the State Level by the rural Development Department of the Government West Bengal and on the National level by the Government of India. The Zilla Parishad at the district level is responsible for the development works carried through its own funding. Other than this various development and welfare schemes of the State and Central Government are through the Zilla Parishad.
The Zilla Parishad of North 24 Parganas came into existence on 26th June, 1986 due to bifurcation of erstwhile 24 Parganas district with respect to North South divide on geographical pattern

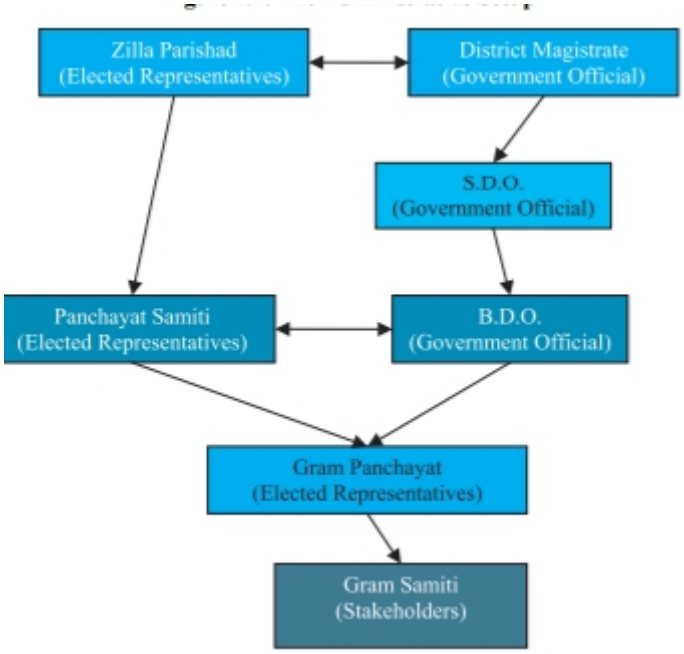
Article 243Q of Indian Constitution:

- A Nagar Panchayat (notified area council, city council) for a transitional area, that is to say, an area in transition from a rural area to an urban area
- A Municipal Council for a smaller urban area; and

- A Municipal Corporation for a larger urban area, in accordance with the provisions of this Part: Provided that a Municipality under this clause may not be constituted in such urban area or part thereof as the Governor may, having regard to the size of tile area and the municipal services being provided or proposed to be provided by an industrial establishment in that area and such other factors as he may deem fit, by public notification, specify to be an industrial township

In this article, "a transitional area", "a smaller urban area" or "a larger urban area" means such area as the Governor may, having regard to the population of the area, the density of the population therein, the revenue generated for local administration, the percentage of employment in non-agricultural activities, the economic importance or such other factors as he may deem fit, specify by public notification for the purposes of this Part.

For constitution of a **Municipality** an area shall have to fulfill the mandatory conditions of a minimum total population of 30,000 (as per last preceding census), a population density of 750 per sq. km., at least 50% adult population of the area shall have to be engaged in non-agricultural pursuits and probable municipal income from the area should be adequate to run the functions of the proposed municipality. If any area is already urbanized but does not comply with any of the above mentioned conditions this area may be declared as a **Notified Area**.
Whenever it appears to the Governor that any town, together with, or exclusive of, any railway station, village, land or building in the vicinity of any such town — (i) contains a population of not less than 30,000 inhabitants, (ii) has a density of population of not less than seven hundred any fifty inhabitants per square kilometre of area, and (iii) has an occupational pattern in which more than one-half of the adult population are chiefly engaged in pursuits other than agriculture, and if the Governor is satisfied hat if such town is constituted a municipal area, the municipal income from taxation and other sources is likely to be adequate for the discharge of municipal function under this Act, the Govemor may, by notification, declare his intention to constitute such town a **municipal area** under this Act (http://nbmonline.org/west_bengal_municipa_act.pdf)



**As per West Bengal Municipal Corporation Act, 2006**

Declaration of intention to constitute **Corporation area:**
Whenever it appears to the Governor that any **one** or more than one municipal area together with, or exclusive of, any railway station, village within the jurisdiction of any Gram Panchayat constituted under the West Bengal Panchayat Act, 1973 (West Ben. Act XLI of 1973), land or building, in the vicinity of such area -
(i) contains a population of not less than 5 lakh inhabitants,
(ii) has a density of population of not less than three thousand inhabitants per square kilometre of area, and
(iii) has an occupational pattern in which more than three-fourth of the adult population are chiefly engaged in pursuits other than agriculture, and if the Governor is satisfied that if such area is constituted a Corporation area, the income of the Corporation from taxation and other sources is likely to be adequate for the discharge of the functions of the Corporation under this Act, the Governor may, by notification, declare his intention to constitute such area a Corporation area under this Act:

**Cantonment Board** is one of civic administration body in India under control of Ministry of Defence. The Board comprise elected members besides ex-officio and nominated members as per the Cantonments Act, 2006.[1] The term of office of a member of a Board shall be five years.[2] The Cantonment Board consists of eight elected Members, three nominated Military Members, three Ex-officio Members (Station Commander, Garrison Engineer and senior executive Medical Officer), one representative of the District Magistrate. Cantonments is divided into four categories, namely,

1. Category I - population exceeds fifty thousand
2. Category II - population exceeds ten thousand, but does not exceed fifty thousand
3. Category III - population exceeds two thousand five hundred, but does not exceed ten thousand
4. Category IV - population does not exceed two thousand five hundred.

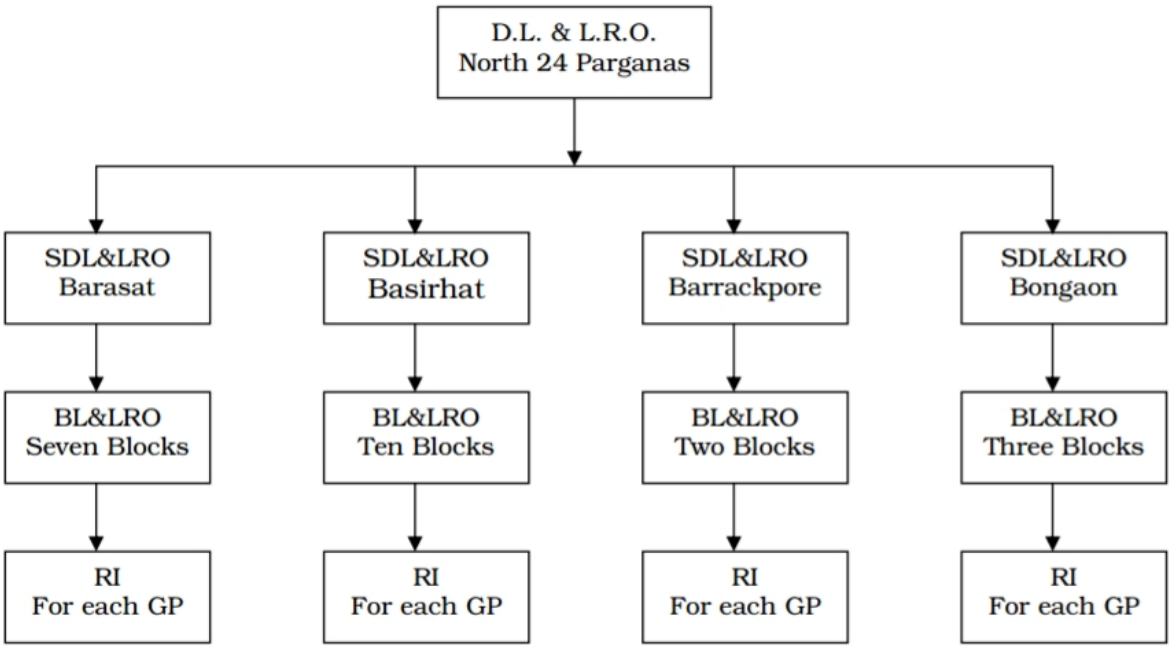
The State Government may, by notification, declare for the purposes of this Act any mauza or part of a mauza or group of contiguous mauzas or parts thereof to be a **Gram** (Section 3, West Bengal Panchayati Raj Act, 1973.)

# ANNEX 16

# Details of Land Related

# Administrative Structure

The Office of the Additional District Magistrate and District Land & Land Reforms Officer has been set up by integrating the former District Settlement Office and the Land Management Wing of the Collectorate and is placed under the overall charge of a District Land & Land Reforms Officer, having the powers of a Collector. One or more Deputy District Land & Land Reforms Officer and other technical and non-technical staff assist the District Land & Land Reforms Officer. In this district there are four tiers of Integrated Setup of L&LR Administration namely :




Functions For D.L.&L.R.O.

At District The District Land & Land Reforms Officer has exclusive Control over the Land & Land Reforms administration within his district and he functions under the general supervision and control of the Collector.

For S.D.L.&L.R.O. at Sub-Divisions:

At the Sub Division level there is a Sub Divisional Land & Land Reforms Officer, performing duties and responsibilities of former Settlement Charge Officer and Sub Divisional Land Reforms Officer. The Sub Divisional Land & Land Reforms Officer has a general power of supervision and coordination of works regarding Land & Land Reforms Administration within his Sub Division.

In West Bengal Land Reforms Act, 1955, “Collector”, in case of a district, is the person appointed by the State Govt. who is in charge of the revenue administration.

“Mouza” means an area defined, surveyed and recorded as such in the revenue record of a district and referred to in clause (g) of article 243 of the Constitution of India as the lowest unit of area for the purpose of public notification for specifying a village. a **mouza** or **mauza** is a type of administrative

district, corresponding to a specific land area within which there may be one or more settlements. Before the 20th century, the term referred to a revenue collection unit in a *pargana* or revenue district.

# ANNEX 17

# Summary of Vision 2020

**(as obtained from the document of WBPHED)**

**To Provide Safe, Sustainable and Adequate Water Supply to All Humans and Livestock in West Bengal by 2020**

**Objectives**

- To ensure permanent drinking water security @70 lpcd (litres per capita per day) in rural West Bengal.
- To ensure drinking water security through emphasis on piped water supply schemes with an objective to complete shift from hand pump tubewells to piped water supply schemes in a phased manner, provision for house to house connection, conjunctive use of groundwater, surface-water and rain water harvesting.
- Delivery of services by the system for its entire design period of quality of water in conformity with the prescribed standards at both the supply and consumption points.
- Issue of potability, reliability, sustainability, convenience, equity and consumers preference to be the guiding principles while planning for a community based water supply system
- To enable communities to monitor and maintain surveillance on their drinking water sources;
- To ensure that all schools and anganwadis have access to safe drinking water;
- To provide enabling environment for Panchayat Raj Institutions and local communities to manage their own drinking water sources and systems;
- To provide access to information through online reporting mechanism with information placed in public domain to bring in **transparency, accountability and informed decision making;**

**Paradigm Shift**

- It is observed that water supply schemes designed to provide 40 lpcd for the entire population in a habitation are often not providing adequate drinking water to people living at the tail end of the schemes or throughout the year.
- As such there is a need to move ahead from the conventional norms of litres per capita per day (lpcd) norms to ensure **drinking water security for all** in the community.
- While initiating this move from lpcd to drinking water security at the State, District and Village levels, it is important to ensure that the basic minimum requirement at the household level for drinking and cooking needs and also for other household needs and cattle are met.
- Water supply for drinking and cooking should maintain quality as per the prescribed BIS standards and for other household and animal needs, the water should be of acceptable standard.
- To prevent contamination of drinking water in the conveyance system, it is advisable to adopt 24 x 7 supply where ever possible. The cost of water supply provision beyond the basic minimum need must be borne by the consumers.
- To ensure this, it is important to maintain potability and reliability of drinking water quality standards both at the production (water treatment plant) as well as at the consumption points (household level).
- Focus on personal hygiene, and proper storage at the house hold level i.e. at the family level will ensure reduction of disease burden leading to improved quality of life and well being of the community.

- For ensuring quality of water. Bureau of Indian Standard (BIS) IS: 10500 was formulated in 1990. World Health Organization has also issued modified Guidelines for Drinking Water Quality (2004) and Guidelines for safe use of wastewaterand grey water (2006). Both the guidelines adopted health based target setting approach.
- Health based target is based on the total exposure of an individual to contamination and moves from reliance on end product testing of water quality to risk assessment and risk management of water supplies commonly known as 'water safety plan'.
- Water safety plan links the identification of a water quality problem with a water safety solution. It includes both water quality testing and also sanitary inspection to determine appropriate control measures. It is a quality assurance tool that ensures protection of the water quality from the catchment to the consumer and from the tap to the toilet.
- Health based target needs to be established for using groundwater, surface water, rainwater and reused/recycled water. For each, the use rather than the source should determine the quality of the water supplied.
- This therefore emphasizes the need to establish **quality assurance programmes for water supplies to reduce the potential risk of contamination of** water supply. This has been indicated under 'Water Quality Monitoring & Surveillance Programme.
- Installation of a water supply system in a habitation does not confer on the habitation the status of a fully covered habitation **unless every house hold in the habitation has been fully covered with potable water in sufficient quantity**. To enable the community to plan, implement and manage their own water supply systems, the State should transfer the program to the PRIs particularly to the Gram Panchayats for management within the village.

**Work Plan (Key Strategies)**

**(A) Resource Creation:**

**(1) Submerged and raised weirs, check dams and contour bunds**

This is the most suitable for the western districts or for the foothills of north Bengal. Rivers of interest are the Kansabati, Kumari, Silabati, Bandu, their tributaries and similar many in the Himalayan foothills. There is a need to build at least 100 such structures in the western districts. A river can be stopped by a wall (masonry or steel) upto say about 10 ft. height to create a pool of water within the river itself. If such walls are further raised it will inundate some surrounding areas also to create a bigger lake. A series of such structures can be built on a river. However, hydraulic failure of the structure because of unknown porosity around the structure (causing leakage of water) is a point of concern. Proper maintenance through regular desilting of lakes, prevention of vector borne diseases like malaria and other measures have to be an integral part of any work causing impoundment of water.

**(2) Flood water diversion and storage:**

Monsoon excess flow of water is to be diverted away from a river – while in spate - by gravity, for collection in natural – but mostly constructed- depressions near the river. NREGA convergence is essential and participation of P&RDD in the matter of land acquisition is vital for success in all types of source creation. Structures can also be built in suitable terrains to act both as a check dam in the summers, a contour bund in the monsoons and also as a diversion structure active in the peak monsoons.

**(3) Rejuvenation of ponds and development of watershed**

There are many ponds in the arid regions which run dry almost throughout the year. These need to be developed by watershed management. This is basically an arrangement to increase the area of catchment, which may be to construct a ring 'aal'' at a distance from the pond. There needs to be some open unencumbered area around the pond. The pond may also be lined by brick or mud to reduce seepage. At least 5000 ponds may qualify for such action in the water - scarce districts.

**(4) Using sub surface flow of a river**

In most rivers where the bed is composed of sand of some reasonable thickness, there will be some water moving within the sand bed, even if water is not showing at the top, as is the case of most rivers except those in the southern part of south Bengal. It is an established practice with the PHE directorate to abstract this water by various structures. River bed vertical tubewells are the easiest to install. They pierce the sand and draw water only from within the saturated bed. But these tubewells are prone to damage due to impact from floating debris like tree trunks in the floods. Horizontal strainers ("infiltration galleries") under the bed are more durable and draw more volume of water per unit length of strainer. They should be preferred over vertical tubewells in most cases in spite of higher initial cost.

The collector well once was a structure of choice for all the large schemes. The disadvantages are high cost per unit volume of water, expertise required in design and construction and time taken for implementation. Above infiltration galleries will always be a better option in such cases.

**(5) Using Groundwater**

Though it should be the long- term objective of a state to move away from sole use of ground water and to prefer conjunctive use with surface water, there will be occasions when use of groundwater will become unavoidable due to techno-economic considerations. But conventional tubewells, big dia. or small, are not truly sustainable structures. The time - tested shallow aquifer ring wells common in villages, where lifting is made by rope and bucket, must be additionally explored in suitable areas where groundwater quality is right. Conventional pumps or windmills may be deployed for lifting.

**(6) Developing cheaper solutions for treatment of contaminants**

Groundwater contamination due to arsenic, fluorides, iron and salinity is common in West Bengal. The removal techniques are expensive to operate. It is necessary to study availability of cheaper and sustainable technologies. There have been thorough studies on arsenic removal, and fluoride removal techniques are also progressing to finalization. Standard techniques are already available for iron removal. Salinity is a more difficult proposition, however, to handle. The main options may be reverse osmosis for small to large schemes and various strains of thermal distillation for very large schemes. Sea water has to be sourced in the near future for big schemes in the coastal areas. Innovative techniques and contracting models will have to be roped in.

**(7) Rooftop rainwater harvesting**

It is a popular option in both the excess rainfall areas and the scanty rainfall areas outside of West Bengal. In this state it has been tried in good numbers only in the hills of Darjeeling. The main reason it has not been tried in large scale in the arid districts is the availability of some kind of a source, however rudimentary or quality- affected they may be; and the emphasis of the

Govt. departments on creating conventional sources only. Such structures can be used both for human consumption and recharge of the groundwater. But they are also vulnerable to quality as long term storages are involved. Per capita cost is also higher than conventional modes. Sufficient care must also be taken in not contaminating an aquifer when recharging is done using rain water.

**(8) State Water Grid**

The last but not the least, the most comprehensive and sustainable system is going to be the State Water Grid and should find a place in the State Water Policy, as in some states. Though it is something that is still some years away, the time for advance planning is already upon the departments. This grid will serve the areas which are predominantly tubewell dependent or where surface sources cannot be conveniently created. Agricultural demand will increase with time and a considerable part of it will continue to be satisfied by groundwater because of absence or creation of alternative sources. Rainwater alone has not been able to sustain paddy cultivation, particularly Boro. Alternative cropping, changing agricultural calendar, and other palliative measures will hopefully be introduced gradually by the agricultural sector, but not sufficiently to prevent escalation of groundwater use. It is therefore necessary to isolate domestic demand from groundwater sources.

This grid may be a large dia. pipe network drawing water from various large sources like the Farakka Barrage, Teesta Barrage, Mahananda Barrage, DVC and the others. Domestic and industrial demand shall have to be satisfied by this grid and for which a 75 years' time horizon may be contemplated. This is similar to inter- basin water transfer but with lower hazards. The downside is power consumption and renewable energy may be a valid parallel option. The capital cost will be high and sharing of industrial and domestic demands will make it more cost efficient.

**(B) Action plan to use renewable energy for running water supply schemes**

The P.H.E. Department has decided that solar power will be deployed for running piped water supply schemes wherever feasible as grid electricity consumes depleting natural resources and should be avoided. Amongst different renewable energy options, solar power stands out as the most available and viable alternative. The initial cost is somewhat higher than obtaining service connection from grid power departments for small schemes, but it has the advantage of being available everywhere and the cost pays out in a few years as very little operation & maintenance costs are involved.

However, this technology is based on solar chips which are mostly imported from abroad. Thus, the availability of quality power producing units in a big number is an issue. But it is expected that the production capacity of the national manufacturers will improve as Govt. of India has provided various facilities to the manufacturers.

Wind power, though it is a feasible alternative, is still at infancy in India because of the various operational problems associated with wind turbines. Ideally, wind turbines are the most suitable for the coastal regions because of the high wind velocity available. Combined with solar, the wind power should be the ideal source of power because power supply can be maintained all through the day and night which may be crucial in some applications.

**(C) Action on management of hazardous materials generated in running water supply schemes:**

Ground water in most of West Bengal is affected by contamination such as arsenic, fluoride, salinity and iron, apart from microbial contamination, which is induced by a temporary contamination. The menace of arsenic contamination is getting under control and the state is likely to become arsenic free in another couple of years. Some action for fluoride areas was taken in the past and schemes implemented in several districts. Recently, following a GoI guideline, PHED has been laying a greater emphasis on fluoride contamination by planning more and more piped water supply schemes most of which will start getting implemented in the middle of the next financial year. Salinity similarly is another issue which is difficult to get rid of in an economical manner particularly where fresh water is not available in the nature.

For removal of arsenic, fluoride and salinity, treatment of raw water before supplying to the community is a common option. Such treatment is not sustainable in terms of cost but the issue being drinking water the state has to opt for the same in many areas.

Associated with treatment comes the management of the hazardous waste which comes as a by-product of treatment and which are slightly to extremely harmful for the environment. Arsenic sludge that is generated by an arsenic removal plant, fluoride treatment process and reverse osmosis plant rejects; all discharge hazardous wastes. These wastes have to be managed in a cost effective and time proven manner. The PHE Dept. has approved one environment-friendly arsenic treatment technique which will discharge no waste to the environment for a very long time. Such, and other innovations will add incremental steps to environment preservation and combating climate change.

**(D) Action on management of wastewater treatment plant effluents:**

The river water management plans such as Ganga Action Plan, Damodar Action Plan or the Mahananda Action Plan should provide against malfunction of treatment plants which allow untreated or undertreated wastes to flow back into the river and cause pollution. Similarly, effluent from the waste water treatment plants should not be discharged into the water bodies or rivers indiscriminately and strict monitoring mechanism should be in place.

**(E) Water Quality Monitoring & Surveillance Programme (WQM&SP)**

No amount of water supply can be expected to fulfill the requirement of reducing the disease burden and increase in productivity unless quality of water is ensured. Presently, the PHE Department has about 118 water quality laboratories and the number of which is increasing with time. Out of 118, 80 are managed by the NGOs and the rest by PHE Department. For the PHE labs, the job has been outsourced to contractors who pay for the staff and receive due considerations from the directorate. The operations of the labs have been badly hit due to the continual absence of nearly half of the sample collectors, reportedly due to the unattractive remunerations fixed by the P&RDD. It is apparent that the tripartite programme of WQM&S run conjointly by the PHED, P&RDD and H&FW has not yet been a success. To introduce accountability, the nodal department PHED should be entrusted with the WQM&SP.

The surveillance of spot sources is expected to be carried out by the Panchayat& Rural Development Department, Govt. of West Bengal under the National Rural Drinking Water Programme guidelines published in April, 2009. There are monitoring units run both by the P&RDD and the PHED under UNICEF assistance. These units continually report microbial contamination in the spot sources in the villages; but the remedial actions, for which the P&RDD remains responsible, remain largely unaddressed though the PHED has placed the Sub-Asstt.

Engineer, Mechanic and the Helper of each block with the BDOs. But water quality is the mandate for the PHED, which still remains answerable and people have high expectations from this department. If surveillance is to be managed by the PHED, it would be impossible to do so under the normal organizational setup. Some regional cells should be opened for controlling the monitoring and surveillance activities. The surveillance and monitoring of water quality should also have specific indicators related to health and nutritional status of the communities along the food safety parameters related to water quality. The cost may be entirely met out of the Support Fund of the GoI.

**(F) Peoples' Participation**

The PHE Department had some years back set up a Communication & Capacity Development Unit (CCDU). After the NRDWP was launched, the State Water & Sanitation Support Organisation (SWSSO) has been set up under the State Water & Sanitation Mission (SWSM) which is an umbrella organization comprising of all the stakeholder departments.

Handing over the decision making power to the community is the central theme running through the NRDWP guidelines. To be effective, the Village Water & Sanitation Committees (VWSC) are to be formed under District Water & Sanitation Mission (DWSM). Such formations have to be facilitated and guided by the SWSSO. The department has fallen behind and the work shall have to be started on war footing. Strengthening of the SWSSO by more appropriate technical personnel is necessary.

Officials and staff have to be trained both in the matter of engineering and administration to introduce a strong work culture and delivery of benefits of water supply. This may be through the SWSSO. Participation of more officers in Master of Engineering courses, foreign seminars and trainings, research and development must be encouraged.

**(G) Disaster Management**

The PHE Department has always been the first to move to the troubled spots in the events of disasters like drought, cyclone and flood. Such spirited participation is made in spite of the perennial shortage of officials and fund for such works. But to add teeth to the action, a disaster management cell has to be opened under the PHE Department headed by a chief engineer for managing disasters where water supply is a vital curative tool.

**(H) Enactments**

Unlike other commodities (like electricity), theft of water is still not regarded as a crime. Schemes after schemes are failing to deliver because of water theft which naturally was not budgeted for. Such thefts come in the shape of illegal water connection for drawing water into the premises which can be a dwelling unit or a commercial establishment. Such water is free and the quantum high as no house connection or usage charges is paid. In the past, the PHED had attempted to cut illegal connections but were faced with law and order situations resisting such disconnections. The police claim helplessness as laws to apprehend the wrongdoers do not exist. It is necessary to frame up acts and rules to prevent water theft.

**(I) Organisation**

The directorate is running short of officers and staff for many years. This has silently taken a heavy toll on output, work quality and cost economy. A thorough reorientation of the organizational structure with filling of posts is necessary. Promotion policies should take into account proper engineering education as the backbone of policies on personnel. Meritocracy should replace mediocracy.

The PHED has to implement works of about Rs. 21,125.00 crore in the next 9 years. A complete overhaul of the organizational structure is necessary. Foreign assistance, soft term lending, alternative contracting models, etc. that may have to be engaged will be achieved if the department is recast as a Board or similar institution, with complete autonomy on personnel, fund generation models and related policies.

**(J) Miscellaneous**

Though it is stating the obvious, schemes must be implemented fast. The problems faced with land acquisition, electricity connection and timely funding delay schemes. Land may be allowed to be directly procured at market rates. The administrative stumbling blocks must be removed and task forces formed to get pending matters moving without any loss of time. Inter departmental co ordination leaves much to be desired and must be enhanced. Top level decisions in engineering and scientific matters must be left to the relevant professionals.

Providing safe and sustainable drinking water to schools all over West Bengal is another important sector where due attention is required and ensuring sustained drinking water supply in all rural schools is one of the important compliance that State Government is expected under the Right to Education Act, 2009. This would require very close monitoring of access, functioning of water source, its timely operation and maintenance and water quality of the source. There are over 90,000+ schools in rural areas that include primary, high schools, ShishuShiksha Kendra etc. PHED to consider having a dedicated cell and officer to coordinate and ensure water supply to all schools and related monitoring. This cell should be headed by senior official at least of the Executive Engineer rank.

# ANNEX 18
# History of Natural Disasters
# In
# North 24 Pgs. District

**(As provided in the Model Disaster Management Plan, 2011 )**

The District of North 24-Parganas came into being on 1st March, 1986 with the bifurcation of the erstwhile 24-Parganas District into North 24-Parganas and South 24-Parganas Districts. Sundarban is situated at the confluence of river Ganga and Brahmaputra with the Bay of Bengal. Part of Sunderban area is annexed to the District of North 24-Parganas, which covers 6 (six) Blocks viz Sandeshkhali-I, Sandeshkhali-II, Hingalganj, Haroa, Minakhan and Hasnabad. These blocks are surrounded by tidal rivers such as the Ichhamati, Bidyadhari, Kulti, Dansa, Raymangal etc. besides being crisscrossed by numerous creeks and channels.

In past, this district was hit by natural hazards in many occasions. The hazards include Cyclone, Storm Surge, Flood, Earthquake etc. of medium to large intensities. Some instances are mentioned below.

**1981:** Earthquake of magnitude 4.9 on Richter scale shook north of Sundarban on 26th March (Epicentre Latitude 22.3, Longitude 89.1).

**1983:** Tornado at Gaighata Development Block.

**1988:** Very severe Cyclone at Hingalganj Development Block.

**1995**: Breech of embankment on 15th & 16th May in Basirhat Sub-Division. 1077 nos. houses were fully and 496 houses were partly damaged.

**1996:** Heavy rainfall occurred on 27th and 28th of October with consequent breach of embankment in Basirhat Sub-Division. 48 nos. of houses were fully damaged.

**1998:** Flood in Bongaon Sub-Division due to incessant rains and over flow of river Ichhamati. Dates of occurrence were 14.08.98 & 15.08.98. Total 60.30 Sq.km. area and 96.700 people were affected. 10,059 nos. houses were affected out of which 3,457 were fully damaged. 18,483 persons were rescued and sheltered in 112 Relief Camps.

Cyclone of high magnitude severely affected 466 Sq. km of area in 10 Blocks and 2 Municipalities. No. of Cattle lost was 773. 2,16,622 people were affected by the calamity.

**1999:** The district was affected by Drought during May – June, 1999. Rainfall up to April, 1999 was only 6.5 mm. In the district 7 lakh people, 1,37,887 nos. livestock were affected and from 4% to 40% Boro paddy was lost Due to heavy rainfall from 21to 24.09.1999, a vast area of 14 (fourteen) blocks and 12(twelve) Municipalities in all the 5 (five) Sub-divisions of the district were waterlogged. 4, 50,000 people were affected.

**2000:** Unprecedented incessant heavy shower from 17.09.2000 to 21.09.2000 followed by very high discharge from the dams and barrages caused huge flood all over the state having highest intensity in about last two centuries. The water level of Churni rose to an unprecedented 11 m against highest recorded level of 9.798 m in 1978. A vast area of Bongaon Sub-Division and part of Barasat (Sadar) and Basirhat Sub-Division were inundated; some places for more than a fortnight. The year 2000 may be designated as the year of the worst precipitation in terms of quantum , intensity and duration. More than 960 Sq. km. area were affected in the district causing damages to houses, crops, school buildings etc. More than 19 lakhs people were affected and 2,65.000 houses were destroyed or damaged. 652 mouzas were declared as flood affected. Total financial loss was Rs. 62,207 lakh

**2001:** There was a severe Thunder Storm on 20.05.2001 at Gaighata Block under Bongaon

Sub-Division. The most affected G.P.s were Jaleswar-II, Duma and Dharampur-I. Four (4) human lives were lost.

**2002:** On 25.05.2002 embankment of Bermajur G.P. on river Choto Kalagachi under Sandeshkhali-II block breached affecting 2,500 people.

A severe cyclonic storm passed over Sandeshkhali-I, Sandeshkhali-II, Hingalgunj and Minakhan blocks on 11.11.2002 affecting 5483 nos. of people. 195 no. of houses were destroyed and 731 were damaged due to the calamity. The event of crop area damaged was 644.30 hec. Money value of which was Rs.5,56,82,000/-

There was a very severe cyclonic storm on 03.04.2002 at 3AM in Bongaon Subdivision. About 65,000 people were affected. 3(three) human lives were lost in Bongaon block and 5 (five) Goats and 1025 Poultry were lost. The extent of damage caused to power and Housing Sector was Rs. 8.5 lakh and 253 lakh respectively.

**2003:** Consequent upon the development of low pressure in the Bihar Plateau Region, the South Bengal districts including North 24-Parganas experienced heavy rainfall during the period from 16.10.'03 to 10.10.'03. Breach of embankments and erosion were reported from Hingalgunj, Sandeshkhali-I and Sandeshkhali-I blocks. Due to the calamity, 14 Blocks in North 24-Parganas district were severely affected 5,10,958 nos. people were affected and 8,539 houses were fully and 15,131 were partly damaged. Losses in Crop sector and Fisheries sector were Rs.282.35 lakhs and 2303.28 lakhs respectively.

**2004:** Due to incessant rain during the period from 10.09.04 to 18.09.04 a vast area of Bongaon, Basirhat, Barrackpore and Barasat(Sadar) Sub-Division was water-logged. 8,89,283 people were affected. Agricultural loss was estimated to Rs. 6802.665 lakhs.359 Mouzas were declared as Flood affected. 18384 dwelling houses were destroyed and 56,865 were damaged in Urban and Municipal areas. There was a violent storm on 06.10.'04 at 12 noon over paruipara, Biswaspara and Angrail within the jurisdiction of Jhowdanda Gram Panchayat under Gaighata block.Two persons were seriously injured and admitted to Hospital. 29 houses were destroyed.

**2006:** Due to incessant rainfall vast area of Basirhat, Bongaon, part of Barasat and Barrackpore Sub-division were affected. 8 persons died due to natural calamity during the year 2006.

**2007:** This District was affected in two phases due to incessant rainfall in 2007. Average rainfall was 1380 mm. Many people were affected.

**2008**: During the year 2008 this District was affected in different occasions by incessant rain with storm (16.09.2008, 26.09.2008, 25.10.2008). About 74,000 people were affected during the above calamities.

**2009:** On 25 May, Cyclone AILA hit costal Bengal with a maximum wind speed of 120 kmph affecting over 1.5 million people.

**The Situation Report (State Govt.)**

Cyclone AILA which hit coastal West Bengal on 25 May, 2009 is described as one of

the worst storms to hit the state in many years. Over 5.1 million people have been affected in 16 districts of West Bengal. The damage impact assessment carried outby the government of West Bengal and the United Nations Development Programme (UNDP) reported considerable deaths, of which 25 were caused by a landslide in Darjeeling. Over 500,000 houses were damaged either fully or partially. The storm was especially devastating for farmers who were preparing to harvest rice and other crops. According to media sources, the Sundarbans national reserve forest was worst-hit, as many as three million people lived in the forests. Government rescue operations are underway, with approximately 60,000 people have been rescued and accommodated in government relief camps. Local media reports also indicate that food packets have been dropped by military helicopters in the affected areas.

**The Damages due to AILA Cyclone in Basirhat Subdivision only:**

- Blocks affected– 10 (all)
- Municipalities affected– 3 (all)
- Villages affected– 857
- People affected– 6,77,662
- Crop area damaged– 16,210 ha
- Value of crop damaged– 42.49 crore
- House damaged / destroyed– Fully 90,748, Partly 48,315
- Embankments damaged– 45.5 km
- Panchayat Property damaged– 15.55 crore
- Road Damaged– 111 km (Value 11.1 crore)