

CHAPTER - VI

Ground Water Quality Management

Chapter VI

Ground Water Quality Management

6.1 Introduction

According to the State Environment Plan (SEP) 2021, despite availability of adequate groundwater resources, the State is burdened with issues such as (i) Water Scarcity in hard rock areas (ii) Intensive ground water extraction in alluvial areas (iii) Quality issues such as infestation of arsenic, fluoride and salinity *etc.*

According to the data¹²⁰ of Central Ground Water Board (CGWB) of 2022, total annual ground water recharge of the State was assessed as 23.61 Billion Cubic Meter (BCM), and the annual extractable ground water resources at 21.42 BCM. The annual ground water extraction was 10.07 BCM *i.e.* 47.01 *per cent* of extractable ground water.

This chapter deals with the steps taken by the State Government in addressing quantitative and qualitative issues related to ground water resources and its impact on human health and environment.

6.2 Status of ground water abstraction

The SEP, 2021 stipulated that there was a need to review and strengthen the existing system of ground water extraction in the State. The West Bengal Groundwater Resources (Management, Control and Regulation) Act, 2005 covers extraction and sustainable use of groundwater. As per the Act, all groundwater extraction must be strictly regulated and limited to the shallow aquifer level, so that it can be easily recharged through rainwater.

The Report¹²¹ of the CGWB covering 345 blocks/Assessment Units (AU) showed that during 2020 to 2022, the number of blocks categorized as critical¹²² from the point of view of the rate of ground water extraction had increased from One block to 22 blocks. The blocks with high saline water had also increased from zero to 60. Ground water extraction had also increased from 44.60 to 47.01 *per cent* of annual ground water recharge (23.61 BCM) during this period as depicted in **Charts 6.1 and 6.2.**

¹²⁰ Dynamic Ground Water Resources of India 2022.

¹²¹ The dynamic ground water resource assessment (in 2022).

¹²² The rate of ground water extraction exceeds annual rate of recharge.

Chart 6.1: Categorisation of assessment units/blocks in terms of quality and stage of extraction

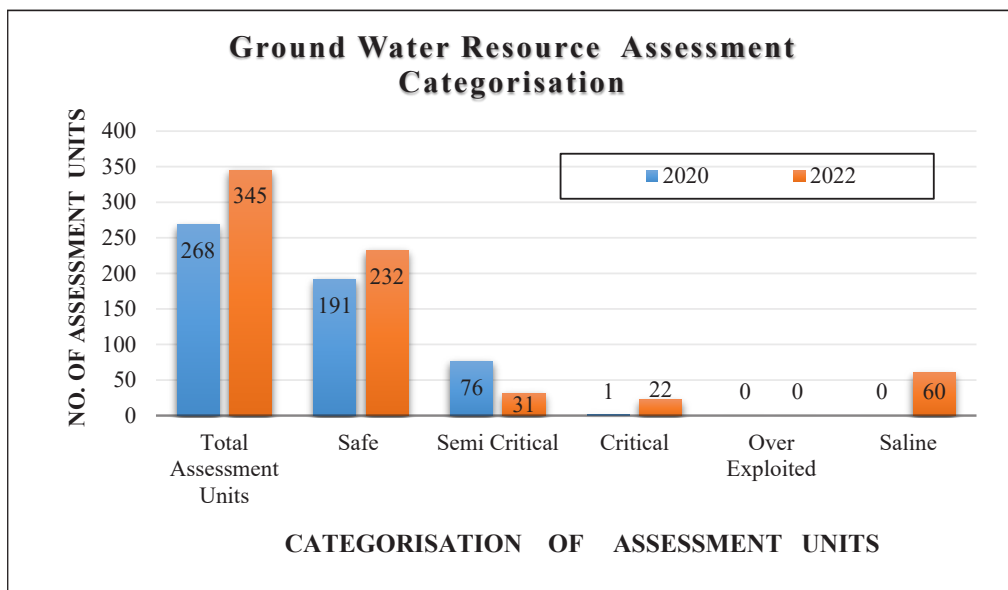
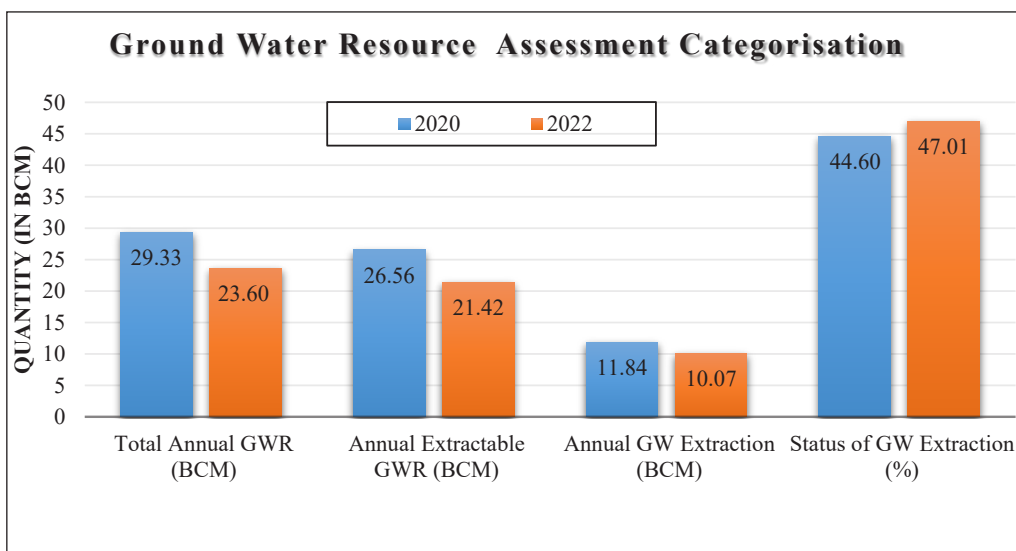


Chart 6.2: Status of Ground Water Extraction



The steady decline in water level and gradual transformation of safe and semi critical blocks into critical blocks during 2020-22 indicated that there was a sharp decline in ground water level. Audit further observed the following:

- The CTO issued by WBPCB requires an industrial unit to regularly submit a ‘**Returns of Water Consumption**’ to WBPCB. However, WBPCB did not ensure compliance of this condition before renewal of CTOs to all 65 selected industrial units during the Audit period.
- Under the West Bengal Ground Water Resources (Management, Control and Regulation) Rules 2006, the State Water Investigation Directorate is responsible for issuing permits for ground water extraction. Out of 51 sampled SPIs, 32 industries did not have a valid NOC from State Water Investigation Directorate (SWID) for extraction of ground water. Further, as flow meters were not installed at ground water intake points for recording ground water extraction, the actual extraction of ground

water by industries could not be assessed by Audit in all the test checked 51 SPIs.

- Analysis of groundwater monitoring data of CGWB for the period (2000-20) from the existing 1500 hydrograph stations in the State also showed significant fall in water level/piezometric level to the order of > 20 cm/year in eleven¹²³ districts. These districts represented areas where intensive groundwater withdrawal had taken place to meet the growing demand for water due to rapid urbanisation, agricultural and industrial activities.

Joint inspection of industries revealed that industrial use of ground water was not effectively monitored by WBPCB and SWID as NOC for extraction of ground water, installation of flow meter *etc.*, were not ensured. ***Thus, despite the alarming situation regarding depletion of ground water levels in the State, control mechanism for ensuring regulated ground water extraction and its use was not effectively invoked by strictly adhering to the provisions of the West Bengal Ground Water Resources (Management, Control and Regulation) Rules 2006.***

Recommendation 11:

Authorisation for groundwater abstraction should be strictly regulated and monitored through consent administration of WBPCB.

6.3 Qualitative aspects of ground water

Water quality refers to physical, chemical, biological and radiological characteristics of water. Protection of groundwater against geogenic and anthropogenic reasons are of foremost importance for groundwater dependent ecology and safeguarding human health. Out of 1.74 crore households in the State (as of December 2023), only 0.72 crore (*i.e.* 41 *per cent*) were provided with tap connection for supply of safe drinking water. Measures taken to address the issues related to qualitative aspects of groundwater are discussed below:

6.3.1 Arsenic contamination

Arsenic is a significant contaminant in terms of its toxic nature with exceedingly diverse manifestations of poisoning. As per Bureau of Indian Standard (BIS) 2012 (IS 10500: 2012), the acceptable limit of Arsenic is 0.01 mg/l. The State had identified 83 blocks in 8 districts¹²⁴ with about 109.26 lakh population as arsenic affected.

6.3.1.1 Status of Arsenic contamination in the sampled districts

In respect of two sampled districts *viz.* Nadia and North 24 Parganas, Audit observed that 38 out of a total 39 blocks (97.5 *per cent*) were arsenic affected. The ground water quality test reports of these two districts for the period 2018-23 revealed that 34 *per cent* of the total samples¹²⁵ including samples from Piped Water Supply Schemes (PWSS) were non-compliant in terms of the acceptable limit for arsenic. Further in respect of PWSS samples, the extent of arsenic contamination was around 51 *per cent* as detailed in the **Table 6.1**.

¹²³ Birbhum, Murshidabad, Purba Bardhaman, Nadia, Howrah, Hooghly, North and South 24 Parganas, Purba and Paschim Medinipur and Kolkata Metropolitan district.

¹²⁴ Purba Bardhaman, Nadia, Murshidabad, Malda, North 24 Parganas, South 24 Parganas, Hooghly and Howrah.

¹²⁵ Hand pumps, dug wells, community tanks, PWSS *etc.*

Table 6.1: Statement of non-compliance of samples from drinking water sources

District	Extent of arsenic contamination (for all source)			Extent of Arsenic contamination in PWSS		
	Total samples	Compliant samples	Non-compliant samples	Total samples	Compliant samples	Non-compliant samples
North 24 Parganas	1,09,511	69,277 (63 per cent)	40,234 (37 per cent)	3,545	2,210 (62 per cent)	1,335 (38 per cent)
Nadia	76,095	52,900 (70 per cent)	23,195 (30 per cent)	1,813	434 (24 per cent)	1,379 (76 per cent)
Total	1,85,606	1,22,177 (66 per cent)	63,429 (34 per cent)	5,358	2,644 (49 per cent)	2,714 (51 per cent)

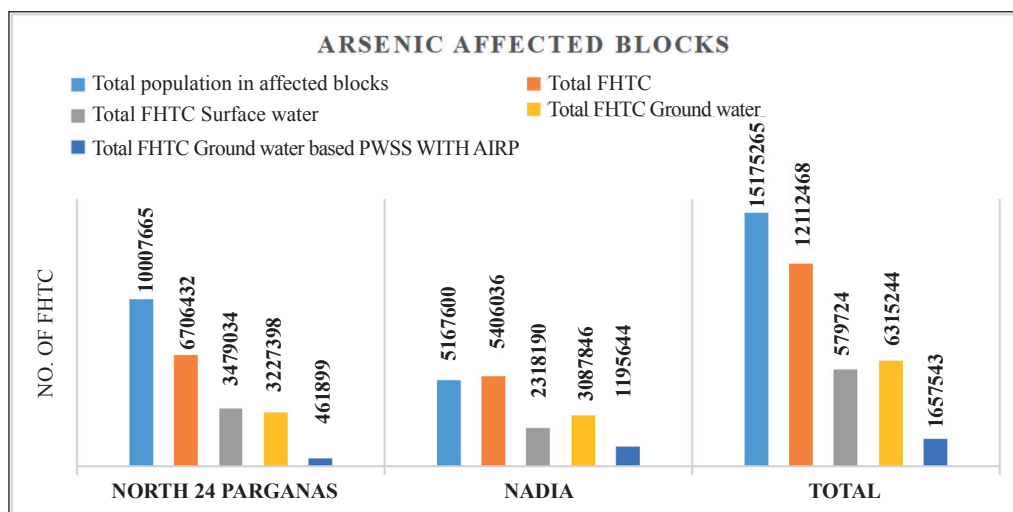
It is significant to note that the percentage of non compliant samples was higher in piped water supply schemes.

6.3.1.2 Remedial measures for Arsenic contamination

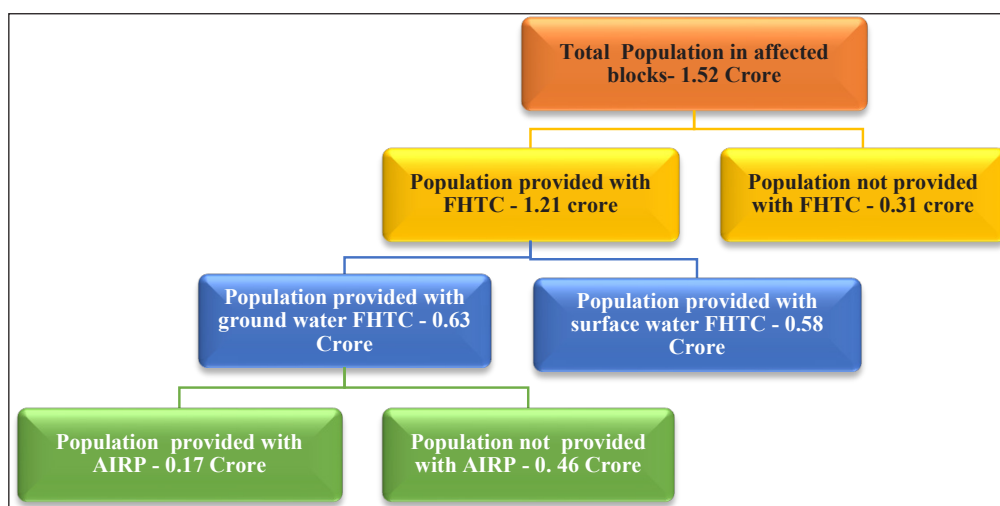
Under *Jal Jeevan Mission (JJM)* erstwhile “*National Rural Drinking Water Programme (NRDWP)*”, of Government of India, a goal was set to provide 100 per cent tap connection to all rural households by March 2024, in a mission mode, including arsenic affected villages.

Status of Functional Household Tap Connection (FHTC) under the Piped Water Supply Schemes (PWSS) of PHED of Government of West Bengal in arsenic affected blocks of the sampled districts as of March 2023 is detailed in **Chart 6.3**.

Chart 6.3: Arsenic affected blocks.



The above chart showed that a population of 1.21 crore (80 per cent) had so far been provided with FHTCs under PWSS based on ground water and surface water sources. Out of this, only 57.97 lakh (48 per cent) were provided with surface water FHTCs and the remaining 63.15 lakh with ground water FHTCs.



From the above chart it may be observed that out of a population of 63.15 lakhs covered under ground water based FHTC, 46 lakh i.e. 73 per cent were not provided with Arsenic Iron Removal Plants (AIRP) under PWSS, although the areas were arsenic affected.

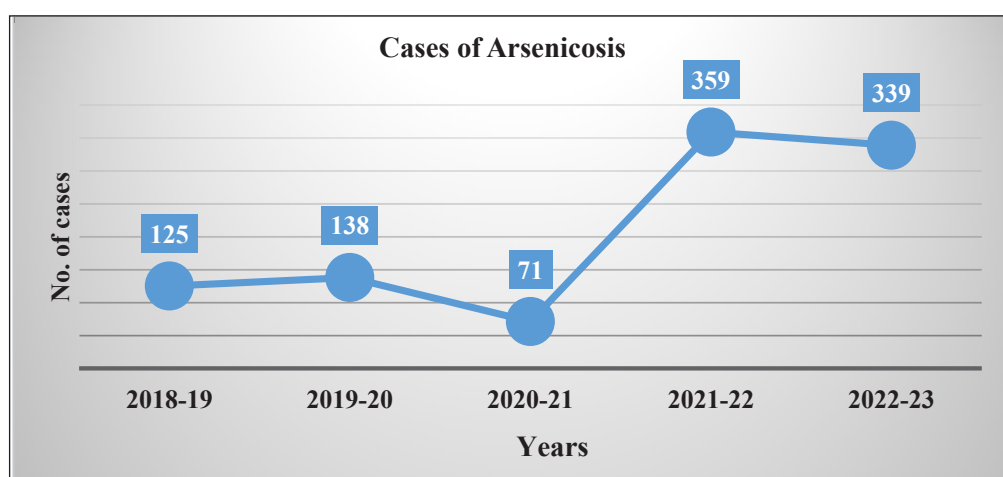
In reply, the Department stated (March 2024) that under Jal Jeevan Mission action was being taken to cover all affected areas with safe water supply by December 2024.

However, the target of providing safe drinking water in the areas was not achieved till date due to the poor quality of water supplied.

6.3.1.3 Health impact

According to the data furnished by the West Bengal Health and Family Welfare (WBH&FW) Department, the total number of people affected due to Arsenic was 1,032 during the period 2018 to 2022 as detailed in **Chart 6.4**.

Chart 6.4: Cases of Arsenicosis



The number of Arsenicosis cases (medical condition like skin lesions/ cardiovascular diseases/cancer *etc.*) detected in eight arsenic affected districts during 2018-19 was 125 and rose to 359 in 2021-22 and marginally decreased to 339 in 2022-23.

6.3.2 Fluoride contamination

While fluoride is important for bone and teeth development, intake of high fluoride content for long durations can result in dental, skeletal and non-skeletal fluorosis. The desirable limit for fluoride in drinking water in India is 1.0 mg/l, although the acceptable limit set by WHO guidelines is 1.5 mg/l.

6.3.2.1 Status of contamination

In West Bengal, 225 villages in 43 blocks of seven districts, are identified as endemic for fluorosis and people in this region are at risk of fluoride contamination. A total population of 6.15 lakh was estimated to be affected by fluoride contamination in these areas.

Out of 43 blocks affected by fluorosis¹²⁶, two sampled districts *i.e.* *South 24 Parganas* and *Birbhum* had eight blocks with fluoride concentration above 1.5 mg/l.

Four blocks of *Birbhum* district *viz.* *Khayrasole*, *Nalhati-I*, *Rampurhat-I*, and *Suri-II* were worst affected where fluoride concentration ranged between 2.28 to 7.8 mg/l. Of the 16,351 samples tested by PHED, during 2018-23, 340 samples had presence of fluoride beyond the permissible limit.

6.3.2.2 Status of mitigation measures in Birbhum District

According to the mandate of JJM, the PHED was committed to provide water of specified quality and quantity to every rural household through piped water supply by March 2024. However, as of December 2023 under the PWSS, only 1.48 lakh, out of 4.61 lakh fluoride affected households of *Birbhum* district were provided with FHTC *i.e.* only 32 *per cent* of households are getting treated piped water.

Further, according to the recommendations (September 2022) of the Fluoride Task Force (FTF)¹²⁷, pending completion of providing treated piped water to 68 *per cent* of the households, the Department would take interim measures for fluoride mitigation for the households.

Audit observed that as an interim measure, 26 Community Water Purification Plants (CWPP)¹²⁸ were installed in 10 blocks between January and December 2022, at a total cost of ₹ 5.17 crore by PHED. Out of these 26 CWPP, only seven were installed in three¹²⁹ out of the four worst affected blocks where 60 *per cent* of cases were observed. Audit further observed that one of the worst affected blocks (*Suri-II*) had not been provided with CWPP.

Thus, due to improper planning in installation of CWPP, the worst fluoride affected places remained vulnerable.

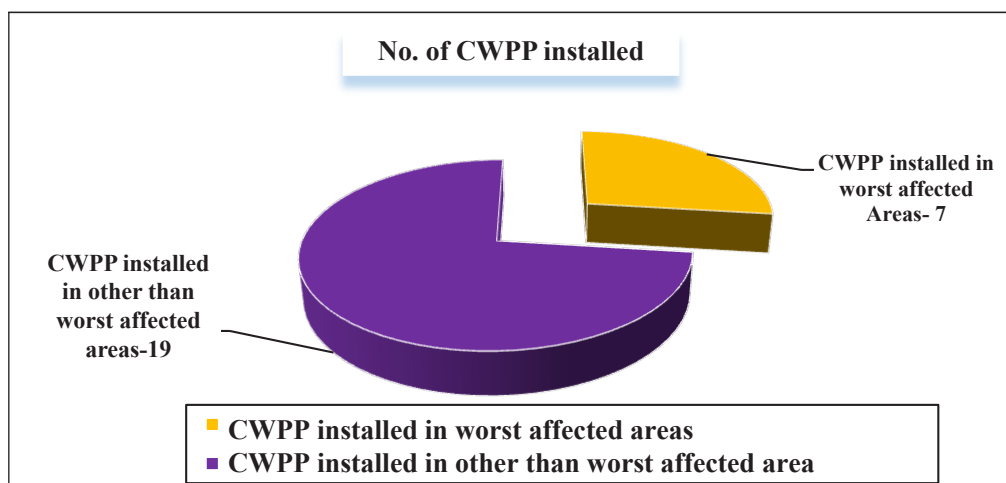
¹²⁶ Discolouration of teeth/increase in bone mass/limitation of joint movement.

¹²⁷ Fluoride Task Force was constituted by Govt of W.B. to guide PHED to mitigate the contamination of fluoride.

¹²⁸ A facility to treat, store and distribute treated water to a small community.

¹²⁹ Khayrasole, Nalhati-I, Rampurhat-I.

Chart 6.5: Community Water Purification Plant installed in fluoride affected blocks.

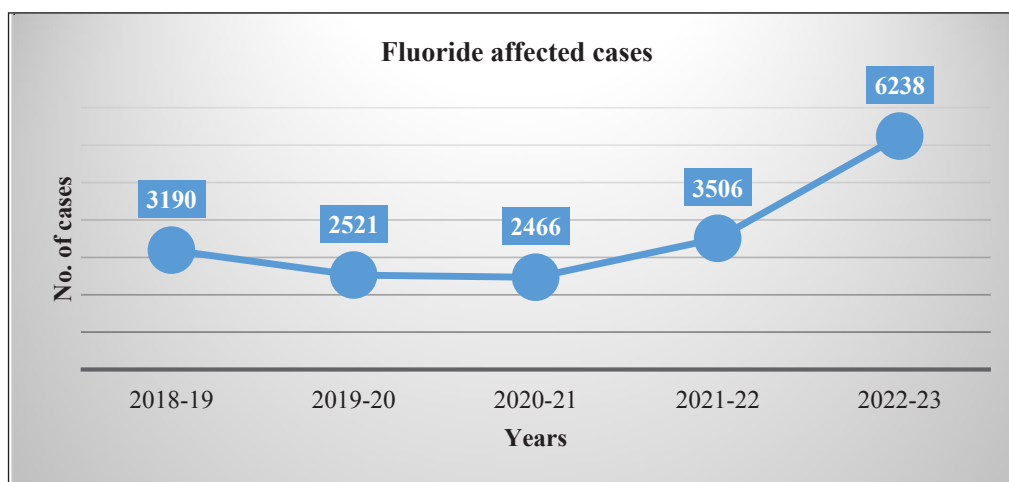


In reply, the Department stated (March 2024) that all areas affected by poor water quality would be covered with PWSS to provide safe drinking water by December 2024 under JJM.

6.3.2.3 Health Impact

As per data provided by Health and Family Welfare Department, GoWB, 17,921 fluoride affected cases were observed in the State during 2018-23 as shown in **Chart 6.6**.

Chart 6.6: Fluoride affected cases



(Source: Records of Health and Family Welfare Department, GoWB)

Despite interim mitigation measures taken by the State, the number of fluoride affected cases continued to rise, during 2018-23 and thus, remained an area of concern.

Recommendation 12:

PHED should implement schemes in a time bound manner to reduce cases of arsenic and fluoride contamination and provide safe and clean drinking water to the entire affected population.

6.3.3 Bacteriological Pollution

Bacteriological contamination of ground water may cause various water-borne diseases such as diarrhoea, typhoid, fever, dysentery, cholera, hepatitis *etc.* State Environment Plan 2021, alluded to instances of leakages in pipes used for water supply and faecal contamination from sewer drains. Audit observed that records were not maintained by PHED to register complaints received regarding such contamination. Further, audit also observed that:

- As per Department of Health and Family Welfare, GoWB, the number of bacteriological contaminated habitations in the State had increased from 3,928 in 2017-18 to 4,812 in 2020-21.
- The bacteriological test reports of the PWSS water in four sampled districts showed the presence of Total Coliform (660 cases out of total 6,096 samples tested) and E. coli (206 cases out of total 6,009 samples tested).
- As per State Environment Plan 2021 of WBPCB, 15 blocks of Purulia district were found to be contaminated. The percentage of samples found to be contaminated varied between 10 *per cent* and 58 *per cent*, indicating the pervasiveness of the problem in Purulia.

In reply, the Department stated (March 2024) that different remedial steps such as increase in testing, chlorination in PWSS, dissemination of water quality reports *etc.*, were being taken. It also added that real time monitoring of chlorine dosing and phasing out of dug wells was under process.

However, the remedial actions taken *viz.* repairing leakages in water supply pipes, disinfection with chlorination *etc.*, were sub-optimal, and 1,85,330 cases of bacteriological contamination were recorded during 2018-23. Against it, only in respect of 30,308 cases (16 *per cent*) were remedial measures, such as disinfection followed by awareness generation, taken, as seen from the records of PHED (March 2023).

6.3.3.1 Health impact of Bacteriological contamination of ground water

According to the data furnished by the West Bengal Health and Family Welfare Department for the period 2018 to 2022, 92.81 lakh people were affected by Diarrhoea, Enteric Fever, Vibrio cholera, of which 137 were reported to have died during the period.

Thus, the measures taken by PHED for dealing with bacteriological contamination of ground water were not able to adequately address prevention of water borne/ water related diseases in the State.

6.3.4 Absence of Solid Waste Treatment leading to ground water contamination

Improper handling of solid waste poses potential problem to human health. Population living close to waste dumps and those, whose water supply has become contaminated either due to waste dumping or leaching from landfill sites are more likely to be impacted. Uncollected solid waste also obstructs storm water runoff, resulting in the forming of stagnant water bodies that become breeding ground of diseases such as diarrhoea, cholera, malaria *etc.*

Solid Waste Management Rules 2016, of GoI came into force in April 2016. A time frame of two years was given as per the Rules for collection of segregated waste and setting up of solid waste processing facilities. However, it was noted that adequate infrastructure for implementation of these Rules had not been created till December 2023.

Further, audit observed the following.

- Out of 128 ULBs in the State, 79 did not have solid waste processing facilities, and the waste got disposed at dumping grounds. As per Annual Report of WBPCB for the year 2022-23 only 23 *per cent* of waste generated was processed as of March 2023.
- The unprocessed fresh waste was gradually getting converted into legacy waste and adding to dumpsites. As of August 2023, there were 123 dumpsites in the State having a legacy waste of 111.44 lakh MT, of which only 49.68 lakh MT of legacy waste was processed leaving a balance of 61.76 lakh MT.
- Out of the 123 dumpsites, only two¹³⁰ had leachate treatment facilities¹³¹ and two¹³² had geo-membrane to arrest leaching. In the absence of these treatment facilities, the possibility of water contamination from dumpsites could not be ruled out.



Figure 6.1: Leachate coming out of Dhapa dumping yard of KMC

¹³⁰ Kolkata (Dhapa) and Baidyabati (RWMC).

¹³¹ Leachate treatment facilities are designed to treat the liquid that percolates through waste materials in landfills, reducing its environmental impact by removing pollutants like organic matter, ammonia and suspended solids.

¹³² Rajpur-Sonarpur, Bhatpara

- Further, as per RRC, town-wise Solid Waste status (June 2023), 39 towns along with the seven selected PRS had generated 7,881 TPD solid waste out of which only 1,526.1 TPD was processed. Due to lack of adequate fresh waste processing facility, Audit observed that 6,354.9 TPD of solid waste was disposed of unscientifically in 39 towns.

Thus, inadequate management of solid waste could lead to problems that impair human and animal health, and ultimately result in economic, environmental and biological losses.

Recommendation 13:

UD&MA Department should take measures for effective implementation of SWM Rules, 2016 and set up adequate waste processing facilities to prevent water contamination due to leaching.