Audit Report of the Comptroller and Auditor General of India Performance Audit on Storm Water Drainage and Sewerage Management Systems in Municipal Corporations for the year ended March 2022

SUPREME AUDIT INSTITUTION OF INDIA
लोकहितार्थ सत्यनिष्ठा
Dedicated to Truth in Public Interest

Government of Odisha

Report No. 8 of the year 2024

Audit Report of the

Comptroller and Auditor General of India
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Table of contents

Preface

Due to rapid urbanisation, Storm Water Drainage (SWD) and Sewerage Management, in Urban areas, has emerged as one of the biggest challenges that our country faces today. Inadequate management of waste has significant negative externalities in terms of public health and environmental outcomes. SWD and Sewerage Management is governed by SWD and Sewerage Manual and supplemented by specific rules. There are 114 ULBs responsible for implementation of the SWD and Sewerage Management in the State.

This report contains results of a Performance Audit on Storm Water Drainage and Sewerage Management System by Municipal Corporations (MCs), in Odisha, which was conducted with the objectives to assess whether the planning of Storm Water drainage and Sewerage Management in MCs were effective, efficient and economical; and monitoring and evaluation of waste management system including adequacy of awareness creation, citizen engagement, for effecting behavioural change, assessment of environmental impacts and implementation of the internal control and monitoring mechanism was adequate and effective.

This Report of the Comptroller and Auditor General of India has been prepared, for submission to the Governor of Odisha under Article 151 of the Constitution of India and under CAG's DPC Act 1971, as amended from time to time, for being laid before the Legislature of the State.

The instances mentioned in this Report are those, which came to the notice in the course of Audit, for the period 2017-22, as well as those which came to notice in the earlier years, but could not be reported in the previous Audit Reports. Matters relating to the period subsequent to 2017-22, have also been included, wherever pertinent.

Audit has been conducted in conformity with the Auditing Standards issued by the Comptroller and Auditor General of India.

EXECUTIVE SUMMARY

Executive Summary

I. Intent of Storm Water Drainage and Sewerage Management Systems

About 40 *per cent* of the World's population is affected by lack of water, while 80 *per cent* of wastewater, throughout the planet, is emptied into oceans or rivers, without proper waste treatment. United Nations Sustainable Development Goal 6 (2015) aims to ensure 'availability and sustainable management of water and sanitation for all', by the year 2030, as this is critical to the health of people and the planet.

Effective storm water drainage and sewerage management provides environmental, social and economic benefits to local communities. When storm water and sewerage is managed well, streams, rivers and lakes are cleaner, flood risks are reduced, costs due to flood damage decrease and the quality of community life increases.

Accelerated growth and rapid urbanisation, along with population increase, have however, led to increased pressure on infrastructure and natural resources, leading to encroachment of water bodies/ drains and depletion of natural drainage systems. Increase in concretisation and the impervious layer have resulted in increase of storm water runoff. A higher runoff leads to more flooding. Consequently, the frequency of floods has increased over the years and floods have become a regular phenomenon, resulting in the submergence of low areas; causing water stagnation at several locations, as well as traffic holdups, for several hours; restricting pedestrian movement; and leading to extensive damage to public property. The need for effective storm water management is, thus, paramount.

Rapid growth of population has also adversely affected storm water drains[1]. Since all drains receive raw sewage from households, causing water pollution in water bodies/ rivers, due to non-availability of adequate sewerage treatment facilities in the cities, it adversely affects the environment and creates health hazards.

II. Why this Performance Audit?

The objective of this Performance Audit was to assess whether the management of storm water drains and sewerage system was effective and efficient and had been carried out economically and scientifically, by the Municipal Corporations.

Period of Audit : FYs 2017-18 to 2021-22

Sample : All Five Municipal Corporations

What Audit found :

Audit observed that the expansion of municipal infrastructure, for storm water drainage and sewerage systems, has not kept pace with the rapid urbanisation that most cities are experiencing. The infrastructure for storm water drainage

[1] Storm water drains: Storm water drainage system components that receive runoff from inlets and convey the runoff to some point. They are either closed conduits, or open channels, connecting two or more inlets.

and sewerage has been poorly maintained, by the Municipal Corporations and has not been upgraded, as per requirements, resulting in waterlogging and urban flooding. Deficiencies in design; lack of planning; and encroachment of storm water drains and sewerage systems, are resulting in excess runoff. Untreated sewage is being carried to the waterbodies, causing water pollution, which, in turn, results in public health and environment hazards. Some of the major audit findings, in this regard, are mentioned in the subsequent paragraphs.

III. Planning for collection/ conservation of storm water and construction of storm water drains and sewerage systems

- Due to absence of regulatory framework for management of Storm Water Drainage, Government of Odisha and Urban Local Bodies failed to comply with the National Disaster Management guidelines, which led to water logging and urban flooding.
- Significant measures to recharge ground water were not taken by Municipal Corporations despite depletion in ground water level.
- Rapid urbanisation has more impact on land use pattern of the cities, mostly on drains/ nallahs.
- Municipal Corporations did not prepare the master plan for storm water drainage management in cities, leading to water logging and urban flooding.
- Municipal Corporations did not provide adequate safety to commuters by covering the drains with slabs.
- Deficiencies in preparation of Detailed Project Report for sewerage projects, led to avoidable expenditure of ₹3,045.44 crore.
- The Daya West irrigation canal was virtually converted to a sewage waste drain and the contaminated water was being supplied for irrigation of 835 ha of agricultural land at downstream.
- Water at intake well of River Kuakhai for water supply to Bhubaneswar city was highly contaminated. The Biochemical Oxygen Demand, Total Coliform and Faecal Coliform were beyond the permissible limits.

IV. Financial Management

- Under utilisation of funds for storm water drain and sewerage management by Municipal Corporations/ Odisha Water Supply and Sewerage Board due to absence of master plans.
- Exemption of GST and Service Tax for consultancy services, led to excess expenditure of ₹30.11 crore from the State exchequer.
- Municipal Corporations did not collect storm water drainage and sewerage charges from public, causing poor own revenue generation capacity to attain self-sustainability.

- Due to non-achievement of service level benchmarks and non-preparation of annual accounts, Urban Local Bodies did not get the central assistance of ₹333.58 crore under 14th Finance Commission grant.

V. Contract Management and Project Execution of storm water drainage and sewerage systems

- Award of work to non-performer and non-termination of contracts, led to time and cost overrun of nine years and ₹249.21 crore, respectively for Cuttack Drainage projects.
- Out of 558.64 Million Liter per Day sewerage waste generated in these five Municipal Corporations, only 52.97 Million Liter per Day (9.48 *per cent*) of the sewerage waste had been collected by the existing sewerage systems, leaving the remaining 505.67 Million Liter per Day (90.52 *per cent*) un-collected and had been discharged to water bodies causing water pollution.
- Non completion of sewerage projects, led to time and cost overrun of 12 years and ₹550.07 crore, respectively for Bhubaneswar sewerage districts I, II and III.
- There was excess payment of ₹5.11 crore for Rourkela West project in deviation to contract conditions and Odisha Public Works Department Code.

VI. Monitoring mechanism

- Non-conduct of regular meetings as required by State Level Steering Committee and Odisha Water Supply and Sewerage Board, for sewerage and storm water drainage management, resulted in lack of effective monitoring mechanism.
- There was lack of monitoring of sewerage projects to control pollution of water bodies and non-levy of environmental compensation of ₹1,239.00 crore by State Pollution Control Board.
- Water pollution/ water contamination pose threat to public health and ecosystems. Across the State, 42.24 lakh people were affected by acute diarrhoea, 4.63 lakh by typhoid, 0.12 lakh by hepatitis and 0.12 lakh by renal diseases during the FYs 2017-22, which were primarily caused due to water contamination.
- Consumption of leafy vegetables grown with polluted water irrigation is risky and harmful to human lives as it contains heavy amount of toxic elements of metals.

VII. Recommendations

1. ***Government may formulate a comprehensive policy to recognise urban runoff as a potential resource of water and prepare a plan of action for its conservation, in consonance with the National Disaster Management (NDM) guidelines.***
2. ***Corporations may evict all encroachments and prevent further reductions in the water bodies. Further, prescribed length and width of natural drains may be maintained, to ensure inter-connectivity of***

the water bodies, for proper conservation of the ecosystem, as well as ground water.

3. ***Government may explore the possibility of interlinking the Storm Water Drainages (SWDs), to the water bodies in the city, to prevent drying up of water bodies and to enhance the ground water recharge.***
4. ***Government may maintain data for different categories of land use, so that Municipal Corporations (MCs) are able to prepare development plans, considering the changes effected due to urbanisation.***
5. ***Corporations may consider all relevant parameters, such as rainfall patterns, increase in the impervious layers, decrease in vegetation etc., while designing and executing roads and drains, to increase ground water recharge and prevent flooding.***
6. ***Corporations may prepare Drainage Master Plans, for development of drainage infrastructure. They may also carry out periodical inspections and maintenance of all the drains, to avoid urban flooding.***
7. ***Government may ensure the preparation of Detailed Project Reports (DPRs) for Storm Water Drain projects, including necessary details, such as the extent and availability of land and alignment of drains etc.***
8. ***Odisha Water Supply and Sewerage Board (OWSSB)/ Water Corporation of Odisha (WATCO) may prepare an action plan, on priority, to connect the existing sewerage lines, with the Sewerage Treatment Plants (STPs), to avoid water pollution in water bodies.***
9. ***Corporations may escalate their efforts to conduct surveys to identify and evict encroachments on SWDs and maintain the stipulated buffer zones, to protect drains and water bodies.***
10. ***Government may take appropriate action on the erring officials who have failed to take action on unauthorised encroachment.***
11. ***Government/ Corporations may devise a suitable mechanism for collection of SWD and sewerage cess, to increase their revenues and strive for self-sustenance.***
12. ***Government may plan appropriate strategies, for timely submission of Utilisation Certificates (UCs), to the funding agencies and the Finance Department.***
13. ***The bye-laws for solid waste management may be enforced strictly to protect water bodies.***
14. ***Government may put in place an institutional mechanism, for ensuring coordination of all line departments, in implementation of Under Ground Sewerage System.***
15. ***OWSSB/WATCO may ensure availability of work site and all mandatory clearance from line departments, before awarding tenders for Underground Sewerage Systems.***
16. ***MCs may plan to commission the remaining sewerage pipelines and STP to ensure adequate sewerage flow and treatment.***
17. ***MCs may plan to provide household connections to sewerage lines, preventing direct discharge of household sewage into water bodies.***

18. ***MCs may plan to restore the non-functional Sewage Treatment Plant to ensure adequate sewerage flow and treatment.***

19. ***Rourkela Municipal Corporation (RMC)/ Berhampur Municipal Corporation (BeMC) may plan to provide adequate capacity of STPs for treatment of sewerage water for Rourkela and Berhampur city.***

20. ***OWSSB/WATCO may focus on ensuring the quality of sewage treatment, by independent audit of water quality and by performing recommended laboratory tests through accredited laboratories.***

21. ***OWSSB/WATCO may take steps to protect the environment by increasing reuse of treated water and converting sludge into manure.***

22. ***Government may activate monitoring committees and strengthen the control mechanisms, as envisaged in the SWD Manual, Sewerage Manual and NDM Guidelines, and accountability of the officers responsible, may be fixed.***

23. ***Government/OWSSB/WATCO/MCs may take adequate and effective steps to protect the environment and ecosystems, by taking prompt action for completion of sewerage networks and by taking measures to prevent wastewater from falling into the drains/ rivers.***

CHAPTER - I
Introduction

CHAPTER - I

Introduction

This Chapter deals with the challenges faced in the management of storm water drainage and sewerage systems in cities. It describes the geography and river basin drainage, of the State. It also describes the rainfall, water supply and storm water drainage network, in the Municipal Corporations. Moreover, it discusses the availability and adequacy of the organisational setup for management of storm water drainage and sewerage systems, along with devolution of urban governance and the role of Urban Local Bodies, in storm water drainage and sewerage systems.

1.1 Introduction

'Storm water' is the portion of precipitation that does not naturally percolates into the ground or evaporate, but flows *via* overland flow, interflow and pipes. A storm water drainage system aims to transport and store the storm water, in a defined surface water body, or a constructed infiltration facility[2]. Thus, rather than soaking into the soil and slowly seeping to surface water, runoff is quickly funneled, through storm water drainage systems[3], directly to streams, rivers and lakes. 'Storm water management'[4] is the control and use of storm water runoff[5]. It includes planning for runoff, maintaining storm water systems, and regulating the collection, storage and movement of storm water. While designing cities, 'Storm Water Management' should be considered as a factor in designing the drainage system.

'Sewage'[6] is the single major source of water resource contamination, contributing 80 *per cent*[7] of the pollution load to water bodies. The sewerage system consists of house service connections, sewer lines, lift stations, pumping stations and sewage treatment plants. The objective of the sewerage system is to ensure that the sewage discharged by the community is properly collected, transported and treated to safe levels and disposed of or reused, without causing any health or environmental problem.

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2 An 'Infiltration facility', in a basin, is a facility, constructed within highly permeable soils, that provides temporary storage of storm water runoff

3 A 'storm water drainage system' refers to constructed and natural features which function together, as a system, to collect, convey, channel, hold, inhibit, retain, detain, infiltrate, divert, treat or filter storm water

4 'Storm water Management' refers to the process of controlling the quality and quantity of storm water, to protect the downstream environment

5 'Runoff' refers to the flow of water across the ground or an artificial surface generated by rain falling on it.

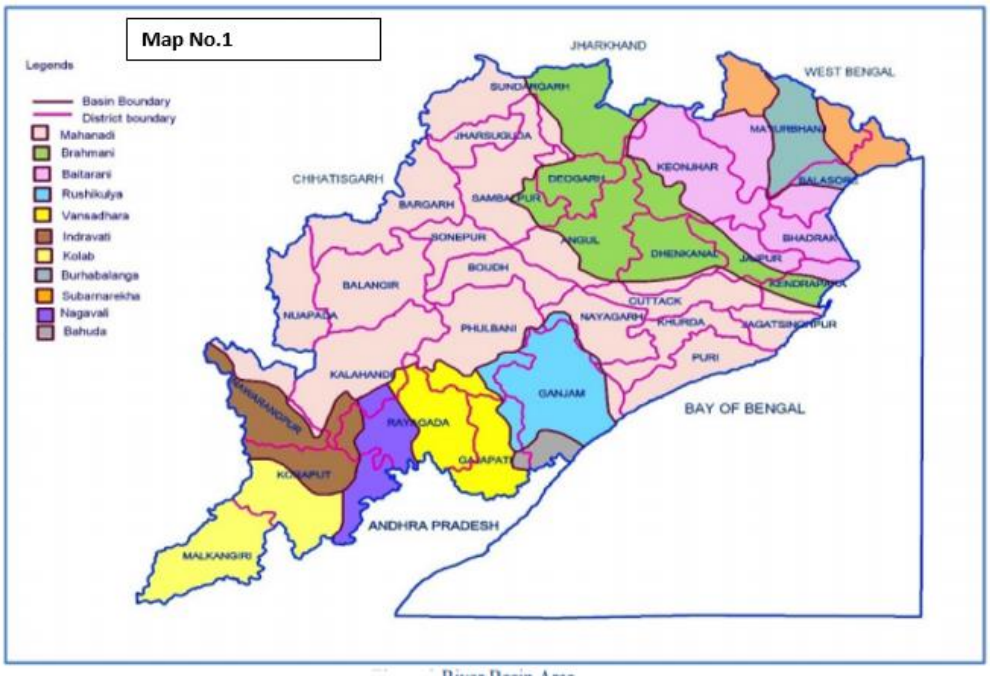
6 'Sewage' refers to the contents of waste closets, latrines, bathrooms, kitchen, stables, cattle-shed and other like places, and includes trade effluent

7 As per National Institution for Transforming India (NITI) Aayog Report 2022 and Sewerage Manual 2013

The management of the storm water drainage and sewerage systems is challenging, as it directly impacts public health, soil, ground water and aquatic life.

1.2 Geography of Odisha

The State of Odisha is spread over an area of 1,55,707 sq. km, in the eastern part of the Indian peninsula and is bounded by 480 km coastline of the Bay of Bengal, to its east. Several rivers, namely the Mahanadi and its tributaries, like Ib, Ong and Tel, Baitarani, Subarnarekha, Brahmani, Budhabalanga *etc*., have their deltas in this region, before their final submergence in Bay of Bengal. The largest coastal lake of India, Chilika, is a brackish[8] lagoon. Rainfall in Odisha, is spread across four months, with 78 *per cent* of the rainfall occuring between the months of June and September. National Compilation on Dynamic Ground Water Resources of India, 2022, published by Central Ground Water Board, Department of Water Resources, River Development and Ganga Rejuvenation, Government of India (GoI), revealed that the requirement of water, for irrigation, domestic and industrial consumption, for Odisha, was about 7.23 bcm[9], *i.e.* 44.25 *per cent* of the total extractable ground water of 16.34 bcm in the State. The river basins drainage of Odisha, is shown in **Map No.1.**



Map No.1: River basins, Odisha (Source: Central Ground Water Year Book 2021-22, Odisha)

1.3 Overview of Municipal Corporations

Details regarding the population, area, drains, annual average of rainfall and water supply per day, in respect of five[10] Municipal Corporations (MCs), in Odisha, are detailed in **Table 1.1**.

[8] Brackish water is the water that is saltier than fresh water, but not as salty as seawater

[9] Billion cubic meter

[10] Bhubaneswar Municipal Corporation (BMC), Cuttack Municipal Corporation (CMC), Berhampur Municipal Corporation (BeMC), Sambalpur Municipal Corporation (SMC) and Rourkela Municipal Corporation (RMC)

Table 1.1: Population, area, drains, annual average rainfall and water supply to MCs

MC	Population *(as of March 2021)*	Area (*in sq. km)*	Drains *(in kms)*	Annual average rainfall *(in mm)*	Water Supply per day (*MLD*[11])
1	***2***	***3***	***4***	***5***	***6***
Bhubaneswar	11,63,000	186.00	541.60	1,705.17	270.64
Cuttack	7,10,323	192.50	707.12	1,565.67	209.00
Sambalpur	3,86,545	303.00	464.22	1,500.73	76.76
Rourkela	5,82,522	200.00	453.09	1,468.20	61.90
Berhampur	4,13,154	86.82	161.94	1,342.87	80.00
Total	**32,55,544**	**968.32**	**2,327.97**	**1,516.53**	**698.30**

Source: *Information furnished by Engineer-in-Chief (EIC), Public Health (Odisha), MCs and Director, Indian Metrological Department*

1.4 Storm water drainage network in Municipal Corporations

The five MCs, mentioned in **Table 1.1**, are spread over an area of 968.32 sq. km and have a total drain network (primary[12] and secondary[13] drains) of 2,327.97 km. They did not, however, have records pertaining to the length of tertiary drains[14], under their jurisdiction. Storm water drainage maps were not made available to Audit, in respect of the Rourkela and Sambalpur MCs. The storm water drainage network of other three MCs is shown in **Map Numbers 2, 3 and 4**.

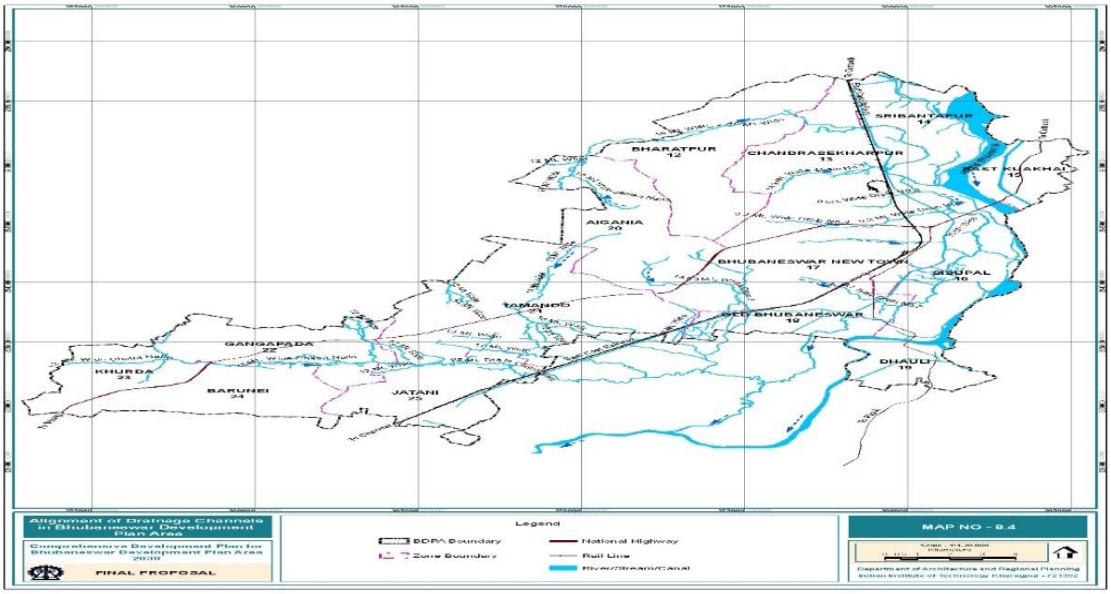
[11] Million liters per day

[12] 'Primary storm water drainage' is the first level of drainage infrastructure, typically consisting of large, open channels or culverts that are designed to convey large volumes of water quickly and safely away from populated areas during heavy rainfall events.

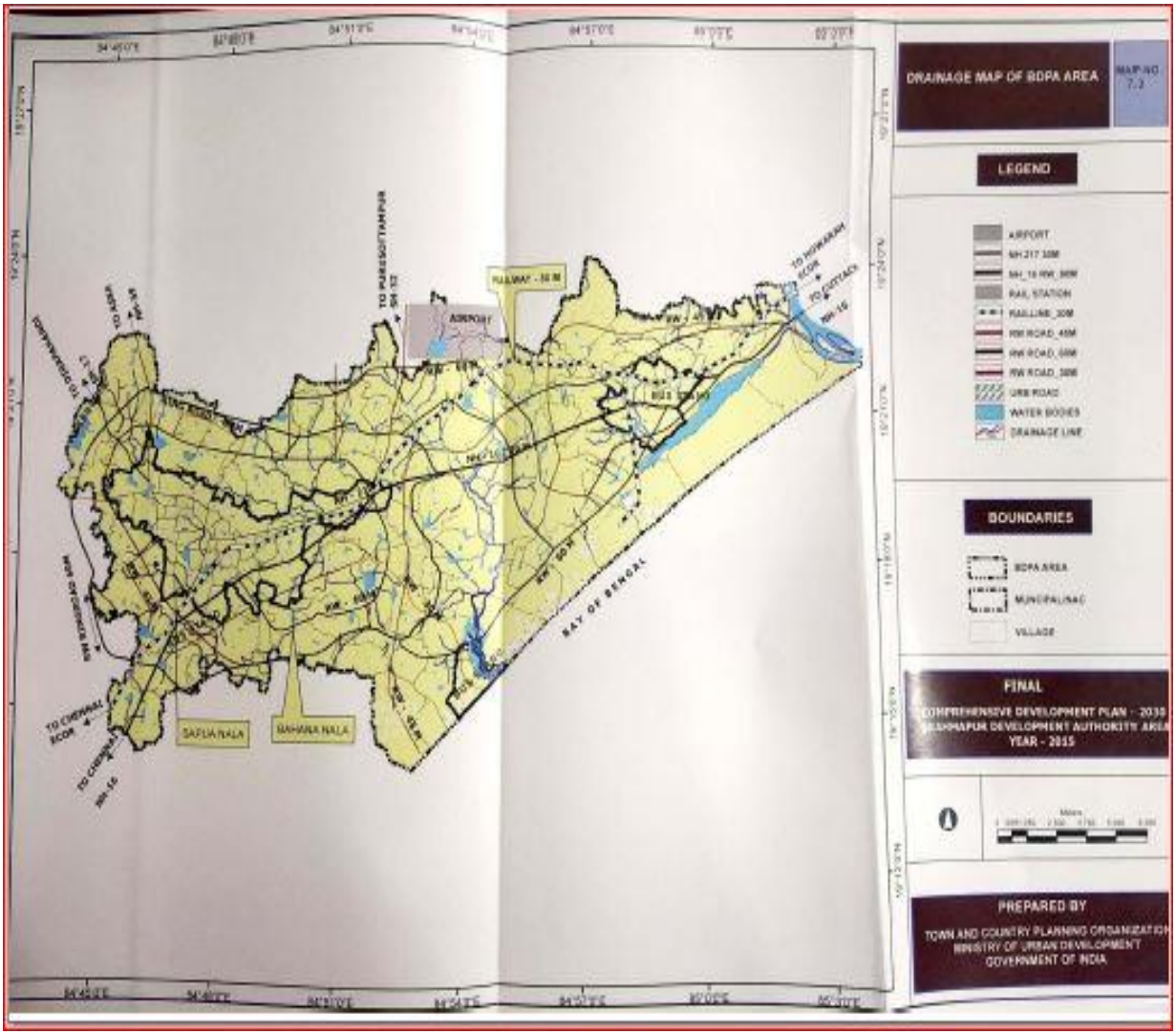
[13] 'Secondary storm water drainage' is the second level of drainage infrastructure, typically consisting of smaller channels or pipes that are designed to convey water from primary drainage systems to specific areas or locations, such as detention ponds or other storm water management facilities.

[14] 'Tertiary storm water drainage' is the third level of drainage infrastructure, typically consisting of small, localised drainage systems such as curb inlets, catch basins and other types of inlets are designed to collect and convey water from streets, sidewalks and other surfaces to primary and secondary drainage system.

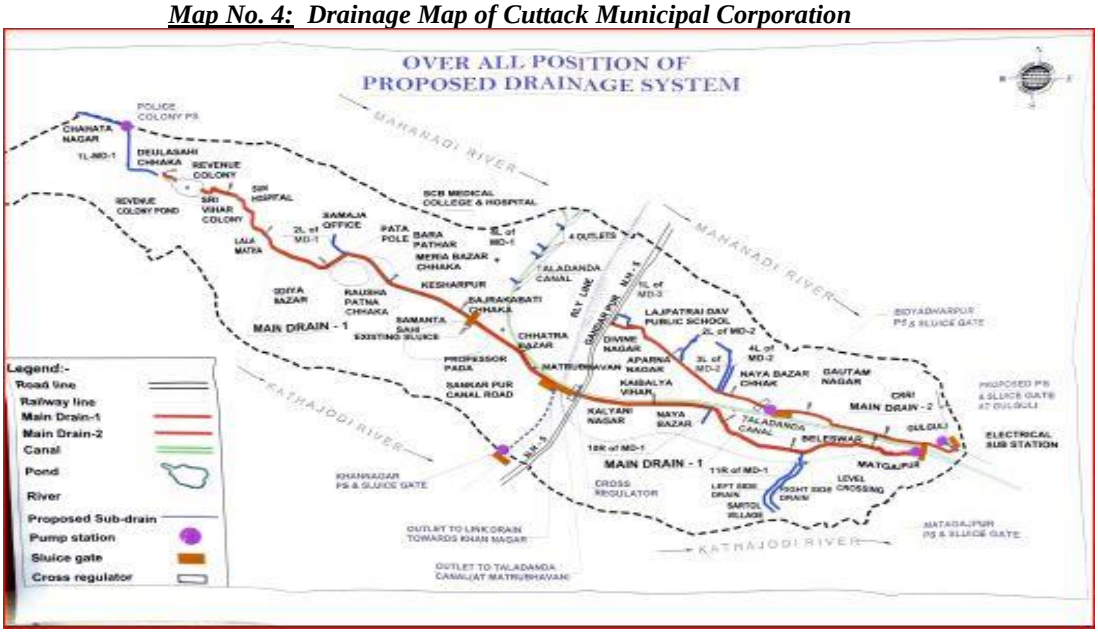
***Map No. 2**: Drainage Map of Bhubaneswar Municipal Corporation*



***Map No. 3:** Drainage map of Berhampur Municipal Corporation*



***Map No. 4:** Drainage Map of Cuttack Municipal Corporation*

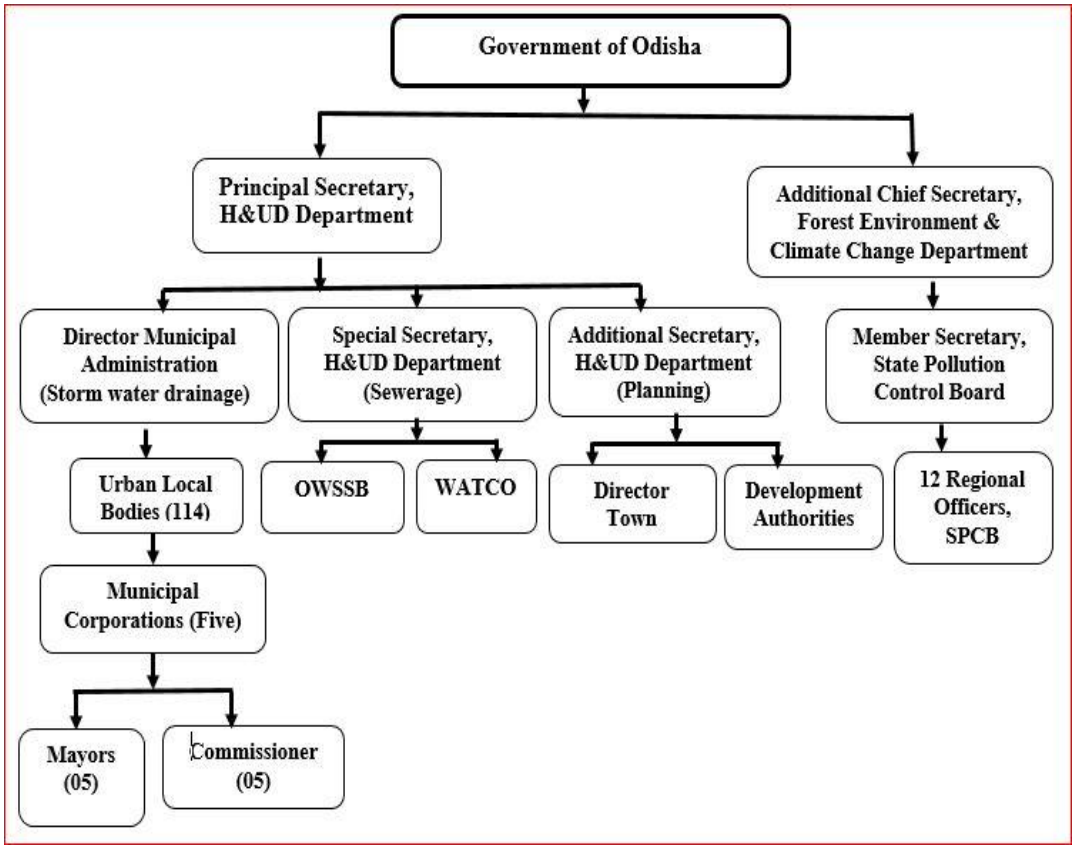


1.5 Organisational setup

The Housing and Urban Development Department (H&UDD), headed by Principal Secretary to Government of Odisha, is the controlling department for all the Urban Local Bodies (ULBs) in the State. The Director of Municipal Administration (DMA) is responsible for enforcing and overseeing the implementation of Storm Water Drainage (SWD) and the Additional Secretary of the Department is responsible for Sewerage Management Systems (SMSs) in urban areas. Out of the 114 ULBs in the State, there are five MCs. The Commissioners of these MCs are responsible for the implementation of SWD. The Engineer-in-Chief (EIC), Odisha Water Supply and Sewerage Board (OWSSB) and Chief Executive Officer (CEO), Water Corporation of Odisha (WATCO), are implementing Sewerage Projects (SPs) in ULBs, at the field level.

The Odisha State Pollution Control Board (SPCB) is the prescribed authority for grant of consent to establishment (CTE) and consent to operate (CTO), for sewerage treatment plants (STPs) by ULBs. It is also entrusted with the responsibility of implementation of Environmental Laws, particularly the Water (Prevention and Control of Pollution) Act, 1974, the Air (Prevention and Control of Pollution) Act, 1981 and the Environment (Protection) Act, 1986. The organisational setup, with regard to the functioning of SWDs and SPs in the State, is shown in **Chart No.1**.

Chart No.1: Organisational chart



1.6 Devolution of functions to ULBs

The 74th Constitutional Amendment Act, 1992, made provisions for the establishment of ULBs, as the third tier of governance in urban areas. It empowers ULBs to perform functions and implement schemes, in relation to the 18 functions specified in 12th Schedule, which, *inter alia*, include urban planning, roads and bridges, sanitation, conservancy and solid waste management.

1.7 Role of ULBs in storm water drainage and sewerage management

As per Sections 24 (iii) and (iv) of the Odisha Municipal Corporation (OMC) Act, 2003, the Municipal Corporations have to make adequate provisions for the construction, maintenance and cleaning of drains and drainage works, as well as for the collection, removal, treatment and disposal of sewage. ULBs are primarily responsible for setting up of STPs, after obtaining CTO from SPCB and ensuring that adequately treated sewage effluent is discharged, either into water bodies, or on land.

CHAPTER - II
Audit Framework, Scope and Methodology

CHAPTER - II

Audit framework, scope and methodology

This Chapter describes the broad objectives of the Performance Audit; sources of the audit criteria used; scope of audit; methodology adopted and the constraints faced, while conducting the Audit.

2. Audit Framework

2.1 Audit Objectives

The objectives of the Performance Audit (PA) were to assess whether:

- the planning and designing, for collection/ conservation of storm water and construction of infrastructure for drainages/ sewerages, had been effective and efficient
- the financial management of projects had been efficient
- there had been adequate transparency in the tendering and award of works, relating to storm water drainages/ sewerages, and whether the execution of such works, had been in accordance with extant rules *and*
- the monitoring mechanism had been adequate and effective.

2.2 Audit Criteria

The following sources of audit criteria were used by Audit, for assessment of the management of storm water drainage and sewerage:

- National Water Policy, 2002 and 2012 and State Water Policy, 2007
- Odisha Urban Water Supply Policy, 2013
- Urban and Regional Development Plans formulation and implementation Guidelines, 2015, by Ministry of Urban Development Department, Government of India
- Odisha Urban Sanitation Policy, 2017
- National Disaster Management Act, 2005 and Guidelines, 2010
- The Water (Prevention and Control of Pollution) Act, 1974
- Odisha Town Planning and Improvement Trust Planning Act, 1956 and Odisha Town Planning and Improvement Trust Rules, 1975, Odisha Development Authority Act, 1982 and Odisha Municipal Corporations Act, 2003
- Wetlands (Conservation and Management) Rules, 2017
- Municipal Solid Waste Management Rules, 2016, Odisha General Financial Rules, Budget Manual, Odisha Public Works Departmental Code, State Schedule of Rates and Analysis of Rates
- Indian Roads Congress (IRC) SP-50- 2013- Guidelines on Urban Drainage and IRC-SP-42-2014- Guidelines of Road Drainage issued by the Indian Road Congress

- Manuals of Sewerage and Sewage Treatment, 1980 and Manual of Sewerage and Sewage Treatment System, 2013, Storm Water Drainage (SWD) Systems, 2019 and handbook, issued by the Central Public Health and Environmental Engineering Organisation (CPHEEO)
- Swachh Bharat Mission guidelines (Urban) and Handbook for Service Level Benchmark (SLBM), issued by the Government of India (GoI)
- Scheme guidelines of various schemes, executed with the assistance of the State/ Central Governments
- Government orders, Court judgements/ National Green Tribunal instructions/ orders, executive instructions and Circulars, issued from time to time
- Time-series satellite imagery of SWDs and Comprehensive Development Plans (CDP) of Cities
- Research and Study Reports of the Odisha University of Agriculture and Technology (OUAT), Indian Council of Agricultural Research (ICAR), Central Institute of Fresh Water Aquaculture (CIFA), Indian Institute of Water Management (IIWM), Indian Institute of Human Settlements (IIHS) and Centurion University of Technology and Management (CUTM), Odisha
- Media reports *and*
- Urban and Regional Development Plans formulation and implementation guidelines, 2015, GoI

2.3 Audit scope and methodology

The PA was conducted from June to December 2022, covering period from the FYs 2017-18 to 2021-22, through test-check of records and documents relating to storm water drainage and sewerage management systems, in the offices of five MCs[15]; Bhubaneswar Smart City Limited (BSCL) and Rourkela Smart City Limited (RSCL); Principal Secretary and Director of Municipal Administration of the H&UD Department; and the SPCB. Audit also scrutinised related records of the office of Additional Chief Secretary, Health and Family Welfare Department (H&FWD); Director of Town Planning (DTP); five[16] Development Authorities (DAs) of Corporation areas; EIC, OWSSB; CEO, WATCO; three[17] Drainage Divisions of the Department of Water Resources (DoWR); and three[18] National Highway (NH) Divisions, of the Works Department, in regard to their involvement in the management of SWD and SPs, within the urban limits of the above MCs.

[15] Bhubaneswar Municipal Corporation (BMC), Cuttack Municipal Corporation (CMC), Berhampur Municipal Corporation (BeMC), Sambalpur Municipal Corporation (SMC) and Rourkela Municipal Corporation (RMC)

[16] Bhubaneswar Development Authority (BDA), Cuttack Development Authority (CDA), Berhampur Development Authority (BeDA), Sambalpur Development Authority (SDA) and Rourkela Development Authority (RDA)

[17] Drainage divisions: Khordha, Cuttack and Berhampur

[18] National Highway Divisions, Bhubaneswar, Cuttack and Rourkela

Audit also analysed the satellite images obtained from *Google Earth Pro* and *Google Earth*, along with the land use data furnished by the Odisha Space Research Application Center (ORSAC), to arrive at the time-series pattern of land use changes due to rapid urbanization, as well as rainfall data from the Indian Metrological Department (IMD), in these MC areas. Audit also analysed the water supply data of urban areas, obtained from the Public Health Department (PHD), to derive the sewerage generation in cities. Information regarding de-silting works, executed for roadside drains, were also obtained from 12 Public Works Divisions[19] (PWDs) and Prachi Irrigation Division, Bhubaneswar inside the corporation areas. Joint Physical Verification (JPV) of various sites was also conducted, along with departmental officials, to identify encroachments and examine the status of repairs, maintenance and de-silting works, carried out by the MCs, in drains and water bodies. Research papers of the OUAT, ICAR, CIFA and other institutions, in regard to the impact of urban sewerage waste, on soil, vegetables, aquatic life and ground water, were also analysed for impact assessment. Illustrative videos, taken during JPV, have also been included in the report, at relevant places, by providing the link and Quick Response (QR) codes for scanning, to access these videos.

The entry conference was held on 19 September 2022, with the Principal Secretary, H&UD Department, in which the audit objectives, criteria, scope of audit and methodology, were discussed.

Draft performance Audit Report was issued on 13 February 2023 to the Government. Despite several requests and issue of reminders (six times, during March 2023 to June 2023), the department was not willing to conduct the Exit Conference.

2.4 Acknowledgement

Audit acknowledges the cooperation extended by the Department, along with all the five MCs, five DAs, DTP, BSCL, RSCL, Drainage Divisions/ PWDs, OWSSB, WATCO, SPCB, PHD, OUAT, CIFA, IMD and ORSAC, Bhubaneswar, in conducting the Performance Audit.

2.5 Audit Constraints

Absence of complete records in the Office of the Principal Secretary to Government, H&UD Department, MCs, WATCO and OWSSB (mentioned at various places in the report), hindered the audit analysis. Hence, the findings of the JPVs, documented in the form of photographs and videos, formed the basis for highlighting the impact of insufficient SWD and sewerage management systems. The findings have been substantiated with reference to various studies relating to the impact of urban wastewater, on agriculture, soil and aquatic life, conducted by OUAT, ICAR and CIFA; research papers of other institutions; media reports; and official tweets of the MCs.

2.6 Previous Audit

A Performance Audit, on the "Implementation of Sewerage projects in the State" had been conducted, covering the period from the FYs 2010-11 to 2015-16 and the findings of the PA had been included in the Report of the

[19] Bhubaneswar I; II; III; IV and V; Cuttack I and II; Sambalpur I and II; Berhampur I and II PWD Divisions and Rourkela (R&B) Division

CAG of India on General and Social Sector for the year ended March 2016, Government of Odisha *vide* Report No. 1 of the year 2017. The report had not been discussed by the Public Accounts Committee as of March 2023. The findings of the report have been referred to, at appropriate places in this report.

CHAPTER - III
Planning, in regard to Storm Water Drains and Sewerage Systems

CHAPTER - III

3. Planning, in regard to storm water drains and sewerage systems

This Chapter discusses the audit findings pertaining to planning and designing, for collection, conservation and construction of storm water drainage, and sewerage systems, in municipal corporation areas. The PA assesses, whether the planning and infrastructure, relating to the storm water drainage and sewerage systems, in municipal corporation areas, were adequate and effective and had been economically implemented by the MCs/ OWSSB/ WATCO.

3.1 Planning and strategy for collection and conservation of storm water

The State formulated (2007) a Water Policy, in line with the National Water Policy (NWP), 2002, which provided policy guidance for management of the water resources in the State. The Policy provided for engineering and biological interventions, for improvement of drainages, as also for appropriate land use plans for areas prone to water logging, with peoples' participation. The policy also stated that there should be a dedicated organisation, for dealing with the problems of drainage, for the entire State.

In addition, the Odisha State Urban Water Supply Policy, 2013, and Odisha Urban Sanitation Policy, 2017, with the objectives of ensuring universal coverage of water and sanitation services.

3.1.1 Absence of Policies and Regulatory framework for storm water management

Absence of regulatory framework of storm water management for ground water recharge and non-compliance to the National Disaster Management Guidelines by the State and ULBs, led to water logging and urban flooding.

Scrutiny of records of the MCs and the Department, revealed that the State had not enacted any Act for Ground Water Regulation, Control and Management. There was no regulatory framework specifically for storm water management, for recharging the ground water to avoid scarcity of water.

Further, the National Disaster Management (NDM) Authority, GoI, recognised urban flooding as being different from riverine floods and brought out (September 2010) a detailed set of guidelines for management of urban flooding. Chapters 2, 4 and 5 of these guidelines stipulated the setting up of an institutional framework for the purpose, designing of urban drainage, modes of disaster risk management *etc.* However, the State Government/ ULBs failed to comply with these stipulations like preparation of inventory of existing storm water drainage system on GIS platform, master plan, pre-monsoon de-silting work and rain water harvesting structures *etc*., in regard to urban storm water management, as detailed in ***Appendix-I*** and discussed, subsequently, at appropriate places[20]. Non-adherence to the provisions of the NDM guidelines led to choking of drains, which resulted in water logging/ urban flooding, in the cities.

The Superintending Engineer (SE), Drainage Division, BMC, replied (October 2022) that, due to shortage of manpower, all the provisions in NDM guidelines

[20] Paragraph Nos. 3.1.6, 3.2.2.2, 3.2.3, 3.2.3.1, 3.2.3.2, 3.2.3.3, 3.2.4.1, 3.2.8 and 3.2.8.1

could not be implemented. RMC, SMC and BeMC noted the audit comments (December 2022). However, replies were awaited from CMC (as of January 2023).

3.1.2 State Water Policy - Urban surface runoff not recognised as a resource

Para 8 of NWP, 2012, emphasised conservation of rivers; river corridors; water bodies and associated wetlands; and flood plains. It also provided that ecological buffer areas were to be managed in an integrated manner, to balance the environmental and social issues. The State Water Policy, 2007 (SWP), however, had not been updated, in line with NWP, 2012. The SWP was to be revised, since it did not factor in water sector reforms, in particular, recognizing urban water runoff, as a water resource, in the wake of growing scarcity and competing demands, on the pattern of the NWP.

In the wake of growing water scarcity and competing demands, State Water Policy, 2007, is to be revised in line with National Water Policy, 2012 to recognise urban water runoff, as a water resource.

BeMC replied (November 2022) that it was in the process of conservation of water bodies and wetlands, and it had also declared buffer zones. BMC stated (October 2022) that the SWP would be decided by DoWR. RMC noted (December 2022) the audit comments, however, replies were not furnished by CMC and SMC, in this regard. Further, the MCs did not furnish details of the declared buffer zones, in SWDs.

3.1.3 Storm water collection systems

Storm Water Management is the control and use of storm water runoff and includes planning for runoff, maintaining storm water systems and regulating the collection, storage and movement of storm water. It also taken into account drainage, in the design of cities and development of housing units. Water bodies, interconnected with canals/ drains, constitute the basic storm water collection system. Various reports[21] and studies have highlighted the fact that rapid urbanization has increased the demand for land leading to poorly regulated developmental activities in the neighbourhood of water bodies and consequent pressures on the storm water collection systems, as mentioned below:

- encroachment of water bodies and SWDs, resulting in decline in the ground water levels, while increasing instances of flooding
- dumping of solid waste, construction debris *etc*., in SWDs, as well as the catchment areas of lakes and water bodies
- sustained inflow of partially treated or untreated sewerage, polluting existing surfaces and subsurface water sources
- reduced water holding capacity, due to accumulation of silt, debris *etc*.; *and*
- loss of interconnectivity between water bodies.

[21] (i) International Journal of Advance and Innovative Research by Odisha Forestry Sector Development Society, Forest, Environment and Climate Change Department, Bhubaneswar (ii) ITPI Journal on Slum Growth in Bhubaneswar: a problem or solution by Nihar Ranjan Rout, Lecturer, Fakir Mohan University, Balasore, Odisha and (iii) Journal on Planning Violation and Urban Inclusion a study of Bhubaneswar by Indian Institute for Human Settlements.

3.1.3.1 Management of water bodies

Out of 460 Government water bodies, 18 water bodies under Bhubaneswar and Cuttack Municipal Corporations were disused and encroached by the unauthorised construction of buildings, as of March 2022.

Records of the selected MCs revealed that there were large number of water bodies in corporation areas, which had been gradually reduced, due to conversion[22]/ encroachment. The water bodies, in cities, were under the control of different authorities, such as MCs, private owners and the Revenue Department *etc*. Details in regard to the number of water bodies, under the jurisdiction of the five selected MCs, are given in **Table 3.1.**

Table 3.1: Status of the water bodies in the five selected MCs, as of November 2022

Status of the water bodies	No. of water bodies					Total
	BMC	CMC	BeMC	SMC	RMC	
Developed water bodies	12	9	1	12	1	35
To be developed	94	194	21	260	6	575
Disused water bodies	1	17	0	0	0	18
Total	**107**	**220**	**22**	**272**	**7**	**628**
Water bodies owned by Government	81	79	22	272	6	460
Water bodies of private owners	26	141	0	0	1	168

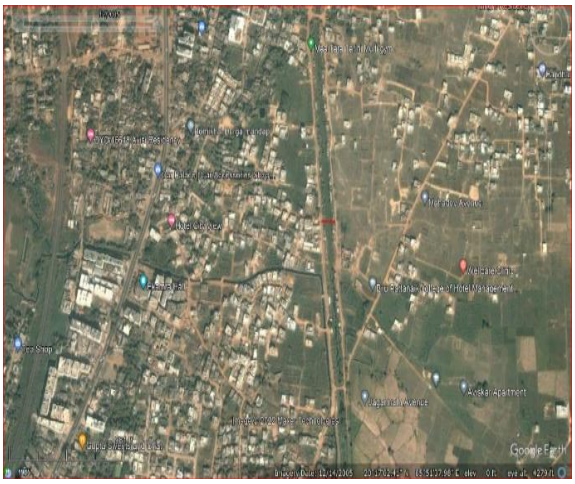
Source: *Information furnished by the selected MCs*

From **Table 3.1**, it may be seen that, out of 628 water bodies, only 460 (73.25 *per cent)* owned by the Government. Out of these, 18 government water bodies, were with a total area of 1.977 acres, had been reported by two MCs[23] as being disused and having been encroached, by the unauthorised construction of buildings, as detailed in ***Appendix-II***.

3.1.4 Reduction in the width of drains

As per the Comprehensive Development Plan (CDP) of Bhubaneswar, (2010), the width of 10 natural drains ranged between 4.9 m and 14.83 m. During JPV with BMC officials, Audit found (14 September 2022) that the width of nine drains (except Drain No. 3) had reduced by two to three meters (approximately) at different stretches and these drains had been surrounded by buildings. Evidence of reduction of the Daya West Canal, under BMC; the Petta Nallah, under CMC; and the Dhobijore Nallah, under SMC, using satellite images from *Google Earth Pro*, is exhibited in the **Satellite Images 1 to 6** (the red marks indicate encroachment over drains/nallahs).

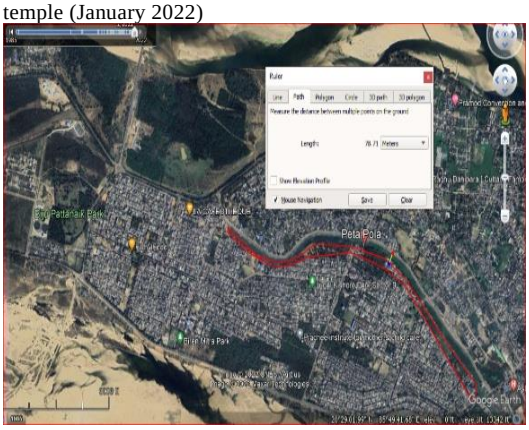
[22] Conversion of water bodies for residential purpose
[23] CMC and BMC



Satellite Image 1: Daya West Canal, at the Tarini temple (December 2005)

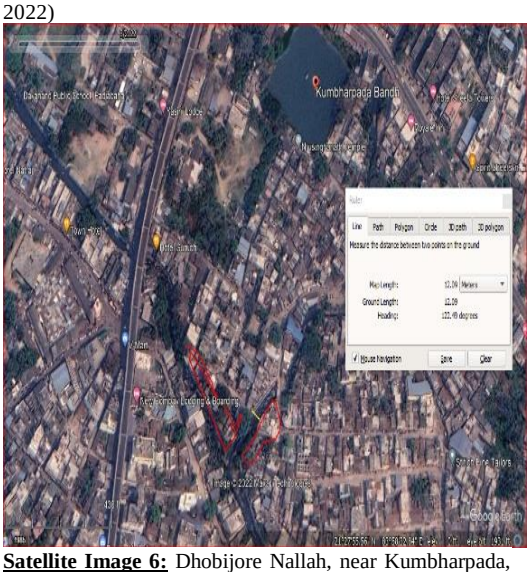
Satellite Image 2: Daya West Canal, at the Tarini temple (January 2022)

Satellite Image 3: Petta Nallah, Cuttack (December 2005)



Satellite Image 4: Petta Nallah, Cuttack (February 2022)

Satellite Image 5: Dhobijore Nallah, near Kumbharpada, Sambalpur (December 2005)



Satellite Image 6: Dhobijore Nallah, near Kumbharpada, Sambalpur (March 2022)

Source: *Google Earth Pro*

Records revealed that BMC had carried out a survey (September 2022) for acquisition of 11.888 acres of private land, to maintain the width of nine natural nallahs, as per the CDP. The land was yet to be acquired (as of October 2022). Due to encroachment of drains, rainwater could not be free flow to the nearest water bodies causing water logging in cities, in rainy seasons. The list of natural drains, available in MCs, as per the CDPs, are

detailed in ***Appendix - III.***

BMC stated (October 2022) that most of the drains were passing through private owned plots; residential houses had been constructed over these plots; and action would be taken for acquisition of land, for widening the drains, as suggested in CDP. The reply is not satisfactory, since BMC had not taken any measure for acquisition of land to maintain these drains, even after creation of a separate Drainage Division, from February 2017 onwards.

3.1.4.1 Development of drains

As per the information furnished by the selected MCs, there were 36 natural drains, in the areas covered by these MCs, having a length of 193.324 km. The development activities, undertaken by these MCs, in regard to these drains, during 2017-22, are detailed in **Table 3.2**.

Table 3.2: Development activities undertaken by the five selected MCs, in natural drains

Municipal Corporation	As of March 2022		Area in which development activities had been carried out/ were in progress/not carried out
	No. of natural drains	Length of drains (*kms*)	
1	***2***	***3***	***4***
Bhubaneswar	10	62.602	Expansion work had been completed only in 11 km, under JNNURM, till 2015. No further expansion works had been taken up.
Rourkela	17	36.139	Cement lining of 9.109 km, in 10 drains, was in progress, under the Smart City Mission.
Cuttack	2	23.043	Construction of drain works, for 23.043 km (including subsidiary drains) was under progress.
Berhampur	2	51.540	In one drain, out of 34.50 km, the development work for 22 km had been completed and three km was under progress. The development works for remaining kms had not been taken up. No development activities had been carried out at another drain, for 17.04 km.
Sambalpur	5	20.000	No Development activities had been carried out at four out of five natural drains.
Total	**36**	**193.324**	**68.152 km**

Source: As per information furnished by the selected MCs

Table 3.2 indicates that development activities had been undertaken for only 68.152 kms of drains, with no development activities in the remaining drains, with a length of 120.249 Kms (63.83 *per cent*), having been undertaken. The MCs had not taken up major works, such as construction, modification and rehabilitation of drains, during the FYs 2017-18 to 2021-22 in the absence of a Master Plan for drainage works, as discussed in **Paragraph 3.2.2**.

Rourkela Smart City Limited (RSCL) stated (December 2022) that unprecedented rain, encroachment and private land along the route, were the major hindrances in the progress of work. BeMC noted the audit comments (November 2022), while BMC did not furnish any specific reply. The compliance of CMC and SMC was awaited.

3.1.5 Storm water conservation systems

As per Chapter 9 of the SWD Manual, 2019, storm water is managed through ground water recharge[24] and rainwater harvesting techniques.

3.1.5.1 Ground water recharge

Paragraph 4.1.1 of the IRC-SP-50-2013 recommended that all storm water drains be efficiently utilised, for the benefit of raising the existing ground water table[25]. This can be achieved by redesigning the existing drainage cross-sections in such a way that storm water starts infiltration into ground at the street level drains itself and continues through tertiary, secondary and primary drains. The guidelines for rooftop rainwater harvesting and ground water recharge, in the urban areas of Odisha (FY 2014-15), recognised ground water as being one of the most important natural resources, with a very wide spatial distribution. These guidelines noted that ground water serves as a major source of domestic water, across the State. As per the water supply and demand status (March 2018) in 114 ULBs, ground water constituted about 41.27 *per cent* of the total public water supply and, thus, played an important role, in so far as water supply was concerned.

The MCs were not taken significant measures to recharge the ground water although the supply of ground water had reduced from 41.27 to 26.11 *per cent* from March 2018 to March 2022, due to depletion in ground water level.

Scrutiny of records of the EIC, PH, Odisha, showed that the supply of ground water had reduced to 26.11 *per cent*[26], as of March 2022, from 41.27 *per cent*, during March 2018, due to depletion of ground water table. The total annual ground water recharge of the State, annual extractable ground water resources and annual ground water extraction, from 2017 to 2022, is shown in **Table 3.3.**

Table 3.3: Annual ground water recharge, extractable ground water resources and extraction, during 2017-22

Years of dynamic ground water resource assessment of India	Total estimated ground water recharge of the State *(in bcm)*	Annual extractable ground water resource *(in bcm)*	Annual ground water extraction *(in bcm)*	Percentage of ground water extraction
1	***2***	***3***	***4***	***5***
2017	16.74	15.57	6.57	42
2020	17.08	15.7	6.86	43.7
2022	17.79	16.34	7.23	44.25

Source: *Dynamic Ground Water Resources Assessment of India by CGWB, GoI*

From **Table 3.3**, it can be seen that ground water extraction was on an increasing trend and, according to extraction, the yearly recharge was not

[24] Recharge: Replenishment of groundwater, by downward infiltration of water, from rainfall, streams and other sources. 'Natural recharge' occurs without assistance or manual enhancement. 'Artificial recharge' occurs when the natural recharge pattern is modified deliberately, to increase recharge

[25] Free surface of the underground water that is frequently subjected to conditions such as fluctuating atmospheric pressure, with the seasons, withdrawal rates and restoration rates. Therefore, the groundwater table is seldom static

[26] Water supplied from ground water for drinking of 114 ULBs was 328.23 MLD / total water supplied from all sources during March 2022 to 114 ULBs was 1256.84 MLD X 100 = 26.11 *per cent*

increased proportionately, resulting water table of these areas are going depleting year on year.

SE, Drainage Division, BMC, stated (October 2022) that action would be taken for construction of ground water recharge pits, in different wards, however, the remaining MCs had not furnished any reply. The reply is not acceptable, as non-construction of suitable structures for artificial groundwater recharge, had led to large volumes of storm water runoff to rivers/ nallahs and wastage of surface water.

3.1.5.2 Rainwater harvesting structures

GoO launched (FY 2014-15) a scheme for rainwater conservation and ground water recharge, through adoption of rooftop rainwater harvesting systems (RRHS), in private and Government buildings, in all the ULBs.

Records of the Director of Ground Water Development, GoO, showed that the Department had constructed 9,796 RRHS, between the FYs 2014-15 and 2018-19, in 11 ULBs[27]. However, due to inadequate budget and manpower, no RRHS had been constructed between FYs 2019-20 and 2021-22. A proposal for construction of 31,425 RRHS, during FYs 2022-27, had been deferred (November 2022) by DoWR, for want of evaluation of the previously constructed RRHSs.

Further, the H&UD Department issued (April 2022) a Standard Operating Procedure (SOP) for water conservation, wherein it was decided to achieve 100 *per cent* coverage of all Government buildings and premises, through rainwater harvesting structures (RWHSs), in addition to covering open spaces, parks and playgrounds *etc*., to ensure that 100 *per cent* surface runoff was harvested. Accordingly, it was planned to construct 20,000 RWHSs in ULBs, with their completion being envisaged by June 2022.

Records of the H&UD Department and MCs showed that work orders had been issued (April to September 2022) for 23,716 RWHSs, in 114 ULBs, for an amount of ₹43.95 crore, under the Mukhya Mantri Karma Tatpara Abhiyan (MUKTA) scheme. Out of these, 19,843 RWHSs had been completed and 3,873 were in progress (as of September 2022). Similarly, under MUKTA scheme, in the five selected MCs, out of 5,604 RWHSs for which work orders had been issued, 2,767 (49.38 *per cent*) had been completed and the remaining 2,837 RWHSs were in progress (as of September 2022). Details of the water table, targets, work orders issued and completed RWHSs, in the five selected MCs is shown in **Table 3.4.**

[27] Angul, Berhampur, Bhubaneswar, Balangir, Cuttack, Jharsuguda, Puri, Rourkela, Sambalpur, Talcher and Titilagarh

Table 3.4: Water table and target, work orders issued and RWHSs completed (as of November 2022)

MC	Water Table (pre- monsoon) during April 2021 *(in mbgl[28])*	Water Table (post-monsoon) November 2021 *(in mbgl)*	No. of RWHSs proposed	No. of work orders issued	No. of work orders less issued (+) / excess issued (-)	No. of RWHSs completed (as of November 2022)
1	*2*	*3*	*4*	*5*	*6*	*7*
Bhubaneswar	0.55 to 8.70	0.25 to 8.00	3,000	799	2,201	0
Cuttack	0.17 to 4.75	0.30 to 5.06	500	290	210	190
Berhampur	1.06 to 9.30	0.28 to 5.13	2,000	713	1287	354
Rourkela	0.52 to 12.23	0.10 to 7.80	2,000	2,020	(-) 20	2,016
Sambalpur	0.99 to 11.70	0.60 to 8.70	1,500	1,782	(-) 282	207
Total			**9,000**	**5,604**	**3,396**	**2,767**

Source: Ground Water yearbook: 2021-22 of the CGWB and figures furnished by the H&UD Department

From **Table 3.4,** it may be observed that:

- Due to extreme hot weather, the water table of the above MCs decreased in pre-monsoon period and causing water scarcity which needs more ground water recharge.
- Although there had been significant depletion of ground water in Bhubaneswar and 3,000 RWHSs had been proposed for construction, however, only 799 work orders had been issued (26.63 *per cent* only). Further, out of the 799 work orders issued, no RWHSs had been completed (as of September 2022).
- The water table, in the area under Cuttack, MC, had been higher than the other MC areas, during the pre-monsoon period. Out of 500 RWHSs proposed, work orders had been issued only for 290 RWHSs (58 *per cent* only). As per the information furnished (November 2022) by the CMC, out of 500 RWHSs, only 190 RWHSs (38 *per cent*) had been completed, incurring an expenditure of ₹51.41 lakh (as of November 2022).
- Out of the 2,000 RWHSs, proposed in Berhampur, where the water table had ranged between 1.06 and 9.30 in the pre-monsoon period, work orders had been issued only for 713 (35.65 *per cent)* RWHSs and only 354 (17.70 *per cent)* RWHSs had been completed.

Audit observed that the work orders for RWHSs had been issued without pre-feasibility reports of the Ground Water Survey and Investigation, as required, *vide* para 4 (e) of guidelines issued (2014-15) by the DoWR. The delay in their completion by more than six months, due to which the completion rate had been only 49.38 *per cent*. Further, as per the SOP, ULBs had to maintain records and related information, including measurement books, in the prescribed manner. However, no such records had been maintained by these MCs.

The Government stated (April 2023) that around 9,343[29] RWHS were constructed in five MCs during 2021-22. Further, stated that the H&UD

[28] Meter below ground level

[29] Bhubaneswar 4,562, Berhampur 673, Cuttack 218, Rourkela 2,583 and Sambalpur 1,307 RWHSs

Department had issued SOP for facilitating smooth execution and maintenance of RWHSs and ULBs were directed to ensure periodic maintenance of all the RWHSs implemented during last two years. The reply of Government was factually incorrect, since MCs had issued 5,604 work orders for construction of RWHS as of September 2022. However, the fact remained that the failure of these MCs, to complete the RWHSs in a timely manner, before the monsoons, had led to failure to tap 100 *per cent* of the rainwater runoff, during July to October 2022, for ground water recharge. Thus, the objective of tapping 100 *per cent* rainwater runoff for ground water recharge had remained unachieved.

3.1.5.3 Non-linking of SWDs with water bodies for ground water recharge

Records of the five selected MCs revealed that not all the SWDs had been interlinked with water bodies/ ponds/ tanks, for the purpose of: (i) ground water recharge and (ii) rainwater runoff, for recharge of water bodies. Particularly, in Cuttack, where perennial rivers are flowing, 17 water bodies had remained disused, due to absence of interlinking, which was indicative of laxity in planning.

BMC stated (October 2022) that, after completion of STPs, the possibility of interlinking the SWDs, with the water bodies, would be surveyed and, if feasible, interlinking work would be taken up. SMC stated (May 2023) that there was natural connection of storm water drains and wherever feasible, inlet points were given for entry of storm water to water bodies. The other MCs did not furnish any specific replies. The reply is not acceptable, as the untreated water, combined with rainwater, had percolated into the ground and the purpose of linking the SWDs with the water bodies had remained unachieved.

3.1.5.4 Impact of concretisation of storm water drains

Paragraph 4.1.1 of the IRC-SP-50-2013, recommended that the depleted ground water in urban conglomerates all storm water drains shall be efficiently utilized for the benefit of raising the existing ground water table. This can be achieved by redesigning the existing drainage cross sections in such a way that storm water starts infiltration into ground at street level drain itself and continued through tertiary drains, secondary drains and primary drains. It shall be commendable if ground water recharging starts at the initial point of side drain of road itself.

Scrutiny of estimates and related records of the five selected MCs, relating to execution of SWDs, revealed that the flow paths/ beds of storm water drains had been concretized without provision of infiltration facilities, in deviation to above IRC provision, which had affected the ground water recharge. Further, the concretization of SWDs had also aggravated vulnerability to frequent floods, in all the five MCs, due to non-infiltration of water, as discussed in **Paragraphs 3.2.2.1, 5.2.1 and 5.2.2.3**.

BMC stated (October 2022) that, for free flow of water and self-cleaning, cement lining had been provided in the beds of the drains. The reply is not

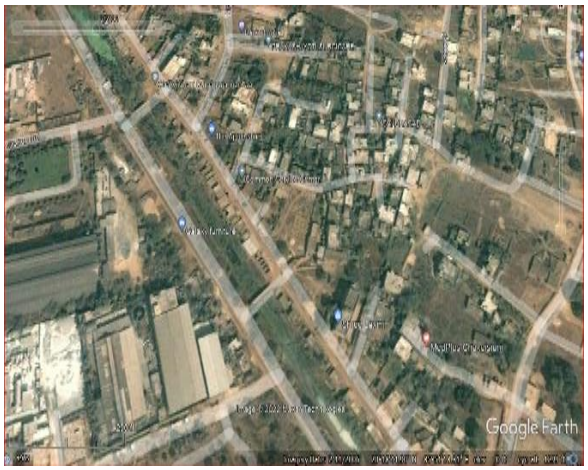
satisfactory, as the concrete drains had not provided any infiltration facilities, which were preventing the natural absorption of water for ground water recharge. The other MCs did not furnish any specific replies.

3.1.6 Other factors affecting the conservation of storm water drains

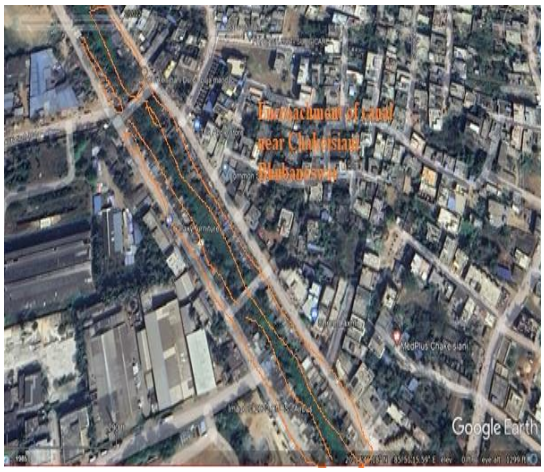
Paragraph 4.1.1 of the NDM guidelines, 2010, stated that rapid urbanisation resulted in increased impermeable surfaces, in the form of pavements, roads and built-up areas, reducing the infiltration and natural storage.

Audit observed that the population growth rate of the five selected MCs had been very high[30] during the FYs 2017-22 and the urban areas of these MCs had increased between 53.30 and 303 sq. km. (as of September 2022)[31]. As per the Annual Action Plan of Department and information furnished by the ORSAC, it had been noticed that due to rapid urbanisation of these MCs, there had been decrease in agriculture land, low lying areas, increase in the built-up areas of roads and consequential decrease in the infiltration areas for the SWDs. However, no complete and accurate data had been maintained by the Department/ ORSAC/ Statistics Department, to arrive at the dynamic land use pattern, over a period. Audit obtained details of the land use pattern changes, by using timeline images of the congestion resulting from rapid urbanisation in these MCs, from *Google Earth Pro.* These changes are visible in **Satellite images 7 to 12**.

Due to population growth, urban areas of five MCs had increased between 53.30 and 303 sq. km. This resulted in rapid urbanisation of these MCs and there had been increase in the built-up areas of roads and consequential decrease in the infiltration areas for the SWDs.



Satellite image 7: Image of Daya West canal at Chakeisiani, Bhubaneswar (February 2006)

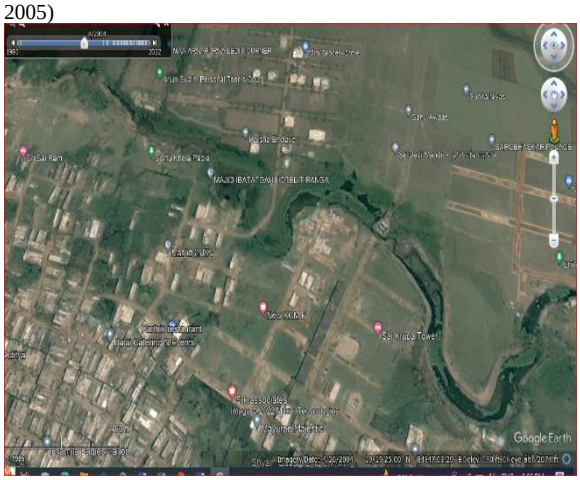


Satellite image 8: Encroachment of Daya west canal at Chakeisiani, of Bhubaneswar (February 2022)

[30] As per Annual Action Plan 2017-18 of H&UD Department
[31] As per profiles of MCs, available on web sites

Satellite image 9: Petta Nallah in CDA area of CMC (December 2005)

Satellite image 10: Encroachment of Petta Nallah in CDA area of CMC (February 2022)



Satellite image 11: Bahana nallah, near Haris Enclave, BeMC area (April 2004)

Satellite image 12: Encroachment of Bahana nallah, near Haris Enclave, BeMC area (July 2022)

BMC stated (October 2022) that, due to rapid growth in urbanisation; increase in cement flooring and roads; bituminous roads; decrease in wetlands and low lying areas, there was less scope for infiltration and ground water recharge in the cities and the matter would be brought to the notice of the Administration, for remedial measures. The other MCs did not furnish any specific reply.

The reply is not satisfactory, since failure, in terms of City planning, by the MCs and DAs, had led to reduction in the low-lying areas, water bodies and drains. Further, the increase in residential areas, commercial areas and roads, had affected infiltration and ground water recharge.

3.2 Planning for construction of storm water drainage and sewerage systems

3.2.1 Preparation of Comprehensive Development Plans

Section 29 (1) of the Odisha Town Planning and Improvement Trust Act, 1956, provides that the Planning Authorities[32] should undertake and complete civic surveys of their areas within two years and submit Comprehensive

[32] Municipal Corporations: Bhubaneswar, Cuttack, Berhampur, Sambalpur and Rourkela

Development Plans (CDPs)/Master Plans[33] (MPs), to the State Government, through the Director, Town Planning of the State, within four years from the date of issue of notification[34] for creation of ULBs.

Scrutiny of records of the selected MCs showed that the CDPs for Berhampur, (August 2015), Bhubaneswar (January 2010) and Cuttack (July 2012), had been prepared with delays ranging from 2.7 to 13.11 years, while the CDPs for Sambalpur and Rourkela had not been prepared (as of May 2023)[35].

The Government stated (May 2023) that CDPs of Rourkela and Sambalpur were under process and would be finalized very soon.

The impact of these delays, in preparation of these CDPs, is analysed and discussed below.

3.2.1.1 Delays in finalisation of Comprehensive Development Plans led to unfruitful expenditure

GoO released (February 2008 to July 2009) ₹1.72 crore[36], for preparation of the CDPs of Rourkela and Sambalpur. Agreements were executed (August 2008 and January 2009), for submission of these draft CDPs, by December 2009 and August 2010, respectively. The concerned agencies were paid ₹1.34 crore[37] for the purpose. They submitted [March 2012 (Sambalpur) and May 2015 (Rourkela)], the draft CDPs, with delays of more than one and half to five and half years. RDA submitted (as of November 2019) the modified CDP of Rourkela, to GoO, for approval, with a delay of four years. The CDP had not been approved (as of November 2022). SDA discussed 200 out of 1,078 objections received (upto December 2022) from the public, relating to the alignment of roads/drains and land use. The draft CDPs of both cities had not been finalised, even after lapse of seven and 10 years, from the dates of submission. Due to these delays, development activities (like sewerage and drainage networks) could not be commenced and undertaken in Rourkela and Sambalpur, rendering the expenditure of ₹1.34 crore unfruitful.

Delay in finalisation of Comprehensive Development Plans for Sambalpur and Rourkela MCs for more than seven and 10 years, resulted in non-commencement and partial completion of developmental activities for drain and sewerage works.

The Government stated (May 2023) that though RDA submitted modified CDP to GoO in November 2019, it was not authenticated by the Planning Member (PM) and Vice-Chairman of RDA. In the meantime, PM has authenticated the same and it would be approved very soon by observing statutory procedures. In regard, CDP for Sambalpur town, Government further stated that no final CDP had been submitted by SDA before GoO, for approval. The fact, however, remained that, due to delay in finalising the

[33] A Master Plan includes analysis, recommendations and proposals for a site's population, economy, housing, transportation, community facilities and land use. It is based on public inputs, surveys, planning initiatives, existing development, physical characteristics and social and economic conditions

[34] Date of notification for creation of ULBs: i) BMC: July 1994; ii) CMC: August 1994; iii) BeMC: December 2008; iv) SMC: November 2013 and v) RMC: November 2014

[35] Due date for preparation of CDPs by MCs: Bhubaneswar (July 1998), Cuttack (August 1998), Berhampur (December 2012), Sambalpur (November 2017) and Rourkela (November 2018)

[36] ₹90.78 lakh for Sambalpur and ₹81 lakh for Rourkela

[37] ₹73.98 lakh for Sambalpur (as of October 2022) and ₹59.80 lakh for Rourkela (as of July 2021)

CDPs, development works like drainage and sewerage works could not be completed/ taken up in these two MCs and there had been changes in the land use patterns, due to urbanisation of these cities also. Thus, the expenditure incurred was likely to be unfruitful.

3.2.1.2 Delays in revision/review of Comprehensive Development Plans

Non-revision of CDPs of Bhubaneswar, Cuttack and Berhampur periodically, resulted in non-commencement and partial completion of developmental activities for drain and sewerage works.

As per Clause 38 of the Odisha Town Planning and Improvement Trust Rules 1975, after approval of the CDP, at least once in every five years, the concerned Planning Authority was to prepare and submit, to the Director/ GoO, a new plan, incorporating the alternations/additions to be substituted in the CDP in operation, after carrying out a fresh survey. Paragraph 1.5.3 of the Urban and Regional Development Plans formulation and implementation guidelines, 2015, GoI, also stipulated that the CDP should be periodically reviewed and plan revision/ evaluation, after every five years, must be built in as a permanent process, to be mandatorily carried out at the completion of the planning period.

Audit observed that, although three Development Authorities (DAs)[38] had notified their CDPs, between January 2010 and August 2015, they had neither evaluated/ reviewed the progress and achievements against the CDPs, nor had they revised the CDPs, even after completion of five years (as of September 2022).

The Government stated (May 2023) that though there was provision for revision of Master Plan in every five years, the exercise could not be taken up, as there had not been any budget provision. The reply is not acceptable, since budget provision for revision of CDPs was vested with the Government. The fact remained that delay in revision of CDPs, based on present requirements, had led to water logging/ flooding in cities, due to lack of planning for storm water and sewerage management, as discussed in the subsequent Chapters.

3.2.1.3 Deficiencies in the Comprehensive Development Plans

Audit observed that three CDPs[39], which had been approved between 2010 and 2015, with validity up to 2030-31, had provided for natural drains only and had not provided details of the water bodies, or the secondary and tertiary drains, with their catchment areas, within the respective Corporation areas. In the absence of such details, encroachment/ disruption of flow in these water bodies and drains, could not be analysed. The deficiencies noticed in these CDPs are discussed below:

- Though these CDPs had recognized the importance of having buffer zones for different types of SWDs, it had not classified the drains as required and, hence, had not notified 'no development areas' along the drains. As a result, the required buffer zones, around/ along the water bodies/ water ways, had neither been marked, nor maintained.
- Though primary drains had been mapped in these CDPs, the secondary and tertiary drains had not been shown in the CDP maps of BMC and BeMC.

[38] Bhubaneswar (January 2010), Berhampur (August 2015) and Cuttack (July 2012)
[39] Bhubaneswar, Berhampur and Cuttack

- The 'CDP' for Berhampur had not provided the details of natural drains, or their length and width, for the purpose of their maintenance.
- Though primary drains had been mapped in CDPs, the related land titles and volume of land to be acquired for widening of these drains, had not been mentioned.
- These three CDPs had not provided for reclamation of low-lying wetlands.

Due to above deficiencies in the CDPs, proper drainage systems could not be implemented and the purpose behind preparation of the CDPs had not been achieved.

While noting all Audit comments, the Government stated (May 2023) that the land title and area of land to be acquired for widening of drains is not practical to specify in CDP. The same is to be identified at the time of acquisition of land as it can be changed from time to time. However, the fact remained that delay in acquisition of land for widening of drains led to encroachment of drains.

3.2.1.4 Non preparation of Zonal Development Plan

Section 10 of the Odisha Development Authority (ODA) Act, 1982, stipulates that Zonal Development Plans (ZDPs) are to be prepared, further sub-dividing the plan areas into various zones for development, simultaneously with the preparation of CDPs. ZDPs may contain provisions regarding the amenities (including drainage and sewerage) to be provided in relation to any sites, or the buildings on such sites, whether before or after the erection of these buildings and the persons or authorities by whom, or at whose expenses, such amenities are to be provided. Section 11(2) of the above Act also stipulates that DAs are to submit the ZDPs, after their preparation, for approval by Government.

Audit observed that none of the five DAs had either prepared ZDPs, or fixed any timelines for their preparation (as of November 2022), due to which proper zonal development activities for storm water drainage and sewerage projects could not be taken up by MCs. Consequently, cities were facing frequent flooding and water logging, as discussed in **Paragraph 3.2.2**.

BeDA stated (November 2022) that preparation of ZDP would be discussed and action would be taken. RDA stated (November 2022) that the ZDP would be taken up, after getting approval of the CDP of Rourkela. Replies of other DAs were awaited (as of March 2023). BeMC stated (May 2023) that ZDP for BeMC is under progress and necessary steps would be taken by the planning officer for approval for its implementation. RMC noted (April 2023) the audit comments. Replies of other MCs were awaited (as of March 2023). These replies are not acceptable, as ZDPs are required, to enable MCs to take up zone-wise development works simultaneously with CDP.

3.2.2 Master plans for storm water drainage management

3.2.2.1 Non-preparation of Detailed Project Reports and Master Plans for storm water drainage management

Non-preparation of detailed project reports and Master Plans for storm water drainages by MCs leading to water logging in rainy seasons.

Paragraph 2.13 of the SWD Manual, 2019, stipulates that, before commencement of storm water drain work, feasibility reports are to be prepared, followed by DPRs. Paragraph 5.1 of IRC-SP-50-2013, stipulates that Master Plans (MPs), of the existing networks of primary and secondary drains, are to be prepared for every city or town, for future guidance, and to check any encroachment or diversion of drains by individuals, particularly in new layouts. Paragraph 2.12 of the SWD Manual also stipulates that Drainage Master Plans (DMPs) should be prepared in consonance with the city MPs, keeping in view the land use plans of the cities.

Scrutiny of records of the selected MCs showed that, out of these five MCs, three[40] had not prepared DPRs, during the FYs 2017-18 to 2021-2022. The other two MCs, *viz*. RMC and BeMC, had prepared DPRs during the FYs 2012-13 and 2016-17, respectively, by incurring an expenditure of ₹ 2.64 crore[41]. Out of 14 priority drains[42] in BeMC, DPRs had been prepared only for five. However, RMC had not executed any drain works, even after a lapse of 10 years from 2012-13, due to non-sanction of its DPR by Government (2012-13), rendering the expenditure of ₹50.30 lakh, incurred on preparation of the DPR, unfruitful (November 2022).

In reply, BMC stated (October 2022) that, after preparation of the MP for the city, DPR would be prepared for SWDs. The reply is not satisfactory, as feasibility study and DPR are mandatory and execution of works, without DPR, was in violation of the SWD manual.

Audit also noted that:

1. The BeMC had prepared (2017) its DMP, while the other four MCs had not prepared any DMPs (as of September 2022).

2. The H&UD Department had released (February 2021/ December 2021) ₹66.66 crore, to 30 ULBs, for preparation of their DMPs, from 5th SFC grants, which included ₹ two crore to BeMC for preparation of its DMP. As BeMC had already prepared its DMP, it had parked the amount of ₹ two crore, allotted to it for this purpose, in its PL account, without utilising/ refunding it to the Department. BeMC stated (May 2023) that the unutilized amount would be used for construction of other drains, as per action plan. The reply is not tenable, since BeMC had already prepared the DMP, the above fund had to be refunded to GoO with interest.

3. The SE, Drainage, BMC, sought (September 2021) permission of the H&UD Department, for preparation of DMP, taking into account the

[40] BMC, CMC and SMC
[41] RMC: ₹50.30 lakh and BeMC: ₹ 2.14 crore
[42] Main drains or meeting point of secondary and tertiary drains

present requirements for Bhubaneswar city, as the CDP for Bhubaneswar had been prepared in 2010. The request was pending for grant of permission, even after a lapse of one year (as of September 2022).

Further, verification of records, showed that realignment[43], re-sectioning[44], proper gradient[45]/ slope to bed and walls of drains[46], had not been executed and hydraulic parameters[47] had not been considered, while framing estimates for drain works. In the absence of DMPs, primary and secondary drains had been constructed without considering the rainfall data, or the required width that was necessary for discharging the water to the main drains. The secondary and tertiary drains had also not been linked with the primary drains. As a result, the drains could not discharge the storm water promptly, causing urban flooding during the rainy season, which was indicative of the lackadaisical attitude of the departmental engineers. **Photographs- 1 to 4 and QR code** from newspapers and electronic media, relating to recent floods (during July 2022 to September 2022), are exhibited below:

https://youtu.be/ZnQwX7roFnw
Water logging at BMC on 15 July 2023 as reported by OTV

Photograph 1: Water logging at the Bomikhal flyover bridge, Bhubaneswar, e-Prameya (newspaper dated 27.09.2022)

Photograph 2: Water logging at the Baramunda flyover, Bhubaneswar, e-Prameya (newspaper dated 27.09.2022)

Photograph 3: Water logging near Bisra Chhak, Rourkela (3 July 2022)

Photograph 4: Water logging at a low lying area of Sambalpur (14 August 2022)

In reply, BeDA stated (November 2022) that the matter would be placed in the next meeting of the board. RDA stated (November 2022) that, after approval of the CDP by Government, SWD projects would be implemented, subject to the availability of funds. BMC stated (October 2022) that the DMP proposal

[43] Re-alignment: revised vertical distance of the drain

[44] Re-sectioning: revised designing which includes trimming and excavation of earth work for drains

[45] Proper gradient: sectioning the drain into proper slope so that water can freely moved from upstream to down stream

[46] Without re-sectioning, proper gradient/ slope to the bed and wall of drains, there would be soil erosion and damage to the drain and protect the free flow of water

[47] Hydraulic parameters means catchment area of the drains for receiving rain water, rain fall data of the that area and flood data

was pending with the Government. SMC stated (May 2023) that, the expression of interest (EOI) for storm water drainage master plan was sent (May 2022) to Chief Engineer-cum-Additional Secretary, H&UD Department for necessary approval which was pending at the Government level. RMC stated (April 2023) that, fresh DPR for preparation of comprehensive SWD system, of Rourkela, in consonance with CDP Rourkela would be invited. The fact, however, remained that the developmental activities for SWD systems, had not been taken up by the MCs, in the absence of DMPs. Non-execution of state works had led to water logging in various parts of the cities, during the rainy seasons. Reply from the CMC was awaited (as of July 2024).

3.2.2.2 Absence of comprehensive storm water drainage inventory

Paragraph 4.5.1 of the NDM guidelines, 2010, stipulates that all ULBs/ State shall prepare an inventory of the existing SWD system, on a GIS[48] platform. The inventory was to be both watershed-based and ward-based, with clear mapping of the major, as well as minor, systems. Further, each road was supposed to have drains on both sides, for collecting storm water, which would ultimately lead into primary/ secondary SWDs, to allow runoff.

Scrutiny of records of the selected MCs revealed that none of them had maintained the SWD inventory, as required. Also, the engineering wings of these MCs, which were responsible for the construction and designing of SWDs, did not possess comprehensive data of different roads and tertiary/ surface roadside drains, within their jurisdictions. Absence of a comprehensive inventory of drains, with the MCs and the failure of the MCs to classify them properly, had led to lack of detailed information like drain number and locations, date on which last improvement work was taken up, rainfall data of the area, run off, year of urban flooding in this drain locations including in regard to buffer zones. This, in turn, had hampered regular maintenance of the drains and provided space for laying of other utilities like construction of buildings and encroachments.

Further, Audit observed, during JPV of drain sites in MCs, that many utility services had been laid across the drains, in many locations, obstructing the flow in these drains. Two instances are as shown in **Photographs 5 and 6.**

Photograph 5: Old damaged water supply pipe line in the Gangua nallah, near the Palasuni bridge, Bhubaneswar

Photograph 6: Water supply pipe passing through the drain near Sreeleathers Patia, Bhubaneswar

In reply, BMC noted the audit comments (October 2022) for future guidance. While BeMC stated that the database of drains was being maintained

[48] Geographic Information System

separately, details of the said database were not furnished to Audit. RMC stated (April 2023) that, inventory of existing SWD system with mapping of major and minor systems in both watersheds-based and ward-based would be taken up. Replies were awaited from CMC and SMC (as of July 2024). The fact thus, remained that, lack of a comprehensive inventory of the SWD, had led to improper management of drains.

3.2.3 Designing of roads and drains for storm water drainage

Paragraph 4.1 of the SWD Manual 2019, by CPHEEO[49], stipulates that the essential requirement of designing for an SWD system is the proper estimation of storm runoff, to downstream drains or the point of disposal. This has a bearing on optimizing the cost of infrastructure as well as its performance. Parameters such as rainfall intensity, imperviousness factor[50], runoff coefficient[51], recurrence period[52], climate change and identification/ zoning of drainage catchment[53], play an important role in runoff estimation. Paragraph 4.11.1 of the NDM guidelines, 2010, states that the projected rate of urbanization is imperative, for considering a 50-year planning horizon. The guidelines mention that: (i) due to developments that are bound to take place during this period, it is difficult to upgrade the underground drains, once they are laid and (ii) accordingly, all future drainage plans for urban areas should be carried out, taking these factors into consideration. Deficiencies in the design of roads and drains, for storm water drainage, noticed during audit, are discussed in the subsequent paragraphs.

In reply SMC stated (May 2023) that after approval of DPR, all the parameters as per SWD Manual 2019 would be followed. RMC noted (April 2023) the audit comments. The BeMC stated (May 2023) that all the parameters like rainfall intensity, outfall arrangement, inlet and runoff co-efficient, alignment were considered during preparation of Drainage master Plan (DMP). BMC stated (May 2023) that drains constructed were designed as per discharge calculation of runoff in empirical formula so that it would be sufficient for coming 50 years. The replies of MCs were not tenable, since audit did not find any design discharge for runoff calculation of rain water in estimates of drainage works. Reply from the CMC was awaited (as of July 2024).

3.2.3.1 Importance of average annual rainfall

Rainfall data, for a period of six years, from the FYs 2016-17 to 2021-22, of the five selected MCs, revealed that rainfall had been mainly spread across six months with 92 *per cent* of the rainfall occurring between the months of May and October, moreover July and August being the months, with the highest amount of rainfall. Analysis of rainfall data showed that the annual average rainfall, in these five MCs, had been between 763.80 mm and 2,050.30 mm, as shown in **Chart -2**.

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[49] Central Public Health and Environmental Engineering Organisation of Government of India

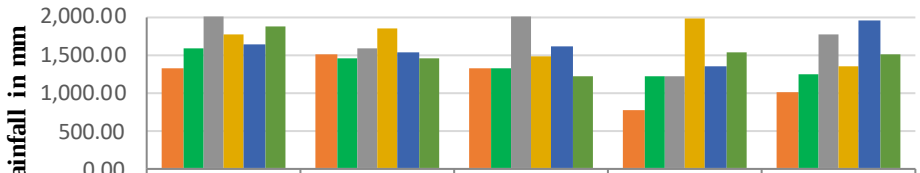
[50] An 'Impervious factor' is a hard area that does not allow water to seep into the ground

[51] Ratio of the volume of water drained during rainfall to the total volume of precipitation during a certain period

[52] Repetitive interval

[53] Drainage Catchment: Water collected from a specific area for the drain

Chart-2: Annual average rainfall in MCs between 2016 to 2021



	BMC	CMC	SMC	BeMC	RMC
2016	1,328.90	1,496.80	1,316.30	763.8	1,014.10
2017	1,588.50	1,463.80	1,330.20	1,220.90	1,240.30
2018	2,023.80	1,584.70	2,050.30	1,210.60	1,770.40
2019	1,761	1,851.10	1,486.30	1,965.20	1,339.20
2020	1,645.80	1,543.20	1,606.90	1,353.90	1,938.20
2021	1,883	1,454.40	1,214.40	1,542.80	1,507

***Source*: Rainfall data provided by IMD, Bhubaneswar**

Scrutiny of the estimates of roads and drains, of these five MCs, showed that rainfall data had not been considered during preparation of the designs of drains for SWDs, due to which, storm water had not been discharged properly, leading to flooding in urban areas.

In reply, RMC stated (December 2022) that steps would be taken to collect Indian Metrological Department (IMD) data, during preparation of DPRs for SWDs. BMC noted (October 2022) the audit observation. BeMC stated (November 2022) that, in future, rainfall data would be utilized during construction of drains. SMC stated (May 2023) that at the time of the preparation of DPR for SWD, it would take necessary consultation from IMD, Central Water Commission and Irrigation Department. Reply from the CMC was awaited (as of March 2023).

3.2.3.2 Non-provision of inlets and outlets in SWDs

Paragraphs 2.4.2.1 and 2.4.2.4 of the SWD Manual, 2019, stipulate the provision of storm water inlets[54] and outlets[55]. Even where open drainage[56] systems are used, inlets are to be connected to open drains, by means of interconnection pipes and need to be hydraulically designed and suitably spaced. The locations of outfall points are to be selected, after: (i) considering the level of surface water of the receiving water bodies and (ii) ensuring that the outfall level is adequately high and well above the High Flood Level[57].

Scrutiny of the records of the selected MCs and PWDs revealed that the selected MCs as well as PWDs had not considered inlet and outlet provisions in the SWDs. Details of inlets and outlets had not been provided, in the designs appended to the sanctioned estimates, by these MCs and PWDs, for

[54] Inlet is a form of connection between the surface of a ground and a drain or sewer for the admission of surface and storm water runoff.

[55] Drain outlet means the lowest end of the main or secondary drain to which a sewer connection is made.

[56] Drains constructed without cover slabs.

[57] HFL is the maximum level to which a body of water could rise, due to rainwater and runoff during a flooding event.

ensuring smooth flow of storm water. Some such instances, noticed during JPV with departmental engineers, are shown in **Photographs 7 and 8**.

Photograph 7: Drain near Ashra, at Unit-III, Bhubaneswar, showing no inlet and outlet provisions

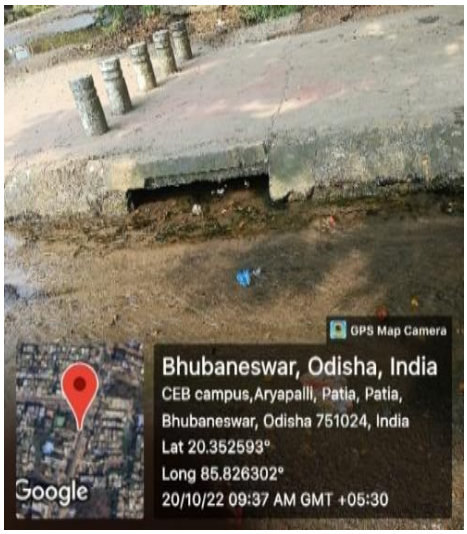
Photograph 8: Drain near Utkal Hospital, Bhubaneswar, showing no inlet and outlet provisions

It was further noticed that:

1. The drain constructed near the KIIT square, under BMC, was above the level of road, resulting in pushback of rain water to the road, causing damage to the road and traffic congestion, leading to inconvenience to the public.

2. The PWDs had constructed a layer, over the existing bituminous (BT) road, without removing the existing BT surface layer, resulting in closures of the inlet mouths, provided in the roadside drains, causing water logging. Two instances are shown in **Photographs 9 and 10.**

Photograph 9: Beherasahi road, IRC village PWD road, BMC



Photograph 10: Near Koil campus road, Patia-Nandankan road BMC

3. In another case, there was a difference in the level of the new drain constructed by the R&B Division No. I, Bhubaneswar, and the existing BMC drain from Pandav Nagar to Jagannath Ashram Chowk, which had led to water logging.

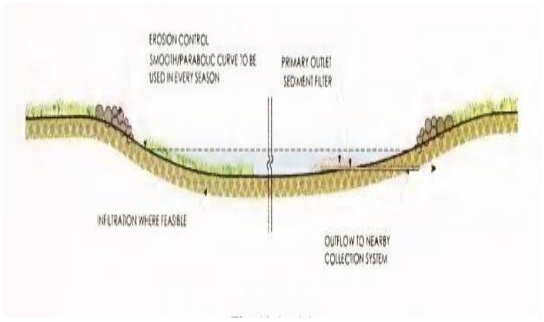
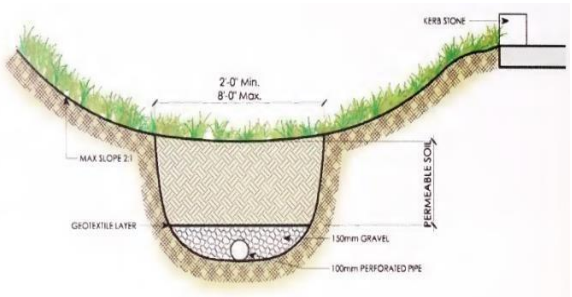
In reply, the SE, Drainage Division of BMC, stated (October 2022) that action would be taken for survey of all drains, for linkages with the main drains, so that water can flow freely to downstream.

SMC stated (May 2023) that the provision of inlets and outlets in SWDs in accordance with SWD manual 2019, will be followed in consultation with PWD and Irrigation Department. RMC stated (April 2023) that inlets and outlets would be prepared and appended to the estimates. BeMC stated (May 2023) that the inlets and outlets had been considered during preparation of drainage master plan. The above deficiencies indicate lack of planning, by the departmental officials, in the construction of SWDs. Reply from the CMC was awaited (as of March 2023).

3.2.3.3 Non-provision of retention and detention structures

Non-provision of retention facilities and detention ponds for storm water, along with the urban roads, led to water logging and urban flooding.

Paragraph 4.19.1 of the NDM guidelines 2010, stipulates that the urban storm water management systems are to include detention ponds[58] and retention system[59], to mitigate the negative impact of urbanisation on storm water drainage.

Typical cross-section of Detention Pond	Typical cross-section of Retention System
	
Photograph – 11	**Photograph – 12**

***Source*: IRC-SP-50-2013 paragraph 10.1 v (a)**

Scrutiny of estimates, for the SWDs of the selected MCs, showed that the estimates (for FYs 2017-22) for construction/ improvements to SWDs, had been executed, without any provision for detention ponds, retention facilities and infiltration facilities in the drains, along with pavements of roads. These MCs had also not built sump tanks[60], under bridges and flyovers, leading to roads getting inundated during rains. Most of the storm water drains also had not linked with primary drains as discussed in **Paragraph 3.2.2.** Thus, storm water runoff could not be discharged from the catchment area in an efficient and timely manner.

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[58] 'Detention ponds' are temporary holding areas for storm water that store peak flows and slowly release them, reducing the demand on treatment facilities during storm events and prevent flooding (Reference: Paragraph 10.1(v) of the IRC guidelines)

[59] 'Retention Systems' are extended detention facilities, infiltration basins and swales (channels designed to store and/or convey runoff and remove pollutants), that can be used for water supply, recreation, pollutant removal, aesthetics and recharging of ground water. (Reference: Paragraph 10.1(v) of the IRC guidelines)

[60] It is usually used for large water tank storage and can be built cheaply using cement-like materials. It is usually part of a rainwater harvesting system, where the rainwater gets channeled into the tank, then pumped out for use.

BMC noted (October 2022) the Audit observation. RMC stated (April 2023) that provision for detention ponds, retention facilities, infiltration media drains would be explored, as per availability of lands along the existing SWDs. BeMC stated (May 2023) that it had not followed the provisions of infiltration, retention and detention structures in preparation of drainage master plan due to land shortage. CMC and SMC did not furnish any response, as of March 2023.

3.2.3.4 Construction of new roads without proper storm water drainage system and sump tanks

Paragraph 1.1 of the IRC-SP-42-2014, envisages adequate drainage as a primary requirement, for maintaining the structural soundness and functional efficiency of a road. Pavement structures, including subgrade[61], are to be protected from any ingress of water; otherwise, over a period of time, water may weaken the subgrade, by saturating it, and cause distress in the pavement structure. Proper drainage takes away the water from pavement surface quickly and reduces the chances of skidding of vehicles. Further, paragraph 11.1 of the IRC SP 50-2013, stipulates that sump tanks, with storm water pumping stations, are necessary, for removal of storm water, from structures like underpasses, road under bridges, flyovers, low lying areas *etc.*, where roads are required to be depressed, to get minimal vertical clearance.

Photograph 13: Jharpada road near Drain No.7 having no drain facilities

Scrutiny of records of BMC and SMC showed that 268 roads had been constructed during the FYs 2017-18 to 2021-22, with an expenditure of ₹47.32 crore[62], without provision of drainage facilities on either side of the roads. This had led to rainwater not being discharged properly, causing water logging, during the rainy season.

Audit further noticed that, although BMC had identified 31 vulnerable points (i.e. low lying areas, where roads had been constructed lower than the drain alignment) and arranged for temporary pumping, to avoid urban flooding, there had been frequent flooding in NH 16 (near ISKCON temple), during the rainy season, due to absence of sump tanks. **Photographs 14 and 15** show the inundated areas.

[61] Subgrade is that portion of the earth roadbed which after having been constructed to reasonably close conformance with the lines, grades, and cross-sections indicated on the plans, receives the base or surface material. In a fill section, the subgrade is the top of the embankment or the fill

[62] BMC (62 roads for ₹32.79 crore) and SMC (206 roads for ₹14.53 crore)

Photograph 14: Pumping of rain water at Satya vihar on 14 August 2022

Photograph 15: Water logging at Fly over bridge near ISKCON temple Bhubaneswar

While accepting the audit comments, BMC stated (October 2022) that temporary arrangements for pumping had been made, since the existing drain levels were higher than the road level. SMC stated (May 2023) that two pumping stations with mobile pumps were used, as and when required. RMC noted (April 2023) the audit observations. BeMC stated (May 2023) that it could not provide sump tank during the construction of new roads, due to shortage of land. The replies were not acceptable since non-provision of roadside drainage in newly constructed roads by MCs, led to water logging.

3.2.4 Maintenance of the storm water drains

Paragraph 12.2 of the IRC-50-SP-2013, stipulates that a drainage system works best, when it is maintained properly, as designed. Hence, it is necessary that the drains retain their shape and slope, as well as their full cross-sections[63] in the designed manner, during their lifetime, particularly during the monsoons. Thus, pre-monsoon works also need to include continuous cleaning of vulnerable points. The system of maintenance includes periodical inspections, continuous maintenance and special maintenance/ repair for improvement.

3.2.4.1 Periodical inspections and execution of de-silting works of SWDs

Paragraph 12.3 of the IRC 50-SP-2013, stipulates that periodical inspections and maintenance of drains are necessary, as failure of drains is likely to occur, consequent to deficiency in maintenance. Paragraph 12.6 of the IRC-SP-50-2013 envisages that de-silting works of all the drains are to be carried out prior the onset of the monsoon season. Similarly, Paragraph 4.12.4.3(i) of the NDM guidelines, 2010, stipulates that pre-monsoon de-silting of all major drains should be completed by 31st March, of each year. The periodicity of cleaning of drains is to be worked out, based on the local conditions, and strictly followed. De-silting of minor drains is also to be carried out, as part of a regular preventive maintenance schedule.

Scrutiny of records and information, furnished by the selected MCs, revealed the deficiencies discussed below:

- De-silting works had not been carried out by SMC, during the FYs 2017-18 to 2021-22, though it had 464.22 km. of drains.

[63] Cross drainage works is a structure constructed when there is a crossing of canal and natural drain, to prevent the drain water from mixing into canal water.

- De-silting works had been carried out in only 1,061 selective reaches of BMC, CMC, RMC and BeMC, by incurring expenditure of ₹92.41[64] crore, during the FYs 2017-18 to 2021-22, though these four MCs had, 1,863.75 km. of drains.

- Five MCs had outsourced road sweeping works (which included de-silting works). In addition to the above, MCs had entered into separate contracts for de-silting works, without de-scoping the agreement value, for de-silting, from sweeping contracts, resulting in overlapping of works.

- Out of 12 PWDs in five MCs, only two PWDs[65] had taken up de-silting works of roadside PWD drains, in the corporation areas, during 2017-22.

Non-taking up of de-silting works, before the onset of the monsoon season, constituted a violation of the IRC/NDM guidelines. Moreover, execution of de-silting for selective lengths, instead of the complete length of drains, defeated the purpose of de-silting for free flow of water.

While all MCs noted the audit observations, BMC stated (October 2022) that de-silting works had been conducted through open tender (during 2017-22) and the process had taken about two months time for finalisation.

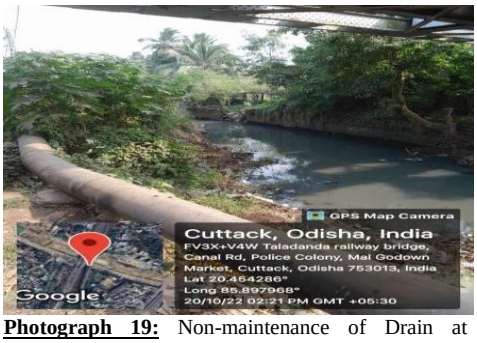
Further, during JPVs of SWDs with departmental engineers, blockages of SWDs had been observed in many places, indicating that periodical inspections and regular maintenance had not been carried out. Some such instances are given in **Photographs 16 to 20**.

Photograph 16: Blockage of Drain at Jayprakash Nagar, Berhampur, due to unwanted vegetation and plastic waste

Photograph 17: Blockage of Daya west canal at Kapilprasad, Bhubaneswar, due to unwanted vegetation

[64] BMC: ₹10.52 crore, RMC: ₹1.94 crore, BeMC: ₹75 crore and CMC: ₹4.95 crore
[65] Bhubaneswar (R&B) Divisions IV and V

Photograph 18: Non-maintenance of Drain at Khetrajpur, Sambalpur



Photograph 19: Non-maintenance of Drain at Matrubhawan, Cuttack

Photograph 20 : Non-maintenance of Drain at Raghunath Palli, Rourkela

BMC stated (October 2022) that action would be taken for periodic surveys, for de-silting and removal of site from water bodies/ drains, as well as periodical maintenance, to avoid choking and overflow during the rainy season. RMC stated (December 2022) that, after the monsoons, vegetation and solid waste were seen, due to dumping of garbage by the inhabitants. BeMC noted (May 2023) the audit comments for future reference. SMC stated (May 2023) that de-silting of the drain works was done regularly, as and when required for free flow of storm water, and CMC did not furnish any reply to audit observations. These replies are not acceptable, since non-maintenance of drains had led to choking of drains and created hindrances for free flow of rainwater.

3.2.4.2 Non-provision of cover slabs over open drains

Municipal Corporations failed to provide adequate safety to commuters by covering the drains with slabs.

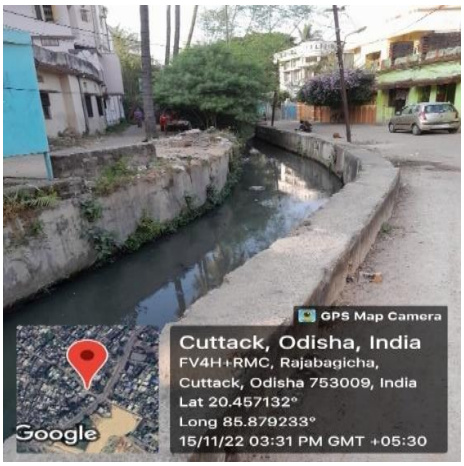
As per instructions issued by GoO (June 2019) for management of drains, MCs were required to ensure cover slabs over drains, to avoid any mishaps and to avoid mixing of solid waste, plastic waste *etc.*, in the SWD systems, which would cause clogging and free flow of drain water. It also reiterated that the Municipal Engineers

Photograph 21: September 19, 2021, a fifteen year old school boy was washed into Drain No.7 of Satabdinagar, Bhubaneswar, due to open drain

would be responsible/ accountable for any mishap, arising out of dereliction in duty/ non-observance of these directions.

During JPV of drains with departmental engineers, it was observed that most of the drains[66] were open and had not been provided with cover slabs. Thus, these MCs had not provided adequate safety to commuters, by covering the drains with slabs. It was noted that seven persons, living in the BMC area, and two persons, living in the CMC area, had died due to open drains, in the last seven years (from 2015-2022). However, the department had not fixed any responsibility for such lapses. Some of these open drains are shown in **Photographs 22 and 23**.

Photograph 22: Drain in front of Kharvel Bhawan Bhubaneswar



Photograph 23: Drain without cover slab near Rajabagicha Cuttack

In reply, BMC stated (October 2022) that action would be taken to: (i) provide cover slabs in secondary and territory drains and (ii) barricade all natural drains, to avoid any mishaps in future. BeMC stated (May 2023) that most of the estimates of drains are incorporated with cover slabs. RMC stated (April 2023) that all newly constructed drains have been provided with cover slab and old open drains have been renovated with cover drains. SMC stated (May 2023) that steps would be taken for covering open drains with cover slabs. CMC did not furnish any specific reply to the audit observations. These replies are not acceptable, since failure to: i) provide cover slabs over drains and (ii) ensure barricading of drains, is a threat to human life.

3.2.5 City Master Plan and City Sanitation Plan, for sewerage management systems

Paragraph 2.4.10 of the Manual on Sewerage and Sewage Treatment Systems (SSTS), 2013, issued by the GoI, stipulates that a City Master Plan (CMP) is to be prepared and a City Sanitation Plan (CSP) is to mandatorily form part of the CMP.

Scrutiny of records of the OWSSB and analysis of data furnished by the selected MCs, showed that the DPRs, for sewerage management systems, had

[66] Drain No.7 of Satabdinagar, drain in front of Kharvel Bhawan, drain in front of State Secretariat, drain in front of Unit – III Girls High School of BMC, drain near Rajabagicha of CMC, drain near Civil Township and Railway Colony of RMC and drains near Khetrajpur and Hirakud to Remed of SMC

been prepared between 2007 and 2017, for four[67] MCs, and CSPs had been prepared and submitted to Government by three MCs[68], in 2017. None of the MCs and OWSSB, had prepared any CMPs, for sewerage management systems, in the urban areas falling under their jurisdiction. The CSPs, prepared by the above mentioned MCs, had not been approved by Government, for more than five years (as of September 2022). In the absence of CMPs and CSPs, none of the sewerage projects had been completed in time, due to frequent changes in their scope/design, which had led to time and cost overruns (as discussed in Chapter V), resulting in the raw sewerage effluents directly entering the nearby rivers and water bodies, creating water pollution, as well as health hazards to public and aquatic creatures.

The Government stated (April 2023) that these executed projects would be made compatible to the city master plan when prepared and further uncovered area would be dealt accordingly. However, the fact remained that DPR for sewerage systems for BeMC was not prepared and CMPs were yet to be prepared.

3.2.6 Inadequate designing capacity of STPs

Paragraph 5.1.4.1 of the Manual on SSTS, 2013, stipulates the norms of: (i) 135 liters per capita per day (lpcd), for water to be consumed by residents and (ii) 80 *per cent* of the water consumed by them, for the sewage generated. The capacities of the STPs were to be fixed, based on the projected population data and the estimated waste generation, for a design period of 30 years.

Scrutiny of records (July 2022) of OWSSB showed that four MCs[69] had constructed nine Sewerage Treatment Plants (STPs), with capacities that were lower than the norms stipulated. Out of these, eight[70] STPs had been functioning only partly, due to non-completion of sewerage lines and one[71] STP was under progress (as of September 2022). Audit worked out the required capacity[72] of the STPs, as shown in **Table 3.5**.

Table 3.5: Design capacity of STPs in five MCs

Sl. No.	Location of STP	Projected Population for a design period of 30 years, based on Census 2011	Required capacity of STPs (*MLD*)	Provided capacity of STPs (*MLD*)	Shortfall in capacity (*MLD*)
1	*2*	*3*	*4*	*5*	*6*
1	Bhubaneswar	22,77,977	246.02	183.50	62.52
2	Cuttack	16,54,758	178.71	85.00	93.71
3	Sambalpur	9,10,543	98.33	40.00	58.33
4	Rourkela	13,16,440	142.18	40.00	102.18
5	Berhampur	9,67,050	104.44	0.00	104.44
	Total	**71,26,768**	**769.68**	**348.50**	**421.18**

Source: *As per population and design capacity provided data furnished by OWSSB and WATCO*

[67] BMC, CMC, RMC and SMC
[68] BMC, CMC and RMC
[69] BMC, CMC, RMC and SMC
[70] BMC (four), CMC (two), SMC (one) and RMC (one)
[71] BMC (one)
[72] Required Design capacity = Population * 80 *per cent* of 135 MLD/10,00,000

Audit observed that, against the requirement of 769.68 MLD capacity, for treatment of sewerage, for the design period of 30 years, OWSSB had provided STPs, with capacity of only 348.50 MLD, for four MCs, which had resulted in under-assessment of 421.18 MLD. Further, no STP had been provided for Berhampur (as of October 2022). Instead, the Department had installed 100 KLD capacity of Septage Treatment Plant[73] (SeTP) between October 2018 and May 2021, incurring an expenditure of ₹5.55 crore, for treatment of household sludge, collected through cesspool vehicles[74], against the requirement of STP of 104.44 MLD, which could not meet the requirement. Thus, OWSSB had permitted designing for capacities that were below the stipulated norms, in the DPRs, resulting in discharge of untreated waste to water bodies.

The Government stated (March 2023) that STPs of adequate capacity were constructed in each MC for treatment of wastewater generated in the city considering projected population 2021. After completion of house sewer connections in the above MCs, all the wastewater generated in the cities would be treated in the STPs. The Government further stated that two SeTPs of 40 and 60 KLD capacity were constructed in BeMC for treatment of sewerage waste generated from households. Reply is not tenable, since STPs were constructed for lesser capacities, in deviation to norms of Sewerage Manual 2013.

3.2.6.1 Non-preparation of DPRs for Sewerage Systems in the Berhampur Municipal Corporation

The CDP of BeMC had recommended (August 2015) setting-up of STPs at Berhampur, as there was no underground sewerage system.

Due to non-provision of sewerage treatment plant for BeMC, the entire sewerage waste generated of 64 MLD as of March 2022, was directly discharged to water bodies.

Scrutiny of records revealed that the work of preparation of the DPR, for sewerage management for BeMC, had been awarded (February 2012) to an agency, at a cost of ₹64.70 lakh, for completion by December 2012. The DPR could not be prepared within the stipulated period. However, payment of ₹14.53 lakh had been made. The contract was subsequently terminated (June 2014). Out of liquidated damages of ₹6.47 lakh, OWSSB adjusted ₹2.02 lakh and the remaining amount of ₹4.45 lakh, was yet to be collected from the agency (as of September 2022).

Fresh tenders had been invited (September 2015), for preparation of the DPR. Though the lowest bidder had quoted (March 2016) an amount of ₹69.80 lakh, the agreement had not been finalized, for reasons not found available on records (September 2022). As such, the DPR had not been prepared, as of September 2022, rendering the expenditure of ₹14.53 lakh unfruitful. No action had been taken against the concerned officer, though the department had directed such action (in June 2014) for delay in completion of the project and mis-management in handling of contract. Due to non-preparation of the DPR, the sewerage project for BeMC could not be taken up and the household

[73] SeTPs are small plants where sludge is treated as settlement basis and in STPs, sewerages are treated in scientific method by using chemicals by aerobic method.

[74] Vehicles which carry sludge from household septic tank to SeTP for treatment

sewerage waste of the corporation area of 64 MLD as of March 2022 is directly discharged into the sea, causing water pollution.

Reply from the Government is awaited (July 2024).

3.2.6.2 Laxity in planning, for connecting the existing sewerage systems to STPs, in Bhubaneswar

As per Paragraph (a) of Section 24 of the Water (Prevention and control of Pollution) Act, 1974, no person shall knowingly cause or permit any poisonous, noxious or polluting matter, determined in accordance with such standards as may be laid down by the State Board, to enter (whether directly or indirectly) into any stream, well, sewer or on land. Paragraph 8 of the IRC: SP: 50-2013 guidelines, also prohibits sewerage drains and their contents, entering into SWDs.

Out of 500.800 km of existing sewerage lines, only 121.16 km had been connected led to discharge of sewer waste to nearby drains, adversely affecting the eco systems. It indicates laxity in planning for connection of existing sewerage line to new two STPs of Bhubaneswar city.

Records of WATCO Division Nos. I and II, revealed that in Bhubaneswar, there were 500.800 km of existing old sewerage lines and 30,760 manhole chambers[75] without STPs and the sewerage generated was being directly discharged to the SWD systems. Four[76] new STPs had been partly commissioned, since December 2020. Accordingly, action was to be taken to connect the existing sewerage lines, with the STPs, to prevent pollution.

It was observed, in this regard, that, out of 322.27 km of sewerage lines under WATCO Division No. II, 121.16 km (37.60 *per cent*) had been connected with two new STPs[77] (as of November 2022) and there had been unauthorized encroachments at 297 places, over 21.82 km of sewer lines and 1,673 manholes, which were creating hindrances in their operation and maintenance (O&M). No action had been taken for removal of these encroachments. Audit could not carry out similar analysis in regard to WATCO Division No. I, as it did not furnish the required information. From the above, it was evident that there was laxity in planning due to non-identification of encroachments for connection of existing sewerage lines to the new STPs.

During JPV of sewerage lines, with WATCO officials, it was found that regular repair/maintenance works had not been carried out in the existing old sewerage lines, for avoiding siltation in pipes and blockages in manholes. A few such instances are exhibited in **Photographs 24 and 25.**

[75] WATCO Division No. I - 178.530 km of existing sewer line and 11,865 manholes and WATCO Division No. II - 322.270 km sewer line and 18,895 manholes

[76] Basuaghai, Kochillaput, Meherpalli and Paikarapur

[77] Basuaghai and Kochilaput

Photograph 24: Part sewerage of Ward No. 38, discharged in BMC Drain No. 10, near Nayapalli Nuasahi

Photograph 25: Unauthorised encroachment over sewerlines, at BJB Nagar, Bhubaneswar

In reply, the Government stated (April 2023) that the power of eviction of unauthorized encroachment was vested with BMC. Reply is not tenable, since the sewer lines had been handed over to WATCO, since October 2019. However effective action, for removal of encroachments, had not been taken, indicating laxity in planning for sewerage management in the city.

3.2.6.3 Deficiencies in the preparation of DPRs and estimates for sewerage works

Paragraph 3.2.7 of the OPWD Code stipulates that, for every work proposed to be carried out, a properly detailed estimate is to be prepared and technical sanction is to be obtained, before it is executed, since the detailed estimate/ technical sanction serve to guarantee that the proposal is structurally sound and the estimate has been accurately calculated, based on adequate data. Paragraph 3.4.10 of the code further requires that the estimates be prepared based on the sanctioned schedule of rates and provide for the most economical and safe way of executing the work.

While scrutinising the DPRs of the OWSSB, the following deficiencies were noticed.

1. Six estimates[78] revealed that inspection chambers[79], for connection of households to the sewer lines, in Bhubaneswar, Rourkela and Sambalpur had not been provided, in the estimates, as required (September 2016 to November 2017). In the Rourkela STP project, 42,440 inspection chambers, costing ₹3.51 crore, (i.e. ₹827 per ICs) had been de-scoped (December 2016) from the original proposal, as it was decided that the consumers[80] would construct the inspection chambers. After one year of commencement of the works (i.e., January 2017), it was decided to include (January 2018) inspection chambers in all six works and to be completed between January and July 2020. Due to the delay in inclusion

[78] Estimates for the Sewerage systems of Bhubaneswar sewerage districts I, II, III and IV, Rourkela and Sambalpur

[79] Used to inspect the drains and their performance. Inspection chambers do not allow physical entry to the drains, but provide a clear inspection area, to see where two or more pipes join

[80] Household users

of 4,77,675 ICs in the estimates, the cost of ICs was increased to ₹80.03 crore (i.e. ₹1,675 per ICs) which led to avoidable expenditure of ₹40.51 crore[81]. Out of the above, only 1,06,070 ICs were completed, with payment of ₹17.77 crore[82] (as of July 2022).

Government while accepting the audit observation stated (April 2023) that during execution of works, it was felt that the consumers were not interested in construction of IC and there would be difficulty in household connections after commissioning of the project without ICs. Hence, ICs were constructed as an extra item of works. However, the fact remained that the incorrect decision led to delay in implementing the sewerage projects.

2. The construction of sewerage systems of Sambalpur and Rourkela MCs were awarded (January 2017) for ₹622.51 crore to two contractors stipulating the date of completion by January 2020, on EPC mode. The scope in sanctioned estimates of above sewerage works for Sambalpur and Rourkela West projects, provided for an amount of ₹5.30 crore[83], for supply of all material, labour and T&P, towards KB brick flat soling and filling interstices with sand, for 1,15,432 sq. m, for restoration of a cement concrete road. Scrutiny of the payment schedule revealed that, although no such KB brick soling had been provided, the rate had not been excluded from the amount put to tender. Non-deduction of the cost of KB brick flat soling, from the technically sanctioned cost, which had been put to tender, led to undue benefit of ₹5.30 crore, to the contractors.

Due to deficiencies in DPRs, delay in award of works and frequent changes in scope of the works, the JICA funded sewerage and drainage projects are lying incomplete, as of July 2022 which led to time and cost overrun for seven years and ₹2,999.63 crore respectively.

3. The DPRs of three sewerages[84] and one drainage system[85], for BMC and CMC, had initially been prepared (FY 2005-06) for a total cost of ₹945.13 crore, for laying of sewer line of 338.90[86] km and construction of three[87] STPs, with JICA assistance. The revised proposal was submitted (August 2011) for 697[88] km of sewer line, due to addition of more areas and project cost was revised and approved (September 2013) to ₹2,974.66 crore. However, Government reduced (June 2017) the length to 632[89] km and increased the number of pumping stations[90] from 25 to 42. Subsequently, the laying of pipeline, through micro-tunneling of 9.407 km, for Cuttack city, was also revised (December 2021) to 46.544 km, attributing this to the difficulties in execution of open sewer. Similarly, the number of pumping stations was also increased (July 2022) from 42 to 56, without giving any reasons. Thus, frequent changes in scope of the works indicated laxity in preparation of DPR, without

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81 ₹ 80.03 crore – (₹1675-₹827) X 4,77,675
82 ₹ 80.03 core /4,77,675 ICs X 1,06,070 ICs
83 Sambalpur: (₹4.18 crore + Rourkela West: ₹1.12 crore)
84 Bhubaneswar sewerage district VI, Cuttack sewerage districts I and II
85 One drainage system for Cuttack
86 Bhubaneswar: 97.80 km and Cuttack: 241.10 km
87 Bhubaneswar: one, Cuttack: two
88 Bhubaneswar: 287 km and Cuttack: 410 km
89 Bhubaneswar: 252 km and Cuttack: 380 km
90 A pump station, otherwise known as a pumping station or a sewage pumping station, is a storage and collection chamber that lifts and distributes wastewater or sewage, when it cannot naturally be carried by gravity

conducting proper survey and investigation, which led to cost escalation of the project and time over run.

Further, works relating to the construction of three sewerage lines, for Cuttack sewerage districts I and II and Bhubaneswar sewerage district VI, were awarded, between January and June 2013, for ₹950.79[91] crore, for completion by July and December 2016, respectively. In Cuttack, the agency had laid 322.32 km of sewerage lines, of which 254.96 km had been commissioned, (as of July 2022), and the balance work had not been commissioned, due to encroachment and led to missing links of sewerage lines. Similarly, in Bhubaneswar, the agency had completed 201.73 km of sewerage lines, out of 252 km. The expenditure of ₹1,561.48 crore had been incurred (as of July 2022) on the abovementioned three works (Cuttack sewerage districts I & II and Bhubaneswar sewerage district VI). The cost had increased, due to change in the scope of works like length of sewer lines, inclusion of trenchless method and pumping stations.

Similarly, work relating to construction and rehabilitation of drainage facilities (main drain including box drain[92]), in Cuttack, had been awarded, (March 2013) for ₹659.09 crore, for completion by March 2016. Subsequently, box drain, for ₹201.23 crore, was de-scoped (August 2018) from the original contract, due to slow progress of work. The agency was paid ₹645.26 crore against the balance work of main drain ₹448.86 crore as of March 2023, which led to cost overrun of ₹196.40 crore. Further, the revised estimate, for box drain, was technically sanctioned (November 2020) for ₹404.66 crore. The box drain work was awarded (July 2021) to another contractor, for ₹450.43 crore, for completion within 18 months. This led to cost overrun for box drain for ₹249.20 crore at agreement stage. However, both the works (main drain and box drain) were in progress with payment of ₹859.39 crore[93] to the contractors as of May 2023.

Due to non-completion of the above four projects, more than nine years, the CE, JICA, OWSSB, Cuttack, submitted (May 2022) revised administrative proposals amounting to ₹3,996.93 crore, due to price escalation, which was approved (September 2022) for ₹3,944.76 crore, by Government.

Thus, these projects had not been completed, as of July 2022, due to frequent changes in their scope, and lack of proper planning had led to time overrun of seven years[94] and cost overrun of ₹2,999.63 crore[95].

3.2.6.4 Sewerage projects of Sambalpur town

As per Paragraph 3.4.10 of the OPWD code, the Divisional Officer should certify that he has personally visited the site and prepared the sanctioned estimate, based on the sanctioned SoR and by providing most economical and safe way of execution of work. To avoid the water pollution of River

[91] Cuttack districts I and II for ₹639.64 crore and Bhubaneswar district VI for ₹311.15 crore
[92] Drains with cover slab in rectangular shape used for plying of vehicles
[93] ₹645.26 crore, on main drain and ₹214.13 crore, on box drains
[94] From the stipulated date of completion of the work (July and December 2016) to March 2022
[95] ₹3,944.76 crore - ₹ 945.13 crore

Mahanadi, administrative approval had been accorded (March 2016), by GoO, for construction of the sewerage systems of Sambalpur town, for an amount of ₹ 373.74 crore.

Records of OWSSB revealed that the scope of work provided for 213.35 km of 200 mm to 300 mm dia gravity sewer, 39.38 km of 200 mm to 1,600 mm dia RCC gravity sewer, 1,180 m of 200 mm to 1,600 mm dia RCC gravity sewer through trenchless technology, 230.84 km of 100 mm dia RCC house sewer, eight number of sewerage pumping stations, 7,285 m of raising main pipeline and construction of an STP of 40 MLD. The work had been awarded (January 2017) at a cost of ₹324.32 crore, to an agency, stipulating completion by January 2020, on the EPC mode. OWSSB had incurred expenditure of ₹190.65 crore[96] on the project as of October 2022.

https://youtu.be/AxlqQXB9g8I
Wastewater of Dhobijore Nallah outfall into River Mahanadi, without treatment

Deficiency in preparation of DPR for sewerage project of SMC led to non-completion of the sewerage project as of October 2022 and the expenditure of ₹190.65 crore rendered unfruitful. The entire sewerage waste generated by SMC had directly been discharged to river Mahanadi causing water pollution.

Audit observed (November 2022) that the scope of work of EPC contract included topographic survey; geotechnical investigations; and preparation of detailed design and drawings. The agency carried out soil survey and investigation works (July 2019) after two and half years of commencement of the work and found the coarse[97] to be fine grained and soft disintegrated rock strata. During execution of the work (February 2021), hard granite rock was mostly encountered, in various locations. The agency submitted (November 2021) the revised price break-up, for excavation of hard rock and micro-tunneling works, since these two items were not part of the original scope of work. Out of the 253 km of sewer line (213.35 km + 39.38 km), the agency had laid only 69 km (as of November 2022), in which only nine km was continuous and the balance 60 km had been laid sporadically, in different parts of the town and, therefore could not be commissioned, due to missing links and excavation of hard rock bed, during execution. No household sewers had been connected, against the target of 30,635, as of November 2022. The STP was connected (December 2020) with the Dhobijore Nallah, by laying 1,000 mm dia of 73.20 m, with an expenditure of ₹24.28 lakh, for trial run and testing. Since the agency had failed to complete the work within the contractual period, OWSSB had submitted (October 2022) a closure proposal, with levy of penalty, as per the provisions of the contract, considering the poor performance of the contractor and non-completion of the sewerage project timely. Approval of the above proposal was awaited from Government (as of November 2022). Due to non-completion of the project, the wastewater of the Sambalpur town continued to discharge into the river Mahanadi, causing water pollution and health hazards to public.

Audit further noted that, as per the water sample collected by the SPCB, from the Dhobijore nallah, near STP pump house at Binakhandi, the concentration of BOD[98] was 32 mg/l, against the permissible limit of three mg/l; Total Coliform (TC) was 1,60,000 mpn/100 ml, against the limit of 5,000 mpn/ 100

[96] Payment to contractor: ₹135.98 crore + land acquisition payment: ₹48.56 crore + payment to other agencies (power supply, compound wall and inspection chamber): ₹4.53 crore + payment to consultancy service i.e. authority engineer: ₹1.58 crore, for supervision of the sewerage works

[97] Soil texture may be rated from fine to coarse. A fine texture indicates a high proportion of finer particles such as silt and clay. A coarse texture indicates a high proportion of sand

[98] Biochemical oxygen demand

ml; and Faecal Coliform (FC) was 1,60,000 mpn/100 ml, against the limit of 2,500 mpn/ 100 ml. **Photographs 26 and 27** show non-completion and discharge of wastewater, to the river Mahanadi.

Photograph 26: Haphazard work at the Sambalpur sewerage project

Photograph 27: Outfall of Dhobijore nallah into river Mahanadi, due to non-completion of the sewerage project

Thus, due to laxity in survey and investigation of the soil strata, while preparing the DPR, the works had not been completed within the contractual period and the expenditure of ₹190.65 crore, incurred on these works, had become unfruitful.

In reply, the Government stated (March 2023) that the STP was completed, and commissioned, along with 10 km. of sewer line. After connection of households to the sewerage systems, in coming days, the wastewater would be collected from the households, for treatment and safe disposal. The reply is not tenable, since the agency had laid total 69 km of sewer line, out of which only 10 km was completed and commissioned, and the balance 59 km laid sporadically in different parts of the town, which could not be commissioned due to missing links. No household sewer was connected so far, against the target of 30,635 households, for which the expenditure incurred on the project was unfruitful.

3.2.6.5 Commencement of work without availability of land

To prevent the water pollution in the Rourkela city, administrative approval was accorded (January 2016) for construction of sewerage system, of the Rourkela East for ₹ 89.41 crore. Paragraph 3.7.4 of the OPWD Code stipulates that no work should be commenced on land which has not been duly made over to the PWD, by a responsible civil officer. As per clause 8.2.2 of the Engineering Procurement Construction (EPC) contract issued by the Ministry of Road Transport and Highways (MoRT&H), GoI, the concerned authority has to provide all land to the contractor, within 90 days of issue of the letter of acceptance and, in no case, beyond 180 days after the appointed date.

Procurement of sewerage line pipes for 3,918.50 meter without availability of land for sewerage project of Rourkela East, led to de-scope the project and infructuous expenditure of ₹7.25 crore towards procurement of above pipes apart from interest of ₹4.41 crore paid on OUIDF loan of ₹40 crore.

Records of the OWSSB revealed that the work for construction of the sewerage system of Rourkela East, had been awarded (January 2017) at a cost of ₹69.29 crore (without availability of hindrance free land of 5.009 acres), with the stipulated date of completion being on or before January 2020. The scope of work provided for laying of sewer network for 46.44 km; setting up of two sewage pumping stations; and construction of an STP of eight MLD capacity.

Audit noticed that OWSSB had not been able to hand over the land, to the contractor, within the stipulated period, (March to June 2017) due to hindrance by the local public and the project had been de-scoped (closed) (August 2020) by GoO. Meanwhile, the contractor had been paid (October 2017) ₹2.84

crore, towards purchase of DI pipes of 3,918.50 meters[99], as well as topographical survey and design drawings for the sewerage project. However, no steps had been taken to utilize the pipes, which had been lying (as of November 2022) idle at the project site, for more than five years and there was possibility of theft, apart from infructuous expenditure. Further, no accountability was fixed against the officer who recommended for purchase the above pipes, without availability of Government land for the project.

Photograph 28: Sewer pipes for Rourkela East Project, dumped at the project site, without utilisation

In addition, OWSSB had paid (July 2017 to December 2020) ₹4.41 crore, towards interest, for availing an Odisha Urban Infrastructure Development Fund (OUIDF) loan of ₹40 crore, during April 2014 to January 2017 for the above project. Thus, award of work, without availability of hindrance free land, had resulted in infructuous expenditure of ₹7.25 crore. The fact remained that, apart from infructuous expenditure, non-completion of the project had led to discharge of sewerage effluent from the households, to the rivers Brahmani and Koel, causing water pollution and threat to the environment. No responsibility of the officials responsible was fixed for procurement of pipes, without availability of land for the project.

The Government stated (March 2023) that it was decided by the authority to utilise the above pipes in water supply and other projects, in the State after depositing the cost with OWSSB. Meanwhile, 400 mm dia DI (K9) pipes of length 592 meter was transferred to WATCO Division Rourkela, to be utilised in water supply purpose and steps would be taken to use the balance pipes in other water supply projects. Further, Government stated that payment of interest was inevitable as per contract condition. The reply is not tenable, since the cost of purchase of pipes of 592 meter in length, which were transferred to WATCO (July 2022) was not realised and balance pipes were remained idle for more than five years, without utilisation in other projects. The fact remained that without acquisition of land, keeping the loan amount idle and repaying it with interest after more than four years proved the imprudent financial management.

3.2.7 Laxity in planning for drainage and sewerage projects under Smart city mission

The objective of the Smart City Mission (SCM) was to promote cities to provide core infrastructure and a decent quality life to their citizens, based on sustainable development. Drainage and sewerage management was one of the core elements, which were to be completed within the mission period of five

[99] 300 mm dia (K9) pipe 1,318.50 meters + 400 mm dia (K9) pipe of 2,600 meters

years (2015-20). Under SCM, cities had to prepare their smart city proposals (SCPs), appropriate to their local context, resources and levels of ambition. Details of the projects implemented under SCM, by the Bhubaneswar Smart City Limited (BSCL) and Rourkela Smart City Limited (RSCL), are given in ***Appendix-IV*** and in **Table 3.6**.

Table 3.6: Projects implemented under SCM, by BSCL and RSCL

(₹ in crore)

Sl. No.	Name of the Smart city	No. of Projects proposed	Project cost	No. of projects under taken	Cost of the projects under taken	Actual Expenditure incurred as of November 2022
1	Bhubaneswar	57	4,537.00	37	1,504.32	745.60
2	Rourkela	33	2,571.27	61	950.91	429.07
	Total	**90**	**7,108.27**	**98**	**2,455.23**	**1,174.67**

Source: *Information furnished by Smart cities*

From **Table 3.6**, it can be seen that BSCL had implemented 37 projects, with a cost of ₹1,504.32 crore, against which expenditure of ₹745.60 crore had been incurred. However, BSCL had not implemented STPs/ drainage projects, despite there being provision in the SCP for the same and the need to increase STP capacities, to meet the gap of 33.01 MLD, in the treatment of sewerage waste, generated in Bhubaneswar. Similarly, the RSCL executed 61 projects against the proposed 33 projects, with an agreement cost ranging between ₹ one lakh and ₹137.76 crore, which constituted 23 works below ₹ one crore. However, RSCL had not implemented any sewerage projects, though there was gap of 10 MLD of sewerage waste generated in Rourkela city.

i) BSCL approved (April 2021) a composite work estimates for road and lake development for ₹33.85 crore. For development of a new road at South side of lake, Zone-III, Satyanagar Bhubaneswar, work was awarded (June 2022) to a contractor at a cost of ₹9.04 crore, for completion within 12 months, from the date of commencement of the work i.e., by June 2023. During the execution of work, the Chief Secretary, Odisha, visited (December 2022) the site and directed to make some additions/ alterations, but the agency expressed (April 2023) unwillingness to continue the work. In the meantime, the agency was paid ₹80 lakh towards excavation of earth work. The technical committee recommended (May 2023) closing of the contract. As a result, an expenditure of ₹80 lakh, became unfruitful due to abandonment of the work.

ii) BSCL awarded (October 2017) the work of development of Janpath road including streetscape, design, beautification, roadside drains for ₹79.57 crore, for completion within 18 months from the date of commencement of work, which was further extended up to January 2022, under EPC mode of contract. The agreement included development of 11.64 km of road on both sides for ₹12.93 crore (i.e. 16.25 *per cent* of the agreement cost as per Schedule-H), instead of actual road distance of 9.80 km for ₹10.89 crore. The work was completed with payment of ₹80.49 crore (September 2022). Thus, there was

an excess payment of ₹2.01 crore[100], towards execution of excess 1.84 km, which led to undue benefit to the contractor.

iii) RSCL had taken up (July 2021 and September 2021) SWD works, in Rourkela, for 10 out of 17 drains, for an amount of ₹77.94 crore, for completion between August 2022 and March 2023, and paid (as of November 2022) ₹48.80 crore, for execution of 9.109 km, out of 12.623 km. Out of 10 works, only one work had been completed and the other works had remained pending, due to non-clearance of sites. However, no sewerage project had been taken up, though there was a gap of 10 MLD between the sewerage waste generated and the STP capacity provided for treatment, as detailed in **Table 3.7**.

Table 3.7: Details of water supplied, sewerage generated and treatment facilities provided, in the two smart cities (in MLD)

Sl. No.	Smart City	Water supply to city	Sewerage waste generated	Treatment capacity provided by OWSSB	Treatment capacity utilized by OWSSB	Balance waste allowed to water bodies	Gap in design capacity and waste generation
1	Bhubaneswar	270.64	216.51	183.50	29.75	186.76	33.01
2	Rourkela	61.90	50.00	40.00	2.60	47.40	10.00
	Total	**332.54**	**266.51**	**223.50**	**32.35**	**234.16**	**43.01**

Source: *Information furnished by PH (O) and OWSSB*

These deficiencies indicate the laxity of BSCL and RSCL, in regard to planning of environment and social benefit projects, like construction of SWDs, as well as sewerage and drainage projects under SCM.

The Government stated (May 2023) that decentralized STP of 20 MLD capacity was designed for treatment of sewerage generated from Saheed Nagar area, as per guidelines of SCM. But it was decided to pump the sewerage from the above area to STP of 56 MLD capacity, for full utilization of the sewerage project of OWSSB. As regards drainage project, Government further stated that BSCL had designed and executed SWD under Smart Janpath project for ₹100 crore and development work of Drain 10 as part of the lake Neutral project for ₹30 crore. The development work could not be completed, due to land issues that had not been resolved by concerned departments yet.

The reply is not tenable, since there was an excess payment of ₹2.01 crore, towards development of road works in Smart Janpath, which needs to be recovered from the contractor. Further, the lake neutral project was abandoned due to alternation/ additional works in midway after execution of works valuing ₹80 lakh rendering the expenditure unfruitful. The development of Drain 10 could not be completed, as the majority of encroachments are registered under Rajiv Gandhi Awas Yojana Scheme.

CEO, RSCL, stated (November 2022) that OWSSB had implemented the sewerage projects. Reply is not acceptable, since management of drainage and sewerage projects, was among the core objectives of SCM and the gap in treatment capacities had continued to persist, in both cities i.e., Bhubaneswar and Rourkela.

[100] ₹ 12.70 crore/ 11.64 km X 1.84 km = ₹ 2.01 crore

3.2.8 Absence of buffer zone for storm water drains

As per Paragraph 6.6.2 (ii) of the NDM guidelines 2010, water bodies and courses shall be maintained as recreational/ green buffer zones and no building activity, other than recreational use, shall be carried out within 12 m from the boundaries of major canals, streams *etc*. and 2 m from the defined boundaries of nallahs/ storm water drains *etc.*

Audit however, observed (September/December 2022) that five MCs had neither provided drains with buffer zones (such as boundary marking on either side of the drains, clearly specifying the no development areas) nor had they adhered to the above stipulations regarding buffer zone. This had resulted in construction of buildings and encroachment of lands, adjacent to the drains.

In reply, BMC stated (May 2023) that: (i) due to non-acquisition of the required land, the buffer zone had not been made as per the CDP and guidelines and (ii) the buffer zone would be defined after land acquisition. BeMC and RMC stated (November/ December 2022) that there was no land available to declare as the buffer zone, for the SWDs. SMC stated (May 2023) that a committee for engineering, planning and enforcement was formed (May 2022) in this regard. The replies are not acceptable, since, even after a lapse of 12 years from the preparation of the CDP, buffer zones had not been identified, which had led to encroachment of the SWDs. Reply of the CMC was awaited (as of August 2023).

3.2.8.1 Survey of encroachments and their eviction

As per Section 407 of the Odisha Municipal Act, 2003, MCs are required to remove the unauthorised encroachments over roads and drains. Further, Paragraph 4.23.1 of the NDM guidelines states that drains are to be delineated and boundaries fixed in new development.

Scrutiny of records of the selected MCs, revealed the following irregularities:

(i) Out of 284 identified encroachments, by two[101] MCs, 225 had been cleared during 2017-22 and 59 cases had remained pending for eviction (as of September 2022). The remaining three[102] MCs had not identified the encroachment areas, over drains and roads (as of November 2022).

(ii) Similarly, out of 548 identified encroachments, under three[103] DAs, 120 had been cleared and 428 were pending for clearance/ eviction (as of September 2022). CDA and SDA had not conducted any surveys for encroachment of drains and roads (as of November 2022). Due to non-eviction of encroachments and non-shifting of utilities, the following works could not be taken up:

- Construction of drain, from Ganganagar square, to Drain No.7, under BMC.

[101] BMC-283 cases identified and 225 cases cleared, and (ii) RMC identified only one and cleared none

[102] CMC, SMC and BeMC

[103] BDA-Total encroachments identified 487 cases of which 120 cases were made encroachment free, ii) BeDA- out of 6 cases identified, no cases were made encroachment free and iii) RDA- out of 55 cases identified, no cases were made encroachment free

- Regular maintenance of drains (due to the existence of 107 electricity poles and transformers, in 66 locations, over roads and drains) in the BeMC area.
- Repair and maintenance work of the Daya West Canal (due to unauthorized encroachment of 1,195 houses).

(iii) The total length of the Daya West Canal[104] is 34.86 km and it passes through the BMC area, from Kalikhama to Sundarpada, for a length of 16.10 km. Due to urbanization, the total catchment area of 2,417 ha of agriculture land, had been reduced to 1,255 ha (as of November 2022), There was unauthorized encroachment of 1,195 houses over Daya West Canal due to which canal water was highly contaminated and polluted, as the drains from the houses were directly connected to the canal. Further, BMC drains were also discharging sewerage and sullage, into the canal, at 11 locations. Thus, the irrigation canal was virtually been converted to a sewage waste drain and the contaminated water was being supplied for irrigation of 835 ha agricultural land. The concentration of BOD was high, being in the range of 4.8 (160 *per cent*) to 58 mg/l (1,933 *per cent*), against the permissible limit of three mg/l. The Dissolved Oxygen Demand (DO) of the water, was very less, in the range of 0.3 (93 *per cent*) to 3.7 (7 *per cent*) mg/l, against the permissible limit of minimum four mg/l at five locations i.e., Kalikhama bridge, Kochilaput, Samantarapur, Bomikhal, Bhetapada and Mundasahi, under the BMC area. TC was ranged between 92,000 and 1,60,000 mpn/ml, against the limit of 5,000 mpn/ 100 ml; and FC was ranged between 35,000 and 1,60,000 mpn/100 mpn/ml, against the limit of 2,500 mpn/ 100 ml, at four[105] locations. The consumption of leafy vegetables/ crops grown with polluted water irrigation is risky and harmful to human lives, as it contains heavy amount of toxic elements as discussed in ***Paragraph 6.5.3***.

https://youtu.be/5FntWKWQztw
Unauthorized Encroachments in Daya West Canal, BMC area.

Daya West irrigation canal was virtually converted to a sewage waste drain and the contaminated water was being supplied for irrigation of 835 ha of agricultural land at downstream. Due to encroachments, Water of the canal was highly contaminated and polluted, as the drains from the houses were directly connected to the canal.

In reply, SE, Prachi Irrigation Division, stated (November 2022) that, in the course of time, encroachers had unauthorisedly occupied the earmarked land, for their residential purpose, due to rapid urbanisation of the capital city, violating all stipulations. A number of encroachment cases had accordingly, been lodged against the encroachers, under intimation to BMC. In the meantime, BDA had initiated steps, with the help of BMC, for evacuation of the encroached land. However, the fact remained that no such eviction was done by BDA or BMC, as of November 2022.

Further, during JPV of drains, with departmental officials, the following were noticed, which led to water logging, reduction of water bodies and blocking of free flow of water causing urban flooding:

[104] Daya West Canal originates from the Puri Main canal, from RD 13.77 km near Dadha Gram Panchayat of Barang block in Cuttack district

[105] Mundasahi, Bomikhal, Samantarapur and Kochilaput

- In Bhubaneswar, the old defunct water supply pipe, in Gangua Nallah, near Palasuni bridge, had not been removed by WATCO, causing water logging.
- The Nayapalli Haza water body, at Behera Sahi, Bhubaneswar, covering an area of 6.395 acres, had been reduced to 4.67 acres, due to construction of private flats and buildings.
- Slums had developed and houses had been constructed, adjacent to the main surface water drain 1, Cuttack.
- In Berhampur, there were encroachments at the Bahana Nallah (in front of Sri Sidha Bira Hanuman temple, at Asoka Road, near Gajapati Nagar), Sapua Nallah, (near Hanuman temple at Andhra Pradesh Road) and Mansing Ghai Reservoir near Alakapuri.
- In Rourkela, there were unauthorized constructions in the Chhend and Basanti Colony.

Due to construction of private flats and buildings, Nayapalli Haza water body, at Behera Sahi, Bhubaneswar, covering an area of 6.395 acres, had been reduced to 4.67 acres.

Photographs 29 to 32, show some of these encroachments.

Photograph 29: Construction of houses over drains, near EIC (Civil) Office, Bhubaneswar

Photograph 30: Shops over drain, in front of CDA Office, Cuttack

Photograph 31: Unauthorized construction of shop over the drain, near Dhobanallah,, Berhampur Municipal Corporation

Photograph 32: Encroachment in the Dhobijore Nallah, Sambalpur

In addition to the above, the satellite images obtained from *Google Earth*

Pro, also proved that there were encroachments and unauthorised constructions over all the natural drains/nallahs, in cities, causing congestion and hindering the free flow of water, resulting in water logging and urban flooding. (Photographs given under paragraph 3.1.6).

3.2.9 Incorrect selection of site for intake well, at Palasuni, Bhubaneswar

Water at confluent point of River Kuakhai and intake well was highly contaminated and Biochemical Oxygen Demand, Total Coliform and Faecal Coliform were beyond the permissible limits. To clean the polluted water, pre-chlorination and additional post-chlorination, is carried out by the WTP authorities, during the pre-monsoon period.

As per paragraph 5.2.7.1 (b) of the Manual on Water Supply and Treatment, of the CPHEEO, intake wells are to be located in places where the best quality of water is available.

Scrutiny of records (November 2022), of WATCO Division –I, revealed that, one intake well, with 81.90 MLD capacity, had been installed downstream (666 m approximately) of the confluence point of Budhi Nallah and river Kuakhai, for supplying drinking water to Bhubaneswar city, through the Palasuni Water Treatment Plant (WTP). The Budhi Nallah carries the wastewater of BMC Drains and has outfall into the Kuakhai river, which deteriorates the water quality during the pre-monsoon season, particularly in the month of May. To clean the polluted water, pre-chlorination and additional post-chlorination, is carried out by the WTP authorities, during the pre-monsoon period.

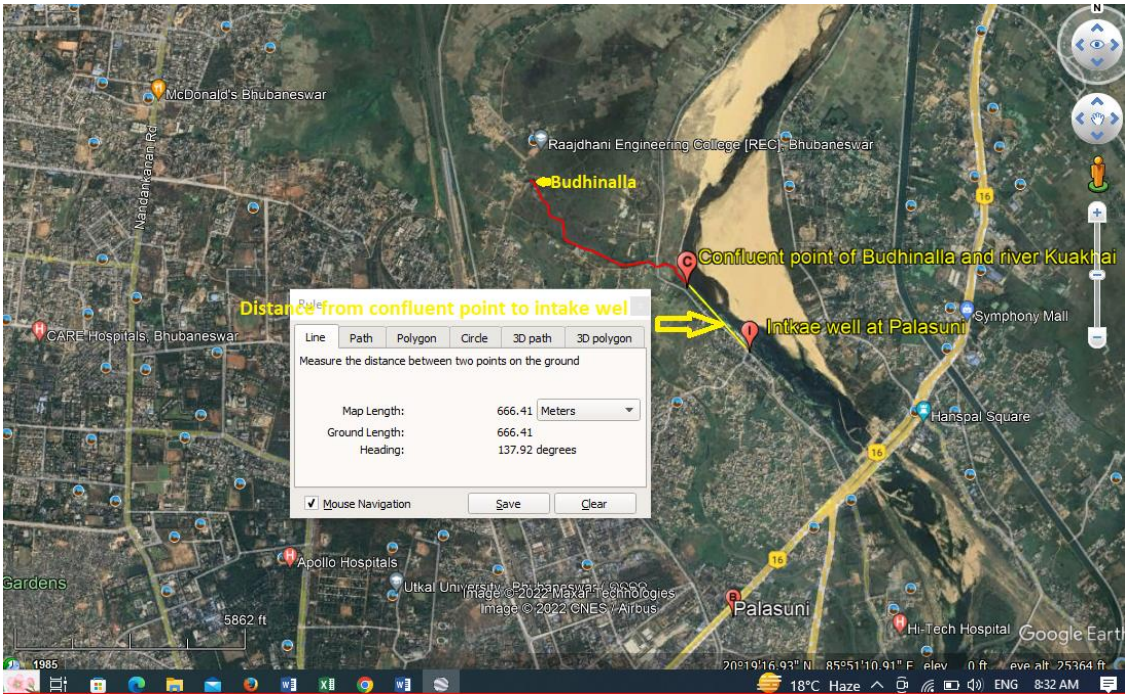
The EE, Drainage Division Khordha, intimated (July 2021) WATCO that the clean water of Budhi Nallah had been contaminated by the entry of raw sewage water from several industries and households, causing health hazards to the general public and aquatic habitats and requested that immediate steps be taken, to make the nallah pollution-free. In this context, Audit requested (November 2022) SPCB, to test the water, at different locations of Budhi Nallah, to ensure the quality of water. Accordingly, one representative of SPCB along with the audit team, collected (November 2022) water samples from Budhi Nallah, at Rokat, before its confluence with Kuakhai; downstream of the confluence; and at the point of intake on the river Kuakhai. It was seen that the concentration of DO[106] ranged from 3.7 to 7.3 mg/l, against the permissible limit of minimum 4 mg/l; BOD[107] ranged from 2.7 to 6.4 mg/l, against the permissible limit of three mg/l (maximum); TC[108] ranged from 11,000 to 160,000 MPN/100 ml, and FC[109] ranged from 3,300 to 1,60,000 MPN/100 ml, against the permissible limits of 5,000 MPN/100 ml and 2,500 MPN/100ml, respectively. As such, the water supplied to Bhubaneswar city, by the intake well from Palasuni, was not safe. The confluent point of Budhi Nallah and the Kuakhai river and the location of intake well, are shown in **Satellite image 13.**

[106] Low dissolved oxygen levels stress aquatic life and creates hypoxic conditions

[107] It directly affects the amount of dissolved oxygen in rivers and streams. The greater the BOD, the more rapidly oxygen is depleted in the stream. This means less oxygen is available to higher forms of aquatic life

[108] Include bacteria that are found in the soil, in water that has been influenced by surface water, and in human or animal waste

[109] It presents specifically in the gut and faeces of warm-blooded animals



Satellite image 13: Intake well and confluent point of the Budhi nallah and the Kuakhai river

The Government stated (April 2023) that the river Kuakhai is the primary source of water, for the city of Bhubaneswar. Budhi Nallah water gets diluted several times near the confluence point in all seasons and the resultant water quality of river found to be complying to Class-C inland surface water category, which is suitable for drinking water supply after treatment. The reply was not tenable as SPCB had confirmed during November 2022 that TC, FC BOD and DO were beyond the permissible limit.

Recommendations:

1. ***Government may formulate a comprehensive policy to recognise urban runoff as a potential resource of water and prepare a plan of action for its conservation, in consonance with the NDM guidelines.***
2. ***Corporations may evict all encroachments and prevent further reductions in the water bodies. Further, prescribed length and width of natural drains may be maintained, to ensure inter-connectivity of the water bodies, for proper conservation of the ecosystem, as well as ground water.***
3. ***Government may explore the possibility of interlinking the SWDs, to the water bodies in the city, to prevent drying up of water bodies and to enhance the ground water recharge.***
4. ***Government may maintain data for different categories of land use, so that MCs are able to prepare development plans, considering the changes effected due to urbanisation.***
5. ***Corporations may consider all relevant parameters, such as rainfall patterns, increase in the impervious layers, decrease in vegetation etc., while designing and executing roads and drains, to increase ground water recharge and prevent flooding.***

6. ***Corporations may prepare Drainage Master Plans, for development of drainage infrastructure. They may also carry out periodical inspections and maintenance of all the drains, to avoid urban flooding.***
7. ***Government may ensure the preparation of DPRs for Storm Water Drain projects, including necessary details, such as the extent and availability of land and alignment of drains etc.***
8. ***OWSSB/WATCO may prepare an action plan, on priority, to connect the existing sewerage lines, with the STPs, to avoid water pollution in water bodies.***
9. ***Corporations may escalate their efforts to conduct surveys to identify and evict encroachments on SWDs and maintain the stipulated buffer zones, to protect drains and water bodies.***
10. ***Government may take appropriate action on the erring officials who have failed to take action on unauthorised encrochment.***

CHAPTER - IV
Financial Management

CHAPTER - IV

Financial Management

This Chapter deals with the management of financial resources by the Municipal Corporations. MCs were largely dependent on Government grants, for undertaking their activities. Audit found that spending on storm water drainage and sewerage management had been minimal. Further, non-levy of cess and non-collection of user charges, had contributed to lower revenue generation of MCs.

4. Financial Management

The Municipal Corporations (MCs), Odisha Water Supply and Sewerage Board (OWSSB) and Water Corporation of Odisha (WATCO), had been provided with funds from various sources, such as the 14th Finance Commission, 15th Finance Commission, AMRUT[110] scheme, OUIDF[111], JICA[112], Finance Commission (FC) Grants and State Grants, apart from their own funds, for management of both Storm Water Drainage and Sewerage Management.

4.1 Receipt and expenditure of five MCs

The 14th Finance Commission (2015-20)/ 15th Finance Commission (2020-25) and AMRUT included four[113] essential services sectors (including SWD) to be provided by local bodies. Details of receipts and expenditure, incurred by the five selected MCs, for the period from FY 2017-18 to FY 2021-22, are given in **Table 4.1.**

Table 4.1: Receipts and expenditure of five selected MCs during 2017-22

(₹ in crore)

Financial year	*Receipts*					*Expenditure*		*Savings*	*Percentage of*	
	GoI grant	*GoO grant*	*Own revenue*	*OUIDF loan*	*Total receipts*	*Total*	*SWD*		*Expenditure on SWD, against the total receipt*	*Grants received, against total receipts*
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
2017-18	118.39	179.03	463.79	5.61	766.82	569.45	61.84	197.37	8.06	38.79
2018-19	124.56	227.13	549.03	3.69	904.41	728.84	60.41	175.57	6.68	38.89
2019-20	168.46	260.79	589.63	7.48	1,026.36	730.99	48.59	295.37	4.73	41.82
2020-21	440.02	476.86	699.77	9.41	1,626.06	905.30	65.04	720.76	4.00	56.39
2021-22	353.52	282.36	617.43	0	1,253.31	1,223.06	100.60	30.25	8.03	50.74
Total	**1,204.95**	**1,426.17**	**2,919.65**	**26.19**	**5,576.96**	**4,157.64**	**336.48**	**1,419.32**	**6.03**	**47.18**

Source: *As per information furnished by the five selected Municipal Corporations*

[110] Atal Mission for Rejuvenation and Urban Transformation
[111] Odisha Urban Infrastructure Development Fund
[112] Japan International Cooporation Agency
[113] Essential services to be carried out: i) water supply services, ii) sewage management, iii) solid waste management and iv) storm water drainage

Analysis of the above receipts of the selected MCs revealed that Government grants had been constituted between 38.79 and 56.39 *per cent* of their total receipts, which indicates that the MCs were dependent on Government grants for undertaking their activities. Further, the expenditure incurred on SWD constituted a meagre amount, which had ranged from four to 8.06 *per cent* of the total receipts, during FYs 2017-18 to 2021-22, resulting in savings of ₹1,419.32 crore, at the end of March 2022, which indicated poor fund management by the selected MCs. Receipts and utilization of funds, under various grants, are detailed in ***Appendix-V*.**

MCs were dependent on Government grants for undertaking their essential activities.

BMC stated (October 2022) that SWD was a component of capital expenditure and it had made budget provisions accordingly. BeMC stated (November 2022) that steps would be taken to utilize the funds, for construction of SWD systems, in the ensuing financial year. SMC stated (May 2023) that steps would be taken to utilize the funds, for construction of SWD in each financial year according to the budget provision. The replies from RMC and CMC were awaited. The fact, however, remained that, despite availability of funds, the MCs had not been able to utilise adequate funds for SWD management, in cities, for want of Master Plan (MP), for drainage systems and inadequate manpower, as discussed in **Paragraphs 3.2.2.1 and 6.3,** respectively.

4.2 Financial performance of OWSSB and WATCO, in regard to sewerage projects

OWSSB and WATCO had taken huge loans (more than the requirement), in addition to Government grants, resulting in accumulation of funds, at the end of each financial year which indicated poor management of funds for sewerage projects.

Based upon the information furnished to Audit, by the OWSSB and WATCO, their capital budgets, GoI/GoO grants, loan from JICA and OUIDF and actual expenditure incurred for sewerage management during the FYs 2017-18 to 2021-22, are shown in **Table 4.2**

Table 4.2: Budget and expenditure for sewerage projects, during the FYs 2017-18 to 2021-22

(₹ in crore)

Financial Year	Budget estimates for sewerage projects	Opening Balance	Receipts				Total available funds	Expenditure	Closing Balance	Percentage of expenditure of total funds received
			GoI grant[114]	GoO grant	Loan (OUIDF/ JICA)	Total				
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
2017-18	505.12	388.48	45.00	35.72	391.08	471.80	860.28	528.18	332.10	61.40
2018-19	383.60	332.10	65.00	72.59	242.53	380.12	712.22	430.39	281.83	60.43
2019-20	153.30	281.83	0.00	199.66	161.94	361.60	643.43	366.78	276.65	57.00
2020-21	301.00	276.65	83.50	529.37	203.51	816.38	1,093.03	615.99	477.04	56.36
2021-22	504.00	477.04	65.00	115.93	323.09	504.02	981.06	574.15	406.91	58.52
Total	**1,847.02**		**258.50**	**953.27**	**1,322.15**	**2,533.92**		**2,515.49**		

***Source**: Information furnished by OWSSB/ WATCO*

It can be seen from **Table 4.2** that, though there were not adequate funds (except for the FY 2019-20) available to cover the budget estimates, however, OWSSB and WATCO had taken huge loans (more than the requirement), in addition to Government grants, resulting in accumulation of funds, at the end of each financial year. Funds ranging from 56.36 to 61.40 *per cent* only, had

[114] AMRUT grant for Sambalpur and Rourkela sewerage projects and special grants received for sewerage projects in the State of Odisha during 2020-22.

been utilised towards sewerage projects, during the period FYs 2017-18 to 2021-22, which indicated poor management of funds. It also showed that the budget provision made for sewerage management was unrealistic, as per the actual requirement on sewerage projects.

The Government stated (May 2023) that the balance funds will be utilised under the aforesaid projects. The reply was not furnished in regard to availing loans, even though funds were available at the beginning of every year, which indicated blockage of funds, due to laxity in planning, for achieving the objective of sewerage management, as discussed in **para 5.3.**

4.3 Grant of mobilisation advances to the contractors

Paragraph 3.7.21 of the OPWD Code stipulates that, as a rule, payment of advances, to contractors, is prohibited. Note-C of the above para states that advances may, however, be given, in cases where issue of such advances is indispensable, provided that necessary precautions are taken against loss. Such a system is not to be allowed to become general, or to continue longer than is absolutely essential, and such advances are to carry interest, at the rate of 18 *per cent* per annum.

4.3.1 Loss of interest due to defective clause in the agreements

Failure to incorporate recovery clause for mobilisation advance with interest from contractors for JICA funded projects in violation to OPWD Code, led to loss of interest of ₹91.14 crore.

Scrutiny of records of the Chief Engineer (CE), JICA, showed that agreements had been executed[115], with four agencies[116], for four works[117], in which a condition was mentioned for payment of interest-free advance, in deviation from the OPWD Code. The EIC, accordingly, paid interest free mobilisation advance of ₹229.94 crore, between February 2013 and December 2018. Failure to incorporate an appropriate clause, for repayment of the mobilization advance, with interest, in the agreement, led to loss of interest of ₹91.14 crore, to the State Exchequer.

The Government stated (March 2023) that, as per general condition of the contract, interest free mobilization advance was issued to the contractors. The reply is not satisfactory, as failure to incorporate the appropriate clause, for repayment of mobilization advance with interest in agreements, led to extra burden to the State Exchequer, since GoO, had paid interest on loan for sewerage projects.

4.3.2 Non-adjustment of secured advance

Paragraph 3.7.21 (a) of the OPWD code stipulated that, secured advance, of 75 *per cent* of the value of cost of the material, may be released to the contractor, on the security of materials brought to the site. Further, recoveries of the advances so made, must not be postponed, until the whole of the work, entrusted to the contractor, is completed.

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115 Between January and June 2013

116 M/s IVRCL Limited, M/s L&T Limited, M/s VA Tech Wabag Limited and M/s Tantia Voltas JV

117 JICA Package I: ₹58.06 crore, for construction of Bhubaneswar sewerage District VI; Package II: ₹89 crore, for construction of Cuttack sewerage districts I, II and III; Package III: ₹24.49 crore, for construction of Sewerage treatment plants for Bhubaneswar Sewerage District VI and Cuttack sewerage districts I and II; and Package IV: ₹58.39 crore, for construction of box drains in Cuttack

Records of the Project Engineer (PE), OWSSB, Sambalpur, revealed that OWSSB had paid secured advance of ₹7.56 crore, to an agency, between December 2017 and March 2021, to work on the Sambalpur sewerage project, for procurement of sewer pipes. Out of this amount, ₹6.08 crore had been adjusted, leaving a balance of ₹1.48 crore unrealised (as of November 2022).

The Government stated (March 2023) that the balance amount of ₹1.48 crore, towards secured advance was recovered from the agency by OWSSB, from 46th RA bill (December 2022). The reply is not satisfactory, as the Department did not provide any documentary evidence for such recovery.

4.4 Avoidable expenditure towards service tax and GST for consultancy services

OWSSB paid (December 2009 to July 2022) consultancy services including service tax/ GST in violation of Finance Act and GST Act, led to excess expenditure of ₹30.11 crore from State exchequer, as the consultancy services coming under pure services are exempted from service tax/ GST.

The Union Finance Act, 1994[118], read with notifications[119] issued during October 2009 and June 2012, excluded services provided for sewerage treatment or disposal, from levy of service tax. The Central Board of Excise and Customs, GoI, also clarified (June 2017) that consultancy services, coming under pure consultancy services[120] (without supply of goods), provided to local authority, by way of any activity in relation to any function entrusted to a Municipality under Article 243W, are exempted from the Goods and Services Tax (GST).

Audit noticed (June 2022) that OWSSB had entered into an agreement with two firms[121], between December 2009 and February 2018, to provide manpower services, for supervision and monitoring of eight[122] sewerage projects. However, the Board had paid ₹205.40 crore to these firms, towards consultancy services, including service tax/ GST of ₹30.11 crore[123], during December 2009 to July 2022, in violation to the Finance Act and GST Act, leading to avoidable expenditure of ₹30.11 crore.

The Government stated (March 2023) that the service provided by Engineering and Project Management Consultancy to OWSSB, was not in the nature of pure service and involved considerable amount of supply of goods. The reply is not satisfactory, as the related agreements had been drawn, for providing supervision and monitoring services, for construction of sewerage projects and does not involve supply of goods and hence to be treated as consultancy services and no need to pay service tax/ GST.

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118 As per Section 65(105) (zzzza) of Chapter V

119 41/2009-Service Tax dated 23 October 2009 and 25/2012-Service Tax dated 20 June 2012

120 Supply of services without involving any supply of goods are treated as 'pure service'. Thus, supply of manpower for cleanliness of roads, and public places, architect services, consulting engineer services, advisory services and like services, provided by business entities, not involving any supply of goods, are to be treated as supply of pure services

121 M/s Tokeo Engineering Consultants Co. Ltd. from December 2009 and it was continued up to March 2023, for JICA projects at Cuttack and Bhubaneswar Sewerage district-VI and ii) M/s Meinhardt Singapore Pte Ltd. from February 2018 to January 2021, for Sambalpur, Rourkela and Bhubaneswar Sewerage districts – I, II, III and IV

122 Under EPC: Six sewerage projects (Bhubaneswar sewerage districts I to IV), Sambalpur and Rourkela West sewerage projects and Under JICA: Two sewerage projects: (Cuttack and Bhubaneswar VI)

123 Service tax: ₹9.13 crore + GST: ₹20.98 crore

4.5 Revenue generation by collection of sewage user fee and SWD cess

4.5.1 Non-collection of sewage user fees

Out of 1,12,110 household sewage connections in four MCs, WATCO collected ₹4.19 crore (up to August 2021), against ₹16.82 crore due (from October 2019 to March 2022), leaving ₹12.63 crore unrealised.

As per GoO Gazette Notification March 2016[124], the sewerage tariff, for different categories of consumers, was to be collected every month. Accordingly, WATCO was required to collect monthly sewerage user fee, of ₹50 per connection, from individual domestic households, as per GoO, H&UD Department Notification (March 2016).

Scrutiny of records of WATCO showed (August 2022) that, out of 1,12,110 household sewage[125]connections, in four[126] MCs, WATCO had collected ₹4.19 crore (upto August 2021), against ₹16.82 crore due (from October 2019 to March 2022), leaving ₹12.63 crore[127] unrealised. Thereafter, no sewerage fees had been collected. Reasons for non-collection were not found available on records. It is pertinent to mention that there was no provision to impose fine/ penalty to defaulters, in the aforesaid notification.

Further, discrepancy in the collection of sewerage fees, during the period from the FYs 2019-2021, was noticed, between the figures reported in the annual accounts of WATCO and the collection statements furnished to Audit, as shown in **Table 4.3.**

Table 4.3: Discrepancy in reporting of collection of sewerage fees

(₹ in lakh)

Financial Year	Figures reported in Annual Accounts	Figures reported to Audit	Difference
2019-20	0	112.08	112.08
2020-21	4.69	216.38	211.69
2021-22	0.13	90.36	90.23

The Government stated (March 2023) that after formation of WATCO, the collection of sewerage cess was being done by WATCO for commissioned sewerage systems in Bhubaneswar, Cuttack and Rourkela. The reply is not satisfactory, as the Department had not collected the sewerage cess from the households and not fixing accountability on officials responsible, for such collection which led to loss of government revenue.

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124 Revised the sewerage tariff from households: Monthly ₹50 per domestic households per connection

125 STP-I: 35,747, STP-II: 24,462, STP-III: 23,387, STP-IV: 10,753, STP-VI: 0 of Bhubaneswar, STP-I CDA: 16,500, STP-II Matagajpur: 350, STP Rourkela: 911 and STP Sambalpur: 0

126 BMC, CMC, SMC and RMC

127 Sewerage fee = 1,12,110 number of consumers X 30 months from October 2019 to March 2022 X ₹50 per household (–) ₹4.19 crore collected = ₹12.63 crore

4.5.2 Non-levy of cess led to non-generation of own revenue by MCs

Both the Government and MCs had not fixed Storm Water Drainage Cess rates to collect from households, despite substantial amounts of ₹336.48 crore, having been incurred for construction, repair and maintenance of drains during 2017-18 to 2021-22.

As per Paragraph 2.6 of the SWD Manual, 2019, O&M funds may be earmarked from the drainage activities of the municipal budget and may be collected in the form of storm water drainage cess, based on the area of the premises and the level of construction done. Paragraph 5.5 of the said Manual also envisaged that, for usage of any infrastructure, user charges were to be levied, considering the present requirement, for O&M of SWDs. Taxes and user fees could be imposed, by the ULBs, under the Municipal Act.

Scrutiny of records of the selected MCs revealed (October 2022) that both the Government, as well as the MCs had not fixed any rates for taxes and user fees, from households, despite substantial amounts of ₹336.48 crore, having been incurred, for construction, repair and maintenance of drains, during 2017-18 to 2021-22.

In reply, BeMC stated (November 2022) that cess would be imposed and collected, after getting approval from the Municipal Council. BMC and RMC noted the audit comments. SMC stated (May 2023) that cess would be collected as per the Manual 2019, after taking approval from competent authority. CMC did not furnish any replies. The replies are not acceptable, since the MCs had failed to take steps for generation of their own revenue, for their self-sustainability.

4.6 Non-submission of Utilisation Certificates

Rule 173 of the Orissa General Financial Rules, requires furnishing of, utilisation certificates (UCs) by the grantee institutions, as it serves assurance to the sanctioning authority that the funds, are utilised for the purpose, for which it was sanctioned and disbursed. Any delays in furnishing these reports, to the grantors, or any inaccuracy in such reporting, undermines the control mechanism, designed to ensure non-diversion and proper utilisation of funds.

Audit observed (October 2022) that, out of an overall amount of ₹4,316.04 crore[128], received from 14th FC, 4th SFC, 5th SFC, AMRUT and JICA, during 2015-22, H&UD Department had submitted UCs for only ₹3,794.97 crore[129], with UCs for ₹521.07 crore, having not been submitted to GoO/ GoI (as of October 2022).

In reply, RMC stated (April 2023) that pending UCs would be furnished. BeMC stated (May 2023) that all UCs, had already been submitted to the Department by March 2023. However, the reply of the Government was awaited (as of August 2023).

4.7 Undue benefit to consultants, due to excess payment for hired vehicles

The Finance Department, GoO, issued a Circular (October 2015) in regard to hiring of private vehicles, for official use, at ₹20,000 each, for heads of

[128] 14th FC: ₹1,439.92 crore, 4th SFC: ₹1,907.17 crore, 5th SFC: ₹66.66 crore, AMRUT-I (Incentive): ₹58.00 crore and JICA: ₹ 844.29 crore (during 2015-22)

[129] UC submitted: 14th FC: ₹1,055.45 crore, 4th SFC: ₹1,840.07 crore, AMRUT-I (Incentive): ₹56.32 crore, and JICA: ₹843.13 crore

department. Despite above FD circular, OWSSB prepared (October 2016) an estimate, for hiring of vehicles, at ₹28,900 per vehicle, for the Sambalpur Sewerage project, which included rental, operation, maintenance, repairs, insurance *etc*., for a run of 2,000 kms approximately.

Scrutiny of records of the OWSSB revealed (July 2022) that an Engineering Procurement and Construction (EPC) contract agreement had been executed (February 2018), with M/s Meinhardt Singapore Pte Ltd., for consultancy services of the Authority Engineer (AE), for supervision of the sewerage works of Sewerage districts- I, II, III, and IV, for Bhubaneswar City, Rourkela City and Sambalpur Town. In the said agreement, provision of hiring of 20 vehicles, at ₹75,000 per month per vehicle, was made, for use during the construction period of 36 months, with an agreed value of ₹5.40 crore[130]. Acceptance (February 2018) of the consultant offer of ₹75,000 per vehicle, despite FD's Circular of ₹20,000 per vehicle and OWSSB's own estimate of ₹28,900 per vehicle, without any justification, led to undue benefits of ₹ two crore[131] (including GST), having already been passed to the consultant (as of February 2021).

The Government stated (March 2023) that the payment made to the authority engineer towards cost of transportation was as per the provision of the agreement. The reply is not satisfactory, as acceptance of consultant's offer at higher rate, in deviation to FD circular, without negotiation and justification, led to undue benefit to the consultant.

4.8 Non-preparation of audited accounts and non-submission of Annual Audit Reports of the Board

Sections 35(2), (3) and (4) of the OWS&S Act, 1991, envisage that the Board is to maintain such books, in relation to its accounts and prepare the balance sheet, in such form and manner, as the regulations may require. Further, the accounts of the Board are to be audited by the auditor, in such manner and, at such times, as per orders of GoO, and certified, and be forwarded with the Audit Report, annually, to GoO, who may issue such directions to the Board, as it may deem fit, and the Board is to comply with such directions.

Audit observed that OWSSB had neither appointed any auditor, nor prepared annual accounts from 2012-13 onwards. In the absence of audited and certified accounts, the actual transactions made by the Board, could not be ascertained in Audit. The Board had also not initiated action for preparation of the annual accounts and submission of annual audit reports to GoO, as required.

The Government stated (May 2023) that Board has appointed statutory auditor from the CAG's empanelled for preparation of annual accounts from 2002-03 to 2011-12 and the firm had submitted Annual Audit reports up to March 2012. Steps were being taken to conduct Annual Audit for the period from 2012-13 to 2021-22.

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[130] ₹75,000 per vehicle for 2,000 km per month, with 20 vehicles, for 36 months.(₹75,000 X 20 X 36)

[131] Undue benefit to the consultant = {(₹ 75,000-₹20,000) X 308.70 (vehicle month, this is the co-efficient factor taken by OWSSB for making payment to the contractor)} X 18 *per cent* GST

4.9 Loss of central assistance

As per paragraphs 9.70 and 9.71 of Fourteenth Finance Commission (FFC) recommendations, GoI allocates basic grants (BG) and performance grants (PG) for ULBs. The BG is to provide a measure of unconditional support to ULBs for delivering basic functions assigned to them. To be eligible for PG, ULBs have to submit audited annual accounts that relate to a year not earlier than two years preceding the year in which it seeks to claim. It will also have to show an increase in own revenues over preceding year, as reflected in audited accounts. In addition, ULBs have to measure and publish Service Level Benchmarks (SLB) for essential services. The details of BG and PG received from GoI during 2015-20 are given below:

Loss of central assistance of 14th Finance (Performance grant and basic grant) for ₹333.58 crore due to non-achievement of service level benchmarks for four essential services, low revenue generation, non-conduct of election to the ULBs and non-preparation of annual audited accounts.

Table 4.4: Details of FFC Grant recommended and shortfall during the period 2015-20

(₹ in crore)

Year	FFC Grants Recommended			FFC Grants Received			Shortfall of Grants		
	BG	PG	Total	BG	PG	Total	BG	PG	Total
2015-16	170.10	0.00	170.10	162.44	0.00	162.44	7.66	0.00	7.66
2016-17	235.54	69.52	305.06	231.26	68.26	299.52	4.28	1.26	5.54
2017-18	272.14	78.67	350.81	258.84	0.00	258.84	13.30	78.67	91.97
2018-19	314.82	89.34	404.16	292.73	0.00	292.73	22.09	89.34	111.43
2019-20	425.39	116.98	542.37	425.39	0.00	425.39	0.00	116.98	116.98
Total	**1417.99**	**354.51**	**1772.50**	**1370.66**	**68.26**	**1438.92**	**47.33**	**286.25**	**333.58**

(***Source:*** *Information furnished by DMA*)

From above table, it could be seen that there was a loss of central assistance of ₹333.58 crore (PG ₹286.25 crore + BG ₹47.33 crore) which was due to non-achievement of SLBs for four basic essential services, low revenue generation, non-conduct of elections to the ULBs and non-preparation of annual audited accounts.

It was pertinent to point out that the above deficiency was mentioned in the PA on Waste Management in Urban areas for the year ended March 2021 covering the period from the FYs 2015-16 to 2019-20 and the findings had been included in Paragraph 2.4 in the Report of CAG of India for the year 2022 (Report No.6), Government of Odisha. Despite the above deficiencies pointed out in the earlier CAG report, the MCs had not taken any step for achievement of SLBs for improvement in storm water drainage and sewerage management in cities as discussed in **Paragraph 6.11**.

Recommendations:

11. ***Government/ Corporations may devise a suitable mechanism for collection of SWD and sewerage cess, to increase their revenues and strive for self-sustenance.***
12. ***Government may plan appropriate strategies, for timely submission of UCs, to the funding agencies and the Finance Department.***

CHAPTER - V
Contract Management and Project Execution for Storm Water Drains and Sewerages

CHAPTER - V

5. Contract Management and Project Execution for Storm Water Drains and Sewerages

This Chapter deals with the challenges faced by the MCs, OWSSB, WATCO, BSCL and RSCL, in the execution of SWD and Sewerage Systems, in their respective jurisdictions. It also deals with the issue of whether the above authorities had executed these works economically, as per the State Schedule of Rates, Analysis of Rates, IRC Specifications, BIS standards and Manuals of Storm Water Drains and Sewerage Management.

5.1 Contract Management and Project Execution for storm water drains

5.1.1 Delays in acceptance of tenders

Paragraph 3.5.18 (iv) of the OPWD Code stipulates that the currency period of any tender should not be more than three months from the last date for receipt of tender.

Audit reviewed (July 2022) the tender documents, in respect of six sewerage projects, invited by OWSSB, and found that acceptance of six tenders had been delayed, with the delays ranging from 08 to 367 days, beyond the prescribed period of three months and reasons for these delays were not available on records. Delays in acceptance of these tenders had a consequential effect on the completion of the projects and had led to under utilisation of funds, amounting to ₹406.91 crore, as discussed in Paragraph 4.2.

The Government stated that out of six tenders invited on EPC mode, three were finalized within 90, 98 and 115 days and remaining three were finalised after lifting of stay order, during June 2017. It was further added (March 2023) that, in case the amount put to tender is more than ₹100 crore, needs approval of State Cabinet as per Works Department OM dated 28.01.2015, however, the above provision was not included in Para 3.5.18(iv) of OPWD Code. The reply was not tenable as tenders were accepted with delay violating the OPWD Code.

5.1.2 Award of works to a non-performing contractor and non-termination of contract

As per Clause 15.2 of the contract (F2 item rate contract) condition, for construction of sewers line at Bhubaneswar and Cuttack under JICA assistance, the employer is entitled to terminate the contract, if the contractor becomes bankrupt or insolvent, or goes into liquidation. Further, Clause 15.4 and 15.5 of the above contract, stipulates that, after a notice of termination, the employer may recover, from the contractor, any losses and damages incurred and any extra costs of completing the works, after allowing for any sum due to the contractor.

Scrutiny of records (July 2022), of CE, JICA, OWSSB, Cuttack, revealed the following irregularities:

The 'construction and rehabilitation of drainage facility' in Cuttack, had been awarded (March 2013) to M/s Tantia-Voltas (JV), for ₹659.09 crore, for construction of drains of 23.043 km (including ₹231.16 crore for box drains of 3.4 km), with the stipulated date of completion being March 2016. The work was in progress, with payment of ₹645.26 crore, having been made (as of May 2023).

Audit observed that the agency had not been able to complete the work within the contractual period and the progress of the work was very slow, with only 366 m of box drains having been completed/ partly completed (*i.e.*, 333 m completed and 33 m partly completed). The High Level Steering Committee decided (August 2018) to de-scope the work of the remaining portion of 3.4 km of box drain, valuing ₹201.23 crore, from the original work, due to poor progress. Although JICA pointed out (November 2016) that the agency was under Corporate Debt Restructuring and progress of the works was far behind, OWSSB did not take any action, against the agency, for the slow progress of work, and allowed the agency to execute the work, till completion of the balance drain work. The de-scoped work was awarded (July 2021) to another agency, for ₹450.44 crore, stipulating completion by December 2022. The work was still in progress, with payment of ₹221.42 crore, having been made (as of May 2023).

In this regard, Audit observed that, against the measured value of works of ₹29.93 crore, the agency had been paid ₹30.96 crore, leading to excess payment of ₹1.03 crore, which had not been recovered (as of July 2022). Further, the original contract had not been terminated and the additional cost of ₹249.21 crore[132] had not been recovered, in terms of the Clause 15.4 and 15.5 of the above contract, which had led to undue benefit to the agency.

The above instances were indicative of the failure of the Department, in awarding contracts, without ascertaining the soundness of the financial stability of the agencies, which, in turn, had delayed the projects, apart from leading to cost overrun of ₹249.21 crore.

Replies in this regard, were awaited (as of July 2024).

5.2 Project Execution for storm water drains

5.2.1 Construction of storm water drains, without considering design discharge, in contravention of IRC specifications

Paragraph 6.8.5 of the IRC-SP-50-2013 stipulates that the minimum width of a drain and minimum diameter of a pipe, are not to be less than 250 mm, and 450 mm, respectively. Further, Paragraph 6.8.6 of the above IRC stipulates that the effective section of the drain, carrying design discharge, is to be considered below the bell mouth pipe, so that there is no back flow of water on the road.

Records of the BMC and R&B Division No. III, Bhubaneswar, revealed the following:

[132] Agreement cost for de-scoped work: ₹ 450.44 crore (-) de-scoped amount: ₹201.23 crore

- Two siphons (one on the ISKCON side and another on the Krishna Tower side), constructed by NHAI, were interlinked into the underground drain, below the flyover bridge of NH 16. The siphon at the Krishna Tower side was connected to the Bhoi Sahi drain, which, in turn, had outfall into Drain 10, at Behera Sahi. Another existing drain, having bed width of 0.6 m, on the left side of the Krishna Tower, was meeting the Bhoi Sahi drain and falling into Drain 10, at Behera Sahi.

Satellite image 14: Flow of water from the ISKCON area, to Beherahsahi, BMC

- The work 'construction of RCC drain having bed width of 1.5 m from Krishna tower (right side) to Bhoi Sahi,' had been awarded (November 2019) by BMC, for ₹1.96 crore, and was to be completed by May 2020. The work had been completed with payment of ₹1.79 crore having been made (as of August 2021).

https://youtu.be/xllfu0CAFfI
Water logging at ISKCON temple area of BMC

- Both the drains had been executed without considering the rainfall data, catchment areas of the drains and design discharge. No retention and detention facilities, for avoiding temporary flooding, had been provided. As a result, the drains had not been able to discharge rainwater promptly and the public was facing water logging during the rainy season, even after construction of drains in that area, as shown in **Photographs 33 and 34**.

Photograph 33: Water logging on 27.09.2022, near ISKCON temple

Photograph 34: Water logging at ISKCON temple (Courtesy: e Prameya[133] 27.09.2022)

To mitigate the water logging problem, NHAI requested (March 2022) the State PWD to take up the work. Accordingly, the work of laying 1.2 m dia hume pipeline, from ISKCON to the Jayadev Vihar drain, was awarded (June 2022), for ₹4.14 crore, by the Roads and Building Division. III, Bhubaneswar (by splitting the work into 62 contracts), stipulating completion by July 2022. Meanwhile, NHAI intimated (June 2022) that digging a depth of 2.5 m, by using heavy machinery; very close to the main carriageway, would compromise the safety of the flyover wall structure and asked for submission of the necessary drawings. Instead of submitting the

[133] The daily Odia newspaper published through electronic media

drawings, the CE (DPI & Roads) closed (August 2022) all the contracts. As such, no action had been taken, for permanent solution of the water logging problem at the ISKCON area, either by the R&B Division or by BMC (as of October 2022).

In reply, BMC stated (October 2022) that the problem had been created by NHAI, due to construction of NH 16 in a faulty manner. There was neither any provision for a retention/ detention pond for storm water, nor for a flat carriageway, with guard wall, for equal distribution of rainwater along the road. The EE, (R&B) Division III, Bhubaneswar, stated (November 2022) that, due to construction of drains with inadequate width, by BMC, the storm water could not be discharged immediately. Thus, water logging continued to take place during the rainy season, due to the lackadaisical attitude of the department, coupled with lack of co-ordination among the H&UD Department, Works Department and NHAI.

5.2.2 Non-completion of drain works by Municipal Corporations

As per para 2.2.1 of the OPWD Code, the time allowed for execution of the works, as specified in the contract data, is the essence of the concerned contracts. To achieve the project objectives, the Department has to ensure that projects are completed on time. Para 3.7.4, of the above code, further stipulates that no work should be commenced on land which has not been duly made over by a responsible civil officer. Delays in the completion of works, are discussed in the subsequent paragraphs.

5.2.2.1 Non-completion of drain work at Cuttack, due to non-handing over of clear site

Scrutiny of records of CMC revealed that, to avoid water logging in the Bidanasi area of Cuttack, an estimate, for improving the drain from "Baimundi Nagar to Petanallah *via* Bandhachaka and Boulachaka (2,000 m) at Bidanasi in Ward No.1", had been technically sanctioned (December 2020), by SE, Drainage Division, Cuttack, for an amount of ₹7.17 crore. The work had been awarded (November 2021) at a cost of ₹5.71 crore, to an agency, stipulating completion by October 2022 and was under progress, with payment of ₹2.88 crore having been made (as of November 2022).

Audit observed that agency had not completed the drain work, from Baimundi Nagar to Bandhachaka from 0 m to 1.115 km (except 50 m drain), as well as seven culverts, due to non-handing over of clear site by CMC, for more than one year (as of November 2022). Commencement of the work, without clearance of site had, led to a missing link of 935 m, in contravention to paragraph 3.7.4 of the OPWD code. Though the major portion of drain had been completed, it could not be connected to Petanallah, at the downstream. As a result, the problem of waterlogging/ inundation, in the adjoining areas, during heavy rains, still continued. This had led to unfruitful expenditure of ₹2.88 crore.

The reply, in this regard, was awaited (as of July 2024).

5.2.2.2 Non-completion of drains by BeMC

Scrutiny of records revealed that the works of five[134] primary drains (3.866 km) had been technically sanctioned (June 2017) by OWSSB, for ₹18.44 crore, under the Odisha Disaster Renovation Project. The works had been awarded (March 2018) to a single contractor, at a cost of ₹18.43 crore, with the stipulated date of completion being March 2019 and subsequent extension of time (EOT) up to February 2020. The contractor had completed only 1.032 km, with payment (as of January 2021) of ₹2.74 crore having been made.

Audit observed that out of five drains, two drain works[135] had not been completed, due to slow progress and narrow road width, due to which the machinery could not be moved to the work site. These works had been de-scoped, due to closure of project period in June 2020. Show-cause notice had been issued (February 2020) by the BeMC to the contractor, for slow progress of work. The contractor filed (March 2020) a Writ Petition, against the show-cause notice, before Hon'ble High Court and stay order was issued on the works (16 March 2020). Due to non-completion of the drains, since the last two years, the expenditure of ₹2.74 crore, incurred on these works, had been rendered unfruitful. The status of incomplete drains, noticed during JPV with BeMC officials, is shown in **Photographs 35 and 36.**

Photograph 35 and 36: Construction of drains under ODRP

Similarly, BeMC had issued work orders, for 48 secondary and tertiary drain works, between September 2021 and September 2022, at an estimated overall cost of ₹3.72 crore, stipulating the dates of completion as being 30 to 60 days from the dates of commencement of the respective works. The concerned agencies had been paid ₹40.27 lakh (as of November 2022), for four works only. Audit noticed that out of, 48 works, three had not been completed, due to encroachment and site disputes; one had remained incomplete due to non-

[134] 1) D1: Drain from Mango (Amba) market junction (from end of drain along road No.5) to Chakra nallah along Andha Pasara road 2) D4: From Naliya Bandha in Aska road *via* Triveni Nagar, Garbage Yard, Niladri Vihar to Bahana nallah branch in Tulsi Nagar 3) D9: From (near) residence of Revenue Divisional Commissioner, Ayodhya Nagar, Gajapati Nagar Main road to Bahana nallah 4) D10: From Axis Bank ATM Jayaprakas Nagar to Bahana nallah near 13th lane and 5) D11: From Bidyutpuri office of the General Manager (Electrical Bidyutpuri colony), Bidyutpuri school to Bahana nallah

[135] Drain Nos. D 9 and D 10

shifting of pipelines; and another 15 had not been started, by the contractors, as detailed in ***Appendix-VI***. The progress of the remaining 29 works was also very slow (as of November 2022).

In reply, BeMC stated (November 2022) that steps would be taken to complete the drains. The reply is not satisfactory, since no effective steps had been taken for completion of these works, resulting in choking of drains and waterlogging on several occasions, causing inconvenience to the public.

5.2.3 Non-maintenance of Nallahs under Municipal Corporations

Section 307 of the OMC Act, 2003, stipulates that there shall be one drain for sullage and polluted water and another distinct drain for rainwater. Paragraph 8 of IRC SP 50-2013 prohibits sewerage drains and their contents entering into the SWDs.

5.2.3.1 Non-maintenance of Gangua Nallah by BMC

The Gangua Nallah originates from Budhi Nallah, at RD 18.00 km, near Rajadhani Engineering College, Bhubaneswar. It flows through Mancheswar, Chakeisini and crosses NH 16 near Palasuni and finally outfalls to River Daya near the Kanti Village, after travelling 31 km. It carries household waste water/ industrial effluent of Bhubaneswar city, through 10 natural drains and has outfall into the river Daya-Chilika lake.

Photograph 37: Incomplete cross regulator at Gangua Nallah

Audit collected information about the water quality, at four locations[136], from State Pollution Control Board (SPCB) and found that the concentration of BOD was high, ranging from 6.1 to 10.1 mg/l, against the permissible limit of 3mg/l and DO between 0.8 and 3.1 mg/l against the permissible limit of 5 mg/l (minimum). Similarly, the TC ranged from 11,716 to 1,40,571 mpn/100 ml, against the permissible limit of 5,000 mpn/100ml and FC ranged from 1,00,314 to 1,37,614 mpn/ 100 ml, against the permissible limit of 2,500 mpn/100ml. The concentration of fluoride of river Gangua Nallah, at Badimula and Palasuni, ranged between 1.593 and 3.668 mg/l, against the permissible limit of 1.5 mg/l, of CPCB norms. Video coverage of the Gangua Nallah, receiving sewage water from Bhubaneswar city and its outfall into the Daya River, causing water pollution and health hazards to public, is exhibited in the QR code.

https://youtu.be/EgO-mva3T8A
Gangua Nallah pollution due to the sewerage waste of all nine natural drains of BMC

Gangua Nallah carries household wastewater/ industrial effluent of Bhubaneswar city, through 10 natural drains and outfall into the River Daya-Chilika lake, thereby causing water pollution and threat to human and aquatic life.

Scrutiny of records revealed that a technical team had visited (February 2015) the sites, and recommended an increase in the existing bed width of the Gangua Nallah, from 18 m to 21 m; increase in the length and height of the Pandara bridge; re-sectioning of the drain alignment by acquiring lands; demolition of old laterite damaged bridge *etc*. EE, Drainage Division,

[136] Near: (i) Rajdhani College (ii) Palasuni (iii) Samantarapur and (iv) Vadimula

Khordha, submitted (November 2019) a proposal to DoWR, for construction of an RCC wall on both sides; construction of service roads and footpath; reconstruction of four bridges which were creating blockages; and land acquisitions of 52.85 acres, at a total cost of ₹432.75 crore, after a delay of four and half years and approval had been pending at the Government level, for more than three years (as of November 2022).

Meanwhile, to divert the excess water of Budhi Nallah to Gangua Nallah, during the rainy season, an estimate, for construction of cross-regulator with RCC guard wall at RD 60 m of Gangua Nallah, had been technically sanctioned (February 2021), for ₹4.77 crore, by the SE, Drainage Circle, Bhubaneswar. The work had been awarded (April 2021) at a cost of ₹3.28 crore, with the stipulated date of completion being March 2022.

Audit however, noted that the agency had executed only structure works, with payment of ₹1.51 crore having been made to it (as of June 2022) and EOT having been sanctioned upto January 2023. The CE, Drainage, levied (January 2021) token penalty of ₹0.40 lakh, for delay in the execution of work, which had not been recovered from the agency.

During JPV (October 2022) of the Gangua Nallah, with EE, Drainage Division, Khordha, Audit observed the following:

- One defunct (old) foot over bridge, adjoining NH 316 and an unauthorized building near the Saptasati temple, were blocking the flow of the Gangua water. **Satellite image 15** of the nallah is exhibited below:

Satellite image 15: Damaged old foot over bridge and unauthorised construction

- The Gangua Nallah, at Palasuni Bridge, was filled with weeds and its flow was being blocked by an old water pipeline. Non-shifting of utilities had resulted in choking and blockage of water, creating problems for the free flow of storm water to the downstream side, as well as afflux in the upstream part of the drain, causing urban flooding.

In reply, the EE, Khordha Drainage Division, stated (November 2022) that BMC and OWSSB would be requested to enforce Solid Waste Management Rules, 2016, to prevent water pollution. The EE further added that WATCO would be requested to remove the old damaged water pipe, while BMC and

BDA would be requested to demarcate the buffer zone for the Gangua Nallah, on both sides and demolish the unauthorised construction adjacent to the nallah. The reply is not satisfactory, as effective steps had not been taken by the Department, to protect the Gangua Nallah from pollution.

5.2.3.2 Non-maintenance of Petta Nallah by CMC

The Petta Nallah is a natural stream, connecting the River Mahanadi and Kathajodi (now defunct, due to the construction of a capital embankment on the River Mahanadi). It starts from Sector-10 of CDA and outfalls into the river Kathajodi, through six vented sluices, constructed over Kathajodi's left embankment, *i.e.* on the CDA Ring Road.roa

During JPV of Petta Nallah with CMC officials, Audit observed (November 2022) that there had been littering of sewerage waste into the Petta Nallah, causing water and environment pollution in the vicinity, in addition to discharge of wastewater of the CDA area, to the Petta Nallah, through underground hume pipes, at several locations. As per the status report (July 2022) of PE, PMU, JICA, out of 1,294 sewerage manholes, in the CDA area, 83 sewerage manholes had been directly connected to drainage manholes, instead of sewerage manholes. The solid waste of the nearby area was also found dumped at several locations, at the banks of the Petta Nallah. (video in QR code and photographic evidence are shown alongside).

Photograph 38: Sewerage outfall into Petta Nallah, in CDA area

Photograph 39: Drain filled with sludges at Abhinav Bidanasi

https://youtu.be/gQ7ZX-xuMuQ
Petta nallah polluted by sewerage water of CDA and Bidanasi area of CMC

Littering of sewerage waste into the Petta Nallah, causing water and environment pollution in the vicinity, in addition to discharge of wastewater of CDA area to the Petta Nallah through underground hume pipes at several locations.

Scrutiny of records revealed that an STP, with a capacity of 36 MLD, had been installed (December 2018) at CDA Sector-1, to treat the sewerage waste of CDA, Bidanasi, and other areas of the CMC, as also to discharge the treated water to the Petta Nallah. Despite operation of STP at CDA, no tangible steps had been taken, by CMC, to connect the sewers of all the houses (November 2022), to the STP. Out of 35,000 houses sewer connections targeted, only 10,495 had been connected (as of March 2022), while the sewerage generated from the balance houses had been directly disposed to the Petta Nallah, causing water pollution and health hazards to the public. The concentration of BOD[137] ranged between 3.2 and 15.8 mg/l against the permissible limit of

[137] Biological Oxygen Demand**:** The dissolved oxygen that microorganisms like bacteria need to oxidize, and organic substances in water, are referred to as BOD

three mg/l. Further, TC[138] ranged from 180 to 1,60,000 mpn/100 ml, against the permissible limit of 5,000 mpn/100 ml, while FC[139] was ranged from 180 to 1,60,000 mpn/100 ml against the limit of 2,500 mpn/ 100 ml. A draft proposal, for development and renovation of the Petta Nallah, was submitted (February 2022), by CMC, to the Revenue and Disaster Management Department, GoO and approval of the proposal was awaited (as of November 2022).

Reply, in this regard, was awaited (as of July 2024).

5.2.4 Non-completion of reclamation of water bodies by MCs

Scrutiny of records of three MCs[140], showed that reclamation of nine water bodies, under three MCs, had been taken up between May 2016 and January 2022, at an agreement cost of ₹16.44 crore, with the stipulated dates of completion being between July 2016 and March 2022. Audit, noticed that these works had not been completed (as of November 2022), despite incurring expenditure of ₹7.68 crore, as discussed in **Table 5.1**

Table 5.1: Status of reclamation of water bodies by MCs

Sl. No.	Corporation	Brief of the work	Audit observations
1.	Bhubaneswar	Renovation and reclamation of three water bodies (i) Nayapalli Haza (ii) Fishery tank at Laxmisagar and (iii) Ananta Basudev Purohit tank in Ward 19 had been taken up, between March 2017 and May 2021, at a cost of ₹12.31 crore, for completion between March 2018 and October 2021. The agencies had executed works valuing ₹5.10 crore (41.43 *per cent*) (as of September 2022) and the remaining works were in progress.	The agencies had executed excavation of earth work only. Other works, like landscaping and area development with plantation, Gym, footpath etc., had not been developed (September 2022). Reasons for delays in the execution of these works were not found on records. Though the agencies had defaulted in execution and had not completed the works within the contractual period, liquidated damages of ₹1.26 crore (*i.e.*, 10 *per cen*t of the estimated cost put to tender) had not been levied, which had led to undue benefit being extended to the three contractors. Laxity in close monitoring of progress of works, by the engineers, had resulted in non-completion of work, despite incurring expenditure of ₹5.10 crore, which became unfruitful. BMC stated (May 2023) that renovation of three water bodies could not be completed, due to hindrances at sites and hence penalty could not be levied. The reply is not satisfactory, as delay in completion of the works was ranged between one and half year and four years, but BMC had not taken steps, for removal of hindrances at the work sites to complete the works.
2.	Bhubaneswar	Reclamation of the Ghagudi tank in Ward 23.	Due to non-maintenance of Ghagudi tank, it lost its existence, by way of encroachments.

[138] Total coliform counts give a general indication of the sanitary condition of a water supply. Total coliforms include bacteria that are found in the soil, in water that has been influenced by surface water, and in human or animal waste

[139] Fecal coliforms are the group of the total coliforms that are considered to be present specifically in the gut and faeces of warm-blooded animals

[140] BMC (four works), BeMC (one work) and SMC (four works)

Sl. No.	Corporation	Brief of the work	Audit observations
			 **Photograph 40:** Encroachment of Ghagudi tank In reply, BMC stated (October 2022) that the work of reclamation of the Ghagudi tank did not relate to the Drainage Division. However, Audit noticed that reclamation of water bodies was being dealt by that Division and, thus, the responsibility could not be avoided.
3.	Sambalpur	Works relating to renovation of Dhama Road tank was awarded (May 2016) for ₹36 lakh, stipulating completion by July 2016. The work was in progress with payment of ₹28 lakh (as of October 2022). Similarly, reclamation of three water bodies (Sidi Bandha, Bada Bandha and Puti Bandha), were awarded (December 2018) for ₹3.84 crore, to a contractor, stipulating completion by June 2010. The works were in progress with payment of ₹1.98 crore (as of October 2022). The scope of work provided for excavation of hard soil, construction of inlet/ outlet, tank cleaning, embankment improvement, construction of bathing complex/ maintenance of guard room, renovation of existing ghat, cement concrete plaster *etc.*	The agencies had executed only tank cleaning, embankment improvement, cement concrete plaster *etc.* (October 2022). Reasons for delay in execution of works were not found available on records and SMC had not levied compensation for default in execution of the work, in terms of clause 2(a) of the contract.  **Photograph 41:** Non-completion of Dhama road tank, Sambalpur In reply, SMC stated (May 2023) that penalty had been imposed, for non-completion of the project within schedule time. However, documentary evidence had not been produced.
4	Berhampur	An estimate of ₹50 lakh was technically sanctioned (September 2021) for the construction of a wall at the Haridakhandi tank water body. The work was awarded (January 2022) for ₹47 lakh, for completion by March 2022. The agency had been paid ₹33 lakh (as of June 2022).	The water body was filled with weeds, grass and bushes. Though the agency could not complete the work within the contractual period, the BeMC had neither issued any show-cause notice to the agency, to expedite the work, nor had it levied compensation of ₹5 lakh, for default in execution, in terms of Clause 2(a) of the contract. BeMC stated (November 2022) that steps would be taken to complete the work. Audit noticed that, though the delays in completion of works was 214 days, show-cause notices had not been

Sl. No.	Corporation	Brief of the work	Audit observations
			issued by the BeMC to the contractor, for the slow progress of the work, indicating the laxity of the departmental engineers in monitoring the work.

5.2.5 Dumping of garbage in open drains

Paragraph 15 (zf) of the Solid Waste Management (SWM) Rules, 2016, envisages that ULBs should frame bye-laws and prescribe criteria for levying spot fines on persons who litter or fail to comply with the provisions of these rules. These rules delegate powers to officers or local bodies, to levy spot fines, as per the bye-laws framed. Accordingly, bye-laws were to be framed by the MCs.

Audit observed that MCs had framed bye-laws, for SWM[141] between May 2017 and October 2019. However, despite provisions for levying of spot fines, for littering solid waste into drains, as per clause 20 in these bye-laws, these MCs had not collected spot fines. This indicated that these MCs had neither strictly enforced penalties for violation and dumping of solid waste/debris into water bodies, nor had they initiated action for patrolling along the SWDs, which had led to undeterred dumping of debris; construction and demolition waste; and garbage, including plastic waste, into SWDs, preventing flow of water and creating waterlogging in the Corporation areas.

During JPV (September 2022 to November 2022) of drain sites, along with the officials of MCs, it was noticed that, in many places/drains, in different wards, garbage had been deposited in open drains as shown in **Photographs 42 to 45**.

Photograph 42: Dumping of garbage in BSWC-1, at the back side lane of Hotel Blue Lagoon, in Rajabagicha, Cuttack

Photograph 43: Dumping of garbage in open drains, at the Bisra Road, Udit Nagar Rourkela

Photograph 44: Dumping of garbage in the Gangua nallah, near low lying bridge near NH 316, Bhubaneswar

Photograph 45: Dumping of garbage in drain No.3, in the Mancheswar area, Bhubaneswar

[141] Bye-Laws for SWM : BMC (October 2019), CMC (May 2017), RMC (August 2017), SMC (August 2017) and BeMC (September 2017)

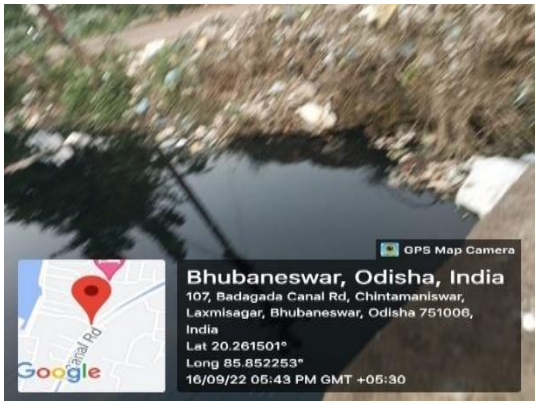
RMC noted the Audit comments (April 2023) and stated that in future, it would be more vigilant for initiating action against the violators, and further stated, that ₹0.62 lakh was collected as fine from the violators. SMC stated (May 2023) that waste management committee would collect SWM user fee, from the citizens, as per SWM bye-law from time to time and impose penalty to the public and commercial organisation, for dumping of garbage into the drains. Reply, in this regard, was awaited from the remaining MCs (as of August 2023).

5.2.6 Non-clearance of site after de-silting works

As per contract conditions of the de-silting work, the concerned agencies should dispose of the excavated soil and clear the work site, within the lead[142] distance. During JPV of drain sites, with officials of the BMC and BeMC, Audit observed that de-silted materials had been deposited at the banks of the drains/ canals. During the rainy season, this material had been slipping into the drains/ nallahs, causing choking/ blockage of drains. Video coverage of one such instance, at the Daya West canal, under the BMC, which was filled with weeds and garbage, is available in the QR code alongside. **Photographs 46 and 47** taken at various drains, show the position in this regard, as observed during JPV.

https://youtu.be/7GgKGznbwVU
De-silted waste near Daya West Canal, BMC

Photograph 46: Solid waste deposited alongside the bank of the Daya West canal, BMC



Photograph 47: Solid waste deposited alongside the bank of the Baragarh canal, BMC

The above indicated the lack of monitoring, in the execution of de-silting works, and regular maintenance of drains/ canals, by the concerned authorities.

In reply, BMC stated (October 2022) that the agency would be asked to clear the sites immediately.

5.3 Sewerage generation, collection, treatment and disposal in Corporations

Section 24 (iii) of the Odisha Municipal Corporation Act, 2003, stipulates that the MCs make adequate provision for the collection, removal, treatment and

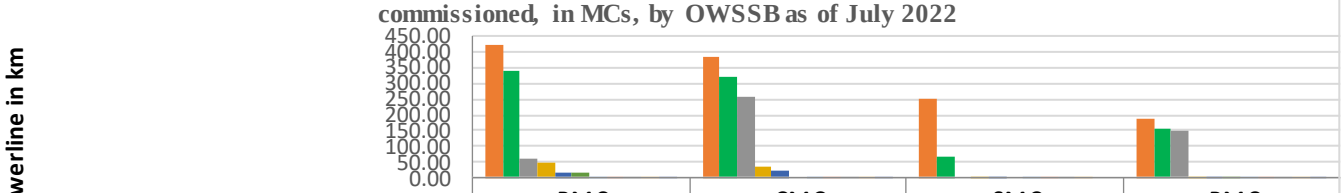
[142] The excavated earth is to be disposed within lead distance of five km

disposal of solid waste, sewage, offensive matter and rubbish and the preparation of compost manure. Further, as per the instructions issued (September 2015) by the SPCB, ULBs are primarily responsible for setting up sewage treatment plants (STPs) and discharging treated sewage effluents, either into surface water bodies, or on land, with prior consent to operate (CTO), from the SPCB.

5.3.1 Execution of sewerage systems by OWSSB and WATCO

Scrutiny of records of the OWSSB showed that out of 12 STPs[143], eight STPs[144] and underground sewerage system (UGSS) had been provided in four MCs, as of March 2022. Out of the remaining four STPs, two STPs had been de-scoped (one each, in BMC/RMC), one was defunct (CMC), one was under progress in BMC and no STPs had been provided in BeMC. Details of the functioning of the eight functional STPs and the sewer facilities provided in these four MCs, are shown in **Chart-3.**

Chart-3: Status of sewerlines, pumping stations and STPs targeted, completed and commissioned, in MCs, by OWSSB as of July 2022



	BMC	CMC	SMC	RMC
Target for laying sewer line (in Km)	419.30	380.00	253.00	185.50
Sewerline completed (in Km)	338.10	322.32	69.00	155.40
Commissioned (in Km)	59.15	254.96	0.00	149.79
No. of pumping stations targeted	51	36	8	4
No. of Pumping stations completed	20	27	1	2
No. of Pumping stations commissioned	18	0	0	2
No. of STPs targeted	6	3	1	2
No. of STPs completed	4	2	1	1
No. of STPs commissioned	4	2	1	1
No. of House connections targeted (in lakh)	3.51	0.53	0.31	0.42
House connections achievement(in lakh)	0.94	0.11	0	0.012

[143] Twelve STPs: Bhubaneswar (six), Cuttack (three), Sambalpur (one) and Rourkela (two)

[144] Functional eight STPs: Bhubaneswar (four), Cuttack (two), Sambalpur (one), Rourkela (one) and Berhampur (zero)

Table 5.2: Performance Analysis in regard to sewer lines, pumping stations and house connections

Name	*Per cent* of Sewer lines		*Per cent* of Pumping Stations		*Per cent* of household connections completed (July 2022)
	Completion against target	Commissioned out of completed	Completion against target	Commissioned out of completed	
1	*2*	*3*	*4*	*5*	*6*
Bhubaneswar Sewerage Districts (I to VI, except V)	80.63	17.49	39.22	90	26.78
Cuttack Sewerage Districts I & II	84.82	79.10	75	70	20.75
Sambalpur	27.27	0	13	0	0
Rourkela	83.77	96.39	50	100	2.86

*(**Source**: Information furnished by the MCs)*

Achievements, in terms of collection of sewerage from source, treatment of sewerage and safe disposal of treated sewerage continued to languish, as discussed below.

(i) Sewerage Management by Bhubaneswar Municipal Corporation

- Out of six STPs, 51 pumping stations and 419.30 km of targeted sewerage lines in BMC, the department could complete only four STPs, 20 pumping stations and laid sewerage line of 338.10 km, as of July 2022.
- From the above mentioned six STPs, only four were commissioned and one was de-scoped. Out of 338.10 km pipeline laid, only 59.15 km were commissioned due to missing links.
- Out of 3.51 lakh households to be connected with sewerage lines, only 0.94 lakh had been connected as of July 2022.
- Out of 216.51 MLD sewerage waste generated in BMC, only 29.75 MLD sewerage waste had been collected by the existing sewerage systems and remaining 186.76 MLD uncollected and discharged to water bodies.

(ii) Sewerage Management by Cuttack Municipal Corporation

- Out of three STPs, 36 pumping stations and 380 km of targeted sewerage lines in CMC, the department could complete only two STPs, 27 pumping stations and laid sewerage line of 322.32 km, as of July 2022.
- Out of 322.32 km pipeline laid, only 254.96 km were commissioned.
- Out of 0.53 lakh households to be connected with sewerage lines, only 0.11 lakh had been connected, as of July 2022.
- Out of 167.20 MLD sewerage waste generated in CMC, only 20.62 MLD sewerage waste had been collected by the existing sewerage systems, remaining 146.58 MLD uncollected and discharged to water bodies.

(iii) Sewerage Management by Sambalpur Municipal Corporation

- ❖ Out of one STPs, eight pumping stations and 253 km of targeted sewerage lines in SMC, the Department completed the STP, one pumping station and laid sewerage line of 69 km, as of July 2022.
- ❖ Out of 69 km pipeline laid, only 9 km were commissioned and balance 60 km were not commissioned due to missing links.
- ❖ Out of 0.31 lakh households to be connected with sewerage lines, no connection so far has been made, as of July 2022.
- ❖ Out of 61.41 MLD sewerage waste generated in SMC, entire sewerage waste discharged to water bodies, due to non-completion of the project.

(iv) Sewerage Management by Rourkela Municipal Corporation

- ❖ Out of two STPs, four pumping stations and 185.50 km of targeted sewerage lines in RMC, the Department completed one STP (another STP was de-scoped due to non-availability of land), two pumping stations and laid sewerage line of 155.40 km, as of July 2022.
- ❖ Out of 155.40 km pipeline laid, only 149.79 km were commissioned and balance sewerage lines were de-scoped due to non availability of land.
- ❖ Out of 0.42 lakh households to be connected with sewerage lines, only 12,000 connections were made so far, as of July 2022.
- ❖ Out of 49.52 MLD sewerage waste generated in RMC, only 2.60 MLD sewerage waste had been collected by the existing sewerage systems, leaving 46.92 MLD uncollected and discharged to water bodies.

(v) Sewerage Management by Berhampur Municipal Corporation

- ❖ There was no STP facility provided in BeMC. Instead, the Department had installed 100 KLD capacity of Septage Treatment Plant (SeTP), for treatment of household sludge, collected through cesspool vehicles, against requirement for treatment of 64 MLD, which could not meet the requirement.
- ❖ Out of 64 MLD of sewerage waste generated in BeMC, entire sewerage waste was directly discharged to water bodies.

Out of 558.64 MLD sewerage waste generated in five MCs, only 52.97 MLD (9.48 *per cent)* of the sewerage waste had been collected by the existing sewerage systems, leaving the remaining 505.67 MLD (90.52 *per cent* uncollected) and discharged to water bodies causing water pollution.

As per para 5.1.4.1 of the Sewerage Manual, 2013, of the CPHEEO, estimated a requirement of 135 liters per capita per day, to be provided for water consumption per person, for UGSS. Further, the norms for sewage generation was set as 80 *per cent* of the water consumed by the residents.

Based on the projected population and water supply to the five selected MCs, during March 2022, Audit worked out that out of 558.64 MLD sewerage waste generated in these five MCs, only 9.48 *per cent* of the sewerage waste had been collected by the existing sewerage systems, leaving the remaining 90.52 *per cent* uncollected. Further, only 14.72 *per cent* of the treated sewerage had been reused and the remaining 85.28 *per cent* had been discharged to water

bodies, as shown in ***Appendix- VII*****.** The physical performance, in terms of sewerage management, in these MCs is given in **Chart–4.**

Chart 4 - Waste generation, collection, treatment and disposal, in the five selected MCs (as of March 2022)

The Government stated (May 2023) that the capacity of the STPs would be fully utilized, once the house sewer connections had been completed and there would not be any flow of wastewater, to water bodies/ rivers. As house sewer connection is under progress, in the above MCs, the capacity of utilization of STPs, would increase day by day, based on number of house connection provided. However, the fact remained that, against the 100 *per cent* sewer networks and household connection, the coverage was ranged from zero to 85 *per cent* and zero to 27 *per cent*, respectively, and the department had not completed the sewerage projects, even after lapse of nine to 14 years, as of March 2022.

5.3.2 Cost and time overrun of sewerage projects

5.3.2.1 Bhubaneswar Sewerage District

Scrutiny of records of the OWSSB revealed that works relating to construction of sewerage systems of the Bhubaneswar city (including STPs for Districts I, II and III) had been awarded (February/May 2008) to an agency, for a cost of ₹286.41 crore, with the stipulated date of completion falling between January and November 2010. These works had, however, not been completed within the prescribed time, in spite of issue of show-cause notices (November 2015), for poor progress of works. Hence, the contract was rescinded (November 2015), in terms of Clause 53.1 of the contract. Meanwhile, the agency had executed works valuing ₹111.31 crore, at the time of rescission of the contract and left the remaining works, valuing ₹175.10 crore, incomplete. These balance works had been awarded (July 2017) to three contractors, at a cost of

₹725.17 crore, for completion by July 2020. These agencies had been paid ₹451.07 crore (as of July 2022) and the works were in progress.

Thus, the purpose of rescinding the earlier contracts had not been achieved. This, in turn, had led to time and cost overruns of 12 years and ₹550.07 crore, respectively. Due to non-completion of the sewerage project, sewerage waste of households had been directly discharged to nearby storm water drains, causing health hazards to public and aquatic life.

The Government stated (March 2023) that the value of left over works from first agreements, which consists of only laying gravity sewers, house sewer, construction of manhole chamber/ inspection chamber/ sewer connecting chambers could not be compared with the value of EPC tenders, which had been awarded for completion of the sewerage projects in all respects. The reply was not tenable, as the works were not completed within the contractual period of second time contracts, the purpose of rescinding the first contracts was not achieved and had a consequential effect on time and cost overrun.

5.3.2.2 Rourkela West sewerage project

Records of the OWSSB revealed that, in order to prevent water pollution in Rourkela City, administrative approval had been accorded (January 2016) for construction of sewerage systems[145], for both Rourkela East and Rourkela West at a cost of ₹89.41 crore and ₹324.08 crore, respectively. The works were awarded (January 2017) for an agreement value of ₹298.20[146] crore, to M/s L&T Limited stipulating the date of completion as January 2020. Due to non-availability of a suitable site, the sewerage project for the Rourkela East project was de-scoped (August 2020) from the agreement. The agency had been paid ₹238.70 crore including GST (as of March 2022), for the Rourkela West project and the work was still in progress (as of July 2022).

Audit also observed that STP had been partly commissioned, since December 2020. Out of the planned 185.50 km of sewer line and four intermediate pumping stations (IMPs), the agency had laid 155.400 km sewer line and constructed two IMPs. Only 149.79 km sewer line and two pumping stations had been commissioned, due to de-scoping of the catchment area and non-finalization of the manhole pumping stations and missing links (July 2022). Out of 42,440 house sewer connections required to be provided, only 1,155 connections (2.72 *per cent)* had been provided (as of November 2022), resulting only 2.60 mld of waste had been treated in STP. Due to non-completion of the project, the sewerage and sullage of the households at Rourkela, continued to be discharged into the river Brahmani, causing water pollution and health hazards to public and aquatic life.

Scrutiny of records also revealed that extra/ avoidable expenditure, of ₹5.11 crore, on the Rourkela West project, in deviation from the contract conditions, had been made, as detailed in **Table 5.3.**

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[145] Rourkela West: (i) STP of 40 mld (ii) pumping stations: four (iii) sewer line of 149.79 km, and Rourkela East: (i) STP of 8 mld (ii) sewer line of 46.44 km (iii) pumping station: Nil

[146] Rourkela East project: ₹69.30 crore + Rourkela West project: ₹228.90 crore, excluding GST

Table 5.3: Excess/ extra payment made to the contractor, for the Rourkela West project

Sl. No.	Nature of deviation	Audit observation
1.	As per the EPC works, payment to the contractor was to be regulated as per provision in Schedule H of the contract.	Schedule H of the project provided for laying of 1,000 mm dia DI K9 pipe of 3,256 m, for raising main, from the pumping station, to the SWD drain near Tarkera and construction of outfall structure at the disposal point. Audit observed that the agency had laid 700 mm dia of DI K9 pipe of 2,918 m, for raising main and had been paid ₹7.36 crore (*i.e.* ₹25,227 per meter), in deviation from the Agreement provisions and without revising the cost for 700 mm dia. The above deviation for laying of pipeline of lesser dia was not approved by the higher authority, as of July 2022. Besides, the agency had executed an additional work of laying of 700 mm dia DI K9 pipe for 1,305.970 meters, at the rate of ₹12,277.89 per meter and had been paid ₹1.60 crore. Payment of the differential amount of ₹3.78 crore[147], on laying of pipeline of 2,918 m, resulted in undue benefit to the contractor (as of July 2022). The Government stated (March 2023) that the project was handed over to WATCO and EIC, OWSSB had requested the GM, WATCO, Rourkela to take necessary action.
2.	Authority Engineer had recommended for payment of ₹4.69 crore during the month of February 2021 for two railway crossings and two highway-pumping works.	Despite recommendation of the AE[148] for payment of ₹4.69 crore, to the agency (February 2021), PE, Rourkela, made payment of ₹6.02 crore, without any justification which led to excess payment of ₹1.33 crore to the contractor, which had not been recovered (as of July 2022). The Government stated (March 2023) that out of ₹6.02 crore, ₹74 lakh was already recovered and balance amount would be settled based on the revised price break up. The fact remained that payment was not made as per actual measurement and recommendation by AE, which led to excess payment.

5.3.2.3 Unfruitful expenditure, due to idling of STP at Matagajpur, Cuttack

Records of OWSSB revealed that, in order to avoid pollution in the Mahanadi and Kathajodi rivers, by wastewater of Cuttack city, a 33 MLD STP had been constructed for a design period of 20 years and had been commissioned (July 2006), by incurring expenditure of ₹3.60 crore. Audit further noted that the PE, OWSSB and EE, PH Division, Cuttack (March 2014) had inspected the STP

[147] 2,918 meter X (₹25,227 - ₹12,277.89 per meter)

[148] Authority Engineer was engaged by OWSSB to supervise the works of sewerage projects, as per the EPC contract

and found that there was inadequate sewerage flow in the storm water channel. Further, two major leakages had been detected in the drain site embankment of the anaerobic pond (including leakage in the 600 mm dia Cast Iron (CI) pipe near pond). Non-functioning of four gate valves, installed inside the facultative pond, was noticed, while Pump IV was not functioning, due to profuse leakage in the 300 mm dia CI delivery pipe. The flow in the manual gate, for sewerage water, near Matagajpur, was not sufficient to run the STP, as a majority of sewerage was being diverted to the link drain at Matrubhawan to river Kathajodi near Khannagar, due to ongoing drainage works, from 2013 onwards. The O&M of the defunct STP had been handed over (January 2020) to WATCO. Due to inadequate flow in the STP of 33 MLD capacity, which had been constructed at a cost of ₹3.60 crore, it had not been put to use for more than eight years, rendering the said expenditure unfruitful, in addition to continued discharge of untreated wastewater to the river Kathajodi.

Photograph 48: Idle STP of 33 MLD capacity, at Matagajpur, Cuttack

It is pertinent to point out that the above deficiency was mentioned in the PA on "Implementation of Sewerage projects in the State" covering the period from the FYs 2010-11 to 2015-16 and the findings of the PA had been included in the Report of the CAG of India for the year 2016, Government of Odisha. Despite pointed out in the CAG report, OWSSB had not taken any steps to make it functional for treatment of sewerage waste of Cuttack city, as of July 2022.

The Government stated (March 2023) that the STP was temporarily under shut down, till completion of JICA drain works. After completion of drainage works under JICA, the same would be repaired and put to operation. The fact remained that though deficiencies were pointed out in the earlier report itself, corrective measures were not taken for more than seven years.

5.3.3 Non-installation of GPS facilities in cesspool vehicles

As per Paragraph 5.2.2.1 of the Swachh Bharat Mission (Urban) Advisory on onsite and offsite Sewage Management Practices, 2020, ULBs are to empanel and register private Global Positioning System (GPS) enabled desludging vehicles and service providers, in their jurisdictions. These registrations are expected to help the ULBs monitor the activity of the desludging machines and prevent unregulated discharge of collected septage in the open environment.

Photograph 49: As per the Bhubaneswar Municipal Corporation's twitter handle

Audit observed that, in the five selected MCs, out of the 64 cesspool vehicles engaged in the septage management for SeTPs, GPS tracking devices had been installed only in 21 (as of July 2022)

indicating poor septage management. The cesspool vehicles were letting out septage into the water bodies.

The Government stated (March 2023) that the O&M of the SeTP systems and cesspool vehicles were under the ULB administration. The installation, monitoring and tracking of cesspool vehicles were being done in phased manner, by the concerned ULBs. However, the fact remained that due to absence of GPS tracking of cesspool vehicles, there was no prevention and collection of septage and these were letting out into the water bodies causing water pollution.

5.3.4 Functioning of sewerage treatment plants

5.3.4.1 Gap between sewerage generation and treatment

Section 17 of the Water (Prevention and Control of Pollution) Act, 1974, stipulates that the SPCB has to: (i) prevent, control or abate pollution of streams and wells in the State and secure the execution thereof and (ii) inspect sewerage or trade effluents, plants set up for the treatment of water, works for the purification thereof and the system for the disposal of sewerage or trade effluents or in connection with the grant or any consent, as required by the Water Act.

Based upon the information furnished by the OWSSB, the details of sewerage waste generated, treated and gaps in treatment, in the five selected MCs, are given in **Table 5.4**.

Table 5.4: Sewerage generated and treated in MCs, as of March 2022

(in MLD)

Sl. No.	Municipal Corporations	Water supply to MCs by PH (O)	Sewerage generated	Sewerage treated	Untreated sewerage
1	Bhubaneswar	270.64	216.51	29.75	186.76
2	Cuttack	209.00	167.20	20.62	146.58
3	Sambalpur	76.76	61.41	0	61.41
4	Rourkela	61.90	49.52	2.60	46.92
5	Berhampur	80.00	64.00	0.00	64.00
	Total	**698.30**	**558.64**	**52.97**	**505.67**

***(Source:** information furnished by EIC, PH and EIC, OWSSB, for NGT compliance 593/2017, in May 2022)*

It can be seen from **Table 5.4** that:

- against the sewerage waste generation of 558.64 MLD, in the five selected MCs, the Department had provided treatment to 52.97 MLD (9.48 *per cent*) of waste, leaving a gap of 505.67 MLD (90.52 *per cent*).
- no STP had been provided for BeMC area, even though the Corporation had generated sewerage waste of 64 MLD.

The Government stated (March 2023) that the estimated waste generation was 281.81 MLD in four MCs, for which 276.67 MLD capacity of STPs were provided, based on 2021 population. After completion of house sewer connections in the above cities, all the wastewater generated in the cities would be treated in the STPs. The reply was not tenable, as the waste generation was calculated at the rate of 80 *per cent* of water demand instead of water supply, for which only 52.97 MLD of waste was received for treatment

out of 558.64 MLD generated and balance sewerage waste was directly discharged to water bodies causing water pollution.

5.3.5 Functioning of STPs

As per Paragraph 5.7.4.2.1 of the CPHEEO Manual, Hydraulic Retention Time (HRT)[149] depends on the volume of sewerage received and the capacity of the primary clarifier[150]. Paragraph 5.18.20.2 of the above Manual recommends that the minimum retention time, for the primary clarifier, in STPs, be 1.5 to 2 hours. The Manual also recommends that the HRT, in primary clarifiers, should not exceed 2.5 hours, considering the surface overflow rate[151]. If the retention time is too short, it will cause carryover of solids. If it is too long, it will increase septicity[152] conditions, resulting in poor performance of the STPs.

Audit however, found that the actual retention time, in the functional units of the STPs, were higher than the recommended maximum HRT. The excess HRT could led to septic conditions in the STPs and also lead to their performing poorly.

Table.5.5: Showing hydraulic retention time of STPs

STP	Rated treatment capacity of the primary clarifier of the STP (MLD)	Average quantity actually treated (MLD)	Actual retention time (Hours) (Recommended maximum 2.5 hours)
CDA, Cuttack	24	16.66	3.25
Matagajpur	8	1.5	12.54
Rourkela	40	2.60	Not furnished
Bhubaneswar I	56	14	3.00
Bhubaneswar II	28	16	3.00
Bhubaneswar III	43.5	9	4.00
Bhubaneswar IV	8	8	3.00

***(Source:** CE, JICA and WATCO)*

From **Table 5.5** it is evident that the STPs did not meet the recommended HRT and surface overflow rate.

While accepting the Audit comments, the Government stated (March 2023) that the HRT was not meeting the desired criteria because of insufficient flow, due to inadequate number of house sewer connections. The HRT would certainly meet the criteria after completion of house sewer connections, resulting sufficient flow to the STPs. Department should take early action to provide house sewer connections in MCs, to avoid septicity due to excess retention period.

[149] The average amount of time a gallon of wastewater will remain in a particular basin during the wastewater treatment process. It is a measure of a soluble compound's average time remaining in a constructed bio-gas reactor or aeration tank. This process goes by other names, including hydraulic residence time, and has a huge impact on effluent water quality

[150] A wastewater treatment device that consists of a rectangular or circular tank that allows those substances in wastewater that readily settle or float, to be separated from the wastewater being treated

[151] As per Sewerage Manual, 2013, surface overflow rate: 25-30 cum/ sqm/ day

[152] The condition in which organic matter decomposes to form foul-smelling products associated with the absence of free oxygen

5.3.5.1 Absence of independent Audit of water quality in STPs

Para 2.1.6 of the Handbook of Benchmarks of the Ministry of Urban Development, GoI, envisages that for quality of the treated water, let out by the STPs, there should be availability of own laboratories or easy and regular access to accredited testing centers, of the State (GoO), for carrying out tests, in addition to periodic independent audit of wastewater quality.

Records of OWSSB and WATCO revealed that, although periodic independent audit, of the water quality of treated water, was required to be carried out, this had not been done. The Department had used the State laboratory at Bhubaneswar, for testing of drinking water quality, as well as the Divisional laboratories at Berhampur and Cuttack, since December 2016, through M/s Spectro Analytical Lab[153], which had been awarded the work, at an agreement cost of ₹45.47 crore, upto June 2027. The following deficiencies were noticed in this regard:

- Due to the work load involved, water quality tests at STPs had been de-scoped from the original contract of the agency, since December 2016, as this work had not been included in the estimate, while entering into the agreement.

- OWSSB/ WATCO had established testing laboratories in all the STPs. However, these laboratories were being operated by the Operation and Maintenance (O&M) contractors of the respective STPs, or by using staff outsourced by the contractor. This arrangement involved conflict of interest, as the contractors were also responsible for ensuring proper treatment of sewage.

Absence of independent water quality testing in STPs led to quality of treated water of STPs was not ensured by WATCO as laboratories at STP sites are operated by the operation and maintenance contractors by using outsourcing staff.

Audit collected water samples of treated water, with the assistance of the SPCB, from various STPs, functioning at Bhubaneswar (four), Cuttack (two), Rourkela (one) and Sambalpur (one), for testing (September 2022/ January 2023) at Central Laboratory of SPCB, Bhubaneswar. These samples showed the presence of contamination, beyond the permissible limits, in STPs. Details of the quality of the water tested, are given in the **Table 5.6**.

[153] For operation and maintenance, the work was awarded to the Spectro Analytical lab, a private agency, for carrying out the test in Government laboratories of Bhubaneswar, Cuttack and Berhampur

Table 5.6: Quality of treated water, of the STPs, in MCs

Parameter	Permissible limit, as per CPCB (in mg/l) for STPs	*Location of STP*							
		Meherpali BMC	*Basuaghai BMC*	*Kochilaput BMC*	*Paikarapur BMC*	*CDA CMC*	*Matagajpur CMC*	*SMC*	*RMC*
pH	6.5-9.0 mg/l	6.8	6.7	6.7	6.8	7.2	7.2	7.3	7.8
TSS	Not more than 20 mg/l	24	11	10	10	13	13	14	21
BOD	Not more than 10 mg/l	2.4	1.7	10	6.2	3.7	3.9	4.9	4.7
COD	Not more than 50 mg/l	8	8	26	16	16	16	35	24
TC MPN/ 100 ML	5,000 maximum	1,60,000	28,000	1,60,000	1,60,000	4.5	1.8	35,000	4,900
FC MPN/ 100 ML	Less than 2,500	1,60,000	22,000	1,60,000	92,000	2	1.8	17,000	780

***(Source:** Water quality test reports, furnished by the Central Laboratory of the SPCB)*
(Full form of the abbreviations used in Table 5.6:* pH*: Potential of Hydrogen; **TSS**: Total Suspended Solids; **BOD**: Biochemical Oxygen Demand; **COD**: Chemical oxygen Demand; **TC**: Total Coliforms; **FC**: Fecal Coliforms, and **MPN**: Most probable number in milliliter)

Table 5.6 indicates the following deficiencies:

- TSS was within the permissible limit, in six STPs, of four MCs, but exceeded the permissible limits in RMC and Meherpali, BMC
- Concentration of TC and FC were beyond the permissible limits, in six STPs.

The above indicates the laxity of OWSSB/ WATCO, in monitoring the quality of the water, treated at the STPs.

The Government stated (April 2023) that the OSPCB being a third party was conducting periodical test (monthly) of water at inlet and outlet of STPs, at different locations of different projects. After receipt of the test report of OSPCB in this regard, the concerned O&M authorities and the agencies were taking necessary follow up action, in case there is any deficiency to the desired parameters. However, the fact remained that the OSPCB was only conducting water sample test of rivers and water bodies.

5.3.5.2 Absence of re-use of treated sewerage water

As per para 7.1.1 of Chapter 7 of the Manual of Sewerage and Sewage Treatment System, 2013, treated sewage is being used for a variety of applications, such as farm forestry, horticulture, fish culture, indirect and incidental uses *etc.* As per the benchmark contained in the MoUD and AMRUT guidelines, at least 20 *per cent* of the treated water was to be re-used/ recycled.

Photograph 50: Treated water allow to flow nearby polluted Petta nallah in CDA, STP, Cuttack

Audit scrutiny of the handling of treated water revealed that OWSSB had not put in place any system, to re-use the treated wastewater for beneficial purposes, but had, instead, allowed it to be transported to nearby water bodies, which had already been polluted by the sewage of household.

The Government stated (March 2023) that the treated water was discharged to polluted Petta Nallah in order to dilute the wastewater and reduce the degree of pollution. Further, it was stated (March 2023) that the strategy and modality for re-use of at least 20 *per cent* of treated water has to be taken up. The reply is not acceptable, since the Department didn't take any action for reuse of treated water from STPs, as of March 2023.

5.3.5.3 Sludge disposal

As per Paragraph 6.10.2.1 of the Manual of Sewerage and Sewage Treatment System, 2013, dried sludge has to be used as fertiliser, for lawns, cash crops and fodder grasses.

Audit observed that OWSSB had not made any efforts to convert the sludge to fertilizer, between March 2020 and June 2022, except in the case of STP-1 at Cuttack, which had produced 60.29 MT of dried sludge, the entire quantity had been spread over low lying areas of the Chakradharpur dumping yard, during the same period. No quality tests had, however, been conducted for the sludge generated from the STP (as of July 2022). Due to non-testing of the quality of the sludge, before it was disposed of, surface water contamination and leaching could not be ruled out.

The Government stated (March 2023) that sludge disposal was the responsibility of contractors as per technical specification of contract. However, the fact remained that the dried sludge was spread over low lying areas of Chakradharpur dumping yard without any quality test.

5.3.5.4 Extra expenditure due to works undertaken in deviation from the Code and Manual

As per paragraph 3.4.10 of the OPWD Code, estimates should be prepared in the most economical manner, based on the State Schedule of Rate (SoR) and Analysis of Rate (AoR).

Scrutiny of records, of OWSSB, WATCO and the selected MCs, revealed that works had been taken up, in deviation from the provisions of the OPWD Code and Sewerage Manual, which had resulted in extra expenditure of ₹28.54 crore, as discussed in **Table 5.7.**

Table 5.7: Details of extra avoidable payments, incurred due to deviation from the OPWD Code and Contract conditions

Sl. No.	Criteria	Audit observation
1.	As per SoR (Chapter 1 & 2), mechanical means of excavation of earth are cheaper than manual excavation of earth work.  **Photograph 51:** Mechanical excavation of earth work, for sewer line near Jagamara crossing, Bhubaneswar.	The estimates of 51 works[154] provided for manual excavation of earth work, at the rate of ₹124.90 to ₹321.30 per cum. However, the SoR provided for mechanical excavation of earth work, at the rate of ₹16.74 per cum, which was cheaper than manual excavation. During JPV, and as may be seen from **photograph 51**, it was noticed that the earth work had been executed by mechanical means, by the contractor at the Jagamara crossing. Adoption of manual means of excavation in the estimates, instead of mechanical excavation of earth work, led to excess payment of ₹11.68 crore[155], for execution of 5.78 lakh cum of earth work, as the contractors had actually adopted mechanical excavation for earth work. In reply, BMC stated (October 2022) that, the labourers were engaged for excavation and transportation of excavated materials to motorable points. The reply was not tenable, since earth work excavation had actually been done by mechanical means, while payment had been released, to the agency, for manual means, leading to undue benefit to the contractor.
2.	Paragraph 3.55 of the Sewerage Manual stipulated that the tunneling method, adopted for sewer construction, could be classified as auger or boring, jacking and mining. As per Para 3.4.10.(iii) of the OPWD Code, if the details are not available at the time of preparation of the estimate, a lump-sum provision may be made and, immediately after sanction, detailed estimates should be prepared and sanctioned by the competent authority, before the works were executed. As per RDSO[156] guidelines, pipes could be	Estimates of three sewerage projects (Bhubaneswar I, II and III) provided for laying of sewer line, by trenchless technology[157] of micro tunneling, for 1.846 km, with payment of ₹15.92 crore. Agencies executed the trenchless work by using the pipe jacking method[158], for sewerage, instead of the micro tunneling[159] process, as provided in the agreement, and received payment for laying of pipelines at higher rates. Payment was made to the agencies, without reducing the cost, for the manual

154 Works are executed by five selected MCs, OWSSB and WATCO

155 Total quantity of earth work executed of 5.78 lakh cum X difference between the rate of manual excavation and mechanical excavation

156 Research Designs and Standards Organisation (RDSO)

157 Technology used for laying of pipelines without the need for massive excavation work

158 Pipe jacking is a trenchless technology method for installing a prefabricated pipe through the ground from a drive shaft to a reception shaft, where jacking force is transmitted through pipe to pipe interaction.

159 Micro tunneling is a trenchless method of sewer construction. It is effective in soft, unstable, and wet soils and can crush large boulders. The tunneling process is remotely controlled and can be used to install larger diameter pipes and longer pipe runs than the Jack and Bore method

Sl. No.	Criteria	Audit observation
	inserted under the tracks, using any trenchless technology, like pushing technique or auger boring technique *etc*. Casing pipe was to be laid by the trenchless technology/ horizontal boring / pushing/ ramming method.	jacking method. The micro tunneling work was non-scheduled item as per the State SoR. Under Secretary to Government, H&UD Department, GoO, had instructed (June 2021) OWSSB, to adopt the rate as per the schedule of rate of Rajasthan, for micro tunneling works. Audit compared the rate of manual jacking and rate adopted by WATCO for micro tunneling, as per SoR of Rajasthan, for 1.846 km which led to undue benefit of ₹10.74 crore[160] to the agencies.

Recommendations:

13. ***The bye-laws for solid waste management may be enforced strictly to protect water bodies.***

14. ***Government may put in place an institutional mechanism, for ensuring coordination of all line departments, in implementation of Under Ground Sewerage System.***

15. ***OWSSB/WATCO may ensure availability of work site and all mandatory clearance from line departments, before awarding tenders for UGSS.***

16. ***MCs may plan to commission the remaining sewerage pipelines and Sewage Treatment Plant (STP) to ensure adequate sewerage flow and treatment.***

17. ***MCs may plan to provide household connections to sewerage lines, preventing direct discharge of household sewage into water bodies.***

18. ***MCs may plan to restore the non-functional Sewage Treatment Plant to ensure adequate sewerage flow and treatment.***

19. ***RMC/ BeMC may plan to provide adequate capacity of STPs for treatment of sewerage water for Rourkela and Berhampur city.***

20. ***OWSSB/WATCO may focus on ensuring the quality of sewage treatment, by independent audit of water quality and by performing recommended laboratory tests through accredited laboratories.***

[160] 1.846 km X rate for micro tunneling works per km (-) manual jacking rate per km

21. OWSSB/WATCO may take steps to protect the environment by increasing reuse of treated water and converting sludge into manure.

CHAPTER - VI
Monitoring Mechanism for Storm Water Drainage and Sewerage Management Systems in Municipal Corporations

CHAPTER - VI

Monitoring Mechanism for Storm Water Drainage and Sewerage Management Systems in Municipal Corporations

This Chapter deals with monitoring and evaluation of the management of storm water drains and sewerage systems, by the Corporations. It assesses whether the institutional mechanisms, for monitoring and implementation of storm water drains and sewerage systems in cities, were adequate and effective, for timely completion of projects and providing the desired outcomes to the public. The Chapter also tries to bring out the negative impact of the lack of management of storm water drains and sewerage systems, to the bio-diversity, affecting the environment and the populace.

6. Institutional mechanism for monitoring of storm water drainage and sewerage systems

6.1 Lack of monitoring

6.1.1 Lack of monitoring by High Level Steering Committee

High Level Steering Committee had met only thrice against target of 20 meetings during 2017-22. Non conduct of HLSC meetings regularly resulted in non-completion of sewerage projects.

The H&UD Department formed (May 2007), a High Level Steering Committee (HLSC)[161], for overall project monitoring, including implementation of sewerage systems in Odisha, which was required to meet at least once in three months.

Scrutiny of records of the Department revealed that the HLSC had met only three[162] times (15 *per cent*), against the requirement of holding 20 meetings, during the FYs 2017-18 to 2021-22 and discussed regarding implementation of sewerage project. Reasons for non-conduct of regular meetings were not found available on records. Absence of periodical meetings indicated the weak institutional mechanism for effective implementation of sewerage management systems, by MCs.

6.1.2 Non-formation of Social Development Committee

Under Orissa Integrated Sanitation Improvement projects, a Social Development Committee (SDC) is to be formed, to: i) monitor project coordination of the social development and public awareness component ii) monitor, supervise and approve annual plans and iii) exercise financial and budget control, through sanitation improvement teams. The SDC was required to meet quarterly and whenever required.

Audit noticed that no SDC was in place, in the Department, indicating lack of monitoring of sanitation improvement projects.

The Government noted (April 2023) the Audit observation for future guidance.

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[161] Members of the HLSC: a) Development Commissioner (Chairman), b) Principal Secretary to H&UD (Vice Chairman), c) Secretary, Finance Department, d) Secretary, Planning and Convergence Department, e) Secretary, Revenue and Disaster Management Department, f) Special Secretary, H&UD Department, g) Chief Engineer, Public Health, h) Member Secretary, OWSSB, and i) Municipal Commissioner of BMC and CMC

[162] HLSC meetings held : 16 June 2017, 04 August 2018 and 23 July 2019

6.1.3 Lack of monitoring by State Level Committee

As per NGT instructions, issued during 2018, treatment of 100 *per cent* sewerage was to be ensured, by March 2020, by the ULBs. In case of non-compliance of the STPs, the concerned local bodies were liable to pay environmental compensation to State Pollution Board, with effect from April 2020 onwards.

Records of the Department revealed that, for compliance to NGT, GoO had formed (February 2019) a State level Committee (SLC)[163], headed by a retired Judge of the High Court. Though the SLC had met 11 times between February 2019 and February 2020, neither compliance to the NGT observations on sewerage management, nor measures to improve the SWDs and SMS, had been discussed. The NGT had levied environmental compensation (July and September 2022) of ₹52 lakh[164] on two ULBs for causing environment pollution which indicated poor monitoring by the SLC.

6.1.4 Deficiency in holding OWSSB meetings, for monitoring STP projects

No OWSSB Board meetings were held during the FYs 2017-18 to 2021-22, against the requirement of 30 meetings.

As per Regulation 3 of the OWSSB Regulations, 1992, Board meetings of the OWSSB were to be convened at least once in a period of two months. The date, time and place of the meeting was to be fixed by the Chairman, or, in his absence; by the Vice Chairman who was competent to convene the meeting under such circumstances. Section 15 of the OWSSB Act, 1991, envisaged that the Board was to render all necessary services, in regard to water supply, sewerage and sanitation, to the State Government and local bodies; prepare draft State Plans for water supply, as well as sewerage and drainage on the directions of the State Government; and review and advise on the tariff, taxes, fees and charges of water supply and sewerage, operating in the areas, under the jurisdiction of the Board.

Audit observed (July 2022) that no meetings had been held, during the FYs 2017-18 to 2021-22, in OWSSB, against the requirement of 30 meetings.

The Government stated (March 2023) that there was no need to hold Board meetings, as review meetings being conducted at Government level. Further, it was stated that meetings should be conducted, as per the necessity. Hence, steps would be taken to hold Board meetings, henceforth. The reply was not tenable, as non-conduct of Board meetings regularly had led to poor supervision and monitoring of STP projects.

6.2 Deficiency in monitoring by State Pollution Control Board

The SPCB is entrusted with the responsibility of implementation of Environmental Laws, particularly the Water (Prevention and Control of Pollution) Act, 1974; the Air (Prevention and Control of Pollution) Act, 1981; the Environment (Protection) Act, 1986; and a number of Rules and

[163] Members of SLC: Director, Environment-cum-Special Secretary, Forest, Environment and Climate Change Department; Director Municipal Administration, H&UD Department; Director, Public health, Health and Family Welfare Department; Chief Environment Scientist, State Pollution Control Board

[164] Two ULBs: Kendrapara ₹24 lakh and Belpahar ₹28 lakh

Notifications, issued thereunder, as amended from time to time. It is also required to carry out environmental monitoring and research.

6.2.1 Non-levy of environmental compensation

As all the five MCs failed to comply the NGT instructions for treatment of 100 *per cent* sewerage by March 2020, environmental compensation of ₹1,239 crore was not levied on MCs by the SPCB as of March 2022.

As per NGT instructions (2018), treatment of 100 *per cent* sewerage was to be ensured by March 2020. In case of non-compliance of sewerage treatment plants, the local bodies would be liable to pay environmental compensation[165] (EC), with effect from April 2020 onwards.

As per CPCB guidelines, EC was to be levied in case of failure to: i) prevent the pollutants from being discharged in water bodies and ii) implement waste management rules. The cost of EC[166] arose on account of untreated/partly treated waste/ sewage of insufficient capacity of waste/ sewage management/ treatment facility.

Scrutiny of records of the SPCB showed that EC, amounting to ₹1,239 crore, had not been levied and collected by the SPCB, from the five selected MCs, since sewerage projects in none of the MCs had been fully completed, as detailed in ***Appendix-VIII***. This was despite the fact that seven STPs[167] had been partially commissioned between December 2018 and March 2022; the percentage of house sewer connections ranged from zero to 29 *per cent;* and the percentage of sewer lines connections ranged from zero to 81 *per cent*, as discussed in **Paragraph 5.3.1** *supra*, resulting in discharge of sewerage waste, generated in cities, to nearby water bodies, causing water pollution.

6.3 Inadequate manpower for monitoring storm water drainage works

As per Paragraph 2.3 of the SWD Manual, 2019, in order to efficiently address day-to-day operation and maintenance issues related to SWDs, and to carry out preventive maintenance, a dedicated cell was to be formed in each ULB and was to have manpower, vehicles and related equipment, at its disposal. Alternatively, a dedicated drainage cell, at the MC level, was to be created, to handle this work efficiently.

Audit however, observed that no separate cell had been constituted, at the MC (except in BMC) level, for storm water drainage management. Though BMC had a dedicated drainage division, in place, from February 2016, there was inadequate manpower for engineering staff. In the other MCs, there were no dedicated drainage divisions, for implementing storm water drains. Despite availability of funds with MCs, as discussed in **paragraph 4.1**, no steps had

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[165] Environmental compensation is a policy instrument for the protection of the environment, which works on the Polluter Pay principle

[166] Formula as per CPCB, for EC (₹ in lacs) = 17.5 (total sewerage generation - installed treatment capacity) + 55.5 (total sewerage generation - operational capacity) + 0.2 (Sewerage generation - operational capacity) x N + Marginal cost of environmental externality x (total sewerage generation - operational capacity) x N (where N is the number of days delayed for STPs). As per the guidelines of CPCB, for calculation of environmental compensation for "Discharge of Untreated/ Partially Treated Sewage by concerned Individual/ Authority" and the order dated 21 September 2020, the Marginal Cost of Environmental Externality is taken as minimum 0.05 and maximum 0.10 for sewage up to 200 MLD.

[167] Bhubaneswar sewerage districts (I to IV), Cuttack (CDA and Matagajpur) and Rourkela West

been taken to fill up the vacancies, as detailed below in **Table 6.1** which had adversely affected the execution and monitoring of SWD projects.

Table 6.1: Inadequate man-power in MCs for Drainage works

Sl. No.	MC	Executive Engineer (renamed as Superintending Engineer)			Sub Divisional Officer (renamed as Deputy Executive Engineer)			Junior Engineer (renamed as Assistant Engineer)		
		SS as per norms	MIP	Vacancy (-) / Excess (+)	SS as per norms	MIP	Vacancy (-)/ Excess (+)	SS as per norms	MIP	Vacancy (-)/ Excess (+)
1	BMC	01	01	0	04	03	(-) 01	16	08	(-) 08
2	CMC	02	02	0	04	02	(-) 02	12	11	(-) 01
3	SMC	01	01	0	01	01	0	10	05	(-) 05
4	RMC	01	02	(+) 01	01	01	0	08	09	(+) 01
5	BeMC	03	01	(-) 02	04	02	(-) 02	13	09	(-) 04
	Total	**08**	**07**	**(-) 01**	**14**	**09**	**(-) 05**	**59**	**42**	**(-) 17**

*(**Source**: Information furnished by concerned MCs)*
***SS**: Sanctioned Strength, **MIP**: Men-in-position*

In reply, BeMC stated (November 2022) that steps would be taken to fill up the vacancies. The replies from other MCs are awaited, as of July 2024.

6.4 Non-levy of compensation for delay in execution of works

As per clause 2(a) of the contract for drainage and sewerage works, if the concerned agency failed to complete any work, within the stipulated period, compensation for delay, at the rate of 10 *per cent* of the estimated cost was to be levied as penalty.

Audit observed that none of the 48 works had been completed in time and OWSSB and MCs had not levied compensation penalty of ₹102.03 crore, for such non-completion (as of July 2022), as detailed in ***Appendix-IX***. Delays in completion of projects ranged between 20 and 2,312 days and led to consequent delays in the achievement of the desired objective i.e. to prevent water bodies from water pollution.

In reply, BMC stated (October 2022) that agencies had been requested to complete the works in time and penalty for delay would be levied as per contract conditions. OWSSB stated (July 2022) that, after finalisation of the EOT applications of individual contracts, liquidated damages would be recovered. These replies are not acceptable, since the MCs and OWSSB had not taken corrective measures for the delayed execution of works. Replies from the other MCs were awaited (July 2024).

6.5 Environmental impact due to delays in the implementation of sewerage projects

As discussed in **Paragraphs 5.3.1 and 5.3.2** *supra*, all sewerage projects had been delayed by more than 09 to 14 years. During audit of the five selected MCs, it was observed that wastewater was being directly discharged into the rivers Mahanadi[168], Kathajodi[169], Kuakhai, Daya, Gangua[170], Brahmani[171] and the Bay of Bengal, leading to water contamination.

[168] The Mahanadi River was being polluted by wastewater through the Dhobijore nallah, Sambalpur town and Cuttack city (near Police Colony)

The water quality of different stretches of rivers and nallahs, from January to July 2022, as per SPCB test reports, is detailed in ***Appendix –X.***

Audit observed that:

- TC and FC in 11 locations, were beyond the permissible limits, for all the six rivers/ nallahs[172]. Analysis revealed that increase in TC and FC was likely to cause increase in bacterial count in these areas, which was likely to result in water borne diseases and affect water quality.
- BOD was not within the permissible limit, in 10 locations, of the six rivers/ nallahs. Increase in the BOD level was likely to drop down the DO level and cause threat to aquatic life.
- COD was excess, in three locations, of two rivers. Similarly, DO was less in seven locations in four rivers.

The Government stated (March 2023) that nine STPs were completed and commissioned by December 2022 and laying of balance sewer lines and providing house sewer service connection in progress. The social benefit intended in the DPRs shall be derived by commissioning above STPs gradually and would be fully derived on completion of targeted household connections. The Government further stated that the water quality parameters of rivers have changed, as evident from the CPCB Report 2022 and benefit of sewerage system would be fully derived on completion of house sewer connections. It is pertinent to mention that CPCB had pointed out that five rivers *viz.*, Brahmani, Daya, Gangua, Kathajodi and Kuakhai were not complying to the prescribed water quality criteria for BOD. The reply was not tenable, since the Department had taken more than 09 to 14 years, to complete the projects, for which intended benefits were not achieved, causing water pollution and threat to human life, soil, vegetables and aquatic life. Moreover, the CPCB Report 2022, only indicated non-complying of the prescribed water quality of rivers, for BOD and not indicated non-complying of water quality, for other parameters, as pointed out by Audit.

Water pollution pose threat to public health and ecosystems. Across the State, 42.24 lakh people were affected by acute diarrhoea, 4.63 lakh by typhoid, 0.12 lakh by hepatitis and 0.12 lakh by renal diseases during the FYs 2017-22 which were primarily caused due to water contamination.

6.5.1 Impact of Water Pollution

The use of contaminated water causes health disorders to humans as well as ecosystems. The reported health disorders, arising due to use of contaminated water, include disorders relating to skin, digestive, respiratory and nervous systems, kidneys, spinal cord and heart; mental imbalance; miscarriage; and cancer. Contaminated water also constitutes a threat to aquatic life. The impact of polluted water, to human life, soil, vegetables and aquatic life, is discussed in the subsequent paragraph.

169 The Kathajodi river was being polluted by Pettanallah, Cuttack and Cuttack city sewerage water, at Khan nagar and Matagajpur

170 The Daya and Gangua rivers were being polluted by the Bhubaneswar city wastewater and industrial wastewater.

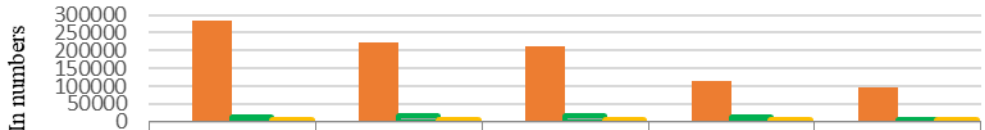
171 The Brahmani River was being polluted by wastewater of the Rourkela city and industrial wastewater of SAIL.

172 The river Kathajodi and Mahanadi of CMC, Daya and Gangua of BMC, Brahmani and Guradih nallah of RMC

6.5.2 Human beings

As per information furnished by the Health Department, GoO, during the FYs 2017-18 to 2021-22, 42,23,675 persons had been affected by acute diarrhoea dysentery; 4,62,660 by typhoid; 12,442 by hepatitis; and 11,612 by renal diseases. The number of persons affected by major diseases, in the districts covering the five selected MCs, is shown in **Chart - 5** below:

Chart-5: Status of diseases arising out of water contamination, in the five selected districts during 2017-22



	Ganjam	Khurda	Sundargarh	Cuttack	Sambalpur
Renal	64	255	137	240	63
ADD	284805	222746	211693	115120	94815
Typhoid	13066	18164	17563	12109	5902
Hepatitis	158	226	298	1010	1019

*(**Source:** information furnished by Family & Health Welfare Department, GoO)*

It was seen that Acute Diarrhoea Disease (ADD) had maximum affect in the district of Ganjam, covering BeMC, where no sewerage projects had been implemented, followed by the Khurda, Sundargarh, Cuttack and Sambalpur Districts. Another major disease arising out of water contamination was hepatitis, with Sambalpur being the most affected district, followed by Cuttack. The third major disease was typhoid and the district most affected by this disease, was Khurda, followed by Sundargarh, Ganjam, Cuttack and Sambalpur. Similarly, Khurda district had the maximum incidence of renal disease, followed by Cuttack, Sundargarh, Ganjam and Sambalpur.

Audit conducted a beneficiary survey in the selected MCs, as shown in the videos with QR codes, given alongside.

6.5.3 Soil and Vegetables

An independent assessment of water quality survey was conducted (2014) by Institute of Water Management, Bhubaneswar, which reported that 10 open drains, in the city of Bhubaneswar, outfall into Gangua Nallah – River Daya. As per the above report, all Gangua irrigated vegetables had higher concentration of heavy/ trace metals in their edible parts, in comparison to samples grown in other sources of irrigation. Appropriate measures to mitigate the risks of utilising such wastewater were necessary, as consumption of vegetables grown with polluted water irrigation is risky and harmful to human lives, as it contains heavy amount of toxic elements.

To assess the impact of polluted water irrigation on soil properties and crop quality, particularly contamination of toxic elements, an independent field and laboratory study was carried out (February 2023) by OUAT and office of the Accountant General (Audit II), Odisha.

https://youtu.be/APa0w0olpC8
Survey at confluent point of Brahmni River and RMC sewerage waste Balughat, Rourkela on 08.12.2022

https://youtu.be/fWq0InbTgpA
Beneficiary survey at Kanti village near Daya river on 31.10.2022

https://youtu.be/nIMSDLvtFVs
Cuttack Main Drain No. I out falling to river Kathajodi causing water pollution

6.5.3.1 Methodology for collection and preparation of soil, water and crop samples

The soil samples collected from the bank of Gangua Nallah, water sample collected from river Daya and the vegetables were collected from the Itipur area from local farmers randomly, for testing of soil, water and vegetables grown on soil irrigated with the Gangua Nallah, during February 2023. Six vegetable crops, namely green leaf (Sag), Brinjal, Coriander leaf, Cabbage, Cauliflower and Radish were collected, to assess the heavy metal contamination.

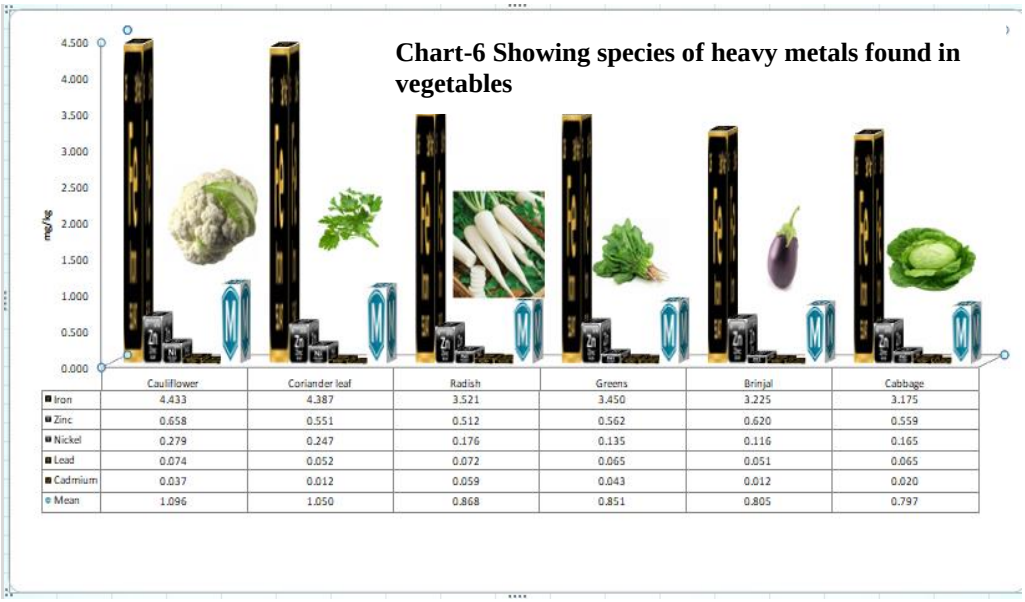
Collection of soil, vegetable and water samples by Audit team with assistance of OUAT, Soil Science Department on 15 February 2023

Photograph 52: Soil and vegetable sample collection by Audit team on 15 February 2023

Photograph-53: Water sample collection by Audit team on 15 February 2023

As per OUAT Report on Impact of Urban Sewerage Waste Water on Soil, Water and Crop in peri-urban areas, city effluents and waste water must not be allowed to mix in the rivers and nullahs of city, as effluent water contains heavy metals which should not be used for irrigation. In this regard, laboratory test conducted on six vegetable crops which were irrigated by contaminated water, revealed the presence of heavy metals, with the results, as mentioned in the **Chart-6**:

Chart-6 Showing species of heavy metals found in vegetables



	Cauliflower	Coriander leaf	Radish	Greens	Brinjal	Cabbage
Iron	4.433	4.387	3.521	3.450	3.225	3.175
Zinc	0.658	0.551	0.512	0.562	0.620	0.559
Nickel	0.279	0.247	0.176	0.135	0.116	0.165
Lead	0.074	0.052	0.072	0.065	0.051	0.065
Cadmium	0.037	0.012	0.059	0.043	0.012	0.020
Mean	1.096	1.050	0.868	0.851	0.805	0.797

The presence of toxic elements in vegetable crops poses serious threat to human and animal health.

Reply from the Government/ OWSSB was awaited (as of July 2024).

6.5.4 Aquatic life

The Centurion University of Technology and Management (CUTM), Odisha, in its Report[173] on May 2020, confirmed the heavy metal concentration in water and in the fish species of Chilika, due to industrial and other wastewater discharged into it. Central Institute of Freshwater Aquaculture (CIFA) and Indian Council of Agricultural Research (ICAR), GoI, stated that the high organic content and very high BOD levels, had led to sudden drop of DO, which, in turn, had resulted in mass fish mortality. Thus, High BOD and less DO, in the rivers Gangua, Daya and Brahmini at Panposh, posed a serious threat to aquatic life.

6.6 Quality control measures not taken for SWD flow, led to pollution of water bodies

Paragraph 12.9(a) of the IRC-SP-50-2013 stipulates that drainage systems should be inspected at least twice in a year, once immediately after heavy rains, and the quality and quantity of outflow should be observed and recorded.

Records revealed that the selected MCs had not taken any action, either to involve the State Pollution Control Board (SPCB) for testing of water samples at different stretches, or for using any other method for testing of the quality of storm water. In the absence of any quality control methodology for SWDs, the water bodies in MC areas had been extremely polluted.

Photograph 54: Guradih nallah carrying the combined waste water of Tarkera nallah, and flowing into river Brahmani, at Deogaon, RMC

Photograph 55: Waste water discharged to the river Kathajodi, at Khannagar, Cuttack

Photograph 56: Waste water discharged to the river Mahanadi, at Jobra, Cuttack

Photograph 57: Waste water of BMC areas carried through Gangua nallah outfalling into river Daya near Kanti village

Photograph 58: Main drain I at Matagajpur flow to river Kathajodi

Photograph 59: Gulguli nallah at Matagajpur flows wastewater to Mahanadi river

In reply, BMC stated (October 2022) that, only the problem could be solved after completion of household connections with sewer lines. However, the reply was silent about the testing of storm water quality. Other MCs did not furnish any specific reply to the audit comments.

[173] Report on 'Bio accumulation of heavy metals in water and fish tissues of Balugaon and Chilika of Odisha'

6.7 Quality management of works under Rain Water Harvesting Structures

As per para 8 of the SOP of RWHS, an effective quality management mechanism is to be implemented, to ensure good quality, as well as the durability of assets being created, by constituting an internal quality supervision team, as decided by the PHEO or the H&UD Department. Further, the quality supervision team is to submit a detailed note of inspection, in the prescribed format, after every site visit.

Audit observed that no such quality monitoring of rainwater harvesting structures (RWHSs) was in place, in the selected five MCs. Neither the MCs, nor the H&UD Department, had formed internal quality supervision teams. Further, since many works were being executed through Self Help Groups, which comprised mainly of non-technical persons, quality monitoring could not be ensured by the Department, as stipulated in the SOP.

The Government stated (April 2023) that ULBs were directed, to ensure quality of constructions by regular site visits and technical monitoring of works executed by concerned engineers. The reply is not acceptable, since none of the test-checked ULBs had formed internal quality monitoring team, to monitor the quality of RWHS, constructed by the Self Help Groups.

6.8 Check measurement not conducted

Appendix II of the OPWD Code stipulates that Sub-divisional Officers and Divisional Officers are to check the accuracy of measurements recorded by the subordinate officers. The Divisional Officer is to particularly check measure at least 10 *per cent* of items of works done. As per paragraphs 2.2.9 and 2.2.23 of the OPWD Code, the engineers, inspecting the various works under execution, are to invariably record their findings, in the register of inspections, maintained at the site of works.

Audit observed that no such check measurements had been conducted by the Divisional Officers of MCs/ OWSSB and WATCO, for drainage and sewerage works, and had not maintained the check measurement register, by the above mentioned authorities, as required. The engineers, who had visited the project sites, had not issued any inspection notes for ensuring quality workmanship. In the absence of check measurements, the possibility of excess payment, due to inaccuracies in measurement, could not be ruled out.

The Government stated (March 2023) that all the measurements were checked and measured by the Engineers of OWSSB, before any payment was made to the Executing Agency. The reply is not acceptable, as OWSSB had not produced any documentary evidence of the same.

6.9 Employment of manual scavengers, in violation to Act

As per Clause 5 (b) of the Prohibition of Employment as Manual Scavengers and their Rehabilitation Act (PEMSR Act), 2013, no person, local authority or any agency, shall, after the date of commencement of the above mentioned Act, engage or employ, either directly or indirectly, a manual scavenger, and every person, so engaged or employed, shall stand discharged immediately from any obligation, express or implied, to do manual scavenging.

Scrutiny of records of WATCO revealed that four sanitation workers, engaged in manual cleaning of sewer lines, had died (March 2021 and April 2021) due to asphyxiation. Employment of manual scavengers was in contravention to the Act and had led to the death of four sanitary workers, which could have been avoided.

The Chief Executive Officer, WATCO stated (March 2023) that preventive measures had been taken and responsible sanitation authority had been appointed and all precautions and safety devices were provided during manual entry into the sewerage systems. The reply was not tenable since employment of manual scavengers was in contravention to the Act.

6.10 Absence of information, education and communication activities

As per Chapter IV of the SWD Manual (Part C) and Para 2.18.1 of the Sewerage Manual, 2013 (Part-C), Information, Education and Communication (IEC) is a multilevel tool for promoting and sustaining risk-reducing behavior change in individuals and communities. As per Appendix - 9 of the Sewerage Manual, 2013, for awareness generation, there should be a provision of 0.25 to 0.50 *per cent*, towards expenditure on IEC activities for sewerage management, for developing partnership with citizens, in mitigating the effects of climate change.

Audit observed (July 2022) that neither had funds for IEC activities been provided, nor had training been conducted, by the selected five MCs, OWSSB and WATCO, for creating awareness among public, in this regard. As such, citizen participation in SWD/ SMS had not been ensured.

The Government stated (March 2023) that school and community awareness programmes were implemented under Odisha Integrated Sanitation Improvement Programme (OISIP) in Cuttack and Bhubaneswar, under the social development component of the projects and the activities were suspended in view of the COVID 19 pandemic. Similarly, IEC activities are being conducted at Rourkela, to enhance house sewer connection. The reply was not tenable, as none of the DPRs of sewerage projects provided cost for IEC activities. However, no documentary evidence was also furnished, in support of such activities.

6.11 Achievement against Service Level Benchmarks

The Handbook of Service Level Benchmarks (SLBs), designed by MoUD, GoI, is a ready reckoner, for assessing the quality of services and defines a common minimum framework for monitoring and reporting on performance indicators, of which eight parameters pertain to sewerage and two parameters pertain to SWD.

Audit observed that the selected MCs had not submitted SLB declarations, from the FYs 2019-20 to 2021-22. Audit worked out the percentage of achievements, based on the information furnished by the MCs, as detailed in ***Appendix –XI,*** and also observed that:

i) Against the SLB of 100 *per cent* for sewer networks and household connection coverage, the coverage had ranged from zero to 85 and zero to 27 *per cent*, respectively;

ii) Against the SLB, of 100 *per cent*, for the quality of sewerage treatment of wastewater in STPs, the achievement was zero to 10 *per cent*;

iii) Against the SLB of 20 *per cent*, for re-use/ recycling of treated sewerage, the achievement was between zero and 12 *per cent* in the STPs.

iv) Against the SLB of 100 *per cent*, for cost recovery in sewerage management, the achievement was zero.

v) Against the coverage of 100 *per cent* SLB for coverage of SWD networks, the achievement was between zero and 85.

While accepting the audit comments, the Government stated (March 2023) that continuous efforts are being taken to cover more households to sewerage networks, to increase the performance percentage. The reply is not acceptable, since the department had taken more than 09 to 14 years, to complete the sewerage projects and the sewerage projects were not completed, as of March 2023.

***Recommendations*:**

22. Government may activate monitoring committees and strengthen the control mechanisms, as envisaged in the SWD Manual, Sewerage Manual and NDM Guidelines, and accountability of the officers responsible, may be fixed.

23. Government/ OWSSB/ WATCO/ MCs may take adequate and effective steps to protect the environment and ecosystems, by taking prompt action for completion of sewerage networks and by taking measures to prevent wastewater from falling into the drains/ rivers.

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The

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Accountant General (Audit-II), Odisha

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(GIRISH CHANDRA MURMU)
Comptroller and Auditor General of India

Appendices

Appendix-I
(Refer paragraph 3.1.1, at page: 11)
Non-compliance with the provisions of the NDM Guidelines, 2010, by MCs

Sl. No.	Actionable item	Audit Observation	Compliance by MCs
1	*2*	*3*	*4*
1	As per Para 4.5.2 of the NDM Guidelines, 2010, all ULBs/ States were to prepare an inventory of the existing storm water drainage system on a Geographic information systems (GISs) platform. The inventory was to be both watershed-based and ward-based, with clear mapping of the major, as well as minor, systems.	MCs had not prepared any master plans for storm water management, as of July 2022. DAs prepared the inventory of drains under the jurisdiction of MCs, as a Comprehensive Development Plan (CDP) of drains, which had been identified as primary drains. The secondary and tertiary drains, which were substantially contributing components of drainage systems were not identified and mapped. This rendered the CDP deficient.	The SE, Drainage Division, BMC, noted the audit comments, for future guidance and stated that, due to shortage of manpower and any design cell, the survey works for secondary and tertiary drains could not be made. The EEs, BeMC, RMC and SMC noted the audit comments, however, no reply was furnished by CMC.
2	As per para 4.7.1 of the NDM guidelines, 2010, catchment area was to be the basis for planning and designing the storm water drainage system, in all ULBs.	MCs had not prepared master plans for storm water management. However, CDP of drains was adopted (for the length and width of primary drains only). No catchment area of primary, secondary and tertiary drains were identified by the MCs or by the DAs.	-do-
3	Para 4.12.4.3 (i) & (ii) of the NDM guidelines, 2010, pre-monsoon desilting of all the major drains was to be completed by 31st March each year. Besides, for the pre-monsoon desilting of drains, the periodicity of cleaning drains was to be worked out, based on the local conditions. The roster of cleaning of such drains was to be worked out and strictly followed.	Neither periodic action plans were prepared for desilting of drains before the onset of monsoon, nor any roster of cleaning worked out and followed. The work of desilting of drains, at different stretches, was entrusted to contractors during the monsoon period.	SEs and EEs of the MCs noted the audit comments and stated that desilting of drains was carried out before and during the monsoon period. The reply was not tenable, since Audit noticed that the desilting works had been taken up during and after the monsoon period, in deviation to NDM guidelines.
4	As per para 4.12.4.3 (vi) of the NDM guidelines, 2010, suitable interventions in the drainage, like traps, comminutors and trash racks were to be used, to reduce the amount of solid waste going into the storm water drains.	Though 120 screen bars were installed by MCs, in different locations of the primary drains, they were not cleaned regularly, by the sweeping staff. Due to non-maintenance, most of them were damaged. As a result, solid waste was flowing to water bodies. During JPV, Audit observed that debris and sewage waste were continuously floating in all types of drains.	The SEs and EEs of the MCs noted the audit comments, for future guidance.

Sl. No.	Actionable item	Audit Observation	Compliance by MCs
1	*2*	*3*	*4*
5	Para 4.12 (xii) of the NDM guidelines, 2010, a master plan was to be prepared, to improve the coverage of the sewerage system, so that sewage would not be discharged into storm water drains.	MCs did not prepare any master plans, for storm water drains. Audit observed that no measures had been taken to avoid mixing of sewage into storm water drains, as of July 2022. Instead, the raw sewage was directly discharging into storm water drains, contaminating the flow in the storm water drains.	The SEs and EEs of the MCs noted the audit comments, for future guidance.
6	As per the para 4.13.3.1 of NDM guidelines, 2010, the re-leveling or strengthening / overlay works of all roads were to be carried out, by milling the existing layers of the roads and recycling of materials was to be obtained. As a result, the road levels would not increase.	Overlaying of roads, repeatedly, on the existing surface, by the PWDs and MCs, led to increase in elevation of roads, as compared to the level of houses of nearby streets, over a period of time.	The SEs and EEs of the MCs noted the audit comments, for future guidance.
7	As per para 4.13.4.1 of the NDM guidelines, 2010, inlets were to be provided on the roads, to drain water to the roadside drains. They were to be designed, based on current national and international practices.	Audit observed that variations in the levels of inlets was leading to stagnation of water on the roads. Absence of monitoring led to clogging of the inlets.	The SEs/ EEs of the MCs and the R&B Divisions, noted the audit comments, for future guidance.
8	As per para 4.16 of the NDM guidelines, 2010, every building in an urban area was to have rainwater harvesting as an integral component of the building utility. ULBs were to ensure that this was implemented.	Rooftop Rainwater harvesting was made (April 2022) mandatory for houses situated within urban house limits. Audit observed that no such rooftop rainwater harvesting structures had been recommended in the building plans approved by the MCs.	The SEs and EEs of the MCs noted the audit comments, for future guidance.
09	As per para 4.17.2 of the NDM guidelines, 2010, the concept of rain gardens was to be incorporated, in planning for public parks and on-site storm-water management, for larger colonies and sites that were to be developed. People were encouraged to adopt this concept, even for sites already developed.	Audit observed that no such rain gardens were executed by the five selected MCs.	The SEs and EEs of the MCs noted the audit comments, for future guidance.
10	As per para 4.18.1 of the NDM guidelines, 2010, all urban water bodies were to be protected. Efforts to be made to restore water bodies, by de-silting and taking other measures. Further, efforts were also to be made to revive the water bodies that had been put to other uses. Water bodies were to be an integral part of the storm water system.	All MCs were responsible for the maintenance and development Lakes/ water bodies, under their jurisdictions. Out of 628 water bodies/ lakes, under the jurisdiction of the MCs, only 35 water bodies had been developed, as of July 2022, while 18 water bodies were not in use.	The SEs and EEs of the MCs noted the audit comments, for future guidance.

Sl. No.	Actionable item	Audit Observation	Compliance by MCs
1	*2*	*3*	*4*
11	As per para 4.19 of the NDM guidelines, 2010, urban storm-water management systems were to include detention and retention facilities, to mitigate the negative impacts of urbanization on storm water drainage.	Audit observed that the five selected MCs had not adopted detention and retention facilities for storm water drains, to mitigate the urban flooding and water logging, in rainy season.	The SEs and EEs of the MCs noted the audit comments, for future guidance.
12	As per Para 4.22.6.2 (i) of the NDM guidelines, 2010, low–lying areas were to be reserved for park and other low-impact human activities, wherever unavoidable, buildings in low-lying areas were to be constructed on stilts above the High Flood Level (HFL)/ Full Tank Level (FTL).	Audit observed that the selected MCs, did not reserve the low lying areas, for construction of parks.	The SEs and EEs of the MCs noted the audit comments, for future guidance.
13	As per Para 4.2.23 of the NDM guidelines, 2010, encroachments on nallahs/ drains/ water courses were to be removed, by providing alternative accommodation to the Below Poverty Line (BPL) people and appropriate rehabilitation packages for other categories of people. The nallahs/ drains/ water courses/ flood plains were to be clearly delineated and boundaries fixed in new developments. There was to be strict enforcement of the relevant bye-laws / regulations, in the new layouts. Any encroachment on the drain was to attract penal action and be treated as a cognizable offence, both against the encroachers and the officials responsible for enforcement of the bye-laws/ regulations.	No penal action were taken, either against the encroachers, or against the officials responsible for enforcement of the bye- laws/ regulations, for their dereliction. Data in respect of encroachments available with the MCs was deficient, as, during JPV, audit observed a large number of encroachments on drains, for which no action had been taken.	The SE, Drainage Division BMC, stated that action would be taken for encroachment free drains, for free flow of storm water, to the downstream. The EEs, BeMC, RMC and SMC noted the audit comments, however, no reply was furnished by CMC.

*(**Source:** As per provisions of NDM Guidelines, 2010 and information furnished by the selected MCs)*

Appendix-II
(Refer paragraph 3.1.3.1, at page: 13)
Disused water bodies, under the MCs (as of March 2022)

(Areas in acres)

Sl. No.	Municipal Corporation	Water body/ Location	Plot No.	Ward No.	Areas	Status
1	Bhubaneswar	Ghagudi tank	8536	23	0.230	No water body, at present.
2	Cuttack	Chandini Chowk	2295/ 3239	6	0.004	No tank available at the site
3	Cuttack	Choudhury Bazar	1187	13	0.002	No tank available at the site
4	Cuttack	Choudhury Bazar	807	13	0.007	No tank available at the site
5	Cuttack	Choudhury Bazar	2047	13	0.002	No tank available at the site
6	Cuttack	Buxi Bazar	61	27	0.725	No tank available at the site
7	Cuttack	Buxi Bazar	97	27	0.094	No tank available at the site
8	Cuttack	Mirkamal Patna	385	26	0.040	Had lost characteristics of tank[174]
9	Cuttack	Mirkamal Patna	391	26	0.050	Had lost characteristics of tank
10	Cuttack	Mirkamal Patna	325	26	0.019	Had lost characteristics of tank
11	Cuttack	Mirkamal Patna	307	26	0.006	Had lost characteristics of tank
12	Cuttack	Mirkamal Patna	230	26	0.380	Had lost characteristics of tank
13	Cuttack	Samantasahi	1550	19	0.020	No tank available at the site. A building has been constructed on it.
14	Cuttack	Samantasahi	1458	19	0.056	No tank available at the site. A building has been constructed on it.
15	Cuttack	Samantasahi	1459	19	0.099	No tank is available at the site. A building has been constructed on it.
16	Cuttack	Jobra	706	34	0.032	Filled up and cannot be used.
17	Cuttack	Bisinabar	93	30	0.154	Tank has been filled up and one building is constructed on the land.
18	Cuttack	Jhanjirimangala	1366	23	0.057	No tank available at the site. One building is located on this tank.
	Total				**1.977**	

***(Source:** Information furnished by the selected MCs)*

[174] Sl. No. 8 to 12, most of the areas of the tanks were encroached by public.

Appendix – III
(Refer paragraph 3.1.4, at page: 13)
Details of natural drains, as per CDPs

Sl. No.	Drain No.	Starting point	Outfall point	Total Length *(in km)*	Size of drains in CDPs (width x depth)
	Bhubaneswar Municipal Corporation				
1	Drain No. I	Buddha Park	Gangua Nallah	5.830	14.3 m X 2.9 m
2	Drain No. II	MCL Corporation	Mancheswar Railway bridge	0.549	4.9 m X 1.7 m
3	Drain No. III	Gajapati nagar	Gangua Nallah	4.226	9 m X 2.1 m
4	Drain No. IV	Ekamrakanan	Gangua Nallah	9.770	9.2 m X 2.6 m
5	Drain No. V	BED college	Gangua Nallah	3.530	5 m X 2 m
6	Drain No. VI	Jayadev Bhawan	Gangua Nallah	3.127	6.5 m X 1 m
7	Drain No. VII	Basic science college	Gangua Nallah	5.455	7.6 m X 2.2 m
8	Drain No. VIII	Baramunda	Pokhariput	6.689	9 m X 2.3 m
9	Drain No. IX	Ghatikia	Gangua Nallah	15.050	14.83 m X 3.3 m
10	Drain No. X	Mamtaz Ali High school	Gangua Nallah	8.376	10 m X 2.4 m
	Total			**62.602**	

Sl. No.	Drain No.	Starting point	Outfall point	Total Length in km	Proposed size of drains (width and depth)
	Cuttack Municipal Corporation				
1	MSWC-I	Deuli Sahi, Cuttack	Matagajpur (Kathajodi river	11.580	Not available in CDP
2	Link drain to MSWC-I	After Bisinabar	Khananagar (Kathajodi river)	1.300	Not available in CDP
3	MSWC-II	NH-5 Near OMP square	Gulguli (Mahanadi River)	5.240	Not available in CDP
	Total			**18.120**	

(Source:** Information furnished by the selected MCs**)

Note: Details of drains and their length and size were not available in the CDPs for Berhampur. The CDPs for Rourkela and Sambalpur had not been finalized (as of March 2022)

Appendix – IV
(Refer paragraph 3.2.7, at page: 45)
Projects under Smart City Mission during 2015-20

Sl. No.	Package ID	Project name	Project cost *(₹ in crore)*	Project period	Schedule date of commencement	Schedule date of completion	Expenditure *(₹ in crore)*
Project under Bhubaneswar Smart City Mission							
1	0DI-BHU-001	Socially Smart Bhubaneswar	3.48	2015-20	18.11.2016	31.12.2027	7.50
2	0DI-BHU-009	Public bicycle sharing scheme	11.80	2015-20	15.10.2018	15.10.2018	2.81
3	0DI-BHU-010	e- Rickshaw	0.00	2015-20		Ongoing	6.12
4	0DI-BHU-012	School equity centers, rental for construction workers, Project Kutumb, One stop social equity centers	9.71	2015-20	15.04.2017	14.04.2018	1.86
5	0DI-BHU-014	I am Bhubaneswar Initiative	2.56	2015-20	05.11.2016	11.04.2019	3.56
6	0DI-BHU-015	Integrated Public Service centers, Public internet access centers, Saheed Nagar	3.58	2015-20	04.10.2017	04.09.2018	25.00
7	0DI-BHU-017	Waste- Let us recycle	25.00	2015-20	10.03.2017	03.12.2020	82.65
8	0DI-BHU-019	ICOMC Building	83.02	2015-20	01.06.2019	31.05.2021	316.84
9	0DI-BHU-021	Smart solution ICOMC	641.40	2015-20	23.12.2017	22.01.2020	8.50
10	0DI-BHU-022	Project Bhubaneswar urban Knowledge center	8.50	2015-20	05.11.2016	11.04.2019	10.50
11	0DI-BHU-023	Traffic management project (ATSC)	14.69	2015-20	05.01.2017	11.05.2017	0.00
12	0DI-BHU-024	Solar city roof top	20.00	2015-20	09.06.2016	18.10.2018	0.00
13	0DI-BHU-025	Common payment card	19.19	2015-20	14.09.2017	13.09.2025	2.22
14	0DI-BHU-026	Smart parks	2.22	2015-20	20.03.2017	30.11.2017	1.00
15	0DI-BHU-027	Sensory Park	1.20	2015-20	11.05.2018	08.08.2018	2.53
16	0DI-BHU-028	Bhubaneswar one	2.53	2015-20	07.05.2016	31.08.2018	0.00
17	0DI-BHU-029	Mission Awaas- Santi Nagar PPP project	55.00	2015-20	-	Yet to be started	0.00
18	0DI-BHU-030	Mission Awas- Satyanagar EPC project	64.48	2015-20	-	Yet to be started	0.00
19	0DI-BHU-031	Mission Awas project Chandrasekharpur PPP project	155.00	2015-20	-	Yet to be started	0.00
20	0DI-BHU-032	Mission Awas project Gadakana EPC contract	79.63	2015-20	-	Yet to be started	0.00
21	0DI-BHU-033	Smart Janapath	100.11	2015-20	04.10.2017	20.11.2019	94.55
22	0DI-BHU-034	Multi-level car parking Raj Mahal square	46.81	2015-20	27.12.2017	26.06.2019	38.86
23	0DI-BHU-035	Multi-level car parking Saheed Nagar	31.02	2015-20	27.12.2017	26.12.2018	29.22
24	0DI-BHU-037	Construction of sewerage system of sewerage district I	0.00	2015-20	27.07.2017	23.08.2020	0.00
25	0DI-BHU-040	Integrated Public service centers at Bapuji Nagar	5.66	2015-20	01.02.2019	31.01.2020	5.66
26	0DI-BHU-041	Drink from tap	25.00	2015-20	-	2015-20	10.00
27	0DI-BHU-042	Digital door numbering	5.00	2015-20	-	Yet to be started	0.00
28	0DI-BHU-043	Development of new road at South side of Lake zone III	11.67	2015-20	-	Yet to be started	0.02
29	0DI-BHU-044	Interior furnishing work of 5 nos of floors of new BMC ICOMC building	32.86	2015-20	-	Ongoing	3.20
30	0DI-BHU-045	Providing & flooring of bamboo fencing at Median of Janapath from Master canteen to Vanivihar	1.00	2015-20	-	Ongoing	1.00
31	0DI-BHU-046	Skill development center	1.00	2015-20	-	Yet to be started	0.00

Sl. No.	Package ID	Project name	Project cost *(₹ in crore)*	Project period	Schedule date of commencement	Schedule date of completion	Expenditure *(₹ in crore)*
32	0DI-BHU-047	Mo Seva Kendra	2.00	2015-20		Ongoing	0.12
33	0DI-BHU-048	City surveillance system III	25.00	2015-20	-	Yet to be started	0.00
34	0DI-BHU-049	Development of new road at North side of Lake zone II	11.20	2015-20	-	Yet to be started	0.00
35	0DI-BHU-050	Redesigning of traffic post	1.00	2015-20	-	Yet to be started	0.00
36		Central Region Urban Transport	0.00	2015-20	-	Ongoing	29.32
37		Administrative & Office Expenses	0.00	2015-20	-	Ongoing	62.56
	Total		**1502.32**				**745.60**
Projects under Rourkela Smart City Mission							
1	ODI-ROU-030	Rourkela one	137.76	2015-20	28.01.2020	28.01.2022	57.82
2	ODI-ROU-052	Battery Operated e-Rickshaw with charging Station	0.5	2015-20	02.02.2017	03.02.2018	0.4
3	ODI-ROU-059	Biju Pattanaik Indoor Stadium	15.77	2015-20	06.06.2019	16.12.2021	15.77
4	ODI-ROU-071	Citizen Friendly Parks	6.26	2015-20	22.09.2018	27.06.2020	6.26
5	ODI-ROU-074	Upgradation of Markets Panposh Market, Daily Market, wholesale Market	53.59	2015-20	10.12.2019	12.12.2021	36.24
6	ODI-ROU-079	Installation of GPS devices in 30 city Buses	0.06	2015-20	01.11.2017	12.12.2017	0.06
7	ODI-ROU-080	Smart road Phase-I Panposh chowk to Ambedkar Chowk with Carriageway 20.7m ROW footpath Cycle-T	24.8	2015-20	20.08.2019	27.08.2020	16.84
8	ODI-ROU-081	Smart road Phase-2 all other road ROW varying from 5m to 30M carriageway footpath Cycle	120.84	2015-20	25.06.2020	28.06.2022	48.28
9	ODI-ROU-087	Upgradation of Birsa Stadium	157.21	2015-20	30.11.2019	12.02.2021	118.42
10	ODI-ROU-088	Smart bus shelters	2.84	2015-20	13.09.2019	31.03.2020	2.22
11	ODI-ROU-089	Making 27 slums in ADB area of RSCL ODF through CLTS	0.47	2015-20	19.01.2018	28.02.2019	0.47
12	ODI-ROU-090	Surface parking for two and four-wheeler	2.94	2015-20	01.06.2020	28.11.2020	2
13	ODI-ROU-093	Brahmani river front Development	0	2015-20	-	-	0
14	ODI-ROU-094	Development of Big Re-creational Park	23.53	2015-20	29.07.2020	31.12.2022	8
15	ODI-ROU-095	Design Development reactional facilities of DAV Pond	18.11	2015-20	12.10.2020	23.11.2021	9.93
16	ODI-ROU-096	Installation of 3D flex in Rourkela	1.67	2015-20	18.09.2020	28.01.2022	0.33
17	ODI-ROU-098	Beautification of Ring road Traffic Chowk to Hanuman Vatika Chowk	21.71	2015-20	29.09.2020	30.04.2022	16
18	ODI-ROU-099	Vedvyas Tourism at Rourkela	21.59	2015-20	19.10.2020	31.10.2021	8
19	ODI-ROU-100	Redevelopment of Existing Park Open Space of RMC	3.36	2015-20	20.10.2020	13.12.2021	2.22
20	ODI-ROU-103	Redevelopment of VSS Market Chhend	2.28	2015-20	22.11.2020	30.12.2021	2.28
21	ODI-ROU-105	Water Conservation Project	0.5	2015-20	05.08.2020	30.12.2021	0.5
22	ODI-ROU-106	Development of Vending Zone near Raghunath Pali Post Office and Jail Road	3.97	2015-20	04.01.2021	24.12.2021	1.44
23	ODI-ROU-107	RMC Road Beautification	6.6	2015-20	18.12.2020	21.09.2021	2.3
24	ODI-ROU-108	Implementation of Storm Water Management Project at Rourkela	91.2	2015-20	19.05.2021	31.08.2022	40.8
25	ODI-ROU-109	Construction of Science Park	13.83	2015-20	02.03.2022	30.11.2022	0.5

Sl. No.	Package ID	Project name	Project cost *(₹ in crore)*	Project period	Schedule date of commencement	Schedule date of completion	Expenditure *(₹ in crore)*
26	ODI-ROU-110	Design, construction of Decorative Glow Garden & Illumination Works at Hockey Chowk, Rourkela	8.65	2015-20	24.02.2022	22.04.2023	0.91
27	ODI-ROU-111	Design, Development of Land scaping and Hardscaping works at Hockey Chowk Rourkela	7.93	2015-20	24.02.2022	22.02.2023	0
28	ODI-ROU-112	Streetscaping of Road from Chhend Main Road to Chhend - BPUT Road	9.06	2015-20	02.03.2022	30.11.2022	0.68
29	ODI-ROU-113	Street scaping of Hockey chowk to labour chowk Panposh chowk to Ambedkar chowk and Hi-Tech hospital chowk to Shambi chowk	5.89	2015-20	02.03.2022	30.09.2022	0
30	ODI-ROU-114	Street scaping of Mahatab road Koel nagar main road and Madhusudan road	4.71	2015-20	02.03.2022	30.09.2022	0
31	ODI-ROU-115	Development of Koel nagar Market	18.83	2015-20	02.03.2022	30.06.2023	0
32	ODI-ROU-116	Smart Food Court near Basanti Over Bridge	0.95	2015-20	23.03.2021	09.04.2022	0.81
33	ODI-ROU-117	Upgradation of Existing playgrounds at Udit Nagar, Chennd, Koel nagar and Civil Township	10.45	2015-20	01.01.2022	01.01.2023	1.6
34	ODI-ROU-119	Procurement of computer Hardware and peripherals for implementation of e-office	0.18	2015-20	02.06.2021	17.08.2021	0.18
35	ODI-ROU-120	Upgradation of Eight parks in Chennd Colony	3.6	2015-20	20.10.2020	10.08.2021	2.18
36	ODI-ROU-121	Upgradation of Nine parks in civil Township and Basanti Colony	3.82	2015-20	20.10.2020	10.06.2021	3.39
37	ODI-ROU-122	e-Shusrut Project	1.46	2015-20	04.12.2021	30.06.2022	0
38	ODI-ROU-123	Road Median Development Chhend to Tisco Road	4.64	2015-20	30.03.2022	30.09.2022	0
39	ODI-ROU-126	Variable message Signe board	1.57	2015-20	30.03.2022	31.05.2022	1.57
40	ODI-ROU-127	Drinking water facility civil Structure	0.77	2015-20	30.03.2022	31.05.2022	0.77
41	ODI-ROU-128	Drinking water facility Stainless steel	0.79	2015-20	30.03.2022	31.05.2022	0.79
42	ODI-ROU-130	Widening and strengthening of road from ROB 212 to Phase -II Bus parking via Kalinga Vihar Chowk Pradhan park Road	9.46	2015-20	28.02.2022	30.06.2022	9.46
43	ODI-ROU-131	Improvement and upgradation of road from Kanak Manjari Chowk to Airport Rourkela	9.98	2015-20	26.11.2021	31.03.2022	0.98
44	ODI-ROU-132	Improvement of road from BSNL Chowk to Kalinga Bihar Chowk	0.81	2015-20	26.11.2021	31.03.2022	0.81
45	ODI-ROU-133	Surface parking at Traffic Chowk Rourkela	2.83	2015-20	04.09.2021	24.05.2022	1.26
46	ODI-ROU-134	Development of vending zone	5	2015-20	30.01.2022	31.08.2022	5
47	ODI-ROU-135	Procurement of BHELMIS for spraying disinfectant for Covid-19	0.04	2015-20	14.04.2020	02.05.2020	0.04
48	ODI-ROU-136	Procurement of Tractor mounted sprayer for spraying of disinfectant for Covid-19	0.03	2015-20	24.04.2020	15.05.2020	0.03
49	ODI-ROU-137	Spraying of Disinfectant	0.05	2015-20	24.04.2020	30.10.2021	0.05

Sl. No.	Package ID	Project name	Project cost *(₹ in crore)*	Project period	Schedule date of commencement	Schedule date of completion	Expenditure *(₹ in crore)*
		through Drone					
50	ODI-ROU-139	Provision of Power supply to Surface parking near BSNL Chowk	0.01	2015-20	18.09.2021	30.11.2021	0.01
51	ODI-ROU-140	Provision for line diversion for Rourkela one Project	0.36	2015-20	15.12.2020	14.01.2022	0.36
52	ODI-ROU-141	Provision of Power supply to Smart Bus Shelter	0.04	2015-20	25.07.2020	24.08.2021	0.04
53	ODI-ROU-142	Provision of Power supply to Netaji Rotary Park-I	0.05	2015-20	30.09.2019	29.10.2019	0.05
54	ODI-ROU-143	Provision of Power supply to Netaji Subash Park	0.03	2015-20	30.09.2019	29.10.2019	0.03
55	ODI-ROU-144	Provision of Power supply to Uditnagar Park	0.04	2015-20	30.09.2019	29.10.2019	0.04
56	ODI-ROU-145	Development of three Anganwadi centers to strengthen early childhood development under ICDS Programme	0.15	2015-20	17.01.2022	16.03.2022	0.03
57	ODI-ROU-146	Baby feeding and diaper changing units at 4 Identified spaces	0.06	2015-20	11.08.2021	10.09.2021	0.06
58	ODI-ROU-147	Splash Pool	0.25	2015-20	30.03.2022	31.05.2022	0.25
59	ODI-ROU-148	Shifting and erection of 11KV & 33 KV line at DAV Pond	0.42	2015-20	24.03.2022	31.05.2022	0.42
60	ODI-ROU-149	Shifting of Water Pipeline near Smart Vending Zone-I	0.19	2015-20	28.03.2022	31.03.2022	0.19
61	ODI-ROU-150	Integrated command control Centre	106.42	2015-20	18.06.2022	31.12.2022	0
	Total		**950.91**				**429.07**

(Source:** Information furnished by the selected MCs**)

Appendix – V
(Refer paragraph 4.1, at page: 55)
Receipt and expenditure of the selected MCs during FYs 2017-18 to 2021-22

(₹ in crore)

Sl. No.	Municipal Corporations	14th Finance Commission				15th Finance Commission				4th& 5th Devolution funds (tied grants)				State grants for SWD			
		Opening Balance	Receipt	Expenditure	Closing Balance	Opening Balance	Receipt	Expenditure	Closing Balance	Opening Balance	Receipt	Expenditure	Closing Balance	Opening Balance	Receipt	Expenditure	Closing Balance
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*
1	Bhubaneswar	0	136.97	136.97	0	0	267.97	154.97	113.00	0	154.79	94.30	60.49	0	60.00	0	60.00
2	Cuttack	0	98.69	93.85	4.84	0	193.02	60.33	132.69	0	111.23	70.57	40.66	0	34.00	0.48	33.52
3	Rourkela	0	50.09	32.86	17.23	0	90.79	43.92	46.87	0	56.45	17.97	38.48	0	2.00	0	2.00
4	Sambalpur	12.10	54.44	34.11	32.43	0	120.62	28.59	92.03	7.60	61.35	17.30	51.65	0	17.00	2.40	14.60
5	Berhampur	12.95	67.93	77.62	3.26	0	103.12	25.10	78.02	18.67	67.03	47.98	37.72	0	21.00	1.97	19.03
	Total	**25.05**	**408.12**	**375.41**	**57.76**	**0**	**775.52**	**312.91**	**462.61**	**26.27**	**450.85**	**248.12**	**229.00**	**0**	**134.00**	**4.85**	**129.15**

Sl. No.	Municipal Corporations	4th SFC & 5th SFC				AMRUT				Municipal fund (own revenue)				OUIDF loan			
		Opening Balance	Receipt	Expenditure	Closing Balance	Opening Balance	Receipt	Expenditure	Closing Balance	Opening Balance	Receipt	Expenditure	Closing Balance	Opening Balance	Receipt	Expenditure	Closing Balance
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*
1	Bhubaneswar	0	128.11	89.02	39.09	0	8.84	8.84	0	95.51	1772.44	1300.38	567.57	0	0	0	0
2	Cuttack	36.45	627.94	480.99	183.40	0	5.89	5.89	0	12.90	168.60	122.82	58.68	0	0	0	0
3	Rourkela	0	30.40	10.35	20.05	0	2.90	2.90	0	118.59	499.08	471.53	146.14	0	0	0	0
4	Sambalpur	6.12	21.55	1.48	26.19	0	0.86	0.86	0	111.58	218.85	291.65	38.78	0.01	5.03	3.66	1.37
5	Berhampur	11.39	33.33	22.91	21.81	0.08	2.81	2.89	0	286.96	260.68	374.47	173.17	6.17	21.16	25.71	1.62
	Total	**53.96**	**841.33**	**604.75**	**290.54**	**0.08**	**21.30**	**21.38**	**0**	**625.54**	**2,919.65**	**2,560.85**	**984.34**	**6.18**	**26.19**	**29.37**	**2.99**

***(Source**: Information furnished by the selected MCs)*

Appendix – VI
(Refer paragraph 5.2.2.2, at page: 67)
Non-start of SWD projects of the Berhampur Municipal Corporation

SI. No.	Project	Project cost *(₹ in lakh)*	Date of issue of work order	Period given for Completion of Work	Present status/ reason for delay
A	*B*	*C*	*D*	*E*	*F*
1	Construction of road and both side drain from Dwarika Nagar end to Trupti Nagar in Ward No.01	17.35	07/01/2022	60 days	Reminder notice issued for execution the work
2	Construction of road and drain Trupti Nagar 2nd line Ward No.1	15.02	04/01/2022	60 days	Reminder notice issued for execution the work
3	Construction of road and drain Trupti Nagar 4th line Ward No.1	15.50	04/01/2022	60 days	Reminder notice issued for execution the work
4	Construction of road and drain at Dandasi sahi Ward No.1	3.69	13/07/2022	60 days	Reminder notice issued for execution the work
5	Construction of road and drain Laxmi Nrusingha Sahi - 10th 11th and 12th line Ward No.2	40.69	13/07/2022	60 days	Not started
6	Construction of road and drain Laxminrusingha sahi - 7th, 8th and 9th line- Ward No.3	49.96	13/07/2022	60 days	Not started
7	Construction of drain at Omm Nagar 1st line in Ward No.02	1.98	14/12/2021	30 days	Not started
8	Construction of Both side Drain at Sahu Colony in Ward No.04	11.89	07/01/2022	60 days	Work not started due to non-shifting of pipeline
9	Improvement road With Cement Concrete Paver Block and Construction of Both Side drain at Ganapathi Nagar 4th Line in Ward No.05	17.15	24/08/2022	60 days	Layout given, work will be started soon.
10	Construction of Drain with cover slab at Minakshi Nagar 1st line in front of mango market 1st gate in Ward No.12	10.49	08/09/2022	60 days	Lay out given. Work to be started soon.
11	Improvement of road and both side RCC drain at Annapurana Nagar 7th	11.35	08/09/2022	60 days	Lay out given. Work to be started soon.

SI. No.	Project	Project cost *(₹ in lakh)*	Date of issue of work order	Period given for Completion of Work	Present status/ reason for delay
A	***B***	***C***	***D***	***E***	***F***
	line in Ward No.12				
12	Construction of main drain at Niladri vihar main road (Left hand)	68.50	08/09/2021	60 days	Work not started. No response by the contractor.
13	Construction of Drain at Tulasi nagar 8th line - 9th line and main road in Ward No.05	11.97	13/08/2021	60 days	Work not started. Reminder letters issued. Contractor did not respond.
14	Improvement of Road and Drain at Sana Harijan Sahi in Ward No.21	5.21	30/08/2022	60 days	Layout given. Work will be started soon
15	Improvement of road with cement concrete paver block at Bada Dhoba sahi, Mochi sahi and CC Road drain cover at Jayamangal Nagar in Ward No.21	9.74	11/01/2022	60 days	Work not started
16	Construction of both side drain at Khodasingi Bada Sahi	19.90			Work not started
	Total	**310.39**			
Non-execution due to encroachment					
1	Improvement of Road and Construction of Drain, Culvert at Raghupati Nagar 1st. Line and Construction of Drain at Raghupati Nagar third line in ward No.03	21.58	04/01/2022	60 days	Drain work stopped due to site dispute.
2	Improvement of Road and RCC Drain at Annapurna nagar 4th line Extension in Ward No.14	27.31	13/01/2022	60 days	Work in progress (delay due to encroachment issue and dispute relating to land demarcation)
3	Construction of CC drain at Subash Nagar 1st line, 2nd line and 3rd line	20.00	10/11/2021	60 days	Work stopped due to site dispute. Joint demarcation to be done. Letter issued to the Tahsildar.
	Total	**68.89**			

***(Source:** Information furnished by BeMC)*

Appendix-VII
(Refer paragraph 5.3.1, at page: 75)
Sewerage generated, collected, treated and untreated waste discharged to water bodies (as of March 2022)

(Quantity in MLD)

Sl. No.	Municipal Corporation	Water supply	Sewerage generated, as per CPHEEO Sewerage Manual *(80 per cent of Col. 3)*	Sewerage collected through sewer lines	Percentage of sewerage collection	Sewerage uncollected and discharged to water bodies (Col. 4 – 5)	Percentage of sewerage discharged to water bodies	From collected sewerage, quantity treated in STPs	Quantity reused from treated Sewerage	Percentage reused from treated sewerage	Quantity discharged to water bodies from treated Sewerage (Col. 9 – 10)	Percentage of treated sewerage discharged to water bodies
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
1	Bhubaneswar	270.64	216.51	29.75	13.74	186.76	86.26	29.75	5.80	19.50	23.95	80.50
2	Cuttack	209.00	167.20	20.62	12.33	146.58	87.67	20.62	2.00	9.70	18.62	90.30
3	Sambalpur	76.76	61.41	0	0	61.41	100	0.00	0	0	0.00	0
4	Rourkela	61.90	49.52	2.60	5.25	46.92	94.75	2.60	0	0	2.60	100
5	Berhampur	80.00	64.00	0	0	64.00	100	0.00	0	0	0.00	0
	Total	**698.30**	**558.64**	**52.97**	**9.48**	**505.67**	**90.52**	**52.97**	**7.80**	**14.72**	**45.17**	**85.28**

***(Source:** Information furnished by EIC, Public Health, Odisha)*

Appendix- VIII
(Refer paragraph 6.2.1, at page: 93)
Environmental compensation not levied for non-compliance to Water Act, 1974

Sl. No.	Location of STP	Water supply to cities, as per EIC, PH (O), during March 2022	Waste generated @ 80 *percent* of water supply in MLD (80 *percent* of col. 3)	Installed capacity of STP (*in MLD)*	GAP (Col. 4 – 5)	Sewerage collected through sewer lines *(in MLD)*	Sewerage uncollected in MLD and discharged to water bodies (Col. 4 – 7)	Target date for completion	Environmental compensation from	Non-completion date	Delay in days (Col. 11 – 10)	Environment compensation *(₹ in lakh)* #
1	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***
1	Bhubaneswar	270.64	216.51	183.50	33.01	29.75	186.76	31/03/2020	01/04/2020	31/03/2022	729	44,980.38
2	Cuttack	209	167.20	85.00	82.20	20.62	146.58	31/03/2020	01/04/2020	31/03/2022	729	36,287.90
3	Sambalpur	76.76	61.41	40.00	21.41	0	61.41	31/03/2020	01/04/2020	31/03/2022	729	14,974.39
4	Rourkela	61.90	49.52	40.00	9.52	2.60	46.92	31/03/2020	01/04/2020	31/03/2022	729	11,321.83
5	Berhampur	80.00	64.00	0.00	64.00	0	64.00	31/03/2020	01/04/2020	31/03/2022	729	16,336.00
	Total	**698.30**	**558.64**		**210.14**	**52.97**	**505.67**					**1,23,900.49**

*(**Source**: Information furnished by OWSSB and EIC, Public health, Odisha)*

 # [Col. 17.5 x (Col. 4 - 5) + 55.5 x (Col. 4 - 7) + 0.2 x (Col. 4-7) x Col.12+0.05*(Col. 4 - 7) x Col.12]

As per CPCB Norms: Formula as per CPCB for EC (lacs Rs) = 17.5 (total sewerage generation - installed treatment capacity) + 55.5(total sewerage generation - operational capacity) + 0.2 (Sewerage generation - operational capacity) X N + Marginal cost of environmental externality X (total sewerage generation - operational capacity) X N where N is the number of days delayed, for sewerage systems

Appendix- IX
(Refer paragraph 6.4, at page: 94)
Delay in completion of works, and non- levy of liquidated damage, for default in execution by the contractors

Sl. No.	MCs/ Unit	Name of the works	Estimated cost put to tender *(₹ in Lakh)*	Agreement cost *(₹in lakh)*	Date of commencement	Stipulated date for completion	Upto date Expenditure *(₹ in lakh)*	Delay up to date of completion/ last date of Audit	Delay in days	Liquidated damage *(₹ in lakh)*	Status
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
1	BMC	Construction of RCC drain which culvert at Sidheswar Nagar in Ward No. 63	71.31	65.54	14-08-2018	13-02-2019	71.29	18-01-2020	339	7.13	Completed
2	BMC	Construction of drain with culverts from Radha Krishna Nagar to Main Drain No.1 in Damna Village	272.11	249.75	12-05-2020	11-11-2020	195.61	17-09-2022	675	27.21	Not completed
3	BMC	Construction of RCC Drain with cover slab at Aurobin Nagar from plot No. 330 to Drain No. 1C near Damana Road in Ward No 9	84.96	72.22	12-11-2020	26-12-2020	36.29	30-10-2021	308	8.50	Completed,
4	OWSSB	Construction of sewerage system for Bhubaneswar city in sewerage District-I	17,808.51	20,671.63	27-07-2017	26-07-2020	13,868.24	19-08-2022	754	1,780.85	Not completed
5	OWSSB	Construction of sewerage system for Bhubaneswar city in sewerage District-II	12,569.99	17,308.00	27-10-2017	26-10-2020	11,660.73	19-08-2022	662	1,257.00	Not completed
6	OWSSB	Construction of sewerage system for Bhubaneswar city in sewerage District-III	37,604.05	34,537.23	27-07-2017	26-07-2020	20,365.04	19-08-2022	754	3,760.41	Not completed
7	OWSSB	Construction of sewerage system for Bhubaneswar city in sewerage District-IV	6,715.58	6,223.00	09-02-2018	08-02-2020	49,767.57	30-03-2022	781	671.56	Not completed
8	OWSSB	Construction of STP & Pumping stations in Bhubaneswar Sewerage District -VI and Cuttack Sewerage District I, II and III	22,052.98	31,998.72	22-07-2013	21-07-2016	26,806.96	30-07-2022	2200	2,205.30	Not completed
9	CMC	Re-construction of drain from Badambadi U.G.M.E School to Badambadi PHD Office at New Colony Main Road in Ward No. 44	16.30	16.30	06-04-2018	05-07-2018	18.01	25-02-2019	235	1.63	Completed
10	CMC	Re-construction of drain with covering Precast slab at (I) Baidyanath Mishra Lane Samadhi patna(II) Inside of Muradkhan Patna Harijan Sahi Sweeper Colony with Road and (III) In front of	20.62	22.06	10-04-2018	09-07-2018	24.71	30-09-2019	448	2.06	Completed

Sl. No.	MCs/ Unit	Name of the works	Estimated cost put to tender *(₹ in Lakh)*	Agreement cost *(₹in lakh)*	Date of commencement	Stipulated date for completion	Upto date Expenditure *(₹ in lakh)*	Delay up to date of completion/ last date of Audit	Delay in days	Liquidated damage *(₹ in lakh)*	Status
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
		Akash Saloon in Ward No-41									
11	CMC	Re-construction of drain with covering Pre-cost slab from (I) working women's Hostel to Bulu Sarangi resident of Gamhadia new colony (II) from Jadu Jena resident to Subosh Das resident of Uchha Sahi with CC road (III) From Arjuna Bhola resident to Shakti Hospital Lane convert and (IV) from Anwar Kachi resident to S. K. Anwar resident of Keshar Pur in Ward No. 33	13.80	14.35	10-04-2018	09-07-2018	15.72	30-10-2019	478	1.38	Completed
12	CMC	Re-construction of Drain with covering Precast slab from (I) Grahacharya House to bisinabar Park (II) Nakei Padia to Bisinabar Park (III) Bisinabar School backside (IV) Kedar Khuntia House to Mangala Patra Lane at Tala sahi with road (V) at advocate P. K. Sarangi Lane at Shakti Nagar and Trilochan Mohanty Lane of Das Sahi (VI) drain from Bishram Nagar Plot No 60 of Ashoka Arora to Plot No. 68 of Premalata Nanda resident and road from Acharya Babu House to Dasa Sahi Main road Maa Mangala Lane and (VIII) Road from Ambika Niwas to Bishram Nagar Main road and by lanes in Ward No. 37	24.57	26.17	11-04-2018	10-06-2018	26.45	30-09-2019	477	2.46	Completed
13	CMC	Re-construction of drain with covering Pre-cost slabs from OSL Lane and Shakti Nagar area in Ward No. 37. Under CMC (Node details of zone 513, 33, 34, 33A, ,32 and 25.A-05)	33.66	31.24	11-04-2018	10-06-2018	34.27	30-07-2019	415	3.37	Completed
14	CMC	Construction of drain from Hotipokhari Bombey Heat Point to Paras Plaza (Balance Portion)	14.28	15.12	17-11-2018	16-01-2019	13.03	30-09-2019	257	1.43	Completed
15	CMC	Construction of Drain behind the Nimpur (Jagatpur) Rehabilitation sites to Panda Sahi in Ward No. 48	29.96	29.36	21-12-2021	20-03-2022	23.53	25-11-2022	250	3.00	Not completed

Sl. No.	MCs/ Unit	Name of the works	Estimated cost put to tender *(₹ in Lakh)*	Agreement cost *(₹in lakh)*	Date of commencement	Stipulated date for completion	Upto date Expenditure *(₹ in lakh)*	Delay up to date of completion/ last date of Audit	Delay in days	Liquidated damage *(₹ in lakh)*	Status
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
16	CMC	Construction Of Main Drain from Baimundi Nagar to Petanallah via Bandha Chhaka and Baula Chhaka at Bidanasi in Ward No. 1	633.98	570.52	29-11-2021	28-10-2022	287.61	25-11-2022	28	63.40	Not completed
17	SMC	Reclamation of water bodies under Sambalpur Municipal Corporation (three water bodies i.e. Sidi Bandha, Bada Bandha, and Puti Bandha) under OUIDF	383.61	345.32	14/12/2018	13-06-2020	198.15	16-11-2022	886	38.36	Not completed
18	SMC	Renovation of Dhama Road Tank, Sambalpur	35.93	30.55	19/05/2016	18-07-2016	27.56	16-11-2022	2,312	3.59	Not completed
19	SMC	Special repair to Church Chowk to Golbazar Chowk via Lastalia House Road such as construction of RCC drain from 02/100 km	33.8	33.8	01-05-2020	31-07-2020	15.89	16-11-2022	838	3.38	Not completed
20	SMC	Special Repair to Dehuripali to Gurunanak School road such as construction of RCC drain from 1/0 to 2/000 km (in Patches for the year 2019-20)	64.23	64.23	24-05-2020	23-08-2020	52.28	16-11-2022	815	6.42	Not completed
21	SMC	Balance portion of Storm Water drain from NH 6 towards the back side of RMC in ward no 14 under SMC Sambalpur	19.99	16.99	12-11-2018	11-02-2019	6.82	16-11-2022	1,374	2.00	Not completed
22	SMC	Construction of RCC drain inside Kamali Bazar, Sambalpur in ward no 23 under SMC, Sambalpur	20	19.34	16-12-2016	15-03-2017	8.51	16-11-2022	2,072	2.00	Not completed
23	RMC	Proposed Drain development in Civil township at Rourkela for AAAA 7-8, UUU 7-8, TTTT 15-16, CCCC 16-30	48.07	36.48	11-05-2022	25-06-2022	19.35	13-12-2022	171	4.81	Not completed
24	RMC	Proposed Drain Development in Civil Township at Rourkela (X1 - X17, Y19 - Y20, Z12 - Z11 / 13)	40.44	30.69	11-05-2022	25-06-2022	22.43	13-12-2022	171	4.04	Not completed
25	RMC	Proposed Drain Development in Civil Township at Rourkela (AA 1- AA15, Z1-Z2, V1-V2)	37.46	28.43	11-05-2022	25-06-2022	22.32	13-12-2022	171	3.75	Not completed
26	RMC	Construction of storm water drain from Jhirpani road culvert to Jagannath Temple A block, Koelnagar .	36.11	30.7	18-04-2021	17-03-2022	34.37	28-04-2022	42	3.61	Completed

Sl. No.	MCs/ Unit	Name of the works	Estimated cost put to tender *(₹ in Lakh)*	Agreement cost *(₹in lakh)*	Date of commencement	Stipulated date for completion	Upto date Expenditure *(₹ in lakh)*	Delay up to date of completion/ last date of Audit	Delay in days	Liquidated damage *(₹ in lakh)*	Status
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
27	RMC	Construction of drain at Plot No. L/79 to 84, L/85 to 90 and L/91 to 98 at Chhend, Ward No.15	12.01	9.12	06-06-2022	06-08-2022	6.92	01-11-2022	87	1.20	Completed
28	RMC	Renovation and construction of road and drain at Bandha Munda area in ward No. 24	16.04	14.3	24-06-2022	23-08-2022	8.68	13-12-2022	112	1.60	Not completed
29	RMC	Construction of Storm Water Drain backside of Qr. No. GM-01, Kalinga Vihar	89.67	84.67	20-06-2022	19-09-2022	75.25	17-11-2022	59	8.97	Completed
30	RMC	Improvement of both CC roads and drains of Basanti Colony of FL, M, E, AE area D/1 Block, RMC	30.8	26.17	27-12-2021	09-02-2022	14.73	13-12-2022	307	3.08	Not completed
31	RMC	Proposed Drains of Basanti Colony of LCL, CM, CE, BM, BL, near (B), Rourkela	60.76	54.25	15-03-2022	29-04-2022	39.65	13-12-2022	228	6.08	Not completed
32	RMC	Proposed Drains of Basanti colony of AM and AL area (A), Rourkela	60.29	58.83	15-03-2022	29-04-2022	17.6	13-12-2022	228	6.03	Not completed
33	RMC	Construction of drain at HIG/B-1 to B/40, Phase-III, Kalinga Vihar	24.62	18.68	08-02-2021	07-07-2021	13.23	25-09-2021	80	2.46	Completed
34	RMC	Proposed BT, C.C Road &Drains of Basanti Colony of E, DM, GM, EM, DL area (G), Rourkela	66.53	59.4	25-12-2021	10-02-2022	51.89	13-12-2022	306	6.65	Not completed
35	RMC	Proposed Drains of Basanti Colony of FM, FL, FE, F/AE area (C)	64.78	57.83	18-03-2022	02-05-2022	27.83	13-12-2022	225	6.48	Not completed
36	BeMC	Construction of RCC drain & culvert at Chanakya Nagar Khala street Main Road in ward No.36	19.34	18.76	29-09-2021	06-05-2022	18.07	08-07-2022	63	1.93	Completed
37	BeMC	Construction of RCC drain at LIG-212/stage -1 near park and LIG-220 2nd Extn (Right side) in ward No.14	10.6	9.01	03-06-2021	23-08-2021	7.86	25-10-2021	63	1.06	Completed
38	BeMC	Construction of drain culvert and road at Nrusingha Nagar main road with extension line in ward No. 14	24.17	22.95	10-11-2021	30-04-2022	18.37	20-05-2022	20	2.42	Completed
39	BeMC	Construction of drain and culvert at Radhamani Nagar Housing board with extension line connecting to main drain	17.09	16.28	12-11-2021	24-04-2022	11.37	25-05-2022	31	1.71	Completed
40	BeMC	Construction of RCC Road and culvert from Gosani Nuagaon new police station to backside ARAY Building via	18.22	16.65	27-08-2021	12-02-2022	10.83	03-06-2022	111	1.82	Completed

Sl. No.	MCs/ Unit	Name of the works	Estimated cost put to tender *(₹ in Lakh)*	Agreement cost *(₹in lakh)*	Date of commencement	Stipulated date for completion	Upto date Expenditure *(₹ in lakh)*	Delay up to date of completion/ last date of Audit	Delay in days	Liquidated damage *(₹ in lakh)*	Status
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
		RI office in Ward No. 27									
41	BeMC	Construction of road and drain at Khajja sahi 6th line in ward No. 17	18.28	17.37	22-10-2021	20-05-2022	6.41	20-08-2022	92	1.83	Completed
42	BeMC	Construction for CC road and drain and culvert at Laxmi Narayan Nagar in Ward No. 37	37.89	32.21	26-03-2021	25-12-2021	37.88	28-02-2022	65	3.79	Completed
43	BeMC	Construction of CC road and drain at Mayuree Vihar in Ward No. 26	31.21	26.53	20-04-2021	25-10-2021	25.94	31-12-2021	67	3.12	Completed
44	BeMC	Construction of drain at Suraj Vihar 4th line in Ward No. 05	21.22	21.21	13-08-2021	01-06-2022	20.33	06-07-2022	35	2.12	Completed
45	BeMC	Construction of RCC drain Culvert and roadside of Royal Pharmacy College in Ward No. 26	15.3	13.65	10-01-2022	09-03-2022	8.28	13-11-2022	249	1.53	Not completed
46	RSCL	Construction of Madhusudanpalli-Malgodown road drain and Railway colony -Ispat Hotel drain in Rourkela	912.21	937.29	03-08-2021	02-08-2022	623.85	03-12-2022	123	91.22	Not completed
47	RSCL	Construction of Government college drain -Basanti colony -Sarana chowk drain in Rourkela	888.26	912.69	03-08-2021	02-08-2022	753.99	03-12-2022	123	88.83	Not completed
48	RSCL	Construction of Gopabandhupalli-Gandhi Road Bisra chowk road -Nala Road drain in Rourkela	909.07	934.06	03-08-2021	02-08-2022	532.49	03-12-2022	123	90.91	Not completed
		Total	**1,02,034.66**	**1,15,849.65**			**1,25,954.19**			**10,203.47**	

*(**Source**: Information furnished by the selected MCs/ OWSSB)*

Appendix-X
(Refer paragraph 6.5, at page: 94)
Water quality of rivers and water bodies, during January-July 2022

(mg/l)

River/ Nallah	Biochemical Oxygen Demand (Admissible limit ≤ 3)	Dissolved Oxygen Demand (Admissible ≥ 5)	Chemical Oxygen Demand (Admissible limit ≤ 50)	Total Coliform (Admissible limit ≤ 5,000)	Faecal Coliform (Admissible limit ≤ 2,500)	Total Suspended Solids (Admissible limit ≤ 100)
1	*2*	*3*	*4*	*5*	*6*	*7*
Kathajodi downstream	3.50	7.7	18.50	38,786	21,656	22
Kathajodi, Matagajpur	2.2	7.2	17.3	13,969	7,125	18
Mahanadi, Jobra railway bridge, Cuttack	60	0.3	138	1,60,000	1,60,000	69
Daya River, BBSR Down stream	4.40	3.8	20.90	1,04,857	76,114	43
Gangua River, near Rajadhani College	7.90	0.8	44.90	1,40,571	1,28,558	35
Gangua River, near Palasuni	9.00	1.1	57.00	11,716	1,00,314	113
Gangua River, near Samantarapur	10.10	0.8	58.00	1,39,571	1,37,614	91
Gangua River, near Vadimula	6.10	3.1	32.00	1,35,143	1,25,429	35
Brahmani River, at Panposh Down stream	4.40	5.7	24.00	24,000	6,600	36
Brahmani River, Rourkela Down stream	3.90	6.4	20.30	18,329	5,486	34
Brahmani River, Rourkela far down stream	2.60	8.4	13.70	1,323	433	25
Guradih nallah, before confluence with the Brahmani River, Rourkela	6.1	4.5	32.00	73,000	31,986	39

*(**Source**: As per Water quality test reports of the SPCB)*

Appendix-XI
(Refer paragraph 6.11, at page: 100)
SLB performance indicators and achievements on SWDs and Sewerage Management, by the MCs

Sl. No.	Performance Indicators	Definition	Benchmark (in *per cent*)	Achievement of MCs for SWD as of December 2022 (in percentage)				
				BMC	CMC	BeMC	SMC	RMC
Sewerage management								
1	Coverage of toilets	Extent of citizens have access to a toilet	100	37	60	38	70	46
2	Coverage of sewage network services	(a) Extent of the underground sewerage (or sewerage collection) network has reached out to individual properties across the service area	100	81	85	0	27	84
		(b) Number of household connections to the sewerage network	100	27	20	0	0	3
3	Collection efficiency of sewage network	Quantum of wastewater collected as a percentage of normative sewerage generation	100	14	12	0	0	5
4	Adequacy of sewage treatment capacity	Capacity available for treatment and utilized	100	16	24	0	0	7
5	Quality of sewage treatment	Wastewater sample tested against the parameters	100	10	08	0	0	10
6	Extent of reuse and recycling of sewage	Percentage of wastewater received at the STPs that is recycled or reused after appropriate treatment for various purpose	20	12	9	0	0	0
7	Extent of cost recovery in sewage management	Extent of cost recovery is expressed as wastewater revenues as wastewater expenses for the corresponding time period	100	0	0	0	0	0
8	Efficiency in collection of sewage charges	Collection of sewerage charges from the households for sewerage connections	90	33	0	0	0	0
Storm water Drainages								
1	Coverage of storm water drainage network	Road length covered by the storm water drainage network	100	70	65	40	0	85
2	Incidence of water logging/ flooding (number)	Number of times water logging is reported in a year	0	2	8	0	0	3

*(**Source**: Information furnished by the selected MCs/ OWSSB and WATCO)*

Glossary of Abbreviations

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Sl. No.	Abbreviation	Description
1.	AAP	Annual Action Plan
2.	ACS	Additional Chief Secretary
3.	ADD	Acute Diarrhoea Disease
4.	AMRUT	Atal Mission for Rejuvenation and Urban Transformation
5.	AoR	Analysis of Rates
6.	BCM	Billion Cubic meter
7.	BDA	Bhubaneswar Development Authority
8.	BeDA	Berhampur Development Authority
9.	BeMC	Berhampur Municipal Corporation
10.	BMC	Bhubaneswar Municipal Corporation
11.	BOD	Biochemical Oxygen Demand
12.	BSCL	Bhubaneswar Smart City Ltd.
13.	BT	Bituminous
14.	CDA	Cuttack Development Authority
15.	CDP	Comprehensive Development Plan
16.	CE	Chief Engineer
17.	CEO	Chief Executive Officer
18.	CFE	Consent for Establishment
19.	CFO	Consent for Operation
20.	CGWB	Central Ground Water Board
21.	CIFA	Central Institute of Fresh Water Aquaculture
22.	CMC	Cuttack Municipal Corporation
23.	CMP	City Master Plan
24.	COD	Chemical Oxygen Demand
25.	CPCB	Central Pollution Control Board
26.	CPHEEO	Central Public Health and Environmental and Engineering Organisation
27.	CSP	City Sanitation Plan
28.	CTO	Consent to Operate
29.	CUTM	Centurion University of Technology and Management
30.	DA	Development Authority
31.	DI	Ductile Iron
32.	DMA	Director of Municipal Administration
33.	DMP	Drainage Master Plan
34.	DO	Dissolve Oxygen
35.	DoWR	Department of Water Resources
36.	DPRs	Detailed Project Reports
37.	DTP	Director of Town Planning
38.	EC	Environmental Compensation
39.	EE	Executive Engineer
40.	EIC	Engineer-in-Chief
41.	EOT	Extension of time
42.	EPC	Engineering Procurement Construction
43.	FC	Finance Commission

Sl. No.	Abbreviation	Description
44.	FC	Fecal Coliform
45.	FD	Finance Department
46.	FYs	Financial Years
47.	GIS	Geographic Information System
48.	GM	General Manager
49.	GoI	Government of India
50.	GoO	Government of Odisha
51.	GPS	Global Positioning System
52.	GST	Goods and Service Tax
53.	H&FWD	Health and Family Welfare Department
54.	H&UD	Housing and Urban Development
55.	HFL	High Flood Level
56.	HLSC	High level Steering Committee
57.	HRT	Hydraulic Retention Time
58.	ICAR	Indian Council of Agricultural Research
59.	ICs	Inspection Chambers
60.	IEC	Information, Education and Communication
61.	IIHS	Indian Institute of Human Settlements
62.	IMD	Indian Metrological Department
63.	IMP	Intermediate pumping station
64.	IRC	Indian Road Congress
65.	JICA	Japan International Co-operation Agency
66.	JNNURM	Jawahar Lal Nehru National Urban Renewal Mission
67.	JPV	Joint Physical Verification
68.	KLD	Kilo liter per day
69.	LPCD	Liters per capita per day
70.	Mbgl	Meters below Ground level
71.	MCs	Municipal Corporations
72.	Mgl	Milligram per liter
73.	MLD	Million liters per Day
74.	MoEFCC	Ministry of Environment, Forest and Climate Change
75.	MoUD	Ministry of Urban Development
76.	MPN	Most Probable Number
77.	MPs	Master Plans
78.	MUKTA	Mukhya Mantri Karma Tatpar Aviyan
79.	NDMA	National Disaster Management Authority
80.	NGO	Non-Government Organisation
81.	NGT	National Green Tribunal
82.	NH	National Highways
83.	NWP	National Water Policy
84.	O&M	Operation and Maintenance
85.	OB	Opening Balance
86.	ODA Act	Odisha Development Authority Act
87.	OMC Act, 2003	Odisha Municipal Corporations Act, 2003
88.	OPWD	Odisha Public Works Department
89.	ORSAC	Odisha Space Research Application Centre
90.	OUAT	Odisha University of Agriculture and Technology

Sl. No.	Abbreviation	Description
91.	OUIDF	Odisha Urban Infrastructure Development Fund
92.	OWSSB	Odisha Water Supply and Sewerage Board
93.	PA	Performance Audit
94.	PCC	Project Co-ordination Committee
95.	PE	Project Engineer
96.	pH	Potential of Hydrogen
97.	PHD	Public Health Department
98.	PM	Planning Member
99.	PMU	Project Management Unit
100.	PWDs	Public Works Divisions
101.	QR Code	Quick Response Code
102.	R&B	Roads and Buildings
103.	RDA	Rourkela Development Authority
104.	RMC	Rourkela Municipal Corporation
105.	RRHS	Rooftop Rainwater Harvesting Systems
106.	RSCL	Rourkela Smart City Ltd.
107.	RWHS	Rainwater Harvesting Structure
108.	SBM	Swachh Bharat Mission
109.	SCM	Smart City Mission
110.	SCPs	Smart City Proposals
111.	SDA	Sambalpur Development Authority
112.	SDC	Social Development Committee
113.	SE	Superintending Engineer
114.	SeTP	Septage Treatment Plant
115.	SFC	State Finance Commission
116.	SHG	Self Help Group
117.	SLB	Service Level Benchmark
118.	SMC	Sambalpur Municipal Corporation
119.	SMS	Sewerage Management Systems
120.	SOP	Standard Operating Procedure
121.	SoR	Scheduled of Rates
122.	SPCB	State Pollution Control Board
123.	SPs	Sewerage projects
124.	SS	Sanctioned Strength
125.	SSTS	Sewerage and Sewage Treatment System
126.	STP	Sewerage Treatment Plant
127.	SWD	Storm Water Drainage
128.	SWM Rules, 2016	Solid Waste Management Rules, 2016
129.	SWP	State Water Policy
130.	TC	Total Coliform
131.	TSS	Total Suspended Solids
132.	UC	Utilisation Certificate
133.	UGSS	Underground Sewerage Systems
134.	ULBs	Urban Local Bodies
135.	WATCO	Water Corporation of Odisha
136.	ZDP	Zonal Development Plan

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