

Executive Summary

The city of Bengaluru is a victim of a paradoxical situation - urban flooding on one hand and depletion of ground water table levels, on the other. There is an urgent need for urban managers to address this issue from the water security/environment and urban planning perspectives.

Rapid increase in frequency of flooding in the city over the last few years, leading to destruction of roads, traffic congestion lasting several hours and extensive damage to public property and health has highlighted the need for a thorough examination into the design, agility/adaptability of the infrastructure for the management of storm water and other relevant issues; hence this performance audit (PA).

The scope of this PA is not limited to the SWD infrastructure. We have attempted to address the larger conceptual question of redefining storm water as a critical natural resource worthy of conservation. The PA which covers the period 2013-14 to 2017-18 involved test-check of records in the Office of the Commissioner, Bruhat Bengaluru Mahanagara Palike (BBMP) and Chief Engineer, SWD along with joint physical inspections of drains. Audit conducted an independent study of long term changes in land use patterns utilising geospatial inputs with technical support from Regional Remote Sensing Centre-South, Indian Space Research Organization, Bengaluru to obtain details of changes across specific time periods which affect ground water recharge, simultaneous variations in SWD infrastructure in order to identify weaknesses in their management/monitoring.

The PA revealed that Bengaluru witnessed large scale encroachment of lakes/drains and depletion of natural drainage systems. The changes in land use such as decrease in vegetation cover and open spaces and increase in built up area resulted in loss of inter-connectivity between water bodies impacting effective recharge of ground water and increase in runoff of storm water. A study by the Indian Institute of Science states that the city (covering an area of 741 sq km) had 1,452 water bodies with a total storage capacity of 35 TMC during early 1800s. By 2016, the number of water bodies in the same area reduced to 194 with a storage capacity of 5 TMC. The current storage capacity which has further declined due to siltation is merely 1.2 TMC (2016). Out of 210 lakes under the jurisdiction of BBMP as at the end of December 2020, 18 lakes with a total area of 254 Acres and 17 guntas were identified as disused lakes; making them vulnerable to encroachments and future conversions.

A robust policy governing storm water management does not exist. The State Government and BBMP failed to consider urban surface runoff (average annual rainfall being 969 mm during 2013-19) as a water resource despite the growing scarcity of water in the State/city. More than 40 *per cent* of properties under the purview of Bengaluru Water Supply and Sewerage Board (BWSSB) failed to adopt mandatory rain water harvesting structures.

The storm water drains of Bengaluru are documented in two different documents prepared by two different agencies – Revised Master Plan 2015 by Bengaluru Development Authority (BDA) and Master plan of drains by BBMP. There were significant discrepancies between these two plans with regard to identification and classification of drains. This deprived the planners of a single source of truth for planning/development of the city. BBMP did not possess fool-proof data on the total number/length and nature of different types of drains under its jurisdiction. The absence of a comprehensive inventory of drains and their proper classification contributed to lack of clarity on critical issues such as the extent of buffer zone to be maintained, *etc.* This in turn hampered maintenance of drains as many utility lines like electrical, telephone, optical cable, *etc.*, were laid across the drains in many locations obstructing flow in the drains.

Comprehensive Detailed Project Reports (DPRs) prepared for improvement of SWDs were reportedly not available with BBMP and the only available revised DPR was deficient. Works executed were either incomplete or were abandoned due to non-availability of required land and poor performance of the contractors. This resulted in BBMP not submitting the Utilisation Certificates and consequent loss of financial assistance of ₹83.59 crore under the Jawaharlal Nehru National Urban Renewal Mission.

Though a large number of works were abandoned and rescinded due to poor performance of contractors, risk and cost clause were not invoked. This led to extension of undue financial benefit of ₹35.31 crore to the contractors. BBMP also resorted to payment of ₹94.93 lakh to an agency without the original records and proper reconciliation under questionable circumstances.

BBMP failed to prepare a SWD manual specifying the design, construction and maintenance of the SWD infrastructure of the city. It failed to factor in reasons for high intensity rainfall due to rapid urbanisation and did not adhere to the provisions of Indian Road Congress and the guidelines of National Disaster Management Authority while designing and constructing roads/drains. Ground water recharge structures were not taken up due to flow of sewage in SWDs. Water bodies and drains were not inter-connected and linkage between different drains was absent. This affected free flow of storm water leading to frequent flooding in various parts of the city.

BBMP executed construction/remodeling of 332 km and maintenance of 308 km of SWDs (primary and secondary) respectively till 2017-18 from out of its own funds and funds received from Central/State Government. The performance audit showed instances of improper and delayed execution of works and execution of SWD works by multiple authorities within BBMP which was fraught with the risk of duplication of claims. It incurred an expenditure of ₹8.51 crore on items of works, which were objected to by audit earlier and though the Committee on Local Bodies and Panchayat Raj Institutions had endorsed Audit's observations. Records such as 'completion plans' and 'as built drawings' and works history registers, which are vital for subsequent planning were absent and basic financial records such as grants register, deposit register, register of securities, schedule of work expenditure,

register of advance *etc.*, were not maintained. This was indicative of a weak financial control mechanism within BBMP.

Rampant mixing of sewage (780 MLD) with storm water is a serious problem. Sewerage lines were drawn inside the SWDs and large quantity of sewage was illegally let into SWDs. Joint inspection of drains confirmed the existence of sewerage lines within SWDs and sewage being discharged into the SWDs directly or through fractured manholes at many places. Since the water in SWDs is not treated in the same manner as sewage, the untreated sewage is flowing into water bodies and affecting the quality of ground water adversely. This carries substantial risk of spurt in vector/water borne diseases such as dengue, typhoid, cholera, hepatitis, *etc.*, and adverse environmental outcomes including disappearance of biodiversity and aquatic ecosystems. The Chief Health Officer (Public Health), BBMP confirmed an outburst of cholera in the city during March 2020 and stated that seven out of the 25 suspected cases had been confirmed as cholera. He, *inter alia*, attributed sewage flowing in open SWDs to the spreading of the epidemic.

The Revised Master Plan 2015 and NGT directions stipulated a buffer zone on either side of primary, secondary and tertiary drains and the statutory provisions stipulated putting in place boundary marks for such descriptions. None of the test-checked drains, though had such boundary markings. This led to encroachment of drains as well as construction in buffer zone. BBMP was yet to take action on 714 out of the 2,626 identified encroachments. The completeness and reliability of the data on encroachments available with BBMP was low as audit noticed significant instances of encroachments, in addition to those recognised by BBMP. Removal of encroachments was incomplete.

Severe blockages of surface drains/SWDs indicated absence of periodical inspections as well as its regular maintenance of drains. BBMP failed to adopt quality monitoring measures and install Sewage Treatment Plants, despite Court directives leading to continuous contamination of water bodies. BBMP did not take up any information, education and communication activities/awareness camps for educating people regarding importance of SWDs and their proper upkeep and did not enforce penal provisions for violation/dumping of debris in SWDs. Consequently, BBMP failed to protect and maintain the drain infrastructure resulting in continuous misuse of the drains.

List of recommendations

1. The State Government/BBMP should formulate a comprehensive policy which clearly recognises urban runoff as a potential source of water requiring clear plan of action for conservation in consonance with the NDM guidelines.
2. BBMP should prevent further reduction in water bodies and length of the natural drains and ensure inter-connectivity of water bodies for proper conservation of the ecosystem as well as ground water.
3. BBMP and BWSSB should jointly prepare a plan of action to prevent sewage flow into SWDs within a definite time schedule and the implementation thereof should be monitored by the State Government.
4. The State Government/BBMP should explore the possibility of letting the treated water to the water bodies in the city to prevent drying up of water bodies and to aid in enhancing ground water recharge.
5. The State Government/BDA should take immediate action to finalise and notify the revised master plan to prevent encroachments of Government assets such as land, water bodies *etc.*, and rectify the omissions with regard to SWDs.
6. BBMP should prepare a comprehensive database of SWDs in coordination with parastatal agencies like BDA, BWSSB *etc.*, to serve as a single source for effective planning and management of SWDs.
7. The State Government/BBMP should ensure that DPRs prepared are comprehensive and realistic and include details such as extent and availability of land, the requirement and sources of fund, coordination with other institutions *etc.*
8. BBMP should initiate immediate action to comply with the instructions of the Government for recovery of risk and cost amounts from all the contractors who have violated norms and blacklist persistent violators. It should initiate action against the concerned officers/officials responsible for non-compliance. It should also put in place adequate and resilient financial controls through proper documentation.
9. BBMP should maintain all the basic records to ensure proper accounting and comply with the statutory provisions for transparency in implementation and execution of works.

10. The State Government should conduct a detailed investigation into the issues regarding preparation of incomplete and deficient DPRs, loss of files by SWD division, payments made under questionable circumstances and take appropriate action based on the findings of the investigation.
11. BBMP should factor in all parameters such as rainfall pattern, increase in impervious layers, decrease in vegetation *etc.*, while designing and executing the roads and drains to increase ground water recharge and prevent flooding. It should ensure strict adherence to the guidelines and norms prescribed for construction of roads/drains.
12. BBMP should prepare action plans, comprehensive project reports, completion plans *etc.*, maintain a works history register and repository of all such records for future use in planning and implementation
13. Since SWD works are identified as emergency works, BBMP should ensure that the works are completed within the prescribed time schedule. It should also consider establishing a separate technical wing for meticulous scrutiny of the estimates to ensure execution of works economically and efficiently.
14. The State Government should ensure strict action against the officers/officials responsible for non-compliance with Government instructions and Committee recommendations. Care should be taken to avoid excess/avoidable payments to contractors.
15. The State Government should conduct an independent verification of the status and quality of all SWD works to ensure their quality and completion.
16. BBMP should accord high priority to prevent discharge of sewage into SWDs. There is a need to prepare and execute (i) medium term strategy for complete cessation of sewage contamination of storm water and lakes eventually and (ii) a short term strategy for installation of sewage treatment plants in coordination with BWSSB to prevent contamination of water bodies.
17. BBMP needs to escalate its efforts to conduct robust surveys to identify and evict all encroachments on SWDs and maintain the stipulated buffer zone.
18. BBMP should put in place an adequate mechanism to conduct and document periodical inspection and maintenance of all categories of drains.
19. BBMP should educate the urban population on the effects of improper management of SWDs and explore the possibility of involving Residential Welfare Associations/Non-Government Organisations for effective management of waste/drains and providing them with incentives.
20. BBMP should prepare the budget clearly indicating the scheme-wise receipts of funds and expenditure incurred thereon and for both capital and revenue activities under each function.

