

2 Chapter

Audit Framework

2.1 Audit objectives

The main objectives of the PA were to ascertain:

- Whether there exists an adequate mechanism for collection and conservation of storm water;
- Whether storm water management was efficient and effective in terms of planning, designing and construction of required infrastructure;
- Whether the protection and monitoring of storm water management systems were effective; and
- Whether funds provided for management of storm water were utilised efficiently, economically and as per relevant rules.

2.2 Audit criteria

The main sources of audit criteria for the PA were:

- Indian Road Congress (IRC) SP:50 of 1999 and 2013 – Guidelines on Urban Drainage;
- National Disaster Management Guidelines: Management of Urban Flooding (September 2010) (NDM Guidelines);
- Karnataka Town and Country Planning Act, 1961
- Revised Master Plans (RMP) of Bengaluru Development Authority;
- Karnataka Municipal Corporation Act, 1976;
- Karnataka Transparency in Public Procurement (KTPP) Act/Rules, Karnataka Financial Code, Karnataka Public Works Departmental and Accounts Code; and
- Government orders, court judgments, executive instructions and circulars issued from time to time.
- Research and study reports of Indian Institute of Science and other reports

2.3 Audit scope and methodology

The PA covering the period 2013-14 to 2017-18 was conducted through test-check of records (April-August 2018) in the Office of the Commissioner, BBMP and Chief Engineer, SWD. Relevant information was also gathered

from Bengaluru Development Authority (BDA), Bengaluru Water Supply and Sewerage Board (BWSSB), Karnataka State Natural Disaster Monitoring Centre (KSNDMC), Department of Revenue, Karnataka Lake Conservation and Development Authority (KLCDA).



Two valleys - Vrishabhavathi and Koramangala which included drain length of 467.10 km were selected for detailed scrutiny. Audit adopted random sampling for selection/analysis of works and conducted joint physical inspections with BBMP officers/officials along approximately 70 drains⁶ (under the six zones of the selected two valleys) to examine the status of drains (drains were physically inspected traversing along the stretch, wherever accessible). A few illustrative videos taken during joint inspection have been included in the report at relevant places by providing the link and also the QR code for scanning.

An entry conference was held (4 April 2018) with ACS, UDD to discuss the audit objectives, scope and methodology. The results of the PA were discussed with the ACS, UDD in an exit conference held on 6 December 2018. The State Government furnished its replies on 8 January 2019. Audit verified the actions and corrective measures stated to have been initiated as per the reply during November-December 2019 and the updated position has been incorporated wherever applicable. The State Government furnished revised replies on 6 August 2020, which have also been incorporated at appropriate places.

2.4 Joint study on geospatial data along with Regional Remote Sensing Centre, ISRO

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 (RRSC). Geospatial technology can provide valuable inputs and tools for mapping and monitoring of natural resources. The monitoring abilities of Remote Sensing (RS), Geographical Information System (GIS) and Global Positioning System (GPS) technologies are valuable for the tracking of dynamics of land use over a period of time.

The aim of the study was to understand the potential application of geospatial and collateral data for generation of inputs for audit. Time series maps were generated using geospatial and ancillary data to analyse significant land use changes covering Koramangala and Vrishabhavathi valleys (out of four valleys).

Methodology adopted for the study

Spatial databases containing building foot prints, road network, lakes, drainage network and sewer lines in vector format obtained from BBMP, BDA and other departments were used for the analysis. The spatial information about natural and artificial features was created/updated to create time series data of lakes, drains, roads, buildings, vegetation and open land layers. These were analysed to understand the changes in land use patterns.

⁶ In addition, few unmapped drains were also inspected.

The work was done by way of superimposition of Satellite Images of 1960 (Corona imagery), 2008 satellite imagery and 2016/2017 satellite imagery and identifying and quantifying the changes in land use and land cover. Shape files (.shp files) of natural and artificial feature layers - built up layer, roads layer, lakes and tanks layer, drainage network layer and open lands layer were created/updated. Details of counts, lengths and areas of these features were generated by way of summaries and statistics of the geospatial features using tools available in the ArcGIS. During this study, several points for joint inspection were identified from the imagery such as drains existing but not shown in departmental maps, possibility of mixing of sewage lines and storm water drains *etc.* The time series data of land use changes were prepared from the layers so created for decrease in water bodies and drains, increase in impervious layer, decrease in wetlands/open lands *etc.*, which have impacts on flooding.

Databases: Departmental spatial databases, High Resolution Imagery, e-Procurement database

Tools: ArcGIS

Technical Help, hardware & software provisioning, mentorship: Regional Remote Sensing Centre, ISRO, Bengaluru.

Field visits and joint inspections substantiated the outcomes of this study. The findings of the study are incorporated at relevant places in this Report.

2.5 Acknowledgement

Audit acknowledges the cooperation and assistance extended by the State Government, BBMP, BDA, BWSSB, KSNDMC and Regional Remote Sensing Centre–South, Indian Space Research Organization, Bengaluru in conducting the performance audit.

2.6 Audit constraints

Absence of complete set of records in the office of the CE, SWD of BBMP (commented at various places in the report) hampered audit analysis. Hence, the findings of the joint physical inspections documented in the form of photographs formed the basis for highlighting the impact of insufficient storm water management. The findings have been substantiated with references to various studies conducted by the Indian Institute of Science, Bengaluru, Media Reports and official tweets of the traffic department.

The State Government, in its reply, cited the continuous flow of sewage in the SWDs as the main reason for not taking up many of the activities envisaged such as ground water recharge structures, restoring interconnectivity among water bodies and drains *etc.*, which are vital for effective storm water management. It further stated that BWSSB was in the process of segregation of sewage from SWDs but did not provide the details of works taken up, the action plan drawn and proposed to be drawn to prevent mixing of sewage with storm water and the time frame within which these works would be completed. In the absence of the details of works taken up for segregation of sewage from

SWDs and a definite commitment from the Government in this regard, audit could not verify the claim of the Government.

2.7 Previous audits

Some of the issues covered in this PA were covered in two earlier performance audits;

- a. SWD works under BBMP were reviewed earlier, as part of the Performance Audit on Jawaharlal Nehru National Urban Renewal Mission (JnNURM) covering the period 2005-06 to 2011-12 and the findings were included in the Report of the CAG of India on Local Bodies (Paragraph 4.1 of Report no.6 of the year 2013-Government of Karnataka). The Committee on Local Bodies and Panchayat Raj Institutions, after discussion, placed its report containing recommendations before the State Legislature (March 2016). The UDD is yet to submit the Action Taken Report on the Committee's recommendations. The gist of the audit observations, recommendations thereon and compliance, if any, is given in **Appendix 2.1**.

The State Government endorsed (January 2019) the reply of Commissioner that the officials who worked between 2006-2010, the projects proposed during that period and the duties/responsibilities of each official at that time were being identified. It further replied that based on the findings by verification of records detailed report on dereliction of duty would be submitted and disciplinary action will be initiated accordingly. However, we noticed that neither the identification of the defaulting officials nor disciplinary action were initiated even as of December 2020. The reply shows BBMP's neglect of the recommendations of the Committee on Local Bodies and Panchayat Raj Institutions. Moreover, the inordinate delay in initiating action against officials responsible for financial loss to BBMP would result in officials going unpunished for reasons such as retirement *etc.*

- b. A Performance audit on "Conservation and Ecological restoration of Lakes under the jurisdiction of Lake Development Authority and Urban Local Bodies" (hereinafter referred to as Report on Lakes) was conducted for the period 2009-14 (Report no. 1 of the year 2015 – Government of Karnataka). The report has been partly discussed by the Committee. The findings of both the reports have been referred to at appropriate places in this report.

2.8 Organisation of audit findings

The findings of the PA have been arranged in line with the audit objectives and are discussed in the following chapters.

Chapter 3: *Collection and conservation of storm water*

Chapter 4: *Planning, designing and construction of storm water drains*

Chapter 5: *Protection and maintenance of storm water management systems*

Chapter 6: *Financial management*