

5 Chapter

Protection and maintenance of storm water management systems

5.1 Protection of storm water drains

5.1.1 Flow of sewage in storm water drains

The SWDs are meant to carry only the runoff from the rain water, and thus were to be generally dry during off monsoon period. Section 230 of the Karnataka Municipal Corporation Act, 1976 (KMC Act, 1976) and Section 72 of the Bengaluru Water Supply and Sewerage Board Act, 1964 specifically prohibit laying sewerage lines inside SWDs. The IRC guidelines (Paragraph 8.1) prohibit sewerage drains and its content entering the SWDs.

The study conducted by Audit with RRSC to analyse the time series land use changes and status of drains (as mentioned in Paragraph 2.4) revealed intersection or overlapping areas between drains and sewer lines that were the likely areas/ zones of possible intermixing of rain water and sewage, a few of which were validated by field visits. The sewer line layer obtained from BWSSB was overlaid on drainage maps and the intersection of the two layers was extracted to identify the overlapping areas. Audit observed that there were continuous stretches where the drains and sewer lines intersect/overlap each other. The total length of such stretches was about 16.0 km with about 728 points of intersection in Koramangala valley and about 28.09 km with about 342 points of intersection in Vrishabhavathi valley. Typical example of overlapping of drains and sewer lines is depicted in **Exhibit 5.1**.

Exhibit 5.1: Intersection of SWD and sewer lines

Koramangala valley



Vrishabhavathi valley



Overlap of sewer line (yellow colour) and drain (blue colour)

Audit also observed that sewerage lines were laid inside the SWDs and large quantity of sewage was invariably let into SWDs in complete disregard of the codal provisions. Out of 1,440 MLD of sewage generated in BBMP areas, about 780 MLD (54 per cent) was discharged into SWDs/water bodies without treatment. BWSSB, which is responsible for sewage disposal within the jurisdiction of BBMP area currently operates 27 Sewage Treatment Plants (STPs) with an operational capacity of 1,073 MLD. The utilisation efficiency was only 60 per cent with 644 MLD of total sewage reaching these STPs. Works in respect of 11 STPs with an operational capacity of 520 MLD were in progress as at the end of March 2021. Further, though 110 villages were made part of the BBMP area in 2007, BWSSB was yet to provide sanitation facilities to these villages.

The joint inspection of drains confirmed the existence of sewerage lines within SWDs. Further, audit noticed sewage being discharged into the SWDs directly or through fractured manholes at many places (**Exhibit 5.2**). This can be attributed to the absence of regular inspections by BBMP as indicated in Paragraph 5.2.1. Consequently, none of the SWDs were dry irrespective of the rainfall.

Exhibit 5.2: Photos showing the flow of sewage in SWDs



Direct discharge of sewage into SWD at Pattanagere, RR Nagar Zone



Discharge of sewage into SWD through fractured manhole at Seshadripuram, West Zone


https://youtu.be/_4s2d2Tjw1w

 Sewage Mixing


<https://youtu.be/jcX0jFzwgGw>

 Sewage Mixing



Sewage flowing in SWD at Ejipura, Koramangala Zone



Discharge of sewage into SWD through fractured manhole at Yeshwanthpur, RR Nagar Zone



Discharge of sewage into SWD through BWSSB pipeline at Silk Board Junction, Bommanahalli Zone



Sewage flowing in the SWDs due to chain of fractured manholes in the drain connecting to Herohalli Lake, Dasarahalli Zone

Source: Photographs taken during joint inspections

Thus, the failure of BBMP to identify and avoid mixing of sewage led to the misuse of SWDs as sewers. Since the water in SWDs is not treated in the same manner as sewage, the possibility of untreated sewage going into water bodies affecting the quality of ground water is very high. 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 (CHO) confirmed the outburst of cholera in the city during March 2020 and stated that seven out of the 25 suspected cases had been confirmed as cholera. The CHO, *inter alia*, attributed sewage flowing in open SWDs to the spreading of epidemic in the city.

The State Government stated (August 2020) that BWSSB had laid sewerage lines and manholes inside the SWDs and as such there were leakages at many places leading to mixing of sewage with drain water. This had increased the pressure on SWDs which has to carry water mixed with sewage throughout the year. It further stated that BBMP was in constant dialogue with BWSSB to segregate sewage from SWD and action was being taken by BWSSB for segregation.

The reply reiterates the absence of coordination between various agencies. However, the details of the action taken for segregation was not furnished for verification.

5.1.1.1 Absence of STPs along SWDs

The IRC guidelines (Chapter 8) stipulate that sewerage drains and their content shall strictly be forbidden from entering SWDs. This can be achieved by providing cut-off drains for sewage all along the SWDs and leading to water body/storage tank. The sewage can then be treated through STPs and used for watering plants on medians, *etc.* Any excess can be led to the main SWD.

Though all types of SWDs invariably carried huge quantity of sewerage, BBMP had not installed STPs for treatment of polluted water in SWDs. Severely polluted water was being discharged into lakes and rivers, without due concern for social, environmental and health impacts.

The Detailed Project Report (DPR) of Vrishabhavathi valley had indicated that an amount of ₹6.73 crore was incurred on construction of STPs at 13 locations during the period 2008-09 as against an estimated cost of ₹7.48 crore. The records relating to five out of 13 STPs were provided to audit. Scrutiny revealed that the works entrusted included both civil works and erection and commissioning of STPs and the works were abandoned after civil works without installation of machinery. The exact reasons for abandoning the works or the details of actual expenditure incurred for construction were not forthcoming from the files. However, as per the letters of the contractors who were entrusted with the works, the reasons for abandoning could be traced to the absence of arrangement for supply of sewage to STPs and instructions by BBMP authorities not to execute the machinery part. This defeated the objective of treating sewage flowing in SWDs before letting into water bodies. Further, in the absence of data on the exact location of these STPs, audit could not locate/identify such installations during the joint inspections.

The State Government replied (August 2020) that BWSSB was responsible for construction and operation of STPs in Bengaluru and sewage flow in SWD was due to illegal connection of sewer in SWD which was not a planned activity. It further stated that an attempt was made by BBMP for construction of STPs along drains under JnNURM scheme as a pilot project in Vrishabhavathi valley wherein the STP sizes were in the range of 250 KLD to 1 MLD whereas the sewage flow in the drain was more than 100-200 MLD. Hence, none of the STPs were commissioned, SWD lines were not connected to any STPs and SWD division was not maintaining the STPs.

The reply was silent on the wasteful expenditure of ₹6.73 crore incurred under JnNURM scheme towards construction of these incomplete STPs. Specific reasons for non-completion and installation of STPs were not furnished. Moreover, as per the revised DPR of Vrishabhavathi valley referred to in Paragraph 4.1.5.1, the work of construction of STPs were executed by BBMP without obtaining the approval of the Ministry. In the absence of the records pertaining to all the works and the fact that the 90 *per cent* of estimated cost of

expenditure incurred was on execution of civil works, the State Government needs to investigate to ascertain whether the construction of STPs were necessary and actually executed.

5.1.1.2 No quality control measures such as quality monitoring for SWD flow leading to pollution of water bodies

The IRC guidelines (Paragraph 12.9) stipulate that the drainage system should be inspected at least twice a year, out of which at least one should be immediately after heavy rains and the quality and quantity of outflow should be observed and recorded. Monitoring the quality of water flowing into the SWD channels was to be ensured, with stricter norms for solid waste disposal, industrial effluent control and any illegal discharge of waste into the drainage network, in view of the impact on the health of the ecosystem and human consumption. All possible efforts need to be made for continuous and constant removal of pollutants and effluents in the drainage system.

Despite being aware that the drains were connected to water bodies and the runoff gets ultimately discharged into rivers which would be used for human consumption downstream, BBMP had not taken any action to either involve the Pollution Control Board in getting the water samples tested at different stretches, to maintain the quality of water or arrange for any study on the ecological impact of the SWDs on environment. In the absence of required quality control methodology for SWDs, the lakes of Bengaluru are extremely polluted due to sustained flow of untreated sewage and industrial effluents, resulting in lakes frothing/catching fire repeatedly through solid/liquid waste floating on its surface, or flammable methane generated from its oxygen-starved waters (**Exhibit 5.3**).

Exhibit 5.3: Photos showing lakes in Bengaluru affected by pollutants



Fuming Bellandur Lake



Frothing Yamaluru Lake



Dead fish in Ulsoor Lake

Source: Media reports



DRDO Lake, CV Raman Nagar

The audit contention is substantiated by the findings of the ‘Report on Inventorisation of Water Bodies in Bengaluru Metropolitan Area’ prepared by the Environmental Management and Policy Research Institute and submitted (September 2017) to Karnataka Lake Conservation and Development Authority. As per the report, the water quality rating study showed that 98 *per cent* of the lakes were unsatisfactory and only 2 *per cent* were satisfactory during monsoon season. The study further indicates that majority of the lakes in Bengaluru Metropolitan area were in under-deteriorated condition and unfit for direct human consumption as the sewage inflow, various pollution loads from different sources and changing land use patterns were imposing detrimental effects on the quantity and quality of water of all the lakes. BBMP in response to an audit query also accepted that as many as 89 lakes were directly connected to SWDs.

Further, the NGT had warned (December 2019) that it would penalise officials for their failure to meet the deadline to build STPs to stop polluted water from entering the city lakes and had set September 2020 as the deadline to create the STPs and lay sewerage networks to stop unchecked discharge of sewage water into the Bellandur, Agara and Varthur lakes.

As per the information furnished (March 2020) by CE, Lakes Division, BBMP, the STPs were installed to prevent flow of polluted water only for eight lakes and the work was in progress for another nine lakes. Considering the laxity in installation of STPs, despite instructions/intervention of Courts/NGT, the possibility of BBMP meeting the given deadlines for arresting assimilation of sewage with water bodies and preserving healthy ecology appears bleak. Audit observed that BWSSB has submitted (June 2020) an affidavit to NGT, seeking extension of time due to restrictions during lockdown period.

The State Government informed (August 2020) that action would be taken to verify the pollution levels in the SWDs with the help of State Pollution Control Board. The details of action taken were, however, not provided. The reply also reflects the apathy on the part of State Government and BBMP towards monitoring of the state of lakes and SWDs.

Recommendation 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.

5.1.2 Absence of buffer zone and boundary marking for SWDs

Buffer zones are areas of land adjacent to a drain or waterbody which are meant for providing utilities such as power, pipelines for water/oil/gas etc., and also to facilitate easy maintenance of drains.

The RMP 2015 stipulated a buffer zone (no-development area) of 50m, 25m and 15m (measured from the centre of the drain) on either side of primary, secondary and tertiary drains. This buffer area was modified (May 2016) by the NGT to 50m, 35m and 25m (measured from the edge of the drain). Further, under Section 58 of the KMC Act, 1976, BBMP had the obligatory function of putting in place substantial boundary marks of such description and in such positions as shall be approved by the Government, defining the limits or any alteration.

Audit observed during the joint inspection of drains that none of the test-checked drains had 'boundary markings' on either sides clearly specifying the 'no-development area' and the stipulation regarding buffer zone was not adhered to in respect of any of the drains. This not only contravened the stipulations regarding the buffer zone/no-development area but also paved the way for construction adjacent to the drains without any off-set space and encroachment of drains.

On audit pointing out the lapse, the State Government stated (August 2020) that action had been taken to form (October 2018) a team under the Chairmanship of the Joint Director of Land Records to mark the boundary of SWDs in a phased manner wherever the land is available along the SWDs and that the work of survey and marking the SWD boundary is in progress.

5.1.3 Survey of encroachments and their removal thereon

Section 234 of the Karnataka Municipal Corporation Act, 1976 (KMC Act, 1976) clearly prohibits construction/erection of any building, wall, fence or other structure on SWDs and empowers the Commissioner, BBMP to remove such structures and recover the cost from the offenders. Paragraph 4.23.1 of NDM guidelines clearly states that the drains should be delineated and boundaries fixed. Further, the Karnataka High Court directed (2011) BBMP to conduct a detailed survey of encroachments on SWDs and to clear all encroachments.

BBMP initially provided a list of 1,988 encroachments identified under its jurisdiction but did not furnish the source/period of information. Hence, audit could not ascertain whether any survey was actually conducted to identify the encroachments.



<https://youtu.be/zF-XoPIjEg>



Encroachments on drains

During the joint inspection of about 70 drains²⁵, Audit observed 23 cases of significant encroachments (**Exhibit 5.4**) as listed in **Appendix 5.1**. Out of these, 16 cases were not in the list provided by BBMP. Thus, the completeness and reliability of the data on encroachments available with CE, SWD was doubtful.

Exhibit 5.4: Photographs showing the encroachments on SWDs



*Himagiri Meadows Apartments,
Bommanahalli Zone*



*Naurang Function Hall,
Tavarekere, Koramangala Zone*



*Private Property at Koramangala
5th Block*



*Private property on JC Road,
Koramangala Zone*



*Private property, Lalbagh Road,
Koramangala Zone*



*Ansal Forte Apartment, Near
Silk Board, Bommanahalli Zone*



*Commercial building at
Koramangala 7th block*



*Private property at BSK 1st Stage,
Srinivasanagar, South Zone*



*Padmavathi Kalyana Mantapa,
Rajarajeshwarinagar Zone*

²⁵ Including few unmapped drains



Spartacus Apartments, 4th T Block,
Jayanagar, Koramangala Zone



Ranka Nest Apartments, West
Zone



Surana College,
Rajarajeshwarinagar Zone

(Arrow marks in red colour shows the width and direction of flow of SWD)

Source: Photographs taken during joint inspections



https://youtu.be/tt_kMnaHFgY



Encroachments on
drains

Audit observed that out of 1,988 encroachments identified by BBMP, 1,225 encroachments were stated to have been removed leaving a balance of 763 encroachments as of October 2018. As per the latest information furnished (December 2020) by CE, SWD, BBMP had identified a total of 2,626 encroachments in various zones, of which 428 were stated to have been removed during the year 2016-17 and 1,484 were removed from 2018-19 onwards. The balance 714 encroachments were yet to be removed. While 52 cases of non-removal were attributed to pending court cases, the reasons for not removing the balance encroachments were not furnished to audit.

The veracity of the claim of having removed the encroachments was doubtful as audit observed during joint inspection that one of the encroachment stated to have been removed continued to exist as illustrated below.

Illustration

RN193 (Primary SWD) under Rajarajeshwari Nagar zone was encroached upon by way of constructing Padmavathi and Meenakshi Kalyana Mantapas. As per the information furnished to audit by BBMP, the said encroachment was removed on 18.08.2016. However, a joint physical inspection (11 June 2018) showed that the kalyana mantapas were existing on either side of the drain and were connected with a concrete platform linking the two buildings (Exhibit 5.5). The impact of the continued encroachment could be seen by way of rainwater entering (20 October 2020) into the dining area of the kalyana mantapa (Exhibit 5.6).

Exhibit 5.5: Existence of kalyana mantapas and concrete platform on drain



Exhibit 5.6: Flooding of dining area of *kalyana mantapa*



Source: Media reports and photographs taken during joint inspection

Apart from the above, audit also observed that the evictions so carried out were incomplete as only certain portions of the encroached buildings were razed and no further action was taken for improving the conditions of the drains (**Exhibit 5.7**). Hence, the claim of BBMP that 1,912 encroachments were removed cannot be accepted at face value.

Exhibit 5.7: Status of evictions stated to have been carried out by BBMP under RR Nagar zone



Source: Photographs taken during joint inspections

The State Government replied (August 2020) that action was being taken to clear encroachments in a phased manner after obtaining the survey maps and encroachment markings from the Revenue Department. It further stated that action would be taken to clear the encroachments noticed by the joint inspection team, following the due procedure.

Recommendation 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.

5.2 Factors affecting/impeding connectivity/smooth flow of storm water in drains: Issues concerning maintenance of the SWD infrastructure

The drainage system is at its best, when it is maintained properly as designed. For this purpose, it is necessary that the drains keep their shape and slope in the designed manner during their life time. It is also necessary to ensure that the drains retain their full cross section, particularly for the monsoons. The system of maintenance can be classified into three categories.

- a) Periodical inspection and maintenance;
- b) Continuous regular maintenance; and
- c) Special maintenance/Repairs for improvement.

5.2.1 Periodical inspection of drains

Failure of drains would occur due to deficiency in maintenance. The IRC guidelines (paragraph 12.3) stipulates periodical inspection and maintenance of drains with principal activities²⁶, particularly at the entry and exit points during the rains. The IRC further stipulates that all cross drainage structures need to be inspected to observe any blockage due to debris, logs and other such materials, problem locations identified and records kept updated.

The details of periodical inspection of drains by field engineers carried out if any, were not made available to audit for scrutiny. During the joint inspections, audit observed severe blockages of surface drains as well as SWDs (**Exhibit 5.8**) indicating either that inspection was not carried out by the field engineers or that no action was taken on the report of the field engineers.

Exhibit 5.8: Photographs showing the blockage of drains



Near Hulimavu lake, Bommanahalli Zone



Pattanagere, Rajarajeshwarinagar Zone


<https://youtu.be/zTsaSmJYZ-o>

Absence of regular inspection

²⁶ Desilting, clearing of weeds, cleaning of obstruction/debris/blockage, repairing of lining immediately at the commencement of damage or deterioration, etc.



Kodipalya, Rajarajeshwarinagar Zone



Jayanagar 7th Block, South Zone



Koramangala 6th Block, Koramangala Zone

Source: Photographs taken during joint inspections



Padmanabhanagar, South Zone

The State Government replied (August 2020) that though there was not record, the drains were generally inspected by field engineers for proposing maintenance work. The reply cannot be accepted as documentation is a very vital evidence for having undertaken the field visits and also for preparing the action plans for regular maintenance of drains. The fact that regular maintenance was absent as discussed below indicates that inspection of drains was not actually carried out.

5.2.2 Absence of regular maintenance of drains

The BBMP did not take up maintenance of drains regularly and continuously leading to blockage and growth of vegetation in the drains, consequently resulting in drains overflowing during rains, particularly where the utility lines were laid. Absence of regular inspection and maintenance also facilitated damage to fencing/ walls of drains allowing inordinate dumping of debris. The lack of maintenance can be linked to the absence of periodical physical inspection of SWDs and documentation of the findings of the inspections by field engineers. This was compounded by the fact that BBMP failed to prepare action plans for regular maintenance activity and also the maintenance manual indicating the roles and responsibilities of the concerned.

Audit observed during joint inspections of drains that SWDs were filled with debris, vegetation and were heavily silted indicating absence of regular maintenance of drains (**Exhibit 5.9**).

Exhibit 5.9: Photos showing the status of drains due to inadequate maintenance



Vegetation inside SWD at Magadi Road Railway Bridge, West Zone



Dumped debris/wastes and garbage inside SWD at Ejipura, Koramangala Zone



Vegetation inside SWD Akshaya Nagar, Bommanahalli Zone



Dumped wastes and garbage inside SWD near Football Stadium, Koramangala Zone



Vegetation inside SWD at Vyalikaval, West Zone



Vegetation inside SWD at Peenya, Rajarajeshwarinagar Zone

Source: Photographs taken during joint inspections

The State Government stated (August 2020) that maintenance of drains has now been entrusted on annual maintenance contract after inviting tenders and obtaining the approval of the competent authority and the work was in progress since 2019-20.

The reply reiterates the fact that regular and continuous maintenance of drains was absent prior to 2019-20. However, audit observed that only 377 km of drain length (45 per cent) out of the total 842 km was entrusted for annual maintenance. Zone-wise analysis further revealed the following:

- The complete length of drains of 73.6 km was entrusted only under East zone
- The entrustment was 97 per cent, 71 per cent and 62 per cent in South zone, Koramangala zone and West zone respectively (Core Bengaluru area).
- In the other five zones, it was less than 50 per cent and ranged from 9 per cent to 49 per cent (Bengaluru agglomeration area).

The partial entrustment for annual maintenance, thus, would not yield the desired results unless the complete length of existing drains are taken up for maintenance on a regular basis.

Recommendation 18: BBMP should put in place adequate mechanism to conduct and document periodical inspection and maintenance of all categories of drains.

5.2.3 Entrustment of desilting works during monsoon period

The IRC guidelines (paragraph 12.6) stipulated desilting of all the drains before the onset of monsoon. Generally, the calendar months from June to September were regarded as ‘monsoon period’. Paragraph 4.12.4.3 of NDM guidelines stipulate that pre-monsoon desilting of all major drains shall be completed by 31 March each year. It further stated that the periodicity of cleaning drains should be worked out based on the local conditions for which a roster should be worked out and strictly followed.

Audit observed from the records made available, that BBMP had taken up 175 desilting works at a total cost of ₹117.29 crore during 2013-17 for selective chainage and not for the entire stretch of the drains. Only the records pertaining to 14 works costing ₹17.56 crore were furnished to audit for verification.

Scrutiny of records disclosed that works were entrusted to contractors between July to November allowing a time period varying from 1 month to 24 months (including monsoon period) for completion. Evidently, the works would be carried out during the monsoon period only. This clearly violated the provisions of the IRC/NDM guidelines that the works were to be completed before the onset of the monsoon. Moreover, desilting for select lengths and not the complete length of drains defeats the very purpose of desilting of drains, as silt from the stretch left unattended upstream would flow downstream filling up the stretch that has already been desilted. Since the works were completed before the commencement of audit and in the absence of majority of the work files,

audit could not identify the break in stretches, if any and also ascertain the occurrence of such instances necessitating taking up the same works again.

Audit also observed that BBMP had not prepared any action plan for desilting of drains before onset of monsoon nor was a roster of cleaning works prepared and followed.

The State Government stated (August 2020) that Bengaluru, in the recent past, was receiving spells of rains during off-monsoon periods also forcing the execution of works to prolong to rainy season. It further stated that action would be taken to avoid such omissions in future and to entrust and get the work completed before onset of monsoon.

5.3 Monitoring and awareness

5.3.1 Absence of penal provisions for violations

Paragraph 13.1 of IRC guidelines stipulate that ‘since large quantum of public funds are spent on SWD implementation, time has come for enforcement of certain disposable systems wherein the offending party shall be penalised and booked under various punitive clauses of respective urban local bodies’. It further provided for deployment of patrolling vehicles and imposing criminal proceedings in the light of serious choking of SWDs by reckless disposal of debris.

The BBMP had neither enacted any penal clauses for violations/dumping of debris nor had initiated action for patrolling along SWDs. The absence of penal provision for booking the defaulters would lead to undeterred dumping of debris, construction and demolition waste, garbage including plastic into SWDs.

The State Government stated (January 2019/August 2020) that action was being taken in this regard. However, the details of action initiated in this regard were not furnished to audit (November 2019/December 2020).

5.3.2 Absence of information, education and communication activities

Behavioural change is vital for effective management of drainage infrastructure, particularly in urban domains. Information, education and communication (IEC) is a multilevel tool for promoting and sustaining risk-reducing behaviour change in individuals and communities. The IEC campaign should target households, shops, and commercial and institutional premises as well as other stakeholders such as government service providing agencies, municipal officials, elected representatives, non-government organisations (NGOs), the informal sector, media, etc., to ensure their participation in nicely managing the urban storm water drainage and solid waste management systems in the city.

Various manuals and rules pertaining to solid waste management underscored the importance of IEC activities and required the State Government and ULBs to create public awareness and educate stakeholders in proper disposal of solid wastes adopting measures like re-use, reduction and recycling of wastes.

Audit observed that poor awareness and civic sense, coupled with insufficient solid waste management led to a situation where the urban population dump

debris/wastes and construction and demolition wastes into SWDs. As against 4,200 and 4,500 tonnes per day (TPD) of waste generated excluding bulk generation during 2018-19 and 2019-20, BBMP had lifted 2940 and 3800 TPD, the collection efficiency being 70 and 84 *per cent* respectively. BBMP did not have secondary storage or transit facilities because of which the primary waste collected was transported directly to compactors at transfer points located at intersection of roads. This arrangement resulted in either throwing of unwanted/non-recyclable wastes into nearby vacant plots/drains or open burning of such wastes by BBMP workers themselves. This also facilitated dumping of wastes by public at such spots.

Despite widespread disposal of all sorts of wastes into SWDs by households and industries/commercial establishments, the BBMP had not taken up any IEC activities or awareness camps for educating the population regarding importance of SWDs and their proper upkeep. Audit observed during JPVs that people resorted to damaging/breaking the chain link fencing erected along the SWDs for dumping wastes (**Exhibit 5.10**). Absence of penal provision against offenders facilitate uncontrolled and continuous dumping of debris/wastes in SWDs.

Exhibit 5.10: Photos showing dumping of debris/wastes in/adjacent to SWDs and breakage of chain link fence of SWDs



Austin Town, Koramangala Zone



Ejipura, Koramangala Zone



Manjunathanagar, South Zone



Rajarajeshwarinagar Zone



Akshayanagar, Bommanahalli Zone

Source: Photographs taken during joint inspections



Cholarapalya, South Zone

Besides, the SWDs which carry high level of sewerage with chemical contaminants get stagnant/blocked with siltation/vegetation and turn into breeding areas for mosquitoes and other hazardous phylum/protozoa. It is, therefore, imperative for the BBMP to conduct health awareness campaigns in the localities along the SWDs that are more prone to hazards. The BBMP had neither obtained information on epidemic outbreaks nor arranged for health camps in any part of the city.

The State Government stated (January 2019/August 2020) that action would be taken to conduct IEC programmes and awareness campaigns to educate citizens regarding up keeping of SWDs. Audit, however, observed that no action had been initiated in this regard even as of December 2020.

5.3.3 Absence of grievance redressal mechanism

Grievance redressal is a mechanism through which the BBMP could connect to people in resolving the issues related to encroachments, dumping of debris/wastes, blockages, silting, functioning of officials *etc.*

Audit observed that grievance redressal mechanism was absent in the office of CE, SWD as the Complaint Register to record the grievances had not been maintained. Specific records were not maintained even in respect of applications received for obtaining information through Right to Information Act.

Absence of grievance redressal mechanism with particular reference to SWDs would result in complaints regarding encroachments and dumping of debris being ignored thereby allowing defaulters to go unpunished.

The State Government stated (January 2019/August 2020) that there is a call centre operating in BBMP for receiving complaints. It further stated that action would be taken to obtain and furnish the details of complaints received and attended to and maintain complaint register to record all types of complaints. However, the same were not furnished to audit (November 2019/December 2020).

Recommendation 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.

Conclusion

Failure of BBMP to coordinate with BWSSB in preventing mixing of sewage in SWDs despite both their Acts specifying separation of sewage and storm water flows led to contamination of fresh water lakes. This, in turn, led to temporary measures disrupting inter-connectivity between water bodies and drains. Though RMP 2015 stipulated a buffer zone on either side of primary, secondary and tertiary drains and section 58 of the KMC Act, 1976 stipulated putting in place boundary marks for such descriptions, none of the test-checked drains had boundary markings. As a result, it paved the way for encroachment of drains as well as construction in buffer zone. Despite identifying 2,626 encroachments on SWDs, BBMP was yet to take action on 714 encroachments. The completeness and reliability of the data on encroachments available with BBMP was also doubtful as audit noticed significant instances of encroachments during joint inspection of drains. The action stated to have taken to clear the encroachments was not complete.

Severe blockages of surface drains/SWDs were noticed indicating absence of periodical inspections as well as its regular maintenance. Failure to adopt quality monitoring measures and non-installation of STPs, despite Court directives resulted in unabated contamination of water bodies. Non-enactment of penal clauses for violation/dumping of debris in SWDs and absence of a grievance redressal mechanism allowed defaulters (encroachment and dumping of debris) to go unpunished. In addition, BBMP did not take up any IEC activities/ awareness camps for educating people regarding the importance of SWDs and their proper upkeep. Thus, the failure of BBMP to protect and maintain the drain infrastructure resulted in continuous abuse of the drains.

Summary of important audit findings

Para number	Audit findings
5.1.1	Sewerage lines were laid inside the SWDs and large quantity of sewage was invariably let into SWDs though the codal provisions prohibit mixing of sewage with storm water. Out of 1,440 MLD of sewage generated in BBMP area, about 780 MLD (54 per cent) was discharged into SWDs/water bodies without treatment.

Para number	Audit findings
	<p>BBMP had incurred ₹6.73 crore on construction of STPs at 13 locations during the period 2008-09. Scrutiny of records relating to five STPs showed that the works entrusted included both civil works and erection and commissioning of STPs and the works were abandoned after civil works without installation of machinery. This defeated the objective of treating sewage flowing in SWDs before letting into water bodies.</p> <p>BBMP had not taken any action to get the water samples tested despite being aware that the drains were connected to water bodies and the runoff gets ultimately discharged into rivers which would be used for human consumption downstream.</p>
5.1.2	<p>Though RMP and NGT stipulated maintenance of buffer zone on either side of the drains, joint inspection of drains showed that none of the test-checked drains had 'boundary markings' on either sides specifying the 'no-development area' resulting in constructions adjacent to the drains without any off-set space and encroachment of drains.</p>
5.1.3	<p>BBMP was yet to remove 714 encroachments out of the identified 2,626 encroachments in various zones. Audit observed 23 cases of significant encroachments, out of which 16 cases were not in the list provided by BBMP. Thus, the completeness and reliability of the data on encroachments available with CE, SWD was doubtful.</p> <p>The veracity of BBMP's claim of having removed the encroachments was doubtful as audit observed during joint inspection that one of the encroachments stated to have been removed continued to exist and the evictions carried out were also incomplete.</p>
5.2.1	<p>The details of periodical inspection of drains by field engineers carried out were not made available to audit. During the joint inspections, audit observed severe blockages of surface drains as well as SWDs indicating either that inspection was not carried out by the field engineers or that no action was taken on the report of the field engineers.</p>
5.2.2	<p>The joint inspections of drains showed that SWDs were filled with debris, vegetation and were heavily silted indicating absence of regular maintenance of drains.</p>
5.2.3	<p>Scrutiny of records of 14 works costing ₹17.56 crore showed that BBMP had taken up the desilting works during monsoon period in violation of the IRC/NDM guidelines which stipulated desilting before the onset of monsoon.</p>
5.3.1/ 5.3.2	<p>As against 4,200 and 4,500 TPD of waste generated excluding bulk generation during 2018-19 and 2019-20, BBMP had lifted 2940 and 3800 TPD respectively. BBMP did not have secondary storage or transit facilities because of which the primary waste collected was transported directly to compactors at transfer points located at intersection of roads. This arrangement resulted in either throwing of unwanted/non-recyclable wastes into nearby vacant plots/drains or open burning of such wastes by BBMP workers themselves.</p> <p>BBMP had not taken up any IEC activities or awareness camps for educating the population regarding importance of SWDs and their proper upkeep. Joint inspection showed that people resorted to damaging/breaking the chain link fencing erected along the SWDs for dumping wastes. Further, BBMP neither enacted any penal clauses for violations/dumping of debris nor had initiated action for patrolling along SWDs.</p>