38th WEDC International Conference, Loughborough University, UK, 2015

WATER, SANITATION AND HYGIENE SERVICES BEYOND 2015:
IMPROVING ACCESS AND SUSTAINABILITY

Performance evaluation of sewerage systems; a case of Himachal Pradesh (northern hill state in India)

A. Gill Dharmendra & B. Nema Arvind (India)

BRIEFING PAPER 2149

Effective and efficient sewerage systems are very important for a densely populated country like India. The sewerage systems in India are solely constructed and managed by the Government and Semi Government agencies. In the lack of competition and comparison, the performance of these systems needs to be evaluated independently and regularly. To evaluate the sewerage systems in India, sewerage systems of urban areas of Himachal Pradesh were evaluated. The data for all the towns was analysed. The analysis revealed that actual performance of sewerage systems in the state is less than the design and the expectations of consumers. The policy-makers need to adjust policies and improve the instruments for implementing them.

Introduction

The effective and efficient collection, transportation, treatment and disposal of municipal wastewater is important for densely populated urban areas of India. A large number of river stretches are severely polluted as a result of discharge of domestic sewage. It is primary responsibility of state governments to establish sewerage systems. Government of India took initiative and financed many sewerage systems in towns/cities along bank of rivers. The Government of India is vigorously pursuing Total Sanitation Campaign and Swachha Bharat (Clean India) programmes. These programmes are providing large amount of funds to the states to develop a clean and pollution free country.

Recognizing the importance of the wastewater management, the emphasis should be on improving performance through reforming the management institutions, policies and planning systems. There still remains a large gap in sewage generation and sewage collection & treatment capacity. The sewerage systems are planned, executed, operated and maintained by government or semi-government agencies, hence has limited scope for competition or comparison. Utilities, those are not subjected to competition may compromise its service quality. The increasing all-round emphasis on transparency, accountability, and efficiency in the provision of this monopolistic service sector necessitates assessment systems that are consistent, comparable, and transparent.

Objective and scope

The objective of this study was to find out planning system, achievements, technologies used, and financial implications. To understand the status of sewerage systems in India, the sewerage systems in Himachal Pradesh were studied. Himachal Pradesh is north Indian state located in Himalayan region. The sewerage systems are planned, constructed, operated and maintained by the State Irrigation and Public Health Department (IPH Deptt.) for the State Urban Development Department (UD Deptt.).

Data collection

Availability of adequate and reliable data is major hurdle in the performance assessment of sewerage systems. The data inadequacies could arise from lack of appropriate infrastructure and systems to measure and record data, the absence of requisite procedures for ongoing data monitoring and analysis, and lack of incentives for the utility staff to collect data and maintain a database.

Most of data available with the departments is about the cost estimates and expenditures rather than coverage of households, sewage collection and STP efficiencies. So the data has been collected by personally visiting the Divisional offices of the Himachal Pradesh Irrigation and Public Health Department and through applications under Right to Information Act, 2005.

Himachal Pradesh has 59 towns having 688 552 urban population and 170770 households. The administrative status of these towns is as 1 Municipal Corporation, 25 Municipal Councils, 23 Nagar Panchayats, 7 Cantonment boards and 3 Census towns. The public utilities in the 7 Cantonment Boards are managed by the Cantonment Boards.

The state UD Deptt. has mandate to provide sewerage systems in 1 Municipal Corporation, 25 Municipal Councils, 23 Nagar Panchayats. The UD Deptt. is executing this responsibility by providing funds to the state IPH Deptt. The sewerage system in one Municipal Council is attended by the UD Deptt. itself.

This study included 1 Municipal Corporation, 24 Municipal Councils and 23 Nagar Panchayats. One Municipal Council i.e., Parwanoo could not be included due non-supply of data by the managers, i.e.,UD Deptt.

Key observations on data

The analysis of data revealed:

- Execution of sewerage systems in the state started in 1992. So far 24 schemes have been commissioned and 25 schemes are in different stages of progress. As per census 2011 the state has 170770 urban households yet all the sewerage systems (commissioned, ongoing and in planning) have been planned to connect only 108604 households.
- The earliest schemes were commissioned in the year 2005.
- Rs 3699 million have been spent on all the schemes and as per present day estimates it needs Rs 3832 million more to complete all the ongoing schemes. The commissioned schemes need Rs 2832 million to fully complete them.
- The commissioned schemes have capacity to connect 67842 households. Although 25750 households have got the connections sanctioned yet only 21870 households have been connected.
- Sewage treatment Plants (STP) of all these schemes on completion will have treatment capacity to treat 110.611million liters sewage per day (MLD). This treatment capacity is far more than the total estimated sewage generation by the urban population. Based on the census 2011, the estimated sewage generation worksout about 70 MLD. 98% STP's are based on Activated Sludge Process with extended aeration. Rest of the treatment is in Septic Tanks, Rotating Bed Contactors and USABR.
- 99% sewerage network is laid with Cast Iron and Ductile Iron pipes. In a very small length Asbestos Cement pipes are used.
- The tariff of sewage management is linked with drinking water tariff. Sewage charges are 50% of the drinking water charges and are collected along with the water charges.
- The sewerage network is extended at the state's cost up to six meters from the premises / boundary of the household.

Discussion

The construction of sewerage systems was started in 1992, whereas the first systems were commissioned in the year 2005. There is large time overrun in the commissioning of the systems, the full completion may still take some more time. The time taken to commission the schemes ranges between 3 to 16 years. The average time taken for commissioning the system is ten and half years. The completion time considered in the cost estimation at the time of sanctions is 5years maximum. This time overrun is affecting the completion costs. The cost overrun at the state level is more than 100%. The cost overrun is increasing the time overrun, creating a vicious cycle.

The household connections proposed in planned (unsanctioned) and ongoing (sanctioned) schemes are quite less than the total number of urban households in the state. This reveals the deficiency in planning of sewerage systems. The survey of networks is done with conventional plain table techniques, which requires lot of manpower and time. So to save these two resources the complete details are not captured in the plans that are resulting in inadequate planning and insufficient cost estimates. This is also one of the major reasons that many sanctioned connections could not connect to the sewer network. The sewer networks need to be planned using GIS techniques so that connection for every household could be planned as per the geography of consumer's surroundings and availability of land.

Many households could not connect to the sewer network just because the neighbours do not allow the use of their land for laying sewer pipes. The absence of building byelawsor lack of their enforcement is responsible for this lapse.

The 99% sewer network has been planned using CI or DI pipes which is the costliest option available. Instead of single pipe material type, a combination of different types of pipe materials depending on the geographical plan and profile of the area could be considered to economize the completion costs.

The sewage treatment is based mainly on activated sludge process with extended aeration. This technology requires larger pieces of land than other techniques. The other technologies used are UASBR, RBC and Septic tanks. The UASBR and RBC have been used in two STP's, one each. The construction of about 15% STP's is held up due to the objection from public. In many cases the people have moved the courts of law against the installation of STP. The people are in favour of closed technologies where the view of surface aerators is not there and the emission of foul smell is avoided. The other low maintenance cost technologies have so far not been experimented in any of the sites.

Conclusions

The wastewater management sector here is still in the phase of providing universal coverage and struggling to ensure that complete sewage is collected, conveyed, treated and disposed effectively. The concern for improving efficiency and effectiveness of wastewater management operations is yet to gain priority over issues related to coverage and planning new infrastructures.

The actual performance of sewerage systems in the state is less than the design and the expectations of consumers. The policy-makers need to adjust policies and improve the instruments for implementing them. The planning and cost estimates for sewerage systems need to be improved. Use of GIS techniques may be useful in planning the sewer networks. The assessment of completion time should be linked to the flow of funds. This may help in eliminating the time and cost overruns.

There is need for legislative regulations for making sewer connection mandatory for every household, instead of applying for connections voluntarily. The building byelaws should be strongly enforced. Building offsets should be allowed for laying of public utilities.

All the abovediscussed developments call for using the approach of performance measurement of sewerage systems to examine their existing strengths and weaknesses and to improve their performance in the areas where they are weak in managing the wastewater.

Sewerage system providers in the country are not subjected to market competition. Thus, it is important that sewerage system status is independently monitored to ensure that the performance of these utilities is efficient and effective. Benchmarking can be a useful tool for identifying best practices and finding scope for improvements.

Non-availability of sufficient and reliable database for use in benchmarking techniques is one plausible reason for scarcity of performance evaluation studies in India and other developing countries.

Note/s

The Principal author is working in the Executive Engineer in the Himachal Pradesh Irrigation Public Health Department since Dec. 2001, prior to this worked as Assistant Engineer since Oct. 1989 in the same Department. He has completed MTech (Environmental Engg. & Mgmt.) from Indian Institute of Technology Delhi and presently pursuing PhD degree in the same Institute.

Contact details

Dharmendra Gill
Executive Engineer,
Himachal Pradesh Irrigation and
Public Health Division
Sundernagar District Mandi (HP)
India 175018
Tel:91 94183 01809
Fax: 91 1907 265153
Email: dharmendra.gill@gmail.com

Dr Arvind K Nema
Professor, Department of Civil Engineering
Indian Institute of Technology Delhi
New Delhi, India - 110 016
Tel: 91-11-26596423
Fax: 91-11-26581117
Email: aknema@gmail.com