CHAPTER 9: MANAGEMENT INFORMATION SYSTEM

9.1 INTRODUCTION

The efficient and effective performance of an agency depends on a clear relationship between management activities such as planning, organisation, selection and training of staff coordination, direction and control of the functions of the agency.

The interaction between the individuals at different management levels, together with use of information in the decision making process, is important to the agency's performance. Each of the management levels has different centres of decision and each of these is supported by an information system.

Management Information System (MIS) is defined as a formal system of making available to the management, accurate, timely, sufficient, and relevant information to facilitate the decision making process and to enable the organisation to carry out the specific functions effectively and efficiently in tune with the organisations objectives.

Organisations have many information systems serving at different levels and functions within them.

The data fed into the MIS initially is internal data and later data from other institutions such as from community and others can also be fed. Each agency has to decide as to which information is relevant and then evolve its own procedures for accurate collection, measurement, recording, storage and retrieval of data. The MIS can be developed either by manual data collection or by use of software.

9.2 NEED FOR MIS

The Central and State governments are massive organisations with many departments and a very large number of people under their employment. These organisations need to function efficiently through proper communications and should have quick access to accurate information at all times so that decisions can be made quickly and appropriately. The MIS is indispensable for accomplishing these tasks.

The ULBs require a comprehensive information system for planning, management and de-centralised governance in the context of implementation of the 74th Constitution Amendment Act. The MIS will support spatial requirements of urban planning and help the ULBs to develop town level urban database. The spatial and attribute database will be useful for preparation of Master / Development plans, detailed town planning schemes, and will also serve as decision support for e-governance.

9.3 MIS IN SEWERAGE SYSTEM

In order to make an effective MIS for sewerage, it is necessary to identify the potential sources of data in every functional area and create reports needed by all users irrespective of their proficiency in data processing. The following are the main/sub systems of a sewerage organisation from which the reports for MIS can be generated.

9.3.1 Financial Management Information System

The system may include information related to Financial Accounting such as:

a. Payroll
b. Revenue management
c. General ledger
d. Accounting
e. Funds

9.3.2 Project Management Information System

This system may include information relevant to Engineering Planning and Design such as:

a. Construction
b. Contracts and monitoring

9.3.3 Human Resources Management Information System

a. Manpower planning and recruitment
b. Personnel development and training

9.3.4 Material Management Information System

a. Purchasing
b. Inventory control

9.3.5 Operation and Maintenance Management Information System

a. Operation
b. Maintenance

9.3.6 Marketing Management Information System

a. Customer information
b. Demand forecasting
c. Market planning

9.3.7 Renewal and Repair Alerts System

a. Sewers
b. Pumping stations
c. Sewage treatment plants

9.3.8 Violations of Discharge Quality of Sewage onto Public Water Bodies and Land

The system should include the parameters listed below. It should be updated weekly and be freely accessible to the public.

a. STP quality
b. Treated sewage discharge standards

9.3.9 Financial Health Status of the Local Body

This system should include the following parameters and need to be updated on weekly basis.

a. Revenue
b. Expenditure

9.4 MANAGEMENT INDICATORS

Data captured through the MIS should provide management indicators for decision-making. The results of actions by managers at the strategic, tactical and operational level are measured by management/performance indicators. These indicators represent a situation, an event or a change brought about by an action aimed at achieving a target set by the agency.

These indicators allow the management to set targets, monitor the O&M, evaluate the performance of the agency and take necessary decisions and corrective actions.

9.4.1 Performance Indicators

Performance indicators (PIs) can be considered as a management tool to evaluate the degree of an undertaking's efficiency and effectiveness. Efficiency is the extent to which the resources of an undertaking are utilized to provide the services, for instance, maximizing service delivery by the minimum use of available resources.

Effectiveness is the extent to which declared or imposed objectives, such as levels of services, are achieved. PIs can also be used for quantitative comparative assessment of performance. This quantitative comparison can be conducted between undertakings, or historically within an undertaking comparing the past and present or actual performance against predefined targets. In India, every sector has indicators and the following limitations are observed:

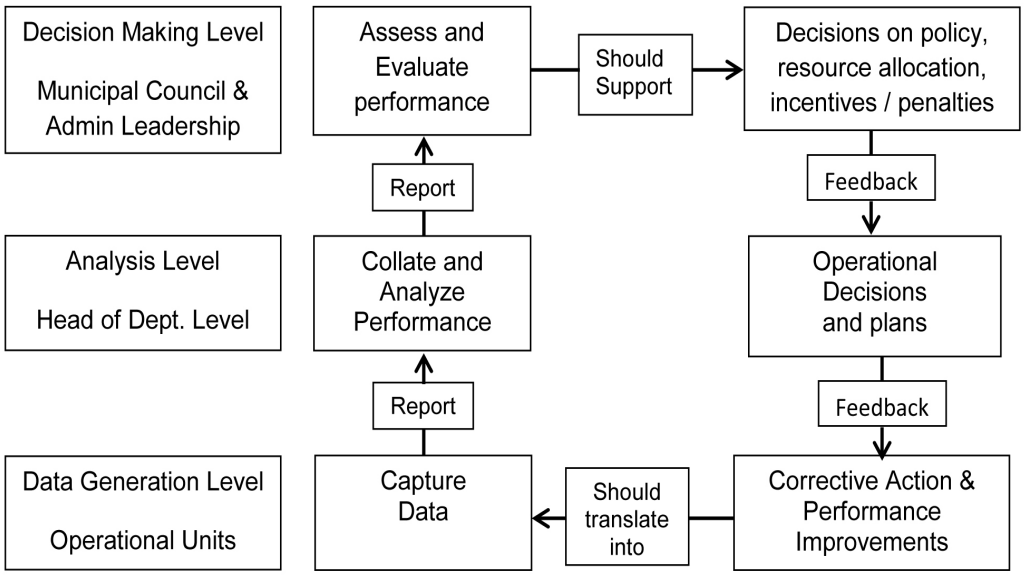
a. Different sets of performance indicators have different initiatives

b. The definition or the assessment method may vary for the same performance indicator, thus inhibiting inter-city or intra-city comparisons.

c. Most measurement exercises have been externally driven (by agencies external to the agency responsible for delivery against those performance parameters), leading to the key issue of ownership of performance report.

d. Most performance measurement initiatives have not been institutionalised, limiting the benefits of monitoring trends in performance over time.

e. The process of performance measurement has not been taken forward into performance management (Figure 9.1).



Source: MoUD, 2011

Figure 9.1 Performance Management System

Measuring service levels of civic agencies implies measuring outcomes, and indirectly also reflects on institutional capacity, financial performance and other parameters. Service level parameters can be measured either from a utility manager's/planner's perspective or from a citizen's or consumer's perspective. In addition, to facilitate comparison between cities/service delivery jurisdictions, and changes in performance over time, it is important that the performance levels are benchmarked, and monitored against those benchmarks.

The MoUD has issued a handbook on Service Level Benchmarks. In the handbook, indicators of 4 sectors: water supply, sewage, solid waste management and storm water drainage, are set with specific definition. These minimum performance parameters are commonly understood and used by all stakeholders. Depending on the specific needs, additional performance parameters can be defined and used. Measuring service level of civic agencies implies measuring outcomes, and indirectly also reflects on institutional capacity, financial performance and other parameters. Service level parameters can be measured either from a utility manager's/planner's perspective or from a citizen's or consumer's perspective. In addition, to facilitate compression between cities/service delivery jurisdictions, and changes in performance over time, it is important that the performance levels are benchmarked, and monitored against those benchmarks. These are presented in the Appendix C 9.1

The International Water Association (IWA) has developed PIs for water supply services and published "Performance Indicators for Water Supply Services" in 2000, and namely, "Performance Indicators for Wastewater Services" in 2003.

These are presented in the Appendix C 9.2. The International Organization for Standardization (ISO) developed international standards for activities related to drinking water and sewerage services and published the “Guidelines for the Assessment and for the Improvement of the Service to Users: ISO 24510”, the “Guidelines for the Management of Wastewater Utilities and for the Assessment of Wastewater Services: ISO 24511” and the “Guidelines for the Management of Drinking Water Utilities and for the Assessment of Drinking Water Services: ISO 24512” in 2007. ISO 24500s are guidelines for evaluation of entire sewerage services, and their aim is to enhance the efficiency of undertakings and services. PIs used for evaluation are key factors.

Performance of an undertaking can be evaluated from various aspects and sewerage services are composed of numerous complicated activities. Therefore, a number of PIs have been developed and made available. Sewerage services in different countries have different histories, and they have different roles. Therefore, selection of proper PIs for each undertaking is most desirable.

In the Japanese national guideline namely, “Guideline for Improving O&M of Wastewater Systems”, published in 2007 by the Japan Sewage Works Association, PIs are composed of Context Information (CI) for undertaking, system and district. PI for operation, users, services, management, environment and references. Example of CIs and PIs are shown in Appendix C 9.2.

9.4.2 Use of Indicators

Performance indicators and the information generated thereon, can be the basis for the decision making process involving determining targets, deciding priorities, drafting schedules of O&M, assigning responsibilities and distribution of human, material and financial resources. In the planning, process, these indicators provide the basis for preparing long-term, medium-term or short-term plans with appropriate finances allocated in the budgets.

These performance indicators provide a measure of what has been achieved so that the results can be evaluated and disparities corrected. Based on the results, the targets and indicators need to be changed so as to be nearer to reality. Some of the uses of these indicators are:

a. Maintenance information can be used to assess changes in conditions of installations and equipment and to identify potential problems such as weaknesses of structure, reliability of equipment or obsolete equipment and also to determine how long the facilities can function usefully.

b. The maintenance activities can be reformulated to achieve maximum yield at minimum cost.

c. The data can be used for preparation of the budget. The best justification for the next year’s budget is an accurate record of the previous year’s activities, costs, workload, growth and production. Similarly, the records on use of spares and materials and performance of equipment can be used to document the importance of the programme and get adequate financial support.

d. The trend in the agency’s workload can indicate where the workload has increased or where the performance has deteriorated requiring more staff.

e. The need for new equipment can also be justified while preparing the budget. Age is not necessarily the only factor for replacing the equipment. Record on production, use and cost of maintenance to keep the equipment operational may also substantiate the need for replacement.

f. The review should bring out need for buying new equipment. Additional equipment (including safety equipment) may become necessary from a review of the performance, either due to hiring of staff or the need for developing equipment for a specific purpose.

g. The review should provide an assessment of what spares and consumables are required for the next year/future.

h. The review can also bring out the need for economy, for hiring external specialized agency or hiring additional staff for attending to routine or breakdown maintenance or repair work.

i. The indicators can be used to measure productivity, reduction in breakdowns or frequency of breakdowns linked to productivity levels so as to achieve reasonable level of maintenance with minimum cost.

Each agency has to choose appropriate methods for evaluating effectiveness in achieving the O&M objectives.

9.4.3 Miscellaneous

Information system department comprises a group of information specialists, programmers and system analysts.

Technology: Appropriate technology with hardware and software is adopted.

Environment: The environment includes the external specialists, hardware and software vendors, consultants, competitors and Government.

9.5 APPLICATION OF MIS IN INDIA

There has been considerable progress towards use of information technology and electronic media in the dispensation of water and sewerage services and their administration in India. Some of the examples are cited here.

9.5.1 Case Study of Bangalore

The Bangalore water supply and sewerage systems have grown enormously over the last four decades. In order to handle such a large system with large volume of geographical information, it was imperative to develop and give decision makers a powerful management and decision making tool.

a) Objectives

a. To provide interactive access to up-to-date network geographical information for O&M purpose

b. To provide a planning tool to enable the acquisition of new and replaced mains

c. To provide accurate and comprehensive network information for monitoring, reporting, decision making and data consolidation

d. To allow the integration of geographical information from different sources and scales, both internal and external

e. To provide a widely available asset management system

f. To set up a pilot repository spatial dataset for the BWSSB.

b) Environment

i. Head Office: One Server with 5 PIII workstations, One Plotter, Scanner and A3 Colour Printer, with software such as ArcInfo 8.1, Arc SDE (Spatial Database Engine), ArcView 8.0 ArcPress and Oracle 8i RDBMS

ii. Divisional offices: One Server with 2 PIII workstations and A3 Printer, with software such as Arcview 3.1 and Oracle RDBMS

iii. Service Stations: One Desktop PC with Printer

c) Development of total GIS solution

i. The total GIS solution developed for Bangalore includes seven applications: Asset management, Water Supply Management, Sewerage Management, Water Quality Management, Consumer Management, Billing System, and Employee Management.

ii. Area covered: 290 km2 (entire jurisdiction area of BWSSB)

iii. Base maps: Digital vector data and maps based on aerial photography provided by Remote Sensing Agency (NRSA), Hyderabad in 1:2000 scale

iv. Road Network and Road Names

v. Base map of Buildings, Green area & Landmarks

vi. Consumers

vii. Location of Service Stations

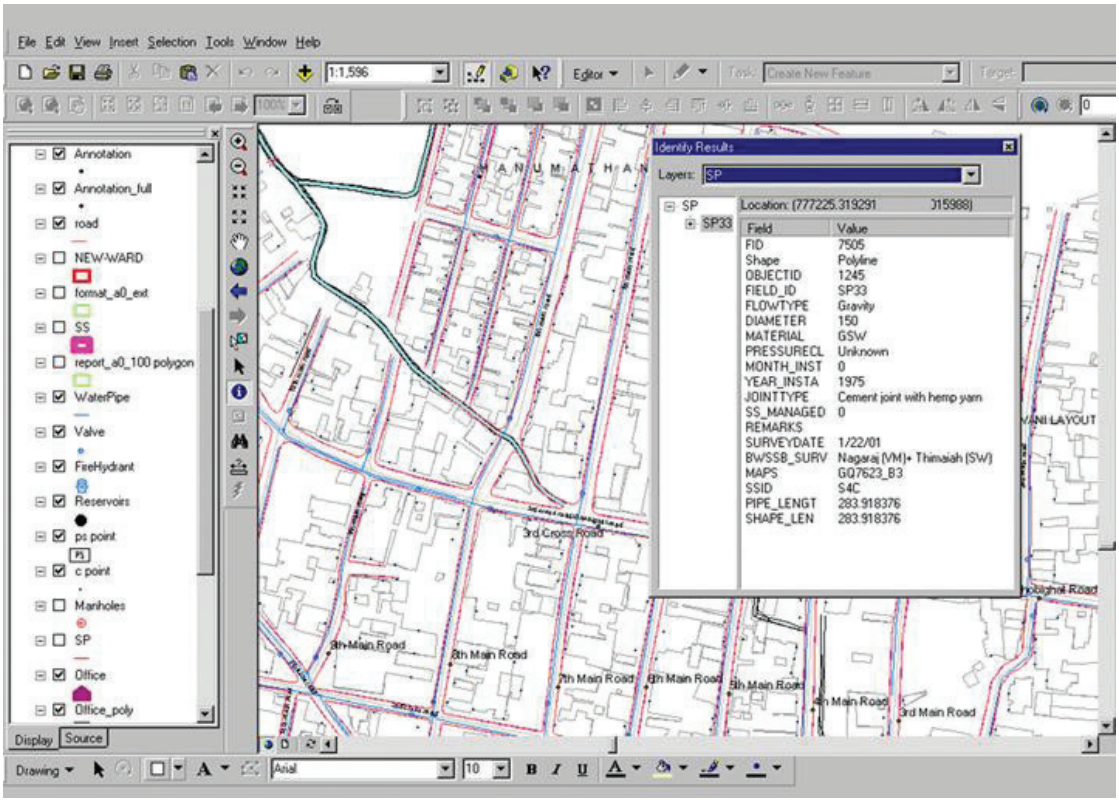
viii. Details of water supply network

ix. Details of sewer network (Figure 9.2 overleaf)

x. Location of BWSSB Offices

xi. Attributes of water and sewer networks

xii. Management indicator panel (Figure 9.3 overleaf)



Source: BWSSB

Figure 9.2 Sewer Networks showing Detailed Attributes of Sewers

Source: BWSSB

Figure 9.3 Management Indicator Panel

d) Facilitating complaint management and maintenance work

a. The system is designed to cater to the need for addressing complaints related to the water and sewage networks. The output from the system enables:

b. Quick identification of location from the digital map

c. Better appreciation of the problem as a holistic view of the network area is available

d. Connectivity with service stations provides speedy implementation of corrective action.

e. A database of all interactions is maintained and this serves as an input for periodic analysis and decision making at the apex level.

The software for service level benchmark on sewerage and sanitation services is available at the MoUD site (www.urbanindia.nic.in).

A complaint redressal and monitoring system should be established so that complaints can be registered by several methods such as – Making a toll-free number available for picking up complaints, receiving complaints through SMS, making a Complaint Book available at relevant locations, and/or providing an online website to receive complaints and making public the link to this website. This website could be designed to send auto-generated complaint numbers to the complainant's email ID to enable the complainant to check what action has been taken and also the complaint status from time to time. The management should monitor the Complaint Book and the website regularly to ensure that the complaints are addressed promptly and appropriately.

9.5.2 Use of Enterprise Resource Planning in Chennai

MIS can also be focussed towards user/public friendlier system especially in the most important aspect of billing and collection. The CMWSSB has successfully deployed such a system by starting a pilot system and since covering its full jurisdiction as follows:

An online billing and collection was taken up initially at one of the ten Area offices and its 19 depot offices and financial accounting section in the Head office and store accounting office. The payments made are immediately updated in the central server at the Head office and the reports could be generated either at Area office, stores or Head office. These areas have been connected through leased telephone lines with the Head office server. All the financial accounting systems were integrated using Oracle Enterprise Resource Planning (ERP) and various stages of bill processing and payments of bills were also integrated through Local Area Network (LAN) at Head office. Online complaints monitoring system has also been implemented in Head office, Area office and its depot offices. Between Head office and Area office, Videsh Sanchar Nigam Limited (VSNL) and Bharat Sanchar Nigam Limited (BSNL) lines and between Area office and depot offices Integrated Services Digital Network (ISDN) lines were installed. After gaining knowledge in the pilot project, the same was replicated in all other 9 Area offices and respective depot offices. All the billing and collection records were migrated to the Oracle ERP system.

Grievances with regard to water tax and charge are also received online from the consumers and are redressed immediately.

Complaints monitoring system under the Oracle ERP system is established to escalate the complaint to the next higher officer automatically if the complaint is not addressed within the specified time limit. Hence, the senior officers would view the complaints. All the stores have been interlinked with the Central Server at Head office using Oracle Inventory module which enables them to know the availability of the stock position (age wise analysis, ABC analysis, etc.) and purchases can be planned accordingly. All the bill passing sections such as supplies, contract and expenses at the Area offices and the Head office have been interlinked using the Oracle ERP system-accounts payable module. Apart from this, the assets conversion details can be known using Oracle assets module. More importantly, all the tender documents, schedules and drawings are uploaded in Government Tender Portal website periodically. The prospective suppliers and the contractors can download the tender documents from the Government Tender Portal website free of cost.

9.5.2.1 Governance and Service Delivery Improvements

The following service delivery improvements have been achieved:

a. Due to interconnectivity, the consumers can pay at any of the 161 collection points or any Area offices, Head office irrespective of the location of the property of the consumer.

b. The outstanding dues of the consumers in respect of water supply and sewerage charges and taxes can be viewed at any place and also on the board's website.

c. Besides cash, cheque, demand draft, credit cards, VISA/Master cards can be used to make payment of water taxes and charges.

d. Procedures such as billing, collection, complaints, tendering are simplified and these can be easily monitored.

e. More accountability and transparency in operation

f. Reduced paper work and stage of bill could be monitored at any time.

This is a case which has rendered higher operational efficiency, user friendliness and most importantly, transparency. The software used in this system is also being upgraded continually.

9.5.3 Use of ABACUS by Kerala Water Authority

The Kerala Water Authority (KWA) jurisdiction is state wide. The KWA together with the National Informatics Centre (NIC) has implemented a comprehensive online application for MIS support for billing and revenue applications as well as consumer services called the Advanced Billing and Collection Utility System (ABACUS) to develop an effective MIS system for billing and revenue collection and to provide consumer services.

The ABACUS supports a comprehensive customer database with facilities like online updating, billing and revenue receipts information, reading sheet prints, centralised billing for local bodies, centralised billing for water tankers, monitoring of meter reading routes, disaggregated data on revenue and customer parameters, billing for faulty meters, consumer ledger for revenue receipts. It also supports a database on meter replacement, service line alteration and consumer category change, disconnection, reconnection, etc. Consumers can view and print information related to their transactions.

9.5.3.1 Governance and Service Delivery Improvements

The following service delivery improvements have been achieved:

a. Online tracking of consumer history
b. Revenue collection enhanced
c. Effective revenue monitoring and control
d. Checking of unauthorized consumption
e. Mapping of supplied and billed quantity
f. Improved consumer satisfaction level
g. To be integrated with e-payment gateway
h. To be integrated with the Customer Complaint Redress System module

9.5.4 Use of TULANA for Service Level Benchmarking

The Directorate of Municipal Administration, Government of Karnataka, designed and developed the online application software, TULANA, to objectively assess the service level performance of ULBs across the State. This application has become an important decision making tool for investments and identification of priority areas. This is implemented as the service level benchmarking tool by way of an information technology web server, application server and database server and software application tool. The objectives of (a) standardized criteria for service level measurement by ULBs and (b) decision making on resource allocation to be based on indicator values for service levels.

Standardized systems were not in place to measure the performance of the investments in terms of service improvement. To rationalize decision-making on allocation of resources, it was decided to introduce a standard online performance-tracking tool for ULBs performance. Key sectors covering water supply, wastewater/sanitation, solid waste management, roads and street lights, disease control and development of parks and gardens and finances were covered. The 'TULANA' was developed as online application software and monitoring tool for service level benchmarking.

9.5.4.1 Implementation

TULANA was conceptualized as an online application covering key service sectors to rationalize decision making, improve accountability and transparency, allocate resources in an equitable and efficient manner, prioritize investments/development plans and encourage competitive spirit by comparison. The key features included web-based application, facility to capture data online from 213 ULBs, inbuilt data validation, generation of MIS reports, inbuilt formula and automated ranking generation based on indicator results.

9.5.4.2 Agency for Implementation

The Centre for Performance Measurement in 2004–05 is housed in the City Managers Association with Advisory & Resource Panel. Indicators were finalized for each sector and criteria for evaluation of performance of a ULB based on a weightage system against each indicator and scoring assigned. Ranking follows from the scoring. This exercise is carried out quarterly and annually.

9.5.4.3 State Support

a. Support on technical and performance related queries of ULBs

b. Data collection templates, user manual, technical manual

c. Pilot testing and development of online application

d. Protocol for access and authentication of data (user ID and password, authentication system)

e. Training on the use of web-based application

f. Provisional report released – modified before final report

9.5.4.4 Governance and Service Delivery Improvements

a. Enthusiastic participation of all ULBs in service level monitoring

b. Monitoring of participation of ULBs as well as performance standards

c. Data used to make decisions on allocation of resources and performance of investments

d. Integrates decision maker, database and ULB performance

e. Standardization of procedures and processes in reporting across ULBs.

9.5.5 Mobile Phone Technology based MIS in Rajkot

The Rajkot municipal corporation has deployed a mobile phone technology, a fully automatic service which retrieves data from a live server and for Short Messaging Services (SMS), in which a GSM modem is used. In practice, weekly monitoring of requests and complaints ensured that they would be resolved within 72 hours. On sending an SMS, the citizen receives relevant information on the mobile phone on transactions related to payments, and receives an alert acknowledging the payment. Further, officials receive daily income/expenditure statements and are able to monitor service and information requests, complaints, etc.

9.5.5.1 Governance and Service Delivery Improvements

a. Single point communication, 24/7

b. Hassle free complaint registration and status notification

c. Lesser response time, reduced search time

d. Search time for service is reduced

e. Reduced queuing up from 200 to 20 a day

f. Elimination of middle personality

g. Equal quality of service regardless of social or economic status

h. Cheapest transaction cost (as low as 1 paisa/transaction)

9.5.6 Other Such Notable Initiatives

Among the other such initiatives, the following are cited here:

a. GIS and Hydraulic Modelling for a Pilot 24/7 Water Supply in Amaravati

b. Water Supply Distribution & Monitoring System by Nagpur Municipal Corporation (NMC)

c. Online Water Quality Monitoring System by Surat Municipal Corporation (SMC)

d. Providing Installing, Integrating and Automation with PLC/SCADA of existing WTP and ESR by Pimpri-Chinchwad Municipal Corporation (PCMC)

9.6 APPLICATION OF INFORMATION TECHNOLOGY IN SEWERAGE – THE JAPANESE EXPERIENCE

Advances in information technology are a worldwide trend. This wave of change will involve not only municipalities and companies but also homes. Information technologies have improved surprisingly in recent years. Several factors, such as social demand for advancement and higher incomes, have spurred a global tide of advanced information systems.

Japan has been employing information technology and many other kinds of advanced technology to facilitate work in the sewage treatment plants, sewers and pumping stations. The salient features of some of the technologies are mentioned here briefly.

9.6.1 Sewerage Mapping and Information System in Bureau of Sewerage, Tokyo Metropolitan Government

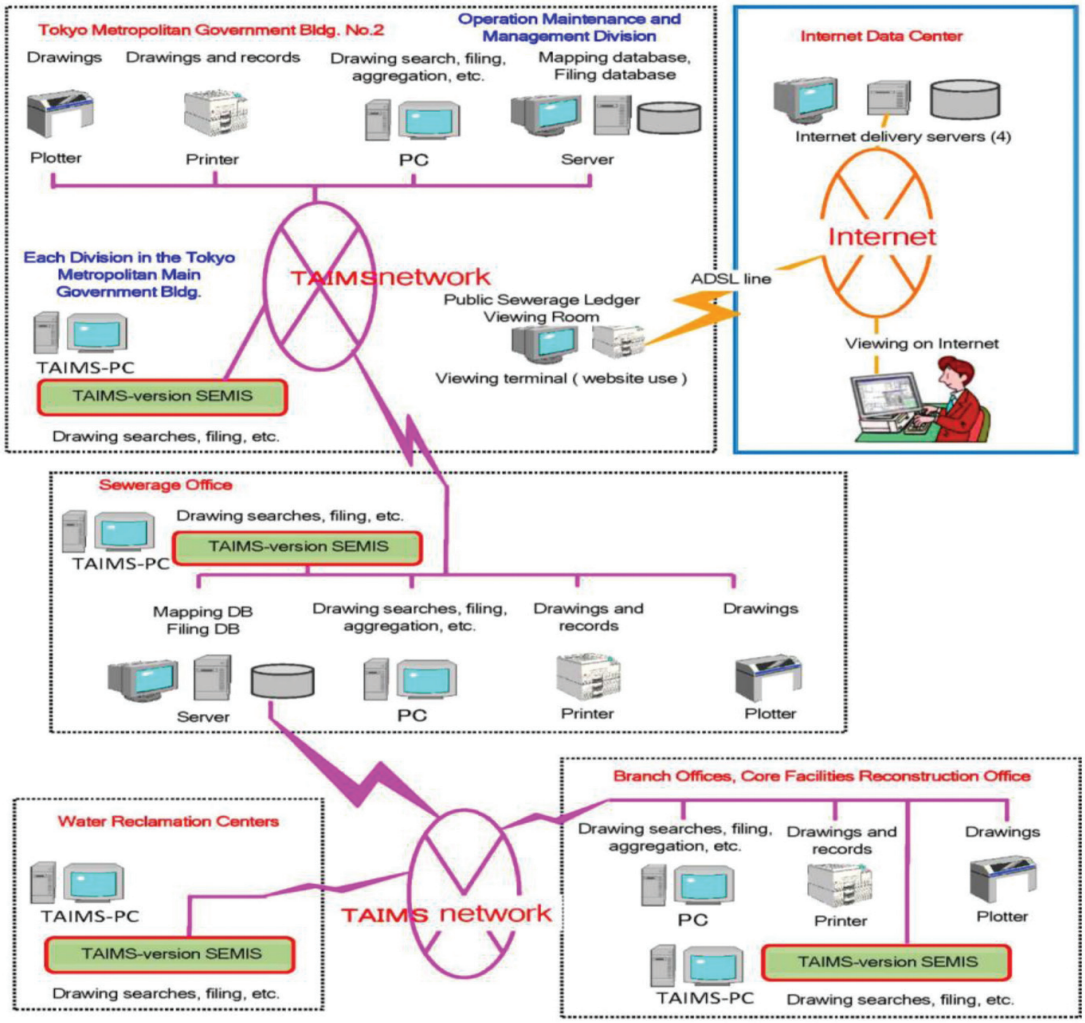
The Tokyo Bureau of Sewerage introduced the Sewerage Mapping and Information System, (SEMIS) using information technologies to administer the large number of drawings collected from its growing sewage infrastructure in 1985. The Bureau introduced the Tokyo Advanced Information Management System (TAIMS), a SEMIS-based system in 2009 that allows required personnel to access all sewage pipe information. Figure 9.4 and Figure 9.5 overleaf shows the details of SEMIS.

SEMIS is a geographic information system (GIS) that brings information from sewage facilities into a unified database for management purposes. The database consists of configuration, attribute and image information. Configuration information consists of facilities data and topographic data; attribute information consists of more than 90 data categories such as pipe diameter, material, year of installation and land manager name; and image information consists of finished drawings and structural drawings for specialized manholes.

A variety of output functions are available to manipulate this information, including configuration search, filing, construction records, standard drawing release, aggregation and Secure Exchange Formate (SXF) data output (a CAD data exchange standard). The configuration search function includes conditional display, upflow/downflow tracking, flow rate measurement, vertical/horizontal view creation and extended area calculation, which has contributed to more efficient planning and design. It is, therefore, a GIS that can aggregate and consolidate all kinds of information.

Source: Bureau of Sewerage, Tokyo Metropolitan Government
(http://www.gesui.metro.tokyo.jp/english/ourprofile/ourprofile13.htm)

Figure 9.4 Sewerage Mapping and Information System (SEMIS)



Source: Bureau of Sewerage, Tokyo Metropolitan Government
(http://www.asianhumannet.org/db/datas/0912-e/sewerage-information.pdf)

Figure 9.5 Structure of the Sewerage Mapping and Information System (SEMIS)

SEMIS consists of the TAIMS specialized information network. TAIMS is a base for realizing high-level administrative management by cooperative approach and information exchange within and outside the city, and by possessing information that transcends the bounds of the in-house organization. It offers procedures for collecting, processing and sharing information. Generally, one employee is provided one terminal for work. The functions of SEMIS are given in Table 9.1.

Table 9.1 Functions of SEMIS

Function	Description
Drawing Search	This function can be used to search for objects with parameters such as address, sewerage mapping number, affiliated sewerage facility and manhole number.
Display - Display control - View switching	Switching between configurations and lead line views is easily done with the Display Control function, accessed through the Switch View button on the toolbar.
Attributes	Clicking on the Confirm Attributes tab allows attribute details to be checked.
Sewerage - Upstream/downstream tracking	The Sewage button on the toolbar can be used for upstream/downstream tracking of pipes, flow rate measurements, vertical/horizontal views, etc.
Conditional Search	By using the Search by Condition button on the toolbar and applying pre-registered information, the system can separate out results by color.
Copy to Clipboard	An area selected on a drawing can be copied to the clipboard.
Printing and Output - Drawing printout and PDF file creation - SXF data output	This function supports printing to laser and inkjet printers and plotters, PDF file creation and output of SXF data for CAD use.

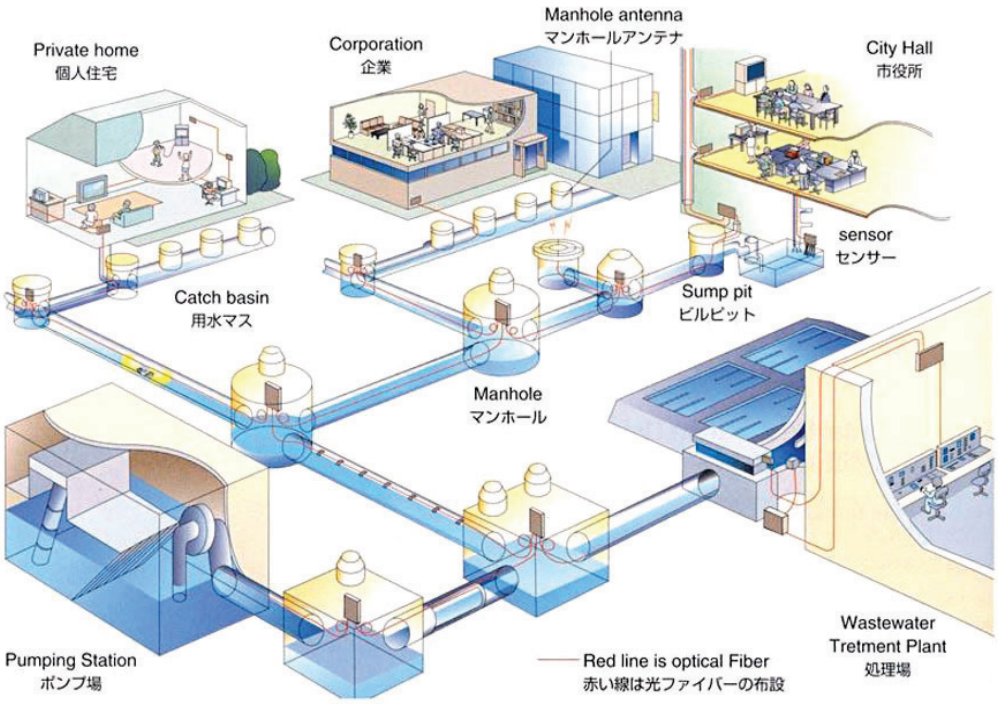
Source: http://www.asianhumannet.org/db/datas/0912-e/sewerage-information.pdf

9.6.2 An Advanced Information System Using Optical Fibre in Sewers

Although most of the current communication cables are metal cables, they will be replaced by optical fibre cables that enable faster and larger capacity communications. Since optical fibre communication requires no electric current in the cable, the cable can be laid in sewer lines.

The merit of installation in sewers comes from the point that sewers are underground. This means that, compared to aerial wires, underground cables do not ruin urban views. They are also highly resistant to disasters such as earthquakes and fires. Optical fibres installed in sewers can support the ideal image of future cities by providing safe communication in emergencies and by contributing to the realization of comfortable cities. Optical fibre cable can be used for a wide range of applications. It has now created the possibility of constructing a network not only linking sewerage facilities but also covering homes and offices, so that the use of optical fibre works can progress.

Since optical fibre has a large transmission capacity, the benefit/investment ratio will increase, as the range of applications becomes wider. When sewer optical fibre networks are used not only for management of sewerage facilities, but also for administrative purposes and personal use, sewage works will truly contribute to the implementation of the advanced information society. An example of optical fibre installed in a part of the sewer system in Kobe city is shown in Figure 9.6.



Note: Diagram showing the use of optical fibre cables for sewerage system management in Japan. Optical cables are allowed in Japanese sewer pipes after the Sewerage Law was revised in 1996.

Source: JSWA, 2002

Figure 9.6 Image of Optical Fibre Network

Fibre optic network was installed in a part of the sewer system in Kobe city in 2002. Sewage treatment plants and pumping stations within the city were connected to the fibre optic network. High speed and stable systems for monitoring and controlling data of treatment plants and pumping stations, and other kinds of systems were realized with the objective of enhancing efficiency and improving the management of sewerage systems.

The main routes are trunk lines of the sewerage network constructed in the aftermath of the Great Hanshin Earthquake, and these trunk lines are designed with high earthquake resisting capacity. The main applications are introduced here.

1) Controls among sewage treatment plants

The Suzurandai STP performs advanced treatment of sewage up to a specific influent flow rate; beyond this flow rate, the influent is diverted to the Seibu STP for treatment. To monitor its condition in the Seibu STP, the flow rate of distributed sewage, water level of the grit chamber and Industrial Television (ITV) images are transmitted using optical fibres installed in the sewers to the Seibu STP from the Suzurandai STP. This is the first time optical fibres have been used in sewers in this city.

The sludge is pumped from the Port Island STP to the Higashinada STP. To monitor its condition in the Higashinada STP, data of the pumped sludge quantity and the like, are transmitted using optical fibres installed in the sewers to the Higashinada STP from the Port Island STP.

2) Remote monitoring and control of pumping stations

The transmission of remote monitoring and control data for pumping stations located in the sewer route of optical fibre installations was sequentially changed over from dedicated telephone line to optical fibre circuit. Now, the sewer optic network is being used for transmitting ITV images and for remote monitoring and control of pumping stations.

3) Optical water level indicator

Optical water level indicators have been installed in sewage trunk lines. There is no need to install transmission equipment at the installed location of the water level indicator on site. The water level can be measured from a remote location. By knowing the water level in a trunk line, the sewage retention status and the influent status can be known beforehand. This enables safe and stable operation of the STP

4) Sewerage facilities and equipment information system

Sewerage facilities and equipment information systems have been constructed and are in operation. This is a system meant for effective and efficient control and management of an enormous number of machinery, equipment, facilities, drawings, work histories, and so on. Sewer optical fibre network is used for the transmission route of this system. The advantages of optical fibres are used effectively to mutually exchange massive volumes of data.

5) IP telephones

IP telephone equipment are being operated using sewer optic fibre networks. Since sewer optic fibre network is used in disaster-resistant network trunk lines, it has the important function of transmitting information during a disaster.

6) Rainfall information system

This system consists of radar equipment for monitoring the rainfall status and information terminals installed in various centres. It captures the rainfall status that varies day to day and hour to hour, and is used to establish disaster prevention systems and to support operation of storm water pumps. Initially, information was distributed using dedicated digital lines, but gradually the transition is being made to sewer fibre optic networks.

This has enabled speedy distribution of information through private networks that can firmly withstand disasters.

7) Fibre optic lease business

To effectively utilize the unused parts of sewer fibre optic network, Kobe city has leased out part of the fibre optic network.

9.7 MIS FOR SATELLITE MUNICIPALITIES

As the cities extend their boundaries, the complexity of assumptions in sewer design versus reality is a matter of great relevance to understand the validation of design assumptions like the design period of sewers, pumping stations, treatment plants, etc. The population growths and the segments of the cities where growths lead or lag are crucial to optimize investment planning. An example can be cited in the case of the Milwaukee Metropolitan Sewerage District (MMSD), USA, which provides wastewater and flood management services for 28 municipalities within its 411 square mile planning area. One of the challenges faced by MMSD was the need to understand the timing and volume of flow contributed by each of these municipalities through their local sewer systems to the MMSD's Metropolitan Interceptor Sewer (MMSD-MIS).

The MMSD-MIS is the regional sanitary sewer system operated by MMSD that connects local municipal sanitary sewer systems to the two regional wastewater treatment plants and regional In line Storage System servicing the Milwaukee metropolitan area.

In 2004, the MMSD has began the development of limited satellite municipality System Evaluation and Capacity Assurance Plans (SECAP) for each of the satellite municipalities it serves. The SECAP hydraulic evaluations were limited in that only those portions of the local sanitary sewer systems necessary to provide required information for the 2020 Facilities Plan project were analysed. The 2020 Facilities Plan is the latest generation of facilities planning undertaken by MMSD to determine what MMSD facilities are required to meet the needs of the region through the year 2020. Specifically, the SECAP project intends to: (1) Identify satellite municipality-system capacity deficiencies; (2) Estimate satellite municipality-system bypass volumes and flow rates for selected wet weather events; (3) Summarize peak flows delivered to the MMSD-MIS system for a selection of wet weather events. Such a MIS is indicated for at least the four historical metro cities in India, namely, Chennai, Delhi, Mumbai and Kolkata to start with.

9.8 SUMMARY

In India, the NIC is primarily responsible for providing computing support to various ministries/departments of the government both at the Centre and the state level, as well as at the level of district administration throughout the country with the progressive establishment of a nation-wide informatics network (NICNET).

These are supplemented with the efforts of the Department of Statistics through the Central Statistical Organization (CSO) and the National Sampling Survey Organisation (NSSO), the State Directorates of Economics and Statistics (SDES) and the statistical units of the central ministries, which are partially fulfilling the information requirement and are responsible for coordination of all the statistical activities including development and maintenance of standards. They have liaison with international agencies as well. (Source: http://www.vikalpa.com/pdf/articles/1996/1996_july_sep_3_15.pdf). All these institutions are merely date entry and retrieval centres. These are not MIS centres. It requires a different expertise to develop an MIS. Perhaps, the BWSSB model needs to be elaborated and validated.