IMIS Readiness Assessment Framework

1. Context

IMIS readiness assessment is a structured evaluation process designed to assess the Local Government's readiness for implementing IMIS to enhance planning, management, and monitoring and evaluation of sanitation systems and services, following the Citywide Inclusive Sanitation (CWIS) approach. IMIS readiness assessment serves as a valuable feasibility analysis tool to make informed decision about IMIS implementation that for developing investment plan, strategies to mitigate potential obstacles or challenges that may arise in the process of implementing IMIS. Three distinct aspects of readiness are assessed, each of which holds equal importance.

- Data readiness
- e-Governance Initiatives and IT readiness
- IMIS-driven sanitation service delivery readiness

During IMIS readiness assessment, pertinent information is primarily collected through Key Informant Interview (KIIs) supplemented by a thorough analysis of relevant documents and reports. Information gathering is performed by a person who have in-depth knowledge on IMIS. Collection of information for IMIS readiness must be guided by the requirement framework illustrated in Appendixes. During the process, general information about the city and relevant documents are also acquired (Appendix A). Each requirement (Data, e-Governance Initiatives and IT and IMIS-driven sanitation service delivery) has been categorized based on its importance, indicating whether it is mandatory (M) or desirable (D). Desirable requirements, while not essential, can either significantly enhance IMIS system efficiency, capabilities for decision-making or increase the likelihood of successful adoption and implementation of IMIS. Subsequently, IMIS readiness assessment and evaluation must be carried out by team consisting of System Analyst, GIS Expert, and Sanitation. It is preferrable that IMIS readiness assessment team possess prior experience in the complete IMIS implementation cycle, including data collection, customization/development of IMIS, and capacity building, for at least one city. The readiness assessment of city for IMIS implementation considers only the mandatory requirements. However, the level of readiness of IMIS and way forward for implementing IMIS is based on the decision made by the assessment team.

2. Data Readiness

Data readiness assessment will be performed based on the availability of the data those are required for IMIS. The data requirements for IMIS were initially identified during the conceptualization phase and have since been continuously updated, incorporating insights gained from the preparation of CWIS planning TA (Technical Assistance) for different International Financial Institutions (IFIs) in Bangladesh (ADB, AIIB, IsDB, WB) and Nepal (WB). Data Requirements for IMIS (Appendix B) comprises a comprehensive list of data sets along with their descriptions, value proposition, data type (spatial/non-spatial), and usefulness for the outcomes and functions of the CWIS (Citywide Inclusive Sanitation). Additionally, the importance of each data set is categorized as either mandatory or good to have for effective planning, management, and monitoring of sanitation systems and services. The listed data sets required for IMIS are further divided into four main categories:

- Urban data: Data about the city's urban pattern, topography, environmental data, and related aspects.
- Sanitation data: Data pertaining to the sanitation system and services.
- Revenue data: Data related to revenue collection associated with sanitation services.
- Business operation data: Micro-level containment database and data generated during the process of delivering sanitation services.

These data sets are considered essential for fulfilling the core purpose of CWIS. However, it is important to note that data sets related to Solid Waste Management (SWM), is not included. During the data readiness assessment, available data layers (spatial/non spatial) will be scrutinized for presence/absence of required necessary attributes as well. All spatial data layers will be examined in GIS software to ascertain if data layers need further update or must be created again through a survey.

3. E-Governance Initiatives and IT Readiness

The requirements related to e-Governance Initiatives & IT have been carefully curated based on the IMIS implementation experiences in various towns in Nepal and Bangladesh. Information aspects relevant to different e-governance initiatives undertaken by LGs, availability, and sufficiency of IT infrastructure in LGs, and willingness/commitment to share required financial resources for IMIS implementation are assessed in this part (Appendix C).

4. IMIS-Driven Sanitation Service Delivery

The requirements related to and IMIS-driven sanitation service delivery, have been carefully curated based on the IMIS implementation experiences in various towns in Nepal and Bangladesh. Information aspects relevant to necessary enabling environment that facilitates the successful implementation and adoption of IMIS for effective institutionalization of IMIS as well as details status of existing sanitation service delivery in LG are captured (Appendix D).

Appendix A. General Information of the City

1. Name of town:
2. Total Area (Sq. Km):
3. Population:
4. Number of Holdings:
5. Name of organizations (NGO/INGO) currently active in sanitation:
6. Presence of any master plan with GIS data (Yes/No):
7. Date of creation of master plan:
8. Format of unique house ID (holding ID):
9. Department responsible for assigning unique house ID:
10. Number of houses constructed per year:
11. Desludging status (min, max, average per month):
12. Proportion of tax collection per year:
13. Number of years since emptying service is operational:
14. Please collect the following information, if available.

SN	Particulars	Yes	No
1	Master plan report		
2	Available GIS dataset		
3	Organogram of the town		
4	Profile of LG		
5	FSM by-laws or sanitation plan		

6	Sample bill receipt that includes the Unique ID e.g. tax bill, water bill		
7	Tariff structure for desludging service		
8	Forms used during providing emptying service		
9	Sample logbooks being maintained in sanitation value chain		

Appendix B. Data Requirement of IMIS

	SN	Dataset	Description	Value Proposition	Data Type	CWIS Outcome (O)/Function (F)	Dataset Creation Year	Planning	Management, Monitoring & Evaluation
URBAN DATA	1	Ward Boundary	Ward level administrative boundary.	Helps in planning, assessing, and monitoring the sanitation situation in ward level.	Spatial	Resource planning & management (F)		M	M
	2	Administrative Zone Boundary	Boundary of administrative zones (wards organized into zones) for delivery of services.	Helps in planning, assessing, and monitoring the sanitation situation in zone level.	Spatial	Resource planning & management (F)		M	M

3	Land use	Provides urban agglomeration of the town and the mapping across the town of the purposes the land serves.	Provides urban agglomeration of the town which helps to identify the areas which are environmental or public health sensitive but vulnerable if sanitation system is not managed properly. Guides the prioritization of the areas for interventions/ systems/ technologies, identification of areas for treatment plants that have minimu	Spatial	Safety (O), Sustainability (O), Resource planning & management (F)		M	M

4	Soil	Soil map image in raster that shows types of soil in different part of the town	Provides information on the permeability rates and safe bearing capacity of the soils that will guide the planning and design of sanitation infrastructure systems.	Spatial	Safety (O), Resource planning & management (F)		D	D
5	Contour	Presents topography of the town with clear elevation levels	Guides the choice of sanitation solution and the planning and design of the solution with optimal investments.	Spatial	Safety (O), Sustainability (O), Resource planning & management (F)		M	D

6	Water table	Water table map in raster image that shows ground water table in different parts of the town	Provides geographic information of areas where ground water is susceptible to pollution due to insanitary/unsafe containment units, unregulated discharge of wastewater. Ground water table information guides the strategies for improved wastewater management of sensitive zones/locations, helps in the strategic planning and design	Spatial	Safety (O), Sustainability (O), Resource planning & management (F)		D	D

7	Waterlogged area	Areas in town where water gets logged frequently	Guides in developing risk reduction and preparedness strategies when planning, designing, and managing the sanitation systems and services as well as storm water management	Spatial	Safety (O), Sustainability (O), Resource planning & management (F)		D	M

8	Area where environmental sensitive activities have been taken	Areas in town which have been used to manage or dispose municipal solid waste such as landfill sites, waste collection points, waste disposing site, dens toilet effluent discharged area, open defecation area, etc.	Helps to demarcating buffer zones around these areas where residential habitations need to be avoided and implementing environmental safeguards while planning, designing the location of sanitation treatment plant should be in conformity of such environment sensitive area.	Spatial	Safety (O), Sustainability (O), Resource planning & management (F)		D	D

9	Population density	Mapping of the population density in different parts of the town.	Helps in planning and making decisions for sanitation system – sewered or non-sewered and technology selection	Spatial	Equity (O), Safety (O), Sustainability (O), Resource planning & management (F)		M	D
10	Settlements	Planned (formal) / unplanned (informal) residential areas including slums and low-income settlements, with their demographic, socio-economic status.	Provides detailed geographical information of the planned / unplanned residential areas, which supports in contextualizing the sanitation solutions vis-a-vis their settlement pattern	Spatial	Equity (O), Safety (O), Sustainability (O), Resource planning & management (F)		M	G

11	Low Income Settlement Area	Low Income Settlement Area with attributes information such as economic condition, households, population, sanitation situation, drinking water situation and waste management situation, public finance support received for settlement development, gender intentional initiatives for sanitation service, incentives received, etc.	The demographical, socio-economic, and baseline status of sanitation and other basic services in low-income settlements will help with the prioritization of the interventions, planning, design & management of the gender intentional and socially inclusive solutions and strategizing the sustainable solutions.	Spatial	Equity (O), Safety (O), Sustainability (O), Accountability (F), Resource planning & management (F)		

12	Building Footprint	Building footprints with its information such as house number, property ID, Tax code, owner name, Contact Number, SWM customer code, FSM customer code, sewerage customer code, water supply customer code, road network code, sewerage network code, drainage network code, SWM service sector code, code of the associated containment	Provides detail information about buildings – where a building is located and how much area has been occupied, building topology, functional use, the types of sanitation system (sewerage or onsite), municipal services receiving, access road, associated sewerage, storm drain, water supply line and corresponding service area if connect	Spatial	Equity (O), Safety (O), Sustainability (O), Accountability (F), Resource planning & management (F)		M	M

13	Road Network	Information about roads such as road name, hierarchy, surface type, width, etc.	Helps with planning and design of sewer network, desludging route, storm water management, and green infrastructure.	Spatial	Safety (O), Sustainability (O), Resource planning & management (F)		M	M

14	Point of Interests (POIs)	Locations and name of city offices, ward office, public places, market, postal service, hospital, health post, buildings, public toilet, rehabilitation center, fire brigade, tourist information center, business complex, shopping mall, police station, parking place, health and fitness, office, etc.	Helps in assessing the need to provide public sanitation facilities in these public places. Helps to understand the concentration of floating populations and design the sanitation facility. Helps in exploring and promoting technology option (e.g., development of DEWATS facility to cater the treatment of large volume wastewater generations, particul	Spatial				

15	Water bodies	Water bodies area covered by Rivers, Lakes, Ponds, etc.	Guides in developing risk reduction and preparedness strategies when planning, designing, and managing the sanitation systems and services as well as storm water management.	Spatial	Safety (O), Sustainability (O), Resource planning & management (F)		M	M

SANITATION	16	Containments	Location of containment with its unique id, associated building, containment type (septic tank/ holding tank/ pit), containment size(m^3), associated road code, last desludging date, population served, public finance support received, etc.	Provides detailed information about every containment in a town, which helps in understanding the number of containments by their types, the total number of populations being served, estimated volume of fecal sludge generated, population served, etc. Understanding the spatial coverage of sanitary that complies with all require	Spatial	Equity (O), Safety (O), Sustainability (O), Resource planning & management (F)		D	M

17	Strom water network	Strom water network with structure type (Pucca, Katcha), width, status (closed, open), and its outfalls	Provides information on the areas that are served with sewer network which helps in assessing the areas which are not connected to sewer where interventions need to be planned for inclusive sanitation. In conjunction with building data, it helps to understand how many buildings by type, households and population are being served	Spatial	Safety (O), Sustainability (O), Resource planning & management (F)		M	M

18	City water supply areas	Areas in town which are covered by the city water supply.	Provides information about areas served and unserved by city water supply, which will help to understand the quantity and quality of wastewater generated in those areas.	Spatial	Safety (O), Sustainability (O), Resource planning & management (F)		D	D

19	Public/Community Toilets (PT/CT)	Public services (PT/CT) in the towns with the types of services provided, capacity, users (male/female), service provider, public finance support received, gender intentional initiatives in design, service fee, incentives received, etc.	Provides location information about centers that deliver public services which will also help in assessing the need to provide public sanitation facilities in these public places. Help to understand the concentration of floating populations and design the sanitation facility. Helps in exploring and promoting technology options (e.g., development of DEWAT	Spatial	Equity (O), Safety (O), Sustainability (O), Resource planning & management (F)		M	M

20	Treatment Plants	Locations, capacity, etc. of WWTP and FSTPs.	Provides geographic location and information about Treatment Plants and helps in proximity understanding of treatment plants from town settlements and various land uses. Helps in planning and decision-making processes such as planning co-treatment of FS in the STP.	Spatial	Equity (O), Safety (O), Sustainability (O), Resource planning & management (F)		M	M

21	Landfill site	Landfill sites with their area, capacity, etc.	Provides information such as collection frequency and service providers of areas. Service area in conjunction with building data helps to estimate the volume of waste generated from the service area. Helps to conduct a feasibility study for implementing different technologies such as co-composting of SW with FS is feasible based on the	Spatial	Safety (O), Sustainability (O), Resource planning & management		D	M

22	Water borne disease hotspot	Hotspot of water-borne diseases that occurred in the town in last 5 years.	Helps to know areas vulnerable to unmanaged sanitation and monitor and evaluation of sanitation intervention.	Spatial	Safety (O), Responsibility (F), Accountability (F)		D	D

REVENUE	23	Tax zone	Tax zone with tax rate and status of revenue collection in different tax and services provided by Pourashava.	Provides tax rates for the different areas in the town. Tax zone in conjunction with the status of property tax collection, service fee collection, and settlement data help in fixing the tariff for service and developing strategies for collecting service fees for efficient and sustainable service delivery.	Spatial	Equity (O), Sustainability (O), Resource planning & management (F), Responsibility (F), Accountability (F)		D	D

SANITION BUSINESS DATA	24	Service provider	Town inhouse unit or outsourced companies providing sanitation service and the gender intentional policy, benefits, and incentives of service providers.	Provides information about service providers that are in-house units or sections of LG or outsourced companies including their information about their coverage, capacity, infrastructure availablle for providing service incentives, penalties. Provides information about targets, the status of performance, incentives,	Spatial	Equity (O), Safety (O), Responsibility (F), Accountability (F), Sustainability (O),		D	M

25	Emptying and Transportation Infrastructure and Services	Service provider’s information including human resources and vehicle inventory (quantity, size, service status).	Helps to understand the transportation infrastructure available and their status.	Non-spatial	Equity (O), Safety (O), Sustainability (O), Resource planning & management (F), Accountability (F)		M	M

26	Customer data	Database of houses that are receiving sanitation services, water supply services, SWM services, etc.	Provides information about the buildings and containments which have received service. Helps in planning and developing different strategies for planning, managing, and M&E of the systems and services.	Non-spatial	Equity (O), Safety (O), Sustainability(O)		D	M
27	Customer feedback data	Customer's feedback about service after desludging the containment.	Helps in management and M&E of the sanitation service.	Non-spatial	Equity (O), Safety (O), Sustainability (O), Responsibility (F), Accountability (F)		D	M

28	Public/Community Toilets (PT/CT) service feedback	User's feedback on PT/CT	Helps in management and M&E of the public service	Non-spatial	Equity (O), Safety (O). Sustainability (O), Responsibility (F), Accountability (F), Resource planning & management (F)		D	M
29	Desludging service feedback	Customer's feedback about the desludging service	Helps in formulating strategies for increasing efficiency of service delivery	Non-spatial	Equity (O), Safety (O), Sustainability (O), Resource planning & management (F), Accountability (F)		D	M

30	Fecal Sludge Data	Fecal sludge collected, treated, and reused records maintained by the town for different sites		Non-spatial	Equity (O), Safety (O), Sustainability (O), Resource planning & management (F), Accountability (F)		D	M

Appendix C. E-Governance Initiatives & IT Requirement of IMIS

Aspects	SN	Requirements	Importance (M=Mandatory, D= Desirable)	Availability (Yes/No)	Remarks
e-GOVERNANCE	1	Is LG currently using any software applications (e.g., Tax Collection System, MIS, etc.), or are they in the process of implementing any?	D		
	2	Does LG employ any online payment mechanisms to deliver municipal services?	D		
	3	Is LG utilizing any mobile apps to provide information to its citizens or deliver municipal services?	D		

IT INFRASTUCTURE	4	Does LG have an in-house IT department, outsource IT services, or hire temporary IT personnel to support IT-related issues?	M		
	5	If not, is LG willing to hire IT personnel to support IMIS operation within its own budget?	M		
	6	Do LG staff members possess good computer skills?	M		
	7	Does LG have sufficient computers and accessories in relevant departments, such as revenue, building, infrastructure, and sanitation departments, to support IMIS?	M		
	8	Does LG have reliable fast internet access within its office premises?	M		

9	Are personnel responsible for sanitation service delivery, such as desludging vehicle drivers and treatment plant operators, capable of using computers and mobile applications?	M			
10	Does LG have any Annual Maintenance Contracts (AMCs) with private companies to maintain any of its software applications?	D			
11	Are there any restrictions on hosting software with a commercial hosting service provider, whether it be a national or international provider?	M			
SUSTAINABILITY	11	Is LG willing to make a partial investment in the required dataset if the dataset as per the IMIS framework is not entirely available?	D		
	12	Is LG willing to designate a focal person with clear mandates to oversee the implementation and operation of IMIS?	M		

13	Is LG willing to share the cost of hosting IMIS on the cloud if there is no provision for hosting it on the government cloud?	M		
14	Is LG aware that regular investment is necessary for the maintenance and hosting of any software application once it is implemented? Will LG be prepared for this investment?	M		
15	Are there any urban planner staff (permanent/temporary) employed by LG?	D		

Appendix D. IMIS-Driven Sanitation Service Delivery

	SN	Requirements	Importance (M=Mandatory, D= Desirable)	Availability (Yes/No)	Remarks
Enabling Environment	1	Has the LG officially endorsed and adopted the CWIS (Citywide Inclusive Sanitation) approach?	M		
	2	Does LG have any specific plans or strategies focused on sanitation, such as a CSP (City Sanitation Plan), sanitation strategy, or FSM (Fecal Sludge Management) by-laws? If not, is the LG currently working on developing such plans?	D		

3	Are there any clearly defined mandates assigned or established for various aspects of the sanitation value chain within the LG's policy or official documents?	M		
4	Has LG established a central-level committee to oversee sanitation activities?	D		
5	Does LG have a dedicated unit responsible for FSM (fecal sludge management)? If not, has the LG assigned the responsibility of FSM to any specific department or staff?	M		
6	Has the LG allocated a specific budget for sanitation purposes?	D		
7	Dees LG already formulate any established model for sanitation service delivery (e.g., process, payments, information collection)?	M		

8	Does LG need to submit annual/quarterly report of progress to higher bodies? If yes, are there any sanitation related indicators in the report?	D		
9	Does LG address inclusive sanitation services targeting poor, vulnerable communities in its policy, planning and budgeting process s? Is there any defined LICs areas within municipality?	D		
10	Does LG conduct periodic promotion for safe sanitation, behavior change and community engagement?	D		
11	Are there any policies that require households to regularly empty containments? Is there a plan for moving towards scheduled desludging?	D		
12	Are there any policy mandates for safe disposal?	M		

Sanitation Service Delivery	13	Is there a mechanism in place for citizens to request emptying services through the LG or private operators?	M		
	14	Does LG enforce licensing mechanism for private operators?	M		
	15	Is there standard tariff set for emptying by LG?	M		
	16	Are there desludging vehicles and other necessary infrastructure available for the emptying service?	M		
	17	Does a formal system for citizens to request emptying services exist?	M		
	18	Does the LG periodically monitor service providers?	M		
	19	Does customer database available for sanitation services?	M		
	20	Does customer database available in digital format?	D		

21	Does a mechanism for customers to provide feedback on the emptying service exist?	M		
22	Is there a provision of transfer stations for buildings that are not directly accessible due to narrow roads? (Yes/No)	D		
23	Does the LG or private operator manage public toilets (PT) and community toilets (CT) within the city?	M		
24	Is there a feedback system in place to monitor the condition and usage of PTs and CTs?	D		
25	Is there a presence of FSTP or any designated area for the disposal of sludge?	M		
26	Are there potential buyers identified for treated wastewater and sludge?	D		

27	Does the LG currently have a building permit process in place to issue and verify building permits?	D		
28	Is there a step within the building permit process to verify the sanitation system?	D		
29	Does the LG monitor the quality and standards of the existing sanitation systems?	D		

Integrated Municipal Information System (IMIS)

1.1 Introduction to IMIS

The Integrated Municipal Information System (IMIS) is a comprehensive digital platform designed to transform how municipalities manage sanitation systems and services, aligning with the principles of Citywide Inclusive Sanitation (CWIS) to achieve Sustainable Development Goal (SDG) 6.2. IMIS equips municipal authorities with tools to plan, monitor, and optimize sanitation service delivery, ensuring equitable access for all, particularly underserved communities. By integrating geospatial data, real-time service tracking, and sanitation-specific analytics, IMIS supports evidence-based decision-making and enhances resource allocation to improve sanitation outcomes.

IMIS also functions as a Digital Public Infrastructure (DPI) at the sub-national level, facilitating the generation and organization of critical data for urban sanitation management. Beyond supporting local governance, IMIS serves as a foundational data system that feeds data into national-level systems for monitoring CWIS indicators and other metrics critical for achieving sanitation targets. This capability ensures alignment between municipal operations and broader national objectives, creating a seamless flow of actionable data across governance levels.

IMIS supports the Planning, Management, and Monitoring & Evaluation (M&E) framework for CWIS systems and services (see Figure 1). This framework emphasizes a structured approach to achieving inclusive and sustainable sanitation outcomes. The Planning component focuses on equitable and gender-inclusive strategies, sustainable financing, and transparent pricing mechanisms. The Management component ensures the safe, accountable, and financially sustainable operation of sanitation systems. The M&E component assesses service quality, equitable distribution, and the performance of sanitation authorities. Together, these components create a continuous feedback loop that helps municipalities refine their strategies and align them with national sanitation goals.

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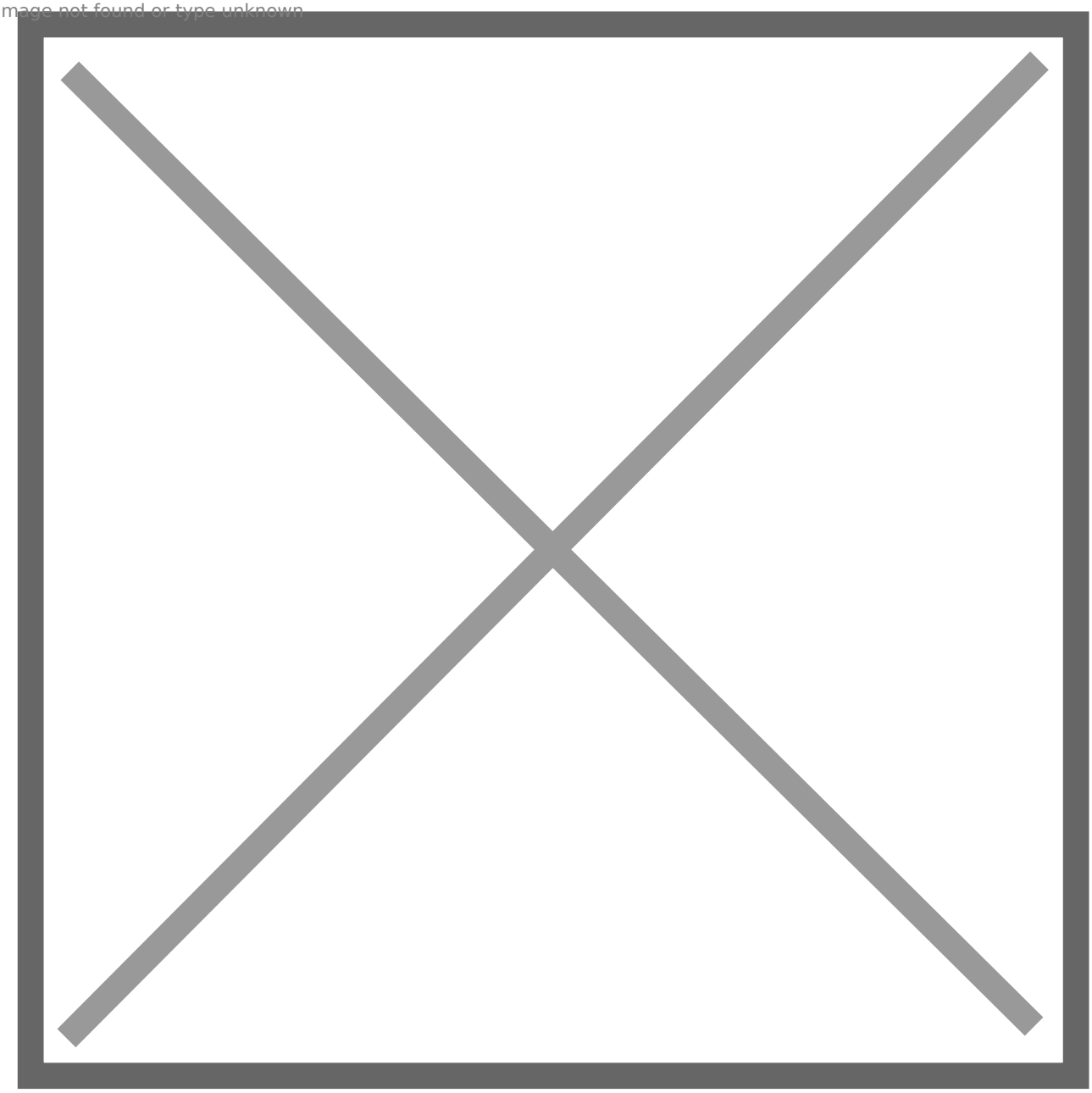

Fig. 1 Planning, Management and Monitoring & Evaluation Framework for implementing CWIS Approach

IMIS comprises ten functional modules, seven of which are core modules directly addressing sanitation systems and services, such as faecal sludge management, sewer connections, and public toilet operations. The remaining three value-added modules enhance complementary municipal services, including property tax collection, solid waste management, and water supply billing. Combined with the **Urban Management Decision Support System (UMDSS)**—a powerful tool for spatial analysis, mapping, and decision-making—IMIS empowers municipalities to adopt CWIS principles while contributing to broader urban governance. Each of these modules are discussed under sub chapter “Modules”.

Built on robust open-source technologies like PHP, PostgreSQL, and OpenLayers, IMIS is made freely available under the **Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0) license**. This licensing ensures that municipalities and stakeholders can access, use, and adapt the system to their needs while promoting collaboration

and innovation in sanitation and urban governance. Its intuitive dashboards enable municipalities to track CWIS indicators, Key Performance Indicators (KPIs), and other metrics essential for sanitation management. As a sub-national data system and DPI, IMIS strengthens municipalities' ability to achieve sanitation objectives locally while feeding reliable, standardized data into national systems for effective CWIS monitoring and governance.

1.2 Modules

The Integrated Municipal Information System (IMIS) consists of ten functional modules: seven core modules and three value-added modules (see Figure 2). The seven core modules include the Building Information Management System (BIMS), Utility Information Management System (UIMS), Faecal Sludge Information Management System (FSIMS), Community Toilet / Public Toilet Information Management System (CTPIMS), Sewer Connection Information Management System (SCIMS), Public Health Information Support System (PHISS), and the Urban Management Decision Support System (UMDSS). The three value-added modules are the Property Tax Collection Information Support System (PTCISS), Solid Waste Information Support System (SWISS), and the Water Supply Information Support System (WSISS). These value-added modules primarily support property tax collection, solid waste management, and water supply billing units, utilizing IMIS as a digital infrastructure to enhance services and improve revenue collection processes. Unlike the core modules, these value-added modules rely on data imported from respective municipal units during their regular business processes, as IMIS does not create data for them. Additionally, they do not directly impact sanitation systems and services under the Citywide Inclusive Sanitation (CWIS) approach.

Conversely, all core modules, except for UMDSS, generate and utilize their own data for various analyses, significantly contributing to the management of sanitation systems and services within the CWIS framework. UMDSS, while not creating data itself, consolidates data from other modules to facilitate decision-making related to sanitation systems, services, and broader urban management issues through its various analytical tools. Access to these modules is determined by the functional roles of municipal staff, executives, and stakeholders, ensuring their integration into daily municipal operations for effective management.

The use of these modules must be embedded into the regular workflows of corresponding departments or units within the municipality. For instance, the FSTP operator, responsible for recording logs of faecal sludge disposed of at the FSTP, is required to use the "Sludge Collection" functional sub-module within FSIMS. Similarly, emptying operators must use the IMIS-provided mobile application to capture data during containment emptying processes under the relevant sub-modules. This integration ensures that information within IMIS is continuously updated without the need for additional resources dedicated solely to data entry.

Each of these ten functional modules is discussed in detail in subsequent sections of this chapter. Additionally, IMIS includes a dedicated Settings module, which focuses on system administration and is covered at the end of the chapter. This structured approach ensures that IMIS is seamlessly integrated into the municipality's operational framework, supporting both sanitation and urban management.

Figure 1 Functional Modules of IMIS

1. Building Information Management System (BIMS)

The BIMS is a core module of the IMIS that serves as a comprehensive database of all buildings within a municipality. It encompasses detailed information about each building, including: Physical attributes (structure type, number of floors, and year of construction); Location details (address and geographical coordinates with building footprints; Usage and ownership (Building usage, ownership status, and associated tax codes); Utilities and services (sources of water, solid waste management services, access to sanitation, access to roads, etc); Demographics and classifications (basic demographic data and classifications for low-income community areas). Buildings are central to IMIS, functioning as the foundational entities that interconnect all other components essential for efficient municipal service delivery.

The building database in IMIS is established using a GIS framework. High-resolution satellite or drone imagery is used to digitize building footprints, which are then verified through field checks and house-to-house surveys. House-to-house survey also collects all other required attributes data about buildings.

New buildings constructed post-IMIS implementation are recorded through the IMIS mobile application during the building permit process and updated for new constructions. The app, currently available for Android, captures building footprints and related data for new structures. Additional building attributes are updated during municipality’s business process in delivering various services such as sanitation assessments, sanitation service delivery and other services. However, this need to be incorporated in municipality’s service delivery policy.

BIMS provides interactive dashboard dedicated for building related information. This dashboard provides visual insights into building data from multiple perspectives. BIMS provides comprehensive interfaces and tools for data entry, updates, queries, and analysis. The system has map-based integration feature that provides geospatial visualization tools for location identification. The module has data extraction tools that has capability for generating data in various formats, including CSV, Shapefiles, and KML files.

BIMS offers municipalities valuable insights into Building infrastructure status, utility and service access and the critical data for planning, management and monitoring and evaluation of sanitation system and services in CWIS approach.

The data maintained by BIMS helps municipality to monitor the CWIS indicators such as (i) % of LIC population with access to safe individual toilets / % of total population with access to safe individual toilets, (ii) Population with access to safe individual toilets, and (iii) Low income community (LIC) population with access to safe individual toilets.

2. Utility Information Management System (UIMS)

UIMS, a core module of the **IMIS**, is designed to manage detailed spatial and attribute data for municipal utilities such as roads, stormwater drains, water supply networks, and sewer systems. UIMS plays a critical role in achieving **CWIS** by enabling municipalities to monitor sanitation infrastructure, identify service gaps, and ensure equitable access to sanitation services, particularly for low-income community (LIC) areas. Through its integration with the **BIMS**, UIMS provides granular insights into utility connectivity for each building, including sewer and drainage links, and water supply access. This integration helps municipalities target underserved areas, plan infrastructure expansions, and prioritize investments in sanitation services.

A key feature of UIMS is its interactive dashboard, which delivers real-time visualizations on sanitation-related utilities. The system empowers municipalities to monitor sanitation coverage trends, identify gaps, and make data-driven decisions to address inequities in service delivery. UIMS also includes advanced map-based input tools integrated with the **UMDSS**, allowing municipalities to add or update utility infrastructure directly within the platform. Currently this tool is available for creating and updating road only. In case of other utilities, they need to be digitized and merged with existing data and import in corresponding utilities database of IMIS with the help of skilled GIS people. In case of attribute data, they can be updated for all kind of utilities directly from the user interface. UMDSS has provided tools to export data in flexible formats, such as CSV, SHP, and KML ensuring seamless sharing and integration with other municipal services.

3. Faecal Sludge Information Management System (FSIMS)

The FSIMS is another core and most important module CWIS. This module enables municipality to digitalize and manage all data related to sanitation systems and services. FSIMS digitalize the complete sanitation service chain from application request for emptying service to the safe disposal of faecal sludge at the treatment plant and the reuse of the treated waste.

The FSIMS is further categorized into five sub-modules:

a. FSM Dashboard (FSMD): The FSMD provides information related FSM services, overall, from containment emptying to transfer and disposal of waste in the FSTP. FSMD provides information about the number of containments; service providers; resources used for service delivery; applications received and responded; containments emptying status, volume of sludge collected, emptied and disposed; and the revenue generated,

b. Containment Information Management System (CIMS): The CIMS maintains the information about the containments in the city, with their location information and attribute information such as building identification number (in case of multiple building served one containment, BIN of main building responsible for taking care of the containment), sanitation system type, dimensions, volume, last emptying date, next emptying date, etc. If a building is connected to a sewer network, that information is maintained in the building database. However, this module does not include a separate feature for adding new containments, if new containment must be added, it has to be updated in corresponding building in building database, through BIMS. A containment may be shared by multiple buildings or vice versa.

c. Service Provider Information Management System (SPIMS): The SPIMS maintains the information related to the sanitation service providers registered with the city that provide emptying services within the city. This information is maintained by municipal authority whereas, two other functionalities employee information and desludging vehicles for service provider to maintain their information about their employees and the desludging vehicles. Only those service providers, employee and vehicles registered in this system are eligible to provide emptying, transporting and disposing faecal sludge in the FSTP or area designated by the municipality. These information help municipality and service provider for efficient management of the resources and efficient service delivery. The information provided by SPIMS also helps monitoring KPIs set by municipality for service provider and tracking emptying vehicle to ensure that the waste emptied from the containment is transported and disposed in the area designated for disposing waste or FSTP allocated by the municipality.

d. Treatment Plant Information Management System (TPIMS): The TPIMS maintains the information related to the treatment plants that could be FSTP, Centralized Wastewater Treatment Plant, Decentralized Waste Water Treatment Plant or Co-treatment Plant, those used by the city to dispose and treat collected faecal sludge or waste water. In addition to this, this sub-module also maintains water sample test data with the standard parameters used for monitoring the performance of the treatment plants in the city.

   The information maintained by TPIMS along the information maintained by BIMS and the ESIMS, helps municipal to monitor the CWIS indicators such as (i) FS treatment capacity as a % of total FS generated from non-sewered connections, (ii) FS treatment capacity as a % of volume disposed at the treatment plant, (iii) WW treatment capacity as a % of total WW generated from sewered connections and greywater and supernatant generated from non-sewered connections, and (iv) Effectiveness of FS treatment in meeting prescribed standards for effluent discharge.

e. Emptying Service Information Management System (ESIMS): The Emptying Service IMS digitalizes the sanitation service chain and enables the city to manage the entire sanitation service chain, starting from application requests for emptying service from the customer to the safe disposal of faecal sludge at the treatment plant. All the activities involved in this process can be monitored in real-time through ESIMS. The module is divided into four categories according to the different stages of the sanitation service chain i.e. application, emptying, sludge collection and feedback. The complete service chain is managed and maintained through the application section; however, the individual sections maintain further detailed information. There are several functional modules under this sub-module:

   § Application – this functional module is accessible to helpdesk and FSTP operator. The helpdesk use it for receiving and maintaining application for customer’s emptying request and collecting and maintain feedback data. FSTP operator use it for updating sludge transferred from the emptied containment and disposed in the FSTP. There is a function to generate report of emptying service under this functional module. Helpdesks generally are the part of the municipality’s sanitation department, emptier are part of the service providers and FSTP operators can be part of the municipality or the private operator as of municipality’s policy.

   § Emptying – there is an easy-to-use native mobile application (android) that allows collection of the emptying information while providing the emptying service, such information can be updated in real-time. The mobile application is used by emptier to collect the information such as emptying start and end time, number of trips, total cost for emptying, and the payment receipt number. Emptying details can be viewed in real-time by help desk and other municipal staff who has access to this module.

   § Sludge collection – FSTP operator in FSTP updates the FS disposal record that includes date, time and volume of waste disposed in the FSTP through the functional module Application through the web app as the waste is transferred and disposed in FSTP. Help desk can view these records in real-time through this functional module.

§ Feedback – this functional module is accessible to the helpdesk, after completing sanitation service chain from emptying to disposal of the waste in the FSTP.

§ Help desks – this functional module is used to create help desk and update their information. Help desk generally are under municipality itself, but the system has capability of managing multiple help desks.

Data maintained by FSIMS along with the building data and LIC data enables CWIS Information Management System to generate CWIS indicators such as (i) IHHL onsite sanitation system that have been desludged, (ii) Collected FS disposed at the treatment plant or designated disposal site, (iii) Low income onsite sanitation systems that have been desludged, (iv) FS collected from LIC that is disposed at treatment plant or designated area, (v) Educational institutions where FS generated is safely transported to TP or safely disposed in situ, (vi) Healthcare facilities where FS generated is safely transported to TP or safely disposed in situ, and (vii) Desludging services completed mechanically or semi-mechanically.

The data export tools under FSIMS allows users to export data in CSV, Shape and KML format where applicable.

4. Community Toilet / Public Toilet Information Management System (PTCTIMS)

The PTCTIMIS is another core module of the system that maintains the information about the Public Toilets (PT) and Community Toilets (CT) in the city. The module enables municipal authority to maintain geographic locations of the PTs and the CTs in the city with their capacities and facilities along with daily user logs in case of PTs. In case of CTs, PTCTIMS maintains the number of households and the population served by CTs, based on the household and population data maintained by building database in the system. Data export feature of the module eanbles users to export data PT/CT data in CSV format. Mapping features of UMDSS with this data enables municipal authorities to map the locations of the PTs/CTs with their operational condition and it has also provided a tool to map the buildings which are served by a specific CT.

CT information along with building information maintained by PTCTIMS helps monitoring four major CWIS indicators (i) Dependent population with access to safe shared facilities, (ii) Shared facilities that adhere to principles of universal design, (iii) Shared facility users who are women, and (iv) Average distance from household to shared facility. Similarly, PT information along with containment emptying data enables municipal authority to monitor CWIS indicators (i) PT where faecal sludge generated is safely transported to treatment plant or safely disposed in situ, (ii) PT that adhere to principles of universal design, and (iii) PT users who are women.

5. Sewer Connection Information Support System (SCISS)

The SCISS is a core module that enables the city to maintain information on new sewer connections established between a building and sewer network within the city. This module provides a native

mobile application (android) that allows the collection of the unique ID of both the building and the corresponding sewer network through a field survey. The collected building ID as well as sewer ID are maintained by this module, and once approved it is reflected in the BIMS, which updates the sanitation system and utility information of the building.

6. Public Health Information Support System (PHISS)

PHISS is another core module of the IMIS, designed to empower municipalities in monitoring and addressing public health and sanitation challenges. PHISS enables the collection and maintenance of water sample data from various sources, including groundwater, surface water, and treated wastewater, to ensure compliance with water contamination standards. This functionality directly aligns with the CWIS objective of monitoring environmental outcomes associated with sanitation systems. Additionally, PHISS records and tracks cases of waterborne diseases across the city, providing municipalities with crucial data to understand and mitigate public health risks.

One of the standout features of PHISS is its ability to maintain spatial and attribute data related to hotspot areas where waterborne diseases, such as diarrhea, cholera, dysentery, and typhoid, have been detected. The system also tracks fatalities linked to these diseases, offering a comprehensive overview of the impact on affected households and populations. By integrating this information with the UDSS municipal authorities can conduct detailed analyses of disease prevalence and its underlying causes. This data-driven approach enables strategic planning, targeted interventions, and efficient allocation of resources to reduce health risks in vulnerable areas.

Water sample data and waterborne cases data maintained by PHISS helps municipality to monitor the CWIS indicators (i) Water contamination compliance of the water sources such as groundwater, surface water and treated wastewater, and (ii) Incidence of faecal-oral pathway diseases (e.g. diarrhea, cholera, dysentery and typhoid). With this information, municipalities can assess the effectiveness of sanitation systems in protecting public health and identify areas requiring urgent attention. By addressing these indicators, PHISS supports municipalities in achieving CWIS objectives, ensuring safe water quality and reducing the prevalence of sanitation-related diseases. The data export tools under PHISS allows users to export data in CSV, Shape and KML format where applicable.

7. Urban Management Decision Support System (UMDSS)

The UMDSS is one of the core and powerful tool in IMIS, it provides advanced capabilities for spatial analysis, mapping, data export, and dashboard visualizations. These tools empower city authorities to engage in evidence-based planning, management, monitoring, and decision-making for planning, management and monitoring and evaluation of sanitation system and services as well as a broader municipal urban management activities. In addition to the UMDSS module, there are IMIS Dashboard, Building Dashboard under BIMS, FSM Dashboard under FSIMS, Utility Dashboard of IMIS, CWISIMS Module including CWIS and KPI dashboard under CWISIMS are also has been considered as the components of UMDSS.

7.1 UMDSS

The UMDSS provides Export Data and Map Feature Sub-modules.

Export Data:

§ The Export Data sub-module enables users to export data layers in flexible formats such as SHP and KML. Users can customize exports by selecting specific ward(s) or combining layers to suit their needs.

Map Feature:

§ The Map Feature is a powerful interactive map interface which provides a dynamic platform to visualize and analyze spatial data created by various modules and sub-modules in IMIS. It displays all spatial information with categorical styling based on attribute inforation, presenting summarized layers at city, ward and 0.5 km grid levels.

§ The interface includes various spatial and complex tools provide both basic and advanced functionalities, catering to a wide range of municipal operations. From navigation and visualization to sanitation-specific analyses and data updates, these features enhance decision-making by offering precise and actionable insights. These tools are – (i) Navigation and Map Interaction Tools (Zoom In & Zoom Out, Municipal Extent, Navigate, Info, Coordinate Information, Locate Point by Coordinate, Measurement Tools, Measure Distance, Measure Area, (ii) Measurement Tools (Measure Distance, Measure Area), (iii) Printing and Support Tools (Print Map, Help), (iii) Sanitation-Specific Analysis Tools (Find Nearest Road, Find Building Connected to Containment, Find Containment Connected to Building, Find Associated Building, (iv) Editing Tools (Add Roads, Remove Markers)

The integration of tools like Find Nearest Road and Containment Analysis directly supports Citywide Inclusive Sanitation (CWIS) goals, while features like Measure Area, Print Map, and Add Roads contribute to broader urban management and planning efforts. By using these tools, municipal authorities can efficiently monitor sanitation systems, plan infrastructure upgrades, and ensure equitable service delivery across the city.

§ UMDSS also offer some specialized tools – (i) Service Delivery Tools for tracking (Applications, Emptied Applications Not Reached to Treatment Plant, Containments Proposed to Be Emptied, Feedback Chart (FSM Service Quality), (ii) General Tools for tracking (Buildings by Structure Type, Property Tax Collection, Water Supply), (iii) Data Export Tools (Filter by Wards, Export Data Set, Building Owner Information), (iv) Decision Tools (Tax Due Buildings, Sewers Potential Buildings, Buildings to Sewer, Buildings to Road, Hard to Reach Buildings, Building Close to Water Bodies, Buildings Using Community Toilets, Area Population), (V) Summary Information Tools (Summary Information Buffer Filter, Water Bodies Buffer Summary Information, Wards Summary Information, Road Buffer Summary Information, Point Buffer Summary Information).

These tools enhance decision-making by providing targeted insights into property, utility, and demographic data. They allow municipalities to analyze specific areas, prioritize interventions, and support efficient planning, management and monitoring and evaluation of CWIS sanitation system and services, and overall urban management.

7.2 CWIS Information Management System (CWISIMS):

CWISIMS is a vital module of the **IMIS** that provides tools to generate CWIS indicators for the city and Key Performance Indicators (KPIs) to monitor the performance of sanitation service providers for a specified year. CWISIMS allows municipalities to set targets for each indicator in alignment with city policies and standards, and it includes a dashboard for the visualization of these indicators. The generated indicator data is maintained in a database, enabling easy access and review when needed, ensuring effective monitoring and planning.

(i) CWIS Dashboard - The CWIS Dashboard tracks 22 sanitation indicators (Annex 1), which are generated annually. These indicators are informed by data maintained across various modules and sub-modules within IMIS, making them integral to understanding citywide sanitation performance. The indicators are based on the CWIS framework developed by Athena Informatics, ensuring consistency with globally recognized standards for inclusive sanitation monitoring. This dashboard provides municipalities with a centralized platform for tracking sanitation progress and assessing the effectiveness of implemented policies and services.

(ii) KPI Dashboard – The KPI Dashboard complements the CWIS Dashboard by focusing on the performance of sanitation service providers. It monitors seven critical KPIs (1.Application Resposne Efficiency, 2. Customer Satisfaction, 3. PPE Compliance, 4. Safe Desludging, 5. Faecal Sludge Collection Ration, 6. Resonse Time, 7. Inclusion), which are also generated annually, using sanitation service data related to faecal sludge management (FSM) service delivery. These KPIs are designed to evaluate the efficiency and quality of services provided by sanitation operators, based on metrics developed by SNV Bangladesh. By leveraging this dashboard, municipalities can benchmark service provider performance and identify areas for operational improvement within their sanitation systems.

CWISIMS, through its dual focus on CWIS indicators and KPIs, provides municipalities with robust tools for monitoring and improving their sanitation systems. By aligning indicator and KPI tracking with international standards and municipal goals, it ensures data-driven decision-making and continuous improvement in sanitation service delivery and management.

7.3 Dashboards

There are all together six Dashboards considerd as the components of UDSS of the IMIS includes six dashboards that serve as its core components: (i) IMIS Dashboard, (ii) Building Dashboard, (iii) FSM Dashboard, (iv) Utility Dashboard, (v) CWIS Dashboard, and (vi) KPI Dashboard. Five of these dashboards have been discussed under their respective functional modules and sub-modules. The remaining dashboard, the IMIS Dashboard, is detailed below.

The IMIS Dashboard serves as the central platform within the IMIS, offering a comprehensive overview of municipal data. It integrates information on building infrastructure, utilities (such as roads, drains, sewer, and water supply), sanitation systems and services, public and community toilets, public health, tax collection, water bill payments, and solid waste management. This dashboard provides municipalities with a unified interface for monitoring and managing citywide operations effectively, supporting informed decision-making and efficient service delivery.

The Urban Management Decision Support System (UMDSS) enables municipalities to implement Citywide Inclusive Sanitation (CWIS) principles, supporting the planning, monitoring, and management of sanitation systems and services through a CWIS-focused approach. It also enhances revenue collection processes, including tax collection, water bill payments, and fees for solid waste management services, while providing actionable spatial insights to improve overall urban management. With its powerful analytical tools, UMDSS empowers municipalities to achieve greater efficiency, transparency, and inclusivity, not only in sanitation management but also in broader urban governance and service delivery.

8. Property Tax Collection Information Support System (PTCISS)

PTCISS is a value-added module integrated into the Integrated Municipal Information System (IMIS), designed to help municipalities monitor and manage property tax collection citywide through powerful map-based visualization tools. It enables city authorities to import property tax data maintained by the municipal property tax collection department into IMIS using a user-friendly data import tool supporting CSV formats. Once the data is integrated, property tax collection information is displayed in graphical formats on the IMIS dashboard and visualized on maps using tools provided by UMDSS. This facilitates quick and intuitive analysis of tax collection status across various parts of the city.

Mapping property tax data provides actionable insights by identifying high-default areas (regions with a significant number of defaulters) and efficient collection zones (areas with fewer defaulters or higher compliance rates). These insights enable the property tax department to focus on areas requiring attention, thereby improving efficiency and compliance. The information generated by PTCISS empowers city authorities to engage in strategic planning and evidence-based decision-making, allowing them to: (a) develop better tax collection strategies, (b) formulate effective policies to increase compliance, and (c) plan for equitable tax management across different city regions.

PTCISS also includes Data Export Tools, enabling municipal authorities to export building data along with their tax payment status. Additionally, it highlights mismatched tax records between the building data maintained in IMIS and the input tax data provided by the property tax department. This functionality helps identify and resolve discrepancies, ensuring data accuracy and transparency.

Currently, PTCISS relies on periodic manual updates using CSV-based imports to maintain data accuracy. However, the system is designed to be future-ready, with the capability to support real-time data integration through an API if the city's property tax collection system provides connectivity access. This upgrade would enable automated and efficient data synchronization as municipal technology evolves.

By leveraging the features and insights provided by PTCISS, municipalities can streamline property tax management, improve transparency, and enhance revenue collection efficiency. These improvements contribute significantly to better urban governance and equitable service delivery.

9. Solid Waste Information Support System (SWISS)

The SWISS that enhances the management of solid waste services and fee collection. The module includes a tool for importing a municipality's solid waste customer data, including their last solid waste management service fee payment date, in CSV format. Based on this imported data, the SWISS module generates and maintains solid waste management customer records in IMIS, along with their fee payment status. It also provides tools to export building data with their solid waste service fee payment status and identifies discrepancies by highlighting records that exist in the municipality's solid waste customer database but are missing from IMIS.

Using the imported data, UMDSS in IMIS helps municipal authorities map buildings with or without solid waste management services and their respective fee payment statuses. This mapping capability enables municipalities to monitor service coverage, assess the status of fee collections, and identify geographic trends in solid waste management service delivery. By integrating solid waste management customer data with building records in IMIS, the SWISS module equips municipal authorities with actionable insights to make informed decisions regarding solid waste services.

The visualized data provided by SWISS supports municipalities in formulating policies to enhance the solid waste management service and fee collection processes. It also aids in optimizing resource allocation and improving overall service delivery by identifying areas requiring attention or adjustments. This integration is currently carried out manually on a periodic basis to ensure the data in IMIS remains up-to-date. Like the PTCISS module, SWISS does not yet support real-time data integration through an API.

10. Water Supply Information Support System (WSISS)

The WSISS is another value-added module within the **IMIS**, designed to enhance the management of water supply services and fee collection. The WSISS includes a data importing tool that allows municipalities to upload water supply customer data, including their last fee payment date, in CSV format. Based on this imported data, the WSISS module generates and maintains records of water supply customers along with their fee payment status. It also provides tools to export building data with their water supply service and fee payment statuses and highlights discrepancies by identifying records present in the municipality’s water supply customer database but missing in IMIS.

Using the imported data, the UMDSS in IMIS enables municipal authorities to visualize the water supply fee payment status of buildings in maps of the City within IMIS. This capability allows municipalities to monitor fee collection statuses and assess geographic trends in water supply fee payments. By integrating water supply customer data with building information in IMIS, the WSISS module equips municipal authorities with actionable insights to make informed decisions regarding water supply services.

The visualized data provided by WSISS supports the development of policies aimed at improving water supply fee collection processes, optimizing resource allocation, and enhancing overall service delivery. This integration helps municipalities target areas requiring attention, ensuring more effective and equitable water supply service management.

Currently, as with the PTCISS and SWISS modules, the integration of data into WSISS must be carried out manually on a periodic basis to maintain accuracy.

11. Settings

This is a module to allows administrators to manage user access and control permissions within the system. Features includes :

User Credentials - **s**ecurely store and manage user authentication details, including usernames, passwords options.

Roles Management- Create and assign roles to users, defining their access level and responsibilities. Roles can be customized to reflect specific job functions.

Permissions Control - fine-tune access by assigning permissions to roles or individuals, ensuring users can only interact with data and features relevant to their role.

Annex 1

CWIS Indicators Used in IMIS (Ref. Athena Informatics)

SN	Indicator	Code
1	% of LIC population with access to safe individual toilets / % of total population with access to safe individual toilets	
2	% of Population with access to safe individual toilets	SF-1a
3	IHHL OSSs that have been desludged	SF-1b
4	Collected FS disposed at treatment plant or designated disposal site	SF-1c
5	FS treatment capacity as a % of total FS generated from non-sewered connections	SF-1d
6	FS treatment capacity as a % of volume disposed at the treatment plant	SF-1e
7	WW treatment capacity as a % of total WW generated from sewered connections and greywater and supernatant generated from non-sewered connections	SF-1f
8	Effectiveness of FS treatment in meeting prescribed standards for effluent discharge and biosolids disposal	SF-1g
9	Low-income community (LIC) population with access to safe individual toilets	SF-2a
10	LIC OSSs that have been desludged	SF-2b
11	FS collected from LIC that is disposed at treatment plant or designated disposal site	SF-2c
12	Dependent population (without IHHL) with access to safe shared facilities	SF-3a

13	Shared facilities that adhere to principles of universal design	SF-3b
14	Shared facility users who are women	SF-3c
15	Average distance from HH to shared facility (m)	SF-3e
16	PT where FS generated is safely transported to TP or safely disposed in situ	SF-4a
17	PT that adheres to principles of universal design	SF-4b
18	PT users who are women	SF-4d
19	Educational institutions where FS generated is safely transported to TP \nor safely disposed in situ	SF-5
20	Healthcare facilities where FS generated is safely transported to TP or safely disposed in situ	SF-6
21	Desludging services completed mechanically or semi-mechanically	SF-7
22	% of water contamination compliance (on faecal coliform)	SF-9