BROCHURE

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Digitalising urban services: IMIS in Bangladesh

IMIS is a digital management tool that enables cities to plan and monitor the professional delivery of urban services. The system maintains big data and helps strengthen governance and accountability mechanisms, at local and national levels.

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About IMIS

IMIS is a GIS-based tool that digitalises municipal service systems behind investment planning and the management of urban service delivery. The system generates real-time, evidence-based big data that enhances the responsiveness of municipal services and their accountability to city dwellers. IMIS in Bangladesh is operational in two City Corporations and two Paurashavas and is currently in expansion.

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Cover Photo: Ms Ummay Joaiyra Rafin, FSM IT Assistant of Jashore's FSM unit, is collecting containment and building information through IMIS mobile application. (@SNV in Bangladesh/Sardar Lutful Kabir)

Photos: @SNV in Bangladesh

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1. Introduction

IMIS is a digital management tool that enables cities to plan and monitor the professional delivery of urban services. The system maintains big data and helps strengthen governance and accountability mechanisms, at local and national levels.

The Integrated Municipal Information System (IMIS) is an important innovation that supports the Government of Bangladesh's vision to create smart cities. IMIS was conceptualised by SNV Netherlands Development Organisation to professionalise Faecal Sludge Management (FSM) services and realise more sustainable urban water cycles. Today, IMIS is expanding its scope beyond FSM, at the request of city governments and utility companies.

IMIS anchors all data and service information on taxpayers' holding code (municipal tax code) to facilitate the integration of multiple data and service streams. By applying the concept of a 'One ID for all services,' IMIS is a powerful digital tool with the possibility for exponential growth.

Figure 1: Concept of a 'One ID for all services'

The digital tool assists city governments to deliver more effective and efficient urban services. IMIS offers the following:

- **Improves quality of data for services provision.** IMIS provides GIS-based data giving the exact spatial location, building footprint, infrastructure, and coverage area for servicing, e.g., water supply, faecal sludge management, building permission, holding assessment, etc.

- **Departs from the use of paper and excel-based databases.** IMIS digitises data, protecting and storing information in the cloud. It facilitates transparency in data collection and entry and sets user permission levels to ensure proper management.

- **Eradicates possibilities of data duplication.** IMIS centralises big data in one system, linking all types of municipal services to taxpayers' holding code.

- **Collects real-time data.** IMIS is complemented by a MobileApp, activating the partnership of service providers in real-time data collection.

- **Strengthens government accountability.** IMIS generates transparent and evidence-based Key Performance Indicators to better monitor services and report these to citizens, local and national governments.

2. IMIS functions

IMIS has three key functions for services provisioning and governance: reporting and monitoring, managing, and planning and decision-making.

Reporting and monitoring

Frequent use of IMIS by an administrator or service provider makes data more accurate and reliable. While services are being delivered, the administrator is able to monitor service delivery remotely. A service provider, on the other hand, collects real-time data as part of their service. Both activities do not only ensure that reports to authorities/employers reflect the actual reality in (serviced) areas, but these also facilitate greater transparency to assess, for example, performance-based contracts.

Figure 2: Reporting dashboard

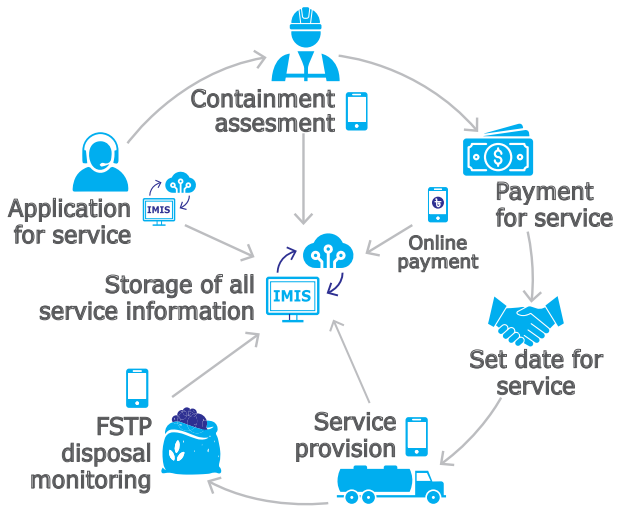

Figure 3: Managing the services

Figure 4: Planning and decision-making

Within the IMIS tool, each service stream (e.g., faecal sludge management, water supply, building approval, holding assessment, etc.) is assigned their own dashboard. Every dashboard has their own data set, Key Performance Indicators and specific targets, and the functionality to generate graph reports.

Data in the dashboard supports the national government's commitment to data transparency for accountability by providing evidence-based data and trends relevant for Annual Performance Agreement (APA) reports to the government.

Managing services

The management of services is digitalised into IMIS, reducing time spending, and realising monetary savings. More efficient and transparent practice leads to faster and more accurate information for service delivery and investments. In turn, customer services and experience improve.

The digital transformation extends to the generation of digital service reports and data forms. IMIS is linked to complementary technologies that allow data collection through mobile applications, online payments through existing commerce gateways, the generation of bills with digital signatures, and publicly accessible forms for application and customer feedback, among others.

Planning and decision-making

Evidence- and spatial-based data are reliable information that give decision-makers an accurate and convincing picture about facts on the ground. The potential expansion or improvement of services can be informed by service coverage and other trends. Key decisions on future investments in infrastructure rely heavily on appropriate data.

IMIS offers a basic set of tools for spatial analysis such as buffer tools, which help users determine potential areas for water logging and their impact on sanitation facilities. Using filters by attribute could provide users with data that visualises high service demand or low coverage to inform responses or corrective actions to take. All data can be exported to Excel or Shapefile for deeper analysis in other software.

Photo 1: Faecal sludge emptying service in Jashore

3. IMIS modules: a deep dive

IMIS is customisable. It can be tailored to the needs of local government and utility or service provider and based on available resources and willingness to digitalise. IMIS comprises several modules, with the possibility to select modules from the growing list below.

Building module

GIS-based physical footprint of all buildings in IMIS are made possible by the building module. Each building outline within the module is assigned a unique identifier called the Building Identification Number (BIN). All databases are linked to a BIN. Whenever a new building is constructed or upgraded, with permission, the specific BIN is updated with new information by the user.

Photo 2: Building data collection in Benapole

Holding module

A non-GIS-based holding module contains municipal taxpayers' holding code with related information, e.g., valuation and tax amount of a building. This module enables the municipalities to conduct holding assessments (valuation), generate quarterly bills for holding taxes, and manage bill payments using online gateways.

Photo 3: Uploading applications on IMIS in Khulna

FSM module

The FSM module systematises information related to faecal sludge management services, including location and type of containments (septic tanks and pit latrines), date of construction, date of last (and frequency) of emptying, vehicle size to use for service delivery, and presence of disposal or re-use facilities. Also available as a MobileApp, the module strengthens service providers' contributions to service expansion, customer experience, and accountability. The module contains several digital forms, which are completed by the service provider and, where necessary, with the customer or the treatment plant caretaker.

Water supply module

The water supply module supports users in locating water meters, generating monthly bills, managing payments, and/or managing applications for new connections. It is currently in development for Khulna Water Supply and Sewerage Authority (Khulna WASA).

Photo 4: Collecting data of the water meter of KWASA

ViewMap

The map facilitates IMIS' capacity to visualise datasets in one screen, which could include (available) information on roads, drains, waterbodies, and administrative boundaries. In ViewMap, users can access detailed information of buildings, containments, and others by clicking on the Info Box. A Tools module

At a glance: FSM services information collected*

Application form: Customer information such as holding ID and location of containment and building.

Assessment form: Technical information on emptying requirements, estimated costs, and service plan.

Emptying form: On-the-job reporting by service provider on amount of sludge collected, time and date service was delivered, total cost, etc.

Disposal form: On-the-job reporting by service provider, completed with treatment plant caretaker, to confirm safe disposal of sludge.

**Every month, service providers generate monthly reports for submission to their employer (municipality or private).*

is integrated in the ViewMap which gives users access to basic analytical tools, e.g., Filtering, Find, Buffering, or Summarise information.

Additional functionalities

Additional functionalities are being developed for IMIS to optimise the system and facilitate its connectivity with other digital systems.

Online payments module to better streamline the IMIS with various national payment gateways. In Bangladesh, IMIS is collaborating with ekpay[1], a payment service from the government.

Interconnect local database to strengthen coordination among different responsible authorities. To illustrate, the upcoming Khulna WASA IMIS platform will be linked up with Khulna city's IMIS to facilitate the sharing of non-sensitive information and improve their respective service delivery. Further, linking up IMIS with existing holding databases (MGSP project by LGED) of some municipalities (as in the case of Kushtia) could help to keep holding lists for FSM services or water supply bills up to date, while providing spatial- based analysis to the external systems.

Link to external databases to align with (and not replace) existing systems and make shared access across different datasets possible. For example, integration with the Health Ministry's databases, e.g., DHIS2 (District Health Information Software v2) may offer important information in the cross-monitor disease spread, outbreaks, and/or pandemics.

[1] EkPay is Bangladesh's largest leading payment processor that offers comprehensive bill payment services for customers and merchants. This is an initiative, taken by Aspire to Innovate (a2i), for establishing a centralized e-Payment System or a P2G (People to Government) platform. For more information: https://ekpay.gov.bd

4. IMIS setup

Earlier investments into IMIS software development ensured the readiness of the digital tool to scale[2]. Today, replication of IMIS is far easier and cheaper.

IMIS is designed to run on a common source code, with a multi-tenant structure.

For each new city that adopts the IMIS tool, the most work required is in the migration of specific datasets. Because of IMIS' design, any upgradation to the source code leads to the automatic update of all platforms, all at once.

IMIS setup takes anywhere between six to nine months, in five steps (Figure 5).

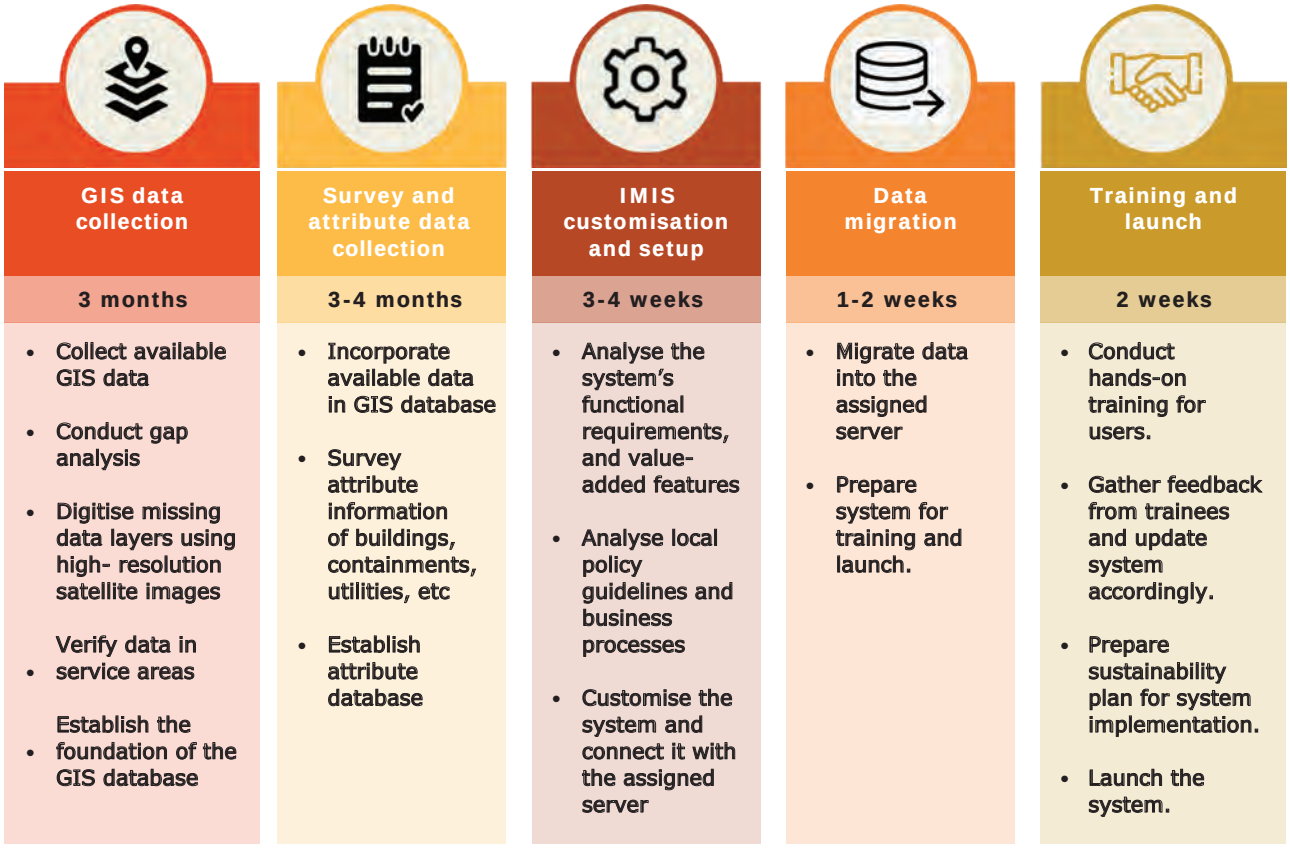

Figure 5: Five steps of IMIS setup
(Source: Innovative Solutions Ltd.)

GIS data collection

Available GIS data in a specific area will determine the level of effort and time required to replicate the system. In many cities in Bangladesh, GIS data of roads, buildings, and administrative boundaries are already available.

However, data is often outdated or missing key information. If quality of existing data is poor, the purchase of high-resolution satellite images (estimated at USD 22 per km^2) and their digitisation (estimated at USD 100 to 150 per 1,000 buildings) will be required.

[2] The IMIS tool was created to digitise rich FSM data collected for the Bill & Melinda Gates-funded SNV project, *Demonstration of pro-poor market-based solutions for faecal sludge management in urban centers of Southern Bangladesh*. Prior to data collection, a non-GIS based system, i.e., customer database, was in use. Since then, the scope of IMIS expanded to incorporate service data of other municipality services.

Photo 5: Containment data collection in Kushtia

Photo 6: Containment data collection in Benapole

Survey and attribute data creation

In Bangladesh, SNV used the Input/Mergin application from Lutra Consulting for initial and massive GIS-based data collection. On-site collection of data, e.g., holding identification, location and type of sanitation and water supply facilities, and structure of households may be required to update or complete data elements. During this step, only indispensable data is collected to prevent resource and time wastage. Day-to-day use of IMIS will keep information up to date.

Customisation and setup

The IMIS platform and system is setup based on an institution's needs and requirements, e.g., the municipality's or water utility's. Several IMIS modules are available for adaptation, and new services (and datasets) may be added incrementally.

Data migration

Before data migration commences, it is critical to have a proper data structure in place. As all platforms share a common source code and data structure, the encoding of GIS and non-GIS data, and their attributes into the IMIS tool should be a straightforward process.

Training and launch

It is important to schedule in moments of training close to the system's launch to enable newly trained users to immediately put new learning in practice and sustain their interest. A set of user manuals for WebApp and MobileApp use are available in English and will soon be available in Bangla. The manuals may be adjusted as further enhancements are introduced.

5. IMIS technical information

Initial software development of IMIS was supported by Innovative Solutions Pvt. Ltd., based in Nepal. In 2020, knowledge and systems were transferred to Streams Tech Ltd. in Bangladesh, which is furthering IMIS system development, maintenance, and expansion.

Photo 7: FSM manager of AID Foundation is assessing the fee, number of trips, etc. while providing service to an applicant in Jhenaidah

IMIS runs on open-source software (PostgreSQL database to store GIS layers; GeoServer to render open maps) and PHP's framework Laravel for MobileApp. The system uses three server instances to separate the web, the database, and map functionalities.

IMIS, which is temporarily hosted in a development cloud server, is aimed to be transferred to the ICT Division of the Government of Bangladesh for complete management.

6. IMIS accessibility and data protection

IMIS is user-friendly and does not require GIS nor IT expertise. Apart from remote IT support for maintenance and further development, any person with basic computer skills can work on IMIS provided that they have the appropriate authorisation. Because the digital tool centralises all information about city services and contains sensitive data of individuals, data protection is paramount. Access to information must be handled with great confidentiality.

Not all IMIS users have access to the same information. Each user is assigned a permission level that corresponds to their function and role in service execution. For example, service providers are able to see customers' building and holding information, but they do not have authorisation to add/edit/export/delete data. Or, holding tax bill generation can only be done and signed off by a revenue chief, not by revenue collectors.

Moreover, the hosting server of IMIS contains a security certificate (SSL) to prevent unauthorised access.

7. IMIS in expansion

IMIS is operational in three municipalities in Bangladesh: Jhenaidah, Khulna, and Jashore; and is under development in two more municipalities: Kushtia and Benapole; two more city corporations: Gazipur and Mymensingh[3], and one water utility: Khulna Water Supply and Sewerage Authority (KWASA). Together, these municipalities service more than three million people.

[3] *NGO Forum* has been supporting Mymensingh City Corporation for FSM since 2018 and now implementing the IMIS tool, with technical support from SNV, for improved and sustainable intervention.

IMIS in Bangaldesh

3 City Corporations
KHULNA
GAZIPUR
MYMENSINGH

4 Municipalities
JASHORE
BENAPOLE
JHENAIDAH
KUSHTIA

1 Water Supply and Sewerage Authority (WASA)
KHULNA WASA

Launched and in use

	KHULNA	JASHORE	JHENAIDAH
Buildings	156,052	43,358	27,047
Containments	67,330	5,200*	20,016
FSM service	✓	✓	✓
Holding Tax	✓	✓ Currently manually linked	✓ Currently manually linked
Launching	Oct 2021	Sep 2021	Jan 2021

*Only in Ward 5

Under development

	KWASA
Water connections	798 (Ward 22)
Features	Water supply

	GAZIPUR	MYMENSINGH	KUSHTIA	BENAPOLE
Buildings	149,146 (Zone 1 & 4)	11,319 (ward:9, 10, 11, 18 & 19)	65,181	12,716
Containments	90,639 (Zone 1&4)	Survey is yet to start	35,407	9,210
Features	FSM service; Hold. Tax, Water supply, Sewer system — In future	FSM service	FSM service	FSM service

IMIS:
Making Cities
Integrated.
Inclusive.
Ingenious.

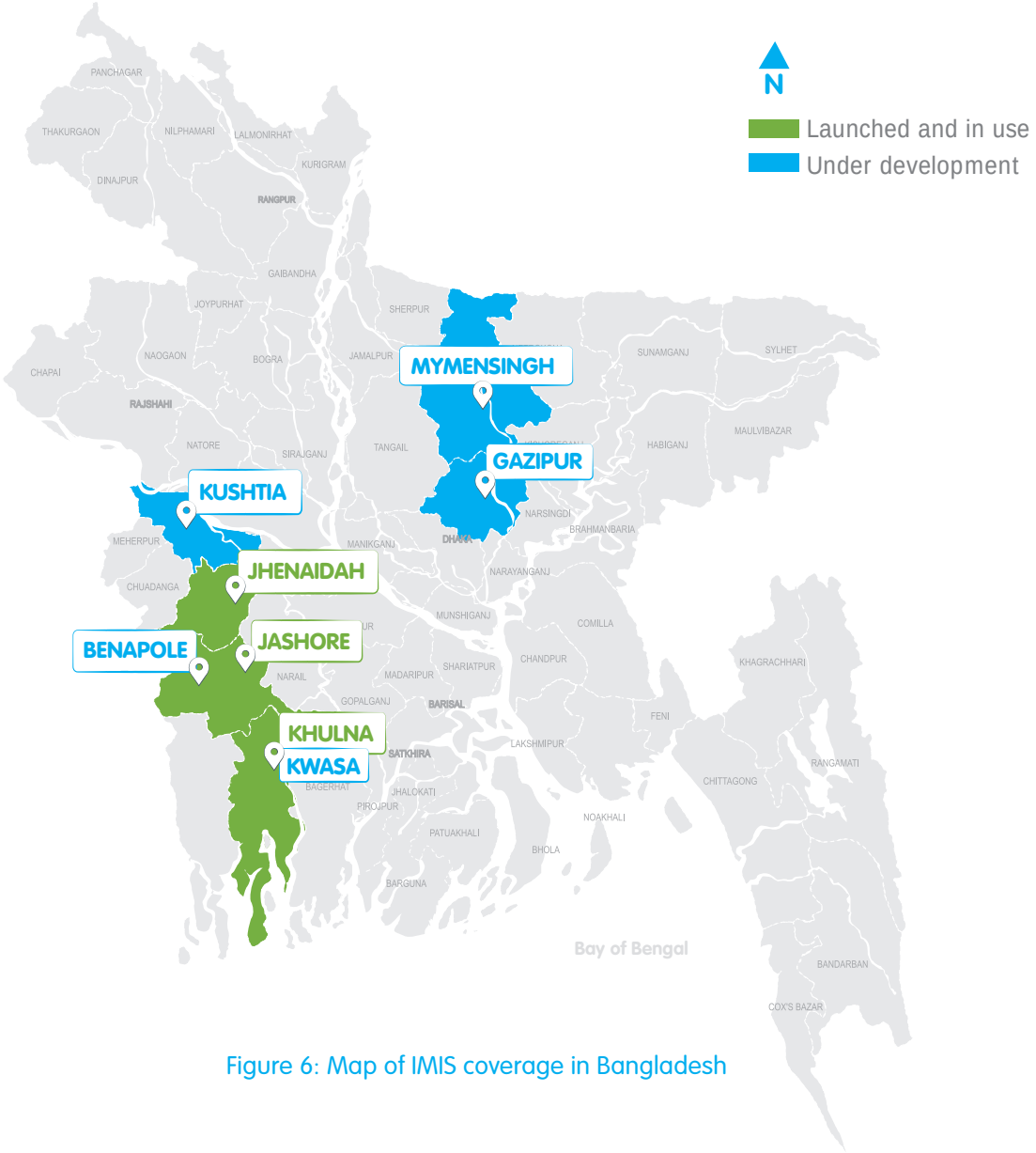

Figure 6: Map of IMIS coverage in Bangladesh

8. Conclusion

There are many advantages for city governments in Bangladesh to adopt IMIS.

GIS-based data, access to more comprehensive data attributes, and proper data entry are instrumental for evidence-based decision making; especially in the context of competing urban service demands and limited resources. When decision-makers have access to up to date and accurate data, trends, and analyses, they gain insight into key development priorities to achieve more equitable and sustainable societies.

At the level of actual services management, when information is based on real-time (monitoring) data, the services delivered become more responsive to needs. Service provider data collection does not only further professionalise their services, as well, ensures that appropriate maintenance data is gathered to prevent costlier repairs and service breakdowns. Customer service and experience improves. Municipality care for its residents become more apparent.

Working with IMIS encourages cross-departmental sharing of information as data is no longer deconcentrated and duplication is redressed.

9. Recommendations

To ensure that IMIS delivers to its promise to help strengthen governance and accountability mechanisms, at local and national levels, some steps to consider going forward are outlined below.

Standardise codification system of holding IDs. Many City Corporations and Paurashavas do not share the same codification system making it challenging to align data entry. Moreover, it is not unlikely for residents of different wards within a city to share the same holding ID number. Fortunately, a standard Taxpayers' Code nomenclator is being promoted by the Local Government Engineering Department (LGED), which combines the Ward and the Tax Zone (also known as Road ID). The Tax Code suggests XX-XXX-XXXX-XX (i.e., Ward-Zone-Holding-Extension) as the nomenclator sequence to follow, which is the key identifier for all municipal services.

Create IMIS promoters at the highest level of authority. Digitalisation requires leadership from municipal authorities. The introduction of new systems disrupts earlier behaviour and practice, which could lead to staff reticence. It is imperative for the highest authorities to lead in early staff orientation and socialisation processes of IMIS. As well, it is highly recommended for IMIS promoters to plan in a time-bound transition process between paper-less and digitalised processes, allowing these systems to coexist for a limited time.

Enforce digitalisation. Introduce work procedures that systematically encourages use of IMIS. For example, consider IMIS as the sole source of municipalities' or service providers' monthly performance reports. To monitor service completion, add in a step that requires a treatment plant's caretaker to affix their signature into the IMIS system, confirming that sludge has been safely disposed.

Use It! Practice persistence. IMIS is designed to become smarter as it receives new information. Practising persistence means overcoming the barriers to IMIS' full adoption and learning how to grow with the digital tool. The more a user engages with IMIS, the quicker it will be for them to adapt to and engage with new datasets entered into the database.

Plan for and view the IMIS as a system in continuous evolution. IMIS is growing and evolving every day, based on user demand and feedback. This requires an emphatic and supportive local team to train and mentor users, as well as flexible IT developers to adapt and improve the system. For this purpose, refresher trainings for users, particularly when new modules are developed or upgraded, are integral in maintaining the proper functioning of the system.

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