

TA 6846- TAJ : SUPPORT TO O&M AND FINANCIAL SUSTAINABILITY OF WATER RESOURCES INFRASTRUCTURE

INTRODUCTION TO THE ASSET AND FINANCIAL MANAGEMENT SYSTEM (AFMS) IN YOVON IRRIGATION SCHEME (VAKHSH BASIN) DIGITAL TRANSFORMATION IN THE IRRIGATION SECTOR



27 MARCH 2024

AGENDA

1. Introduction to “Asset and Financial Management System” (AFMS)
2. AFMS Technology options for Yovon Irrigation Scheme at ALRI (*Vakhsh River basin*)
3. Proposed Architecture and Technology for the AFMS
4. Functional Aspects of the Yovon AFMS
5. Innovative techniques for irrigation asset management & maintenance (Digital Transformation)

FOCUS & SCOPE

Technology and Innovation: this webinar aims to highlight adopting innovative irrigation infrastructure maintenance technologies.

➔ **Digital Transformation of Asset Management:** process of using digital technologies to create new - or modify existing — business processes, cultures, and user experiences to meet changing business and market requirements.

OPTIONS FOR THE TECHNOLOGICAL STACK

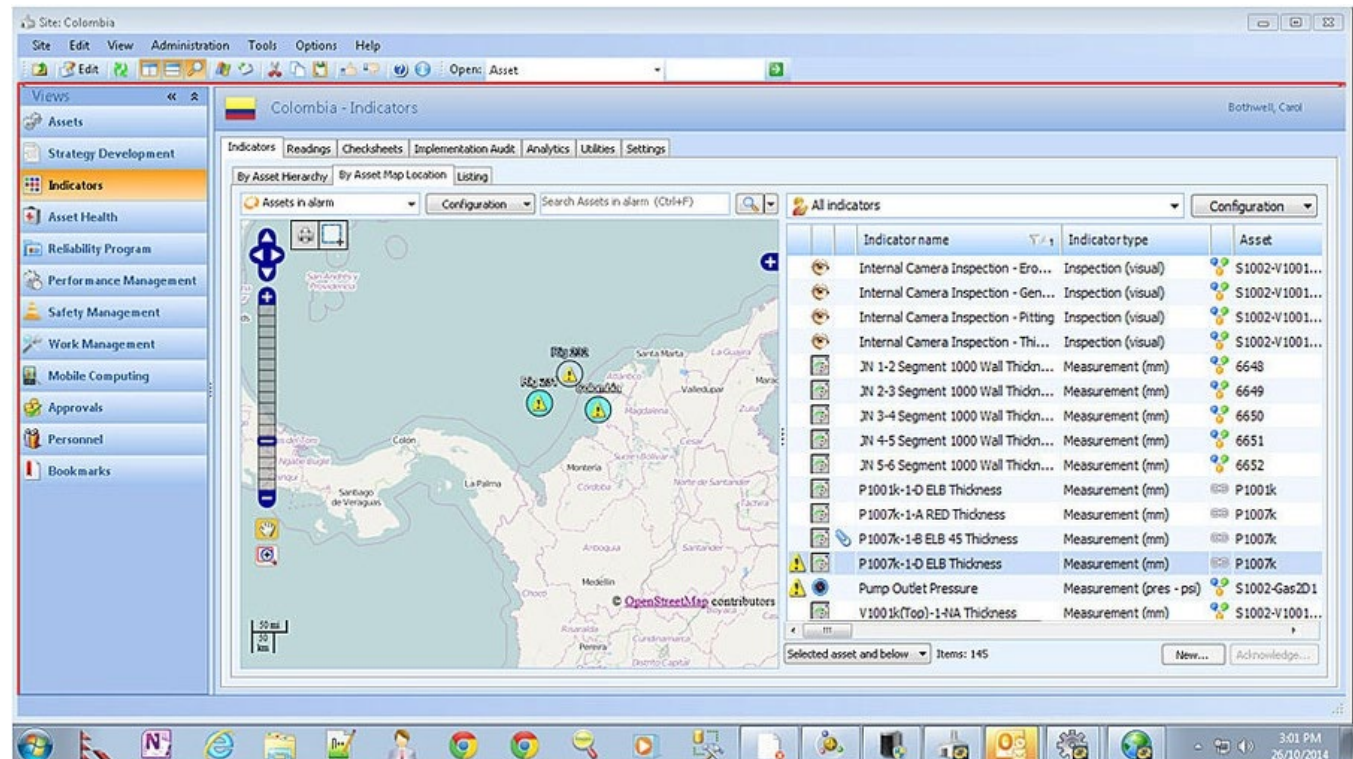
What technology can be used for the AFMS software:

1. Existing off-the-shelf (OTS) software (commercial or open source)
2. **Bespoke web-based application (running in web browser)**
3. Enterprise Resource Planning (ERP)
4. **Desktop software integration**

Should aim at “Asset Management” according to international best practices and Standards ISO 55000 providing guidelines and requirements for the implementation of asset management systems, complying with relevant legal and regulatory requirements.

AFMS-OPTION 1: OFF-THE-SHELF (OPEN-SOURCE OR COMMERCIAL)

1. Rubicon Water (<https://rubiconwater.com/>) FarmConnect etc..
2. SAMS4i (IWMI/CGIAR) (<https://samsv2.iwmi.org/>)
3. Snipe-IT – IT asset management cloud software (<https://snipeitapp.com/>)
4. Bentley AssetWise
5.



AFMS - OPTION 2: BESPOKE WEB-APPLICATION

The screenshot displays the ePAKSI web application interface. The top navigation bar includes the ePAKSI logo, a hamburger menu, and a user profile for 'administrator'. The left sidebar contains a 'MENU' section with options: Dashboard, Daerah Irigasi, Subsistem, Laporan Masyarakat, and Peta. Below the menu is a 'REFERENSI' section with options: Propinsi, Kabupaten, Aset, Aset Field (PAI), and Aset Field (IKSI).

The main content area shows the 'Table Daerah Irigasi' for 'D.I. Lamasi (00060003)'. It features a table with columns for 'SKEMA', 'SIEDI', 'SIEDI 2', and 'IKSI'. Below the table, summary statistics are displayed:

Daerah Irigasi	: D.I. Lamasi (00060003) / 11506 Ha	Jumlah Aset (PAI)	: 150 Saluran / 363 Bangunan
Kewenangan	: BALAI BESAR WILAYAH SUNGAI POMPENGAN-JENEBERANG	Jumlah Sub Sistem	: 0 Sub Sistem

The central part of the interface is a map showing the irrigation network. The map is overlaid with a red line representing the irrigation system, with numerous purple icons indicating specific assets or structures. A blue location pin marks 'Pasar Sentral Lamasi'. The map includes standard navigation controls like zoom in (+), zoom out (-), and a full-screen button. The Leaflet logo is visible in the bottom right corner of the map area.

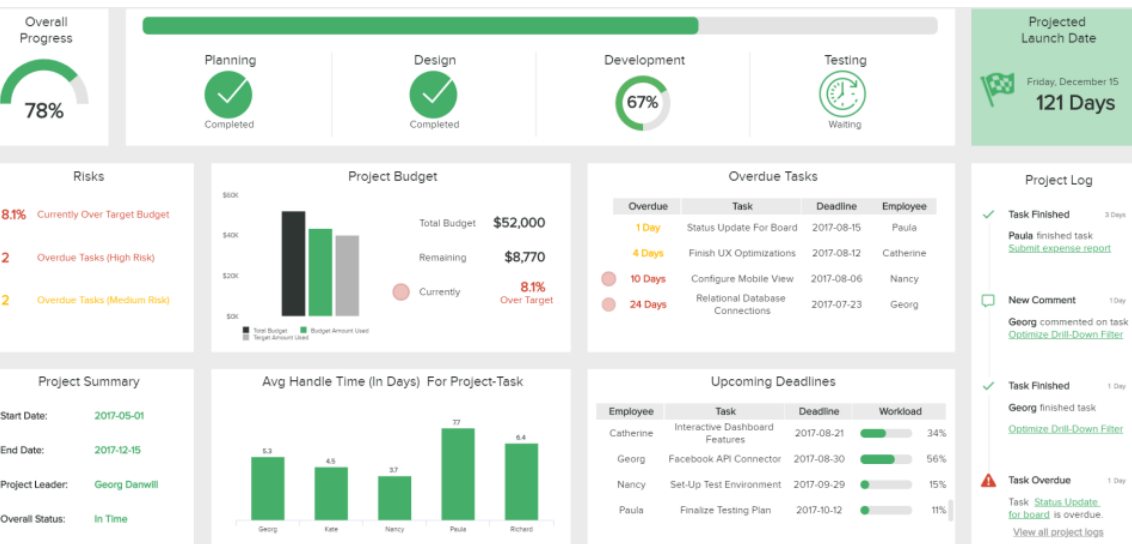
- Examples: ePAKSI

AFMS-OPTION 3: ENTERPRISE RESOURCE PLANNING (ERP)



Examples: SAP, Oracle, IBM

AFMS-OPTION 4: SOFTWARE COMPONENT INTEGRATION



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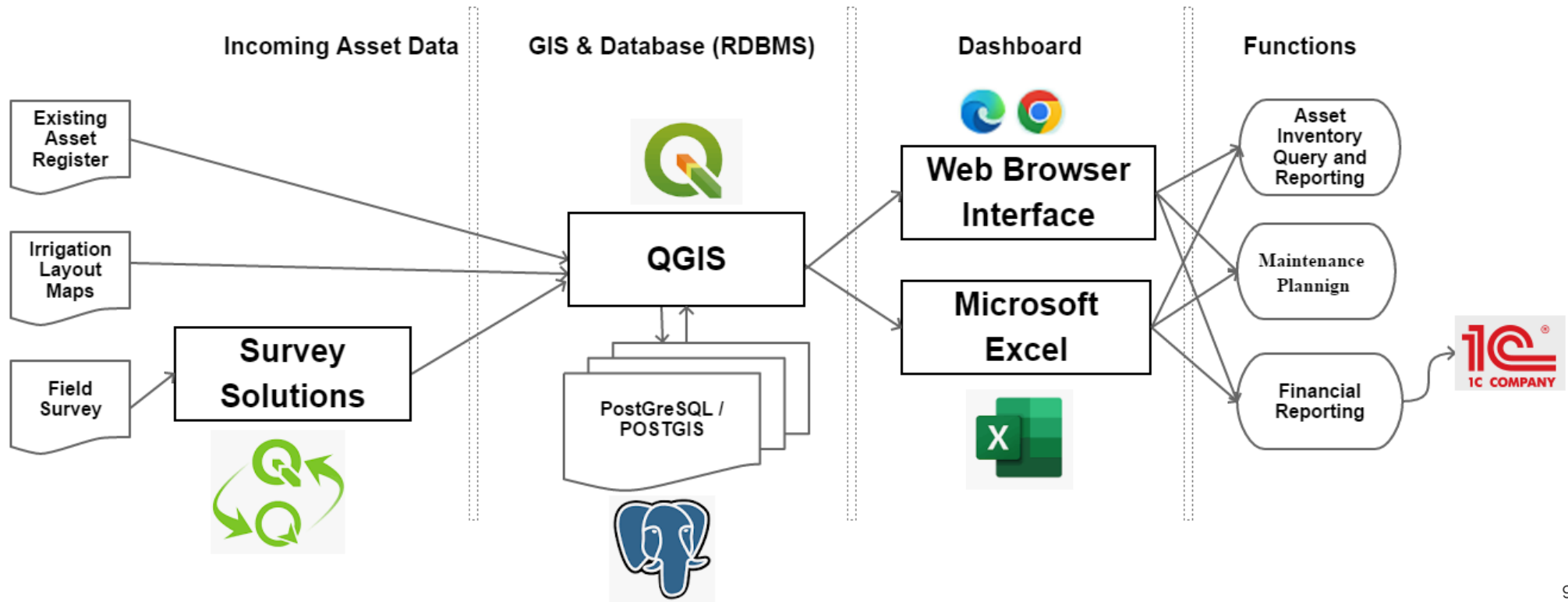
Specific existing applications
Desktop Software

Dashboard with Tabular Data in web interface

PROPOSED TECHNOLOGY ARCHITECTURE

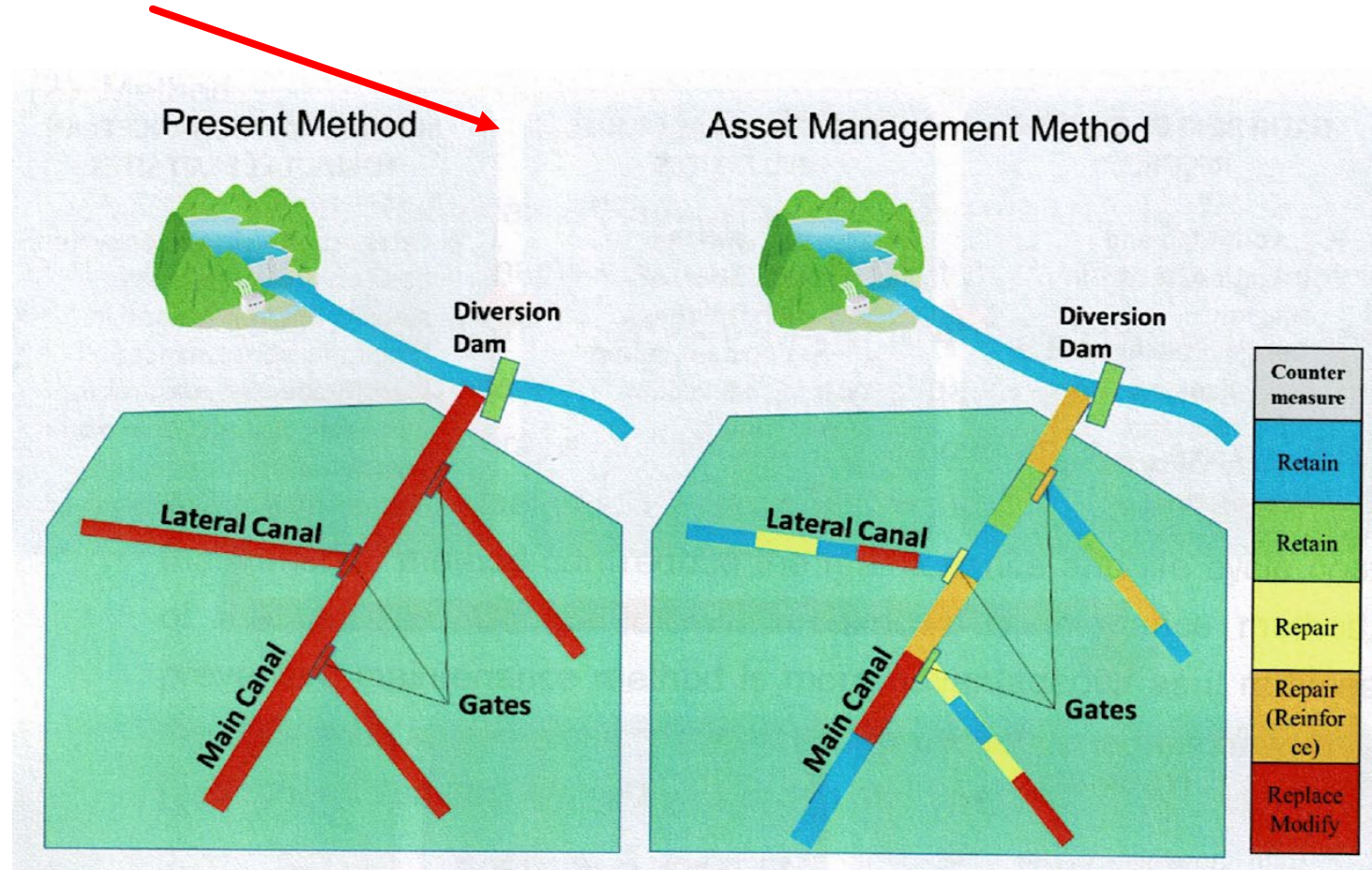
AFMS envisaged by the TA has the following components:

- a database to store asset technical details and financial information,
- a desktop GIS to store and manage the spatial information,
- an desktop accounting/financial package for budgeting, forecasting and financial reporting, and
- an interfacing facility or dashboard for data conversion and data transfer



YOVON AFMS FUNCTIONALITIES

1. Asset inventory (asset register)
2. Asset lifecycle management with asset maintenance; and
3. Asset Financial management



YOVON AFMS: MAIN FINANCIAL MANAGEMENT FUNCTIONS

1. Financial management of asset full life cycle under the Asset Register and Inventory functionality (acquisition – depreciation - maintenance and repairs - replacement or disposal)
2. Budgeting for Operations and Maintenance (O&M):
 - Develop annual maintenance and operations budgets for irrigation assets.
 - Forecast and allocate funds for routine maintenance, repairs, and operational expenses.
 - Track and analyze actual maintenance costs against budgets.
3. Billing and Revenue Management: Manage billing and revenue collection for irrigation water supply services
4. Financial Reporting and Analysis: Generate financial reports for irrigation assets, such as income statements, balance sheets, and cash flow statements.
5. Integration with Accounting Systems enable data exchange and synchronization for streamlined financial processes with existing desktop software (1C or other).

DIGITAL TRANSFORMATION

INNOVATIVE TECHNIQUES FOR IRRIGATION ASSET MANAGEMENT & MAINTENANCE

1. Innovations in Data Collection & Data analysis
 2. Innovative Applications and Decision Making
- *Not particular applicable in Yovon at the moment*

1. DATA COLLECTION AND ANALYSIS

Examples of big spatial data as support for asset management:

- **Aerial Imaging, Drone Technology and Satellite Technology :**
 - Provide valuable insights into crop health, soil moisture, and water stress.
 - capture high-resolution aerial data to assess asset condition and assist in defining irrigation needs.
Identification of irrigation inefficiencies

- **Satellite-linked Asset Sensors Network:** Field gate, pumping stations, canal level, flow regulators and pipeline pressure instruments feeding real-time telemetry help remote monitoring, control automation and predictive maintenance.

- **Soil Moisture Sensors and Probes:** measure the water content in the soil, providing real-time information for irrigation decisions.
 - Avoidance of over-irrigation and waterlogging.
 - Improved water use efficiency and resource conservation.
 - Customized irrigation based on specific soil conditions.

2. APPLICATIONS FOR DECISION MAKING

Advanced data analytics and decision support systems analyze these large datasets to provide actionable insights for irrigation asset management.

- **Artificial Intelligence (AI) and Machine Learning (ML) Applications:** applying machine learning algorithms to analyze the collected data from various sources.
 - Predictive maintenance: can identify patterns, anomalies, and predict potential failures or maintenance needs for pumps, valves, pipelines etc. before problems occur, optimizes maintenance schedules. (applications mainly provided by specialized Service Providers)

- **Community-Based Geographic Information System (GIS):** to ensure sustainable operation and maintenance of irrigation assets.
 - Selected users capture and update crop and farmland data, asset condition monitoring
 - Maps of rehabilitated canal networks, structures, and field irrigation channels.
 - Accurate information helps farmers adapt their practices, optimizing water allocation.

- **Digital Twin Platforms:** GIS overlays with flow simulation models, project drawings, past upkeep data, manuals and specifications for every facet of infrastructure. Creates dynamic digital profiles with immersive visualization of the current and simulated future state.

CHALLENGES AND CONSIDERATIONS:

- **Technology adoption costs:** Implementing these technologies often requires initial investments, which may be challenging for some irrigation districts or individual farmers. Addressing this through financial assistance programs is often required.
- **Data security and privacy:** Implementing robust data security measures is essential to protect sensitive data collected from sensors and water customers.
- **Capacity building and training:** Equipping irrigation managers and personnel with the skills necessary to operate and utilize these technologies effectively is crucial.

CONCLUSIONS

- Various IT technology options are available for performant AFMS systems: technology is not the limiting factor
- Data collection and asset condition updates are costly and resource consuming;
- Continuous capacity building required.

- Close collaboration ongoing with Worldbank “Strengthening Water and Irrigation Management Project (SWIM)” project in Vakhsh and Zarafshan (2023-2027) : Development of “Irrigation Management Information System” (IMIS).



THANK YOU