

PAPER 7

Integrated Asset Management

An effective way of increasing service reliability and overall business performance for service providers

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ABSTRACT

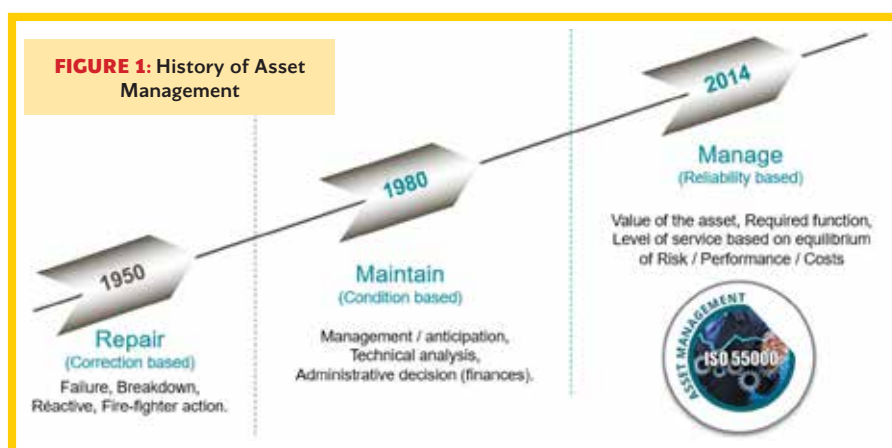
Service Providers are more than ever under pressure to improve their overall performance and cost efficiency. The sector is becoming increasingly regulated and at the same time it is becoming more and more difficult to secure funds. Service providers have no choice: they will have to improve at least the quality and reliability of their services and they will have to become considerably less dependent on third party funds by becoming financially sustainable.

The best way to face this challenge is the introduction of best practices in integrated asset management (IAM), where IAM can be best defined as: "An integrated approach to monitoring, operating, maintaining, upgrading, and disposing of assets cost-effectively, while maintaining a desired level of service and is intended for improving the overall business performance."

This paper looks at available technology, best-practices and a practical approach, applied within the ISO 55000 Standards framework, towards building capacity for IAM especially for water, sanitation and electricity service providers. All aspects of IAM are dealt with in a coherent and integrated manner leading to effective Business Planning.

Aspects dealt with include:

1. Policy on Asset Management & Levels of Service
2. Asset Register/ Data Management
3. Maintenance Management
4. Operations (Monitoring & Control)
5. Distribution Management (Technical & Commercial losses)
6. Asset Management/ Rehabilitation Planning (Reliability Centred AM Methodology)
7. Transmission/ Distribution Optimisation
8. Business Planning
9. Monitoring, Evaluation & Improvement



INTRODUCTION

What is Asset Management

Over the years, correction-based maintenance (addressing failure) changed to preventive maintenance based on condition and more recently to Reliability based maintenance striving for a balance between Risk, Performance and Cost.

More recent approaches however adopted a more integrated approach also addressing Asset and Utility performance as a whole, both in terms of overall Investment planning and Institutional strengthening, with a suitable definition – adopted in this document - been as follows:

"An integrated approach to monitoring, operating, maintaining, upgrading, and disposing of assets cost-effectively, while maintaining a desired level of service and is intended for improving the overall business performance."

Asset Management Standards - ISO 55000 and ISO 55001

In February 2014, the ISO55000 family of international standards for Asset Management (AM) were published. The International standard for AM comprises of three complimentary documents ISO 55000 – Overview, principles and terminology, ISO 55001 – Management System Requirements and ISO 55002 – Management systems – Guidelines for the application of ISO 55001. The standard is aimed at enabling an organisation achieve its objectives through the effective and efficient management of its assets. ISO 55000 and ISO 55001 (ISO 55000, 55001, 55002, 2014) set Standards for Asset Management.

ISO 55001 is limited to specifying the requirements to those items that can be captured and documented in a Management system. It also has little or no reference to the actual Asset Management **Activities** the Utility should be carrying out but mainly focusses on Management principles of **Implementing** Asset Management and thereafter **Monitoring** its progress.

The Institute of Asset Management is a UK-based not-for-profit professional body for those involved in acquisition, operation and care of physical assets,



FIGURE 2: Life Cycle Management of Assets

especially critical infrastructure. It was instrumental in the development of the international standard ISO 55000 for AM. The IAM in their "Anatomy" of Asset Management analysis (IAM, 2015) give a more detailed breakdown of the ISO 55001 standards, by re-grouping the standards under six main type of activities/ areas and introducing Asset Management Activities by the Utility (under the title Lifecycle Delivery). The breakdown is still quite generic though with little emphasis on Utility Industry Specific Asset Management practices and systems

Proposed Methodology Overview

The proposed methodology includes a PROCEDURE for transforming the Utility, a MANUAL framework for Utility AM practices and the TOOLS (information systems) the Utility needs to carry out Asset Management.

The proposed methodology or "AM framework" is a comprehensive solution aimed towards achieving the objective set through the definition of AM, through an institutional strengthening project by implementing best-practices, all within the framework of ISO55000 family of international standards for Asset Management (AM). The proposed AM framework addresses all core business functions of the organisation relating to the asset life-cycle, including business functions under: (a) Corporate Management, (b) Data Management, (c) Operations and Maintenance, (d) Rehabilitation Planning and (e) Business Planning all briefly explained in this document.

The AM framework will be implemented through the assistance of an AM Consultant. Activities by the Consultant should be general to facilitate the AM framework and specific under each identified Business function. Infrastructure plans provide input to various AM functions but are usually covered under separate projects.

The proposed Methodology is broken up into four parts as follows:

- 1) *Phase 1: Assessment & Strategic Planning Study for Asset Management:* An initial evaluation stage followed by the formulation AM policies, Standards and a detailed Strategic Asset Management Plan (SAMP).
- 2) *Phase 2: Implementation of Strategic Asset Management Plan (SAMP):* This phase follows phase 1 and refers to the process of changing the Utility from its current status to that of a fully functional Utility with regard to Asset Management Practices and (optionally) to appropriate AM Accreditation in ISO standards.
- 3) *Phase 3: Asset Management Practices:* Phase 3 refers to the actual AM practices required by the modern Utility for effective AM, covering all required functions ranging from Senior Management Planning, Corporate Management, Data Management, Operations and Maintenance and Technical Planning.

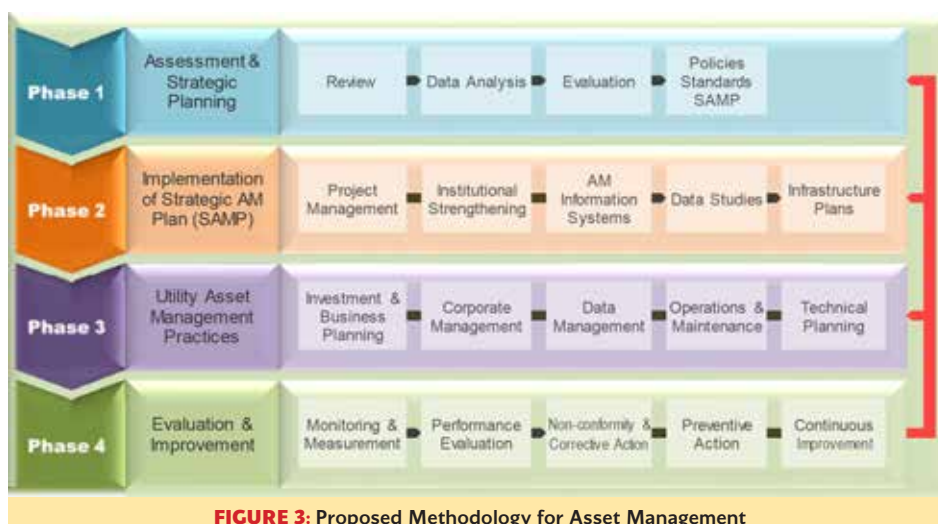


FIGURE 3: Proposed Methodology for Asset Management

4) *Phase 4: Evaluation & Improvement:* Continuously monitoring and evaluating performance both of the Utility as a whole and of the implementation of the Asset Management System (AMS) during all phases and taking Improvement measures through Corrective Action (for Non-conformity) Preventive Action and Pro-Active measures for Continual Improvement.

PHASE 1: ASSESSMENT AND STRATEGIC PLANNING Review

Includes review of AM Legislation Current Policies, Strategy & Objectives. It goes further to review current AM Practices taking into account organisational structures, People (adequacy and competency), Procedures and best practices used as well as Information Systems in place.

Data Analysis

At the Assessment stage a basic evaluation of the Asset Register is required to establish completeness (missing elements, missing attributes) and condition records for the elements. It is also advisable to perform an overall water/ energy Audit, establishing main components of non-revenue water/ energy as these give a good idea to the extent and nature of the problems experienced by the Organisation.

Evaluation

Once the review and basic data analysis has been carried out a general Gap Analysis is carried out to evaluate Current AM practices against the AM Standards (ISO 55001) and the Proposed AM model (Best-Practices).

Policies, Standards & SAMP

The following should be established bearing in mind current best-practices in consultation with all relevant stakeholders.

- 1) **Asset Management Policies:** The AM Policy should state the principles and requirements through which the organisation would manage its assets.
- 2) **Asset Management Information Standards:** Information standards refer to the asset register information to be kept in terms of elements, their attributes and their hierarchical structure as well as the Asset Management Information Systems (AMIS) to be operated. Information Standards must comply with legislation where applicable and be in line with industry best practices.
- 3) **Levels of Service (LOS) Standards:** To enable planning activities LOS must be identified and defined. Such LOS should be comprehensive and cover all variables needed to enable (a) Demand Analysis, (b) Financial Asset Valuation and (c) Risk Assessment and Rehabilitation & Preventive Maintenance planning. LOS standards must comply with legislation where applicable and be in line with industry best practices.

4) **AM Implementation Framework:** The AM Implementation Framework is a step before the SAMP. It is basically the recommended SAMP prior to refinement and approval through workshops/ liaison with the major stakeholders.

5) **Strategic Asset Management Plan (SAMP):** The SAMP defines the Strategic objectives of the organisation as well as it sets down the manner in which AM practices would be deployed and monitored.

PHASE 2: IMPLEMENTATION OF STRATEGIC AM PLAN (SAMP)

General

Successful implementation of AM Practices/ Activities results in Effective Utility Management; for that to be achieved both distribution problems and institutional issues have to be addressed. The sections below describe the recommended Main Activities to achieve this.

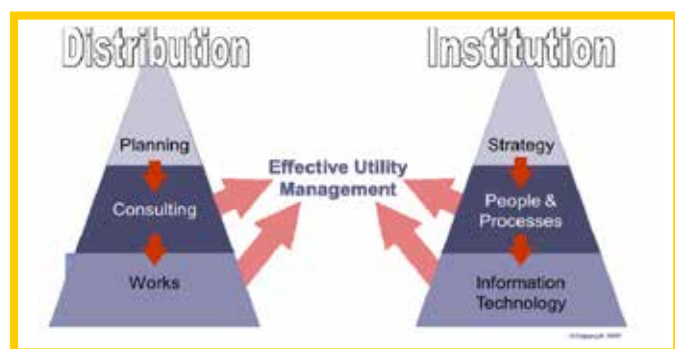


FIGURE 4: Principles of effective AM Practices/ Utility Management

Project Management

The proposed methodology employs a formal policy and procedures in managing and administering Asset Management projects. The Policy for Project Management & Contract Administration serves as a workflow and responsibility guideline for Project Managers, Project Directors and people involved with project administration. The purpose of this policy is not only to provide clear distinction between the different levels of responsibility, but also to clarify the interaction between the Operator personnel, visiting experts as well senior members of the all companies taking part in the project.

The project management methodology takes the following into account:

- 1) **Consistency** – with the AM policy, with the other organisational policies and with the organisation's overall strategic plan
- 2) **Framework** – sets out a framework, including decision-making criteria, to support the development of asset management objectives and practices (also referred to as AM System-AMS);
- 3) **Stakeholder needs** – addresses the requirements and expectations of stakeholders;
- 4) **Change Management approach** – performs gap analysis of current status with desired status and sets out an achievable path with minimum disruption to current operations.
- 5) **Risk Management approach** – defines critical factors for the successful implementation and sustainability of AM practices and remedial measures that can be taken to remedy problems arising.
- 6) **Risk (of failure) Assessment approach** – defines risk tolerability criteria and prioritises activities according to the criticality of the asset or activity and the level of risk associated with it;
- 7) **Performance Assessment approach** – defines performance tolerability criteria and activities that can measure such performance
- 8) **Asset requirements** – it identifies data attribute, functional, performance and condition requirements for the assets (both present and future), taking account of changes in demand and/or service levels;
- 9) **Life cycle approach** – it explicitly considers the life cycle of the assets and the interdependencies between each of the life cycle stages; It focuses in addressing all components of AM within the organisation as defined in Phase 3: Asset Management Practices/ Activities.
- 10) **Continual improvement** – it incorporates relevant feedback, including

outputs from management review, to improve the organisation's asset management capability and to ensure that it is still applicable for the set objectives

- 11) **Work Plan** – a detailed work plan outlying all required resources, activities and required timeframes is formulated to achieve the set objectives within the budgetary and timeframe requirements.

Institutional Strengthening

Following the recommendations of the SAMP certain actions need to be taken with regard to building up capacity in the organisation to handle the prescribed AM activities of Phase 3.

Such actions will include:

- 1) **Workshops:** Workshops have a special role in Asset Management projects. Workshops should cover Asset Management Policies, Planning and Control as well as Asset Management Best Practices and should be attended by all stakeholders as well as decision makers. Typical workshops to be carried out include:
 - 2) **Organisational Restructuring and Enhancement:** The Utility organisational structure might have to be changed to be able to cope with the AM practices to follow. New job positions (with appropriate job descriptions) will have to be defined and matched with existing personnel. Where necessary additional personnel might have to be hired.
 - 3) **Implementation of Procedures & Best Practices:** This is the bulk of the work and includes for every AM practice described in Phase 4:
 - a. Formulation of Business procedures, Business functions and roles, Job descriptions and Departmental Deliverables.
 - b. Requirements definition and Gap Analysis (between current practices and best practices) and the formulation of an appropriate work plan and change management plan.
 - c. Implementation of Business Processes in association with Asset Management Information systems (AMIS) (see next section) to support these processes
 - d. Extensive training, both class-room and hands-on, in the use of the systems and procedures introduced.
 - e. Implementation of Management reporting to ensure deliverables as well as information flow at all levels.
- It should be noted that the proposed methodology employs a well-documented predefined range of Business Process Models for all aspects of Asset Management. These models are based on best practices and are instrumental in improving Utility performance and profitability. They are adjusted through gap analysis to suit the local environment, business practices and Information systems used.
- 4) **Capacity Building (Data Management, O&M, Planning):** Capacity building refers to providing support to the Utility personnel and divisions after implementation to enable them deliver expected outputs in a timely manner. Capacity building effort will lessen with time as Utility personnel become more proficient.

Asset Management Information Systems (AMIS)

The Asset Management Information Systems should address all Utility departments and be implemented in an integrated environment both on a transaction and data model level. Data Integration (especially between the commercial and technical asset registers is important to enable demand analysis and water/ energy balancing.

The diagram below describes the different data entities in a municipal environment required for integration. The diagram that follows illustrates the various Business functions and corresponding information systems and their functionality within a Utility/ municipality.

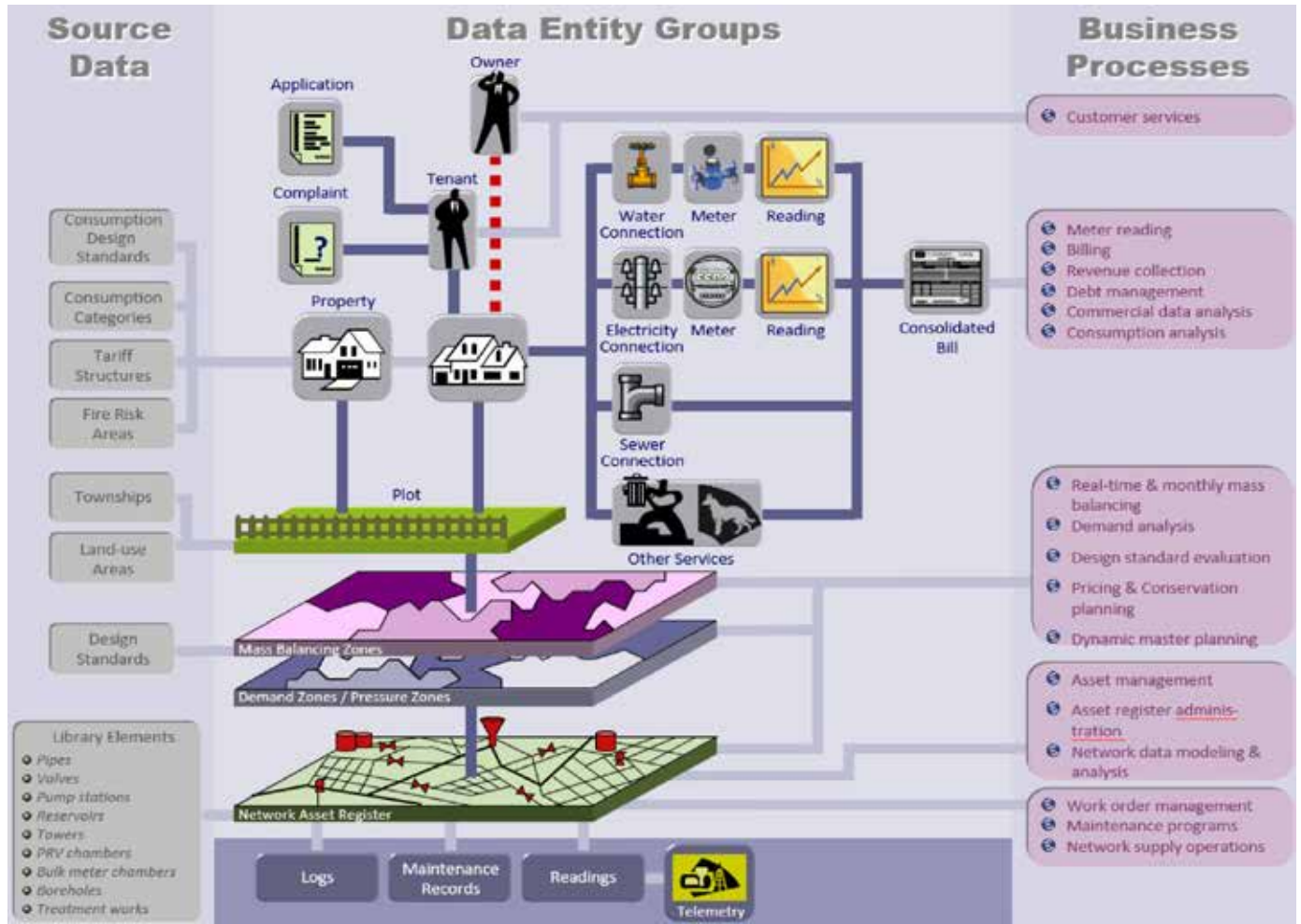


FIGURE 5: Required Data Integration for Asset Management

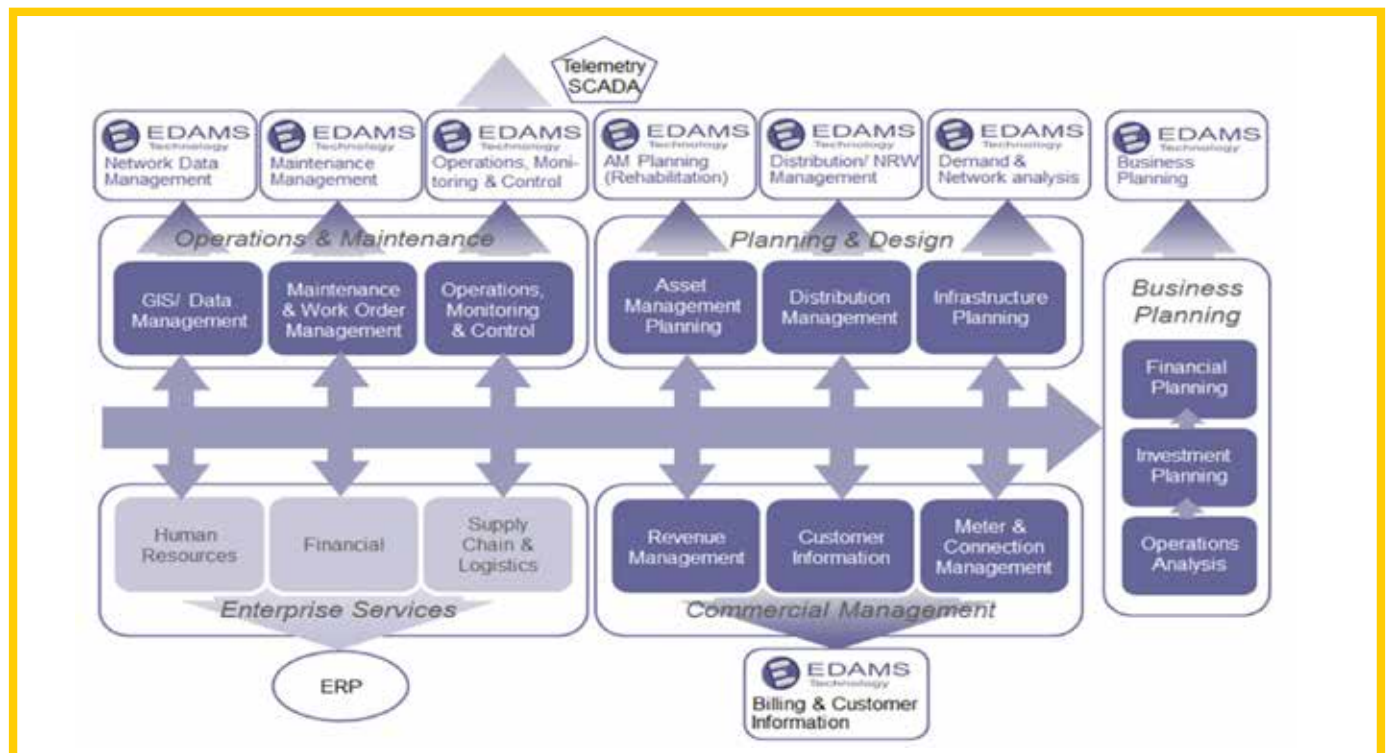


FIGURE 6: Business functions and Information systems in a Utility for Asset Management

Data Studies

1) Asset Registry (Compilation and Validation): The compilation and maintenance of a validated asset register with geographical reference, stored in a robust geographical database is important for the purposes of Maintenance Management, Asset Management and Distribution Management. The study will include evaluating the current register in detail for completeness and accuracy and initiate appropriate field investigations for its validation for correctness.

2) Commercial Data Validation (Billing Data Cleaning): The main objective of the study is the establishment of a validated and field-reconciled commercial database to be utilised by the Billing system in order to enable proper management and efficient operation of the revenue and customer services functions of the utility. In particular, the following objectives must be satisfied:

- a. Existing billing database: The current database needs to be evaluated and cleaned up of errors accumulated over the years
- b. Field Survey: Identify and record all properties and customers (actual, illegal and prospective) and characteristics pertaining to tenants, properties, connections and meters as well as establishing geographical reference through coordinates/ linking to geographical reference like plot, building, property databases.
- c. Matching and Billing data enhancement: Match Surveyed Properties to Commercial Database and update information
- d. Unmatched records: Create action requests in Billing system if required to (a) Investigate Connection/ Meter and (b) Investigate Customer details
- e. Reduction of Commercial Losses: Improved billing, addressing malfunctioning meters and identifying illegal/ unregistered connections will result in the Reduction of Commercial Losses
- f. Outstanding debt: The exercise will also address the problem of outstanding debt which has been attributed partially to a poor customer database. The field exercise should also validate high outstanding arrears on customer accounts and determine collectable and uncollectible debt on Customer Accounts.

Infrastructure Planning

Infrastructure planning results in the formulation of the Upgrading Plan, the Master Plan, the Emergency Response Plan and the Shutdown & Outage Management Plan.

Prior to carrying out any of these plans detailed Demand analysis is required.

- 1) Demand Analysis:** Both Actual and projected demands for both existing and future scenarios should be calculated, spatially distributed as per user location and taking into account non-revenue water/ energy (existing and projected)
- 2) Upgrading Plan:** The Upgrading Plan addresses infrastructure performance issues ensuring proper service delivery under present conditions for the present supply area. One of the main outputs of the Upgrading Plan is the design of new District Management Areas (DMA) for effective **distribution/ Non-Revenue water/ energy management.**
- 3) DMA implementation and commissioning:** Following the Upgrading Plan a project is carried out to implement the DMA in the field through rezoning/ remedial and other required work as well as the installation of bulk metering. Once the DMA are implemented they are handed over to the Utility for Distribution management.
- 4) Emergency Response Plan:** The Emergency Response Plan, sets down operational rules (shutting/opening valves, etc.) to handle emergencies (contamination, large leaks, breakdowns, etc.)
- 5) Shutdown & Outage Management Plan:** The Plan sets down operational

rules (shutting/ opening valves, etc.) to operate the network in the case of maintenance works or intermittent supply for demand conservation purposes.

- 6) Master Plan:** The Master Plan looks at future capital requirements to ensure continuation of proper service delivery both in the existing areas (bulk supply) and new areas to be developed.

PHASE 3: ASSET MANAGEMENT PRACTICES

Asset Management Practices/ Activities are divided into 5 main functional groups as indicated in the adjacent table. The following gives a brief description of each.

Group A: Investment & Business Planning

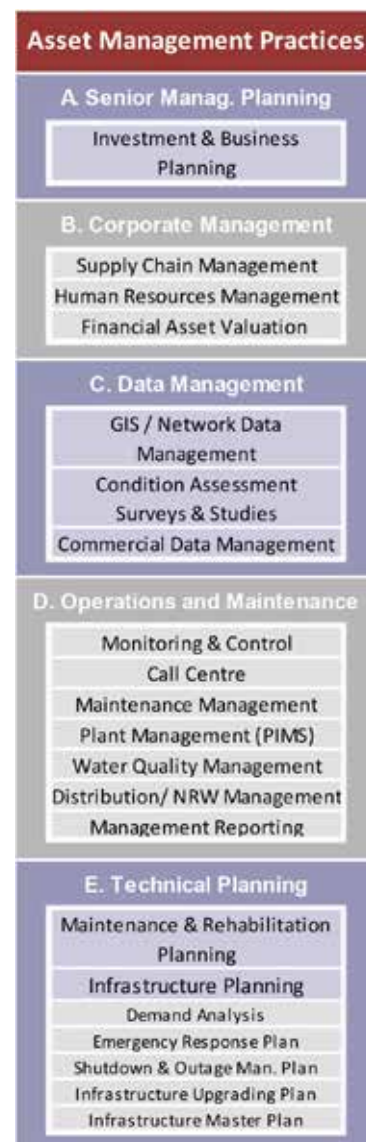
The Business Plan and Model will assess the performance and sustainability of the Organisation based on its current condition and the effect of various interventions to be carried out through a proposed Investment Plan on its performance.

The model will allow sensitivity analysis through (i) tariff structure Scenarios, (ii) Required achievable Performance Target scenarios and (iii) inclusion of Investment Plan interventions. Once set up the model and Plan can be revised on a yearly basis.

Group B: Corporate Management

Includes various activities usually carried out by the Financial/ Corporate Services departments.

- 1) Supply Chain Management:** Procedures and systems used by the Organisation to ensure that all outsourced asset management activities/ assets are aligned with the asset management objectives of the organisation and to monitor the outcomes of these activities/ assets against these objectives.
- 2) Human Resources Management:** Top Management commitment is for the successful implementation and sustainability of asset management. Organizational Roles, Responsibilities and Authorities throughout the organisational structure should be clearly defined for Asset Management purposes.
- 3) Financial Asset Valuation:** The main objective of Financial Asset Valuation is to provide more meaningful financial reporting, to satisfy regulatory requirements and to provide meaningful input to maintenance and rehabilitation planning for improving asset reliability and extending asset useful life.



Group C: Data Management

- 1) GIS/ Network Data Management:** The asset register with geographical reference, stored in a robust geographical database is important for the purposes of Maintenance Management, Asset Management and Distribution Management. The division should maintain the asset register compiled and validated in Phase 2 and continuously improve its accuracy and completeness through pre-defined network data evaluation exercises.
- 2) Condition Assessment Surveys & Analysis:** Condition Assessment surveys should be carried out on a regular basis using condition assessment categories and Asset defect and failures categories for recording asset condition. Condition Assessment Analysis is done using indicators for asset condition based on various inputs (field survey, maintenance records, age, material, soil conditions, etc.). Main output of Condition assessment is the useful life of an asset that forms the main input to Financial Asset Valuation.
- 3. Commercial Data Management:** The analysis and identification of problems in the billing database, such as malfunctioning meters, non-paying or institutional consumers with high wastage and leakage as well as connections with wrong possible consumer category allocation should be done on a regular basis. For billing databases with geographical reference of connections (through a link to the cadastral data or coordinates) properties with possible illegal connections could also be identified. A cost in terms of lost revenue is identified for each problem and category of problems for prioritising actions. Addressing identified problems results in increased revenues.

Group D: Operations and Maintenance

- 1. Monitoring & Control:** The purpose of Monitoring and Control is required for many of the Asset Management Activities. Main functions include: (a) Linking to Control Systems (telemetry, SCADA, etc.), (b) Metering/ Logs Management and (c) Data Analysis for reformatting and storage purposes in continuous records.
- 2. Call Centre:** A proper Call/ Contact Centre is important to establish a two-way communication with Customers, the public and even Utility personnel through all possible communication media means. The CRM (Customer Relationship Management) implemented should integrate with the Utility's Billing and Customer Services system as well as the Organisation's Maintenance Management system to enable 2-way workflow.
- 3. Maintenance Management:** The main purpose of maintenance management is the improvement of productivity and efficiency of the maintenance function, the improvement of service delivery (less breakdown time) and the collection of information for condition assessment needed for Asset Management (rehabilitation planning). People, Processes and Information systems must be improved to enable proper maintenance operations as per best practices in all aspects of Maintenance, including Routine/ Preventive/ Proactive with Reliability-driven maintenance programs, both for the networks and plants/ stations.
- 4. Plant Management:** Plant Management includes various activities ranging from Monitoring and Control, Operations, Maintenance, Financial Asset Management and Water Quality Management. As with Maintenance Management People, Processes and Information systems should be addressed to ensure proper operation of all types of plants, including Water Treatment, Sewer Treatment as well as booster-pump stations.
- 5. Water Quality Management:** The main purpose of the Water Quality Management system is to improve water service provision (quality) and ensure quick emergency action in case of contamination. An appropriate LIMS (Laboratory Information Management System) focusing on the competencies of the Analytical Laboratories and the traceability of data

and leading to Laboratories accreditation, must be deployed. A monitoring system is also needed for quality analysis relating to local standards, related operations and reporting to ensure procedural measures as well as reporting for compliance with current and future legislation for water treatment works and wastewater treatment works.

- 6. Water Distribution Management:** The main purpose of Distribution Management is (a) to ensure proper service delivery (quantity and pressure), (b) identify, localize and quantify system losses (leakage) and to ensure procedural measures as well as reporting for compliance with current and future legislation for proper distribution management (No Drop and RPMS (Regulatory Performance Measurement System)). The main output of distribution management is a Water Audit and a leakage Reduction Program. A water audit should be carried out per metered zone. In the absence of zones or meter records it should be carried out for the entire WSP. Water entering the zone should be divided as IWA (International Water Association) breakdown and even go further to include parameters such as Wastage and Internal leakage (W&IL) as well as Unpaid Authorised Consumption. The Water Audit identifies areas that exhibit high leakage and forms the basis for the Leakage reduction program, a proactive leakage detection and fixing program; bearing in mind that possible rezoning recommended by the Upgrading Plan might also result in high reduction of leakages. Note that if the network is not properly zoned (isolated zones) with bulk meters proper distribution management can't be carried out and the WSP should consider embarking on the development of an Upgrading Plan as soon as possible.
- 7. Management Reporting:** It is important to ensure effective management reporting at all levels both in terms of upwards flow of information via management reporting and performance indicators, and the downward flow of management control. An appropriate system is deployed at all departments with Asset Management functions both for reporting purposes and for performance evaluation (Phase 4).

Group E: Technical Planning

- 1) Maintenance & Rehabilitation Planning:** Using information from (a) Condition Assessment surveys and studies as well as output from (b) Financial Asset Valuation, Risk Assessment is carried out with output in the form of two plans, (1) Rehabilitation Plan (replacement, refurbishing) & (2) a Preventive Maintenance plan. The main purpose of these plans is to minimise the risk of failure, minimise the cost of ownership of the existing assets, maintain required level of service and sustain the infrastructure in a proper working condition.
- 2) Infrastructure Planning:** The Infrastructure plans formulated during the Implementation Phase (Phase 2) need to be updated on a regular basis as the need arises. More specifically:
 - a. Demand Analysis:* Preferably on a yearly basis
 - b. Upgrading Plan:* Never – The need should not arise again of AM practices are carried out.
 - c. DMA implementation and commissioning:* Never – Expansion of the supply area will result in new DMA that should be properly designed from the outset and handed over to Distribution Management
 - d. Emergency Response Plan:* Preferably on a yearly basis as demand variables change (e.g. fire risk areas or properties build)
 - e. Shutdown & Outage Management Plan:* Preferably on a yearly basis or as needed as demand variables or conservation policies change.
 - f. Master Plan:* Preferably on a 5-year basis the Master Plan should be re-visited and capital requirements reconsidered as requirements might change if projected demands (at time of the design) differ substantially from actual demands.

PHASE 4: EVALUATION & IMPROVEMENT

As per the ISO standards performance evaluation implies three main activities: (a) Monitoring, Measurement, Analysis & Evaluation, (b) Internal Audit and (c) Management review.

1. Monitoring, Measurement, Analysis & Evaluation: The needs to be monitored and measured together with the methods of carrying out such monitoring and measurements as well as frequency of doing so are defined. Methods of evaluating such results also have to be defined (benchmarking).

2. Internal Audit: An internal auditing system has to be set up and internal audits be carried out on a regular basis for the purpose of establishing whether the Asset Management System (AMS) conforms to the standards set and to verify the results of the evaluation with regard to Asset performance and performance of the Utility as a whole.

3. Management Review: Top management shall review the Utility's AMS at regular intervals to ensure sustainability of the system. Management shall review (a) progress in developing of the AMS, (b) external and internal changes that might affect progress in the AMS, (c) information relating to all aspects of the system AMS, (d) opportunities for improvement and (e) changes in the profile of risks and opportunities.

Improvement comes about through (a) Nonconformity and Corrective Action, (b) Preventive Action and (c) Pro-Active Action for Continual Improvement. A properly designed and implemented Risk Management Plan (RMP) can be instrumental in minimizing the risk of failure and setting mechanisms for problem resolution.

Monitoring progress in the implementation of the AM practices in the Organisation can be expressed through appropriate KPI (Key-Performance-Indicators) which can also be instrumental in instigating appropriate improvement actions.

1) Nonconformity and Corrective Action: Refers to actions taken to control and correct such conformities identified as well as any actions required to deal with any possible consequences. In certain cases, changing a component of AMS might be required. Management reporting (described under Phase 3) provides the main input for evaluation and identifying Nonconformity and Corrective Action.

2) Preventive Action: The Utility shall establish processes to proactively identify potential failures in the AMS and be ready for quick and effective action.

3) Continual Improvement: The Utility should strive for continuously improving the sustainability, adequacy and effectiveness of its AMS

CONCLUSIONS & BENEFITS OF AM PRACTICES

The paper describes an integrated a comprehensive approach for Asset Management aimed towards monitoring, operating, maintaining, upgrading, and disposing of assets cost-effectively, while maintaining a desired level of service and is intended for improving the overall business performance. Benefits can be many including improved management, better service delivery, financial (increased revenues and decreased costs), higher creditworthiness and enhanced compliance and transparency for the organisation.

REFERENCES

- ISO 55000:2014 Asset Management – Overview, principles and terminology
 ISO 55001:2014 Asset Management – Management systems – Requirements
 ISO 55002:2014 Asset management – Management systems – Guidelines on the application of ISO 55001
 IAM, 2015, Anatomy of Asset Management, Version 3, December 2015, The Institute of Asset Management

TABLE 1: Benefits arising from implementing AM practices

Type	Benefit	
Improved management	Accurate technical asset register Effective proactive and preventive maintenance Data and evidence-based decisions (job costs; budgeting, performance indicators) Risk based Rehabilitation and Maintenance planning Best Practice standards, procedures and workflows Integrated processes: Overcoming sectorial divisions and integrated collaboration Permanent change through use of operational systems Cost-effective investment and business planning Informed and strategic decision making through reports and Performance Indicators	
Better services	Improved customer services Improved service delivery (pressures, quality, less breakdown time) Quicker maintenance response & more effective emergency & crisis management Increase customer satisfaction & Improve perceptions	
Financial benefit	Increased revenues Reduced wastage and internal leakage Reduced leakage Reduced production and pumping costs	Reduced maintenance and rehabilitation costs Better planning for future investments Asset valuation
Higher creditworthiness	Accurate balance sheet Non-revenue audit reports Operational cost budget Capital cost requirements	Improved financial performance Sustainable/ Profitable operations Attain grants and Loans
Enhanced compliance and transparency	Reporting and performance indicators Easy assessment of regulative requirements	