Water Infrastructure Asset Management

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Water Infrastructure Asset Management

Neil Grigg, Colorado State University
Outline of topics and some background information
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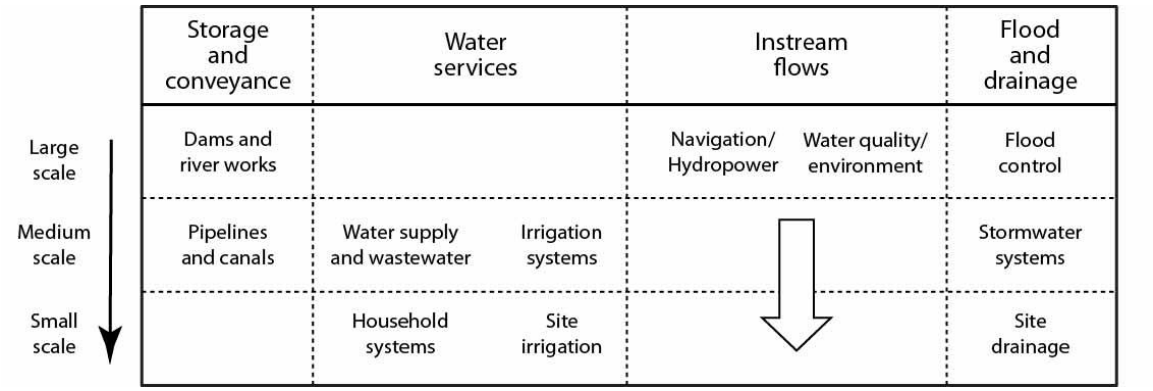
What is “water infrastructure?"

Water infrastructure comprises a number of systems, which I have summarized in this diagram. The systems we will discuss on the webinar are under water services at “water supply and wastewater.” These have levels, such as for water: source, treatment, and distribution. We will focus on the capital-intensive distribution systems.



What is asset management?

There are many definitions. Seattle Public Utilities definition is: Asset management is a “way of doing business that maximizes the public’s return on their investment in utility infrastructure by implementing utility–wide strategies that emphasize reliability in the assets and processes so that the desired levels of service are provided to our customers in the most cost effective manner.”

International Infrastructure Management Manual: A systematic approach to the procurement, maintenance, operation, rehabilitation and disposal of one or more assets. It integrates the utilization of assets and their performance with the business requirements of asset owners or users. Asset management is all about the continuous alignment of asset performance to meet service delivery outputs to deliver the desired outcomes.

SIMPLE (a software platform): "A management paradigm and a body of management practices that is applied to the entire portfolio of infrastructure assets at all levels of the organization which seeks to minimize the total cost of acquiring, operating, maintaining and renewing the organization's assets within an environment of limited resources while continuously delivering the service levels customers desire and regulators require at an acceptable level of business risk to the organization."

Synonymous terms: infrastructure management, capital management, lifecycle management

New about asset management: how it draws together existing management methods. Also, emphasis on using fixed assets better

Basic questions: what do I own; where is it; what is its condition; what is its useful life; and what is its value?

Why is asset management needed?

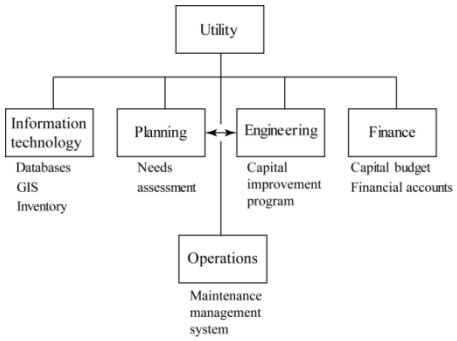
- Systems expanded and infrastructures become mixtures of new and old
- Management more challenging as regulations tighten
- Water assets out-of-sight and out-of-mind
- Workers retire
- New managers inherit vast systems of unknown condition
- Replacement value of water, wastewater, and stormwater in range of $2 trillion
- Large backlog of investment needs must be met if service levels are maintained

What are the functions in asset management?

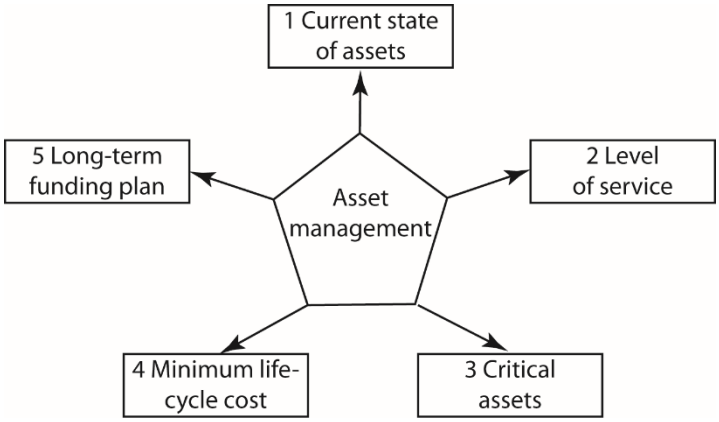
Steps are:

- Optimize life–cycle value of physical assets
- Maintain required service levels
- Manage asset condition
- Monitor performance
- Manage risk of asset failures
- Seek continuous improvement in use of assets

Functions within the organization:



Functional management area	Asset management activity
Budget and finance	Capital budget and accounts
Planning	Needs assessment
Engineering and construction	Capital improvement program (CIP)
O&M	Maintenance management system (MMS)
Information systems	GIS, databases, inventory



Asset management steps from USEPA best practices guide

Plan section	Department responsible
Services, customers and standards	Planning
Assets	Engineering
Demand planning	Planning
How services are managed	Operations
Operational programs	Operations
Management and support processes	Administration
Financial issues	Finance
Performance measurement	Finance and budget

Asset management applied to water infrastructure

Asset management applies to any fixed asset or infrastructure system
Methods used by a private company, public agency, military unit

Utility director wrote in local newspaper: it includes a catalog of when replacements and repairs will be needed. This involves a record of the condition of pipes, valves, wires, and cables (they also manage the electric system), which is prepared at each maintenance

project. Another feature is the locations and details of water system components to keep diagrams, maps, and drawings updated to supplement files and historical documents. The application of these features is to identify replacement and maintenance expenses in advance, set priorities, prevent failures, and avoid sharp rate increases.

Best practices

Inventory: preparing an asset inventory and system map; developing a condition assessment and rating system; assessing remaining useful life by consulting projected-useful-life tables or decay curves; and determining asset values and replacement costs.

Level of service: what levels of service do my stakeholders and customers demand; what do the regulators require; what is my actual performance; and what are the physical capabilities of my assets?

Analyzing requirements: Analyzing current and anticipated customer demand and satisfaction with the system; Understanding current and anticipated regulatory requirements; Writing and communicating to the public a level of service agreement that describes your system's performance targets; and Using standards to track system performance over time. The level of service agreement will be the utility's action to inform customers about their services and to be transparent about costs and benefits of providing them.

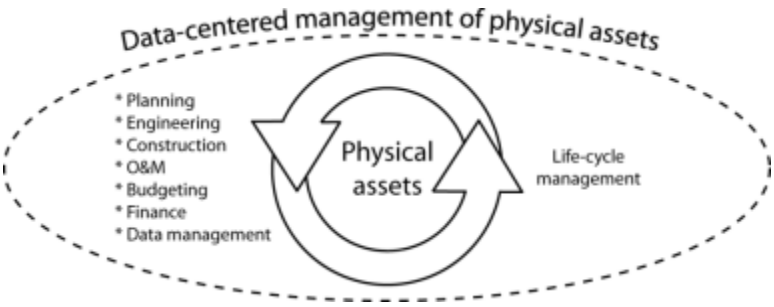
Risk: Asset management deals with risk of failure of infrastructure assets and requires the utility to manage consequences of failure. The asset management program requires the identification of critical assets with high risks and major consequences of failure. Assets should be ranked by their level of criticality by asking questions such as how can assets fail; how do they fail; what are the likelihoods (probabilities) and consequences of asset failure; what does it cost to repair the asset; and what are the economic, social, and environmental costs of failure?

Avoiding failure: listing assets by criticality to system operations; conducting failure analyses; determining the probability of failure and listing assets by failure type; analyzing risk and consequences; and reviewing and updating any vulnerability assessment available.

Finance and budget: alternative strategies exist for managing O&M, personnel and capital budget accounts; costs of rehabilitation, repair, and replacement for critical assets; moving from reactive maintenance to predictive maintenance; knowing the costs and benefits of rehabilitation versus replacement; evaluating lifecycle costs; deploying resources based on asset conditions; and analyzing the causes of asset failure to develop specific response plans.

Long-term funding strategy that recognizes the costs and revenues of the water systems. Do we have enough funding to maintain our assets for our required level of service; is our rate structure sustainable for our system's long-term needs; how should we revise the rate structure; should we fund a dedicated reserve from current revenues; and how should we finance asset rehabilitation, repair, and replacement.

Data requirements in asset management

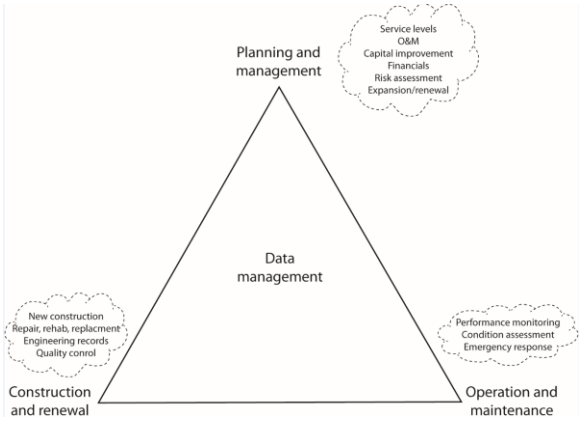


Implementation of asset management for water systems

Elements of the water asset management system:

- Optimize life–cycle value of physical assets
- Continuous improvement in assets
- Capital improvement programming
- Financial planning
- Assess asset condition
- Monitor performance and service levels
- Manage risk of asset failures
- Data management (inventory, location, attributes)
- O&M

This asset management triangle illustrates activities as they relate to the core functions of planning and management, construction and renewal, and O&M. Key subsidiary asset-related activities are shown alongside each of the core functions.



Gaining approval for asset management plans

Once the plan is prepared, the asset management coordinator should be involved with measuring outcomes and updating and improving the plan. Ideally, an annual report might be rendered that included a statement such as this hypothetical one:

The organization's physical assets are valued at $xxx million, and during the past year they delivered improved service over the previous year that was indicated by (evidence of better service and fewer failures). Investments in renewal were $xxx and improved condition assessment and repair methods have extended the lifecycles of existing assets by xx percent, representing a savings of $xxx for the city's utility and public works customers.

This hypothetical report is only partially complete and is missing data, but it illustrates how the organization is seeking to get more from its investments in assets by raising the management bar.