



Infrastructure Stability for Rural and Small Systems

Now that you have completed your *Rural and Small Systems* “Self-Assessment” exercise and determined that Infrastructure Stability is important to your utility, this handout can help you get started on improving your Infrastructure Stability practices. It describes some of the key “Building Blocks” of infrastructure success for small utilities, giving you a starting place to improve utility infrastructure practices. The handout also includes specific suggestions on how to measure a utility’s infrastructure stability, and lists a number of free resources with practical information on how to improve practices. Successful Infrastructure Stability management is also highly dependent on successful management of a utility’s finances. A complementary handout for Financial Viability is also available from USDA and EPA as a part of this resource series. For more information on the Infrastructure Stability management area, please refer to the *Rural and Small Systems Guidebook to Sustainable Utility Management*.

INFRASTRUCTURE STABILITY: The system understands the condition and costs associated with its critical infrastructure assets. It inventories its system components, conditions, and costs, and has a plan in place to repair and replace these components. It maintains and enhances the condition of all assets over the long-term at the lowest possible life-cycle cost and acceptable level of risk.

– *Rural and Small Systems Guidebook to Sustainable Utility Management*

Additional Information

EPA website: <https://www.epa.gov/sustainable-water-infrastructure/tools-effective-water-and-wastewater-utility-management>

USDA website: <https://www.rd.usda.gov/programs-services/services/sustainable-management-tools>



HOW CAN ASSET MANAGEMENT HELP YOUR SYSTEM REACH SUSTAINABILITY?

COST EFFICIENCY: Cost savings are achieved when assets are identified, tracked, and proactively managed to stabilize infrastructure, reduce unexpected costs, and utilize effective financial planning.

RELIABILITY: System reliability is achieved when water systems can anticipate, prepare for, and make contingency plans for critical asset failures. Asset management ensures that customers can rely on consistent service and access to assets, and that a water system has the ability to adapt to changing needs.

COMMUNICATIONS: Proactive asset management helps systems effectively communicate challenges and solutions to customers, which helps maintain customer satisfaction and protect human health in the event that assets fail or maintenance activities impact users.

Source: Top Three Reasons to Support & Implement Asset Management at Your Water System (EPA/USDA)

Building Blocks of Infrastructure Stability

ASSET INVENTORY SYSTEM

To maintain and improve the infrastructure in a system, it is important to first identify and understand all of the parts in the system. Start with a complete catalogue of assets—e.g., pumps, treatment systems, buildings, etc.—and record the condition of these assets. The condition of an asset will help in predicting the remaining lifespan of the asset and planning for upgrades or repairs.

EXAMPLE ACTIVITIES

- Create an inventory of assets, including determining the current condition and predicted lifespan of each asset
- Create a standardized inventory checklist, and train all employees on inventory procedures
- Develop a routine for recording and updating the utility inventory on a regular basis

SYSTEM MONITORING

Monitoring certain kinds of utility data provides important information on the condition of utility assets. This is especially important for assets which are difficult to visually inspect. Systems which regularly monitor data can better judge the condition of non-visible assets, and see if repairs are becoming more common or less common within the utility.

EXAMPLE ACTIVITIES

- Conduct inflow and infiltration (I&I) or water loss analyses to identify leakages in pipes
- Monitor and record annual breakages in pipes
- Track the frequency and cause of repeat maintenance problems
- Conduct an energy assessment to determine the energy use of each part of the system

ASSET MANAGEMENT PLAN

With the information gathered from inventories and data monitoring systems, a utility has a chance to make a proactive plan to improve their assets. An asset management plan combines the current conditions of assets, the predicted lifespans of assets, and the predicted repair/upgrade costs together to create a plan to prioritize and repair assets as needed. The asset management plan will help with this financial planning by providing information on future costs, making it easier to calculate necessary rates for operating and maintaining the utility's assets.

EXAMPLE ACTIVITIES

- Identify aging and high-priority systems, and create a plan for maintenance/repairs/upgrades
- Predict maintenance and upgrade costs and incorporate these costs into financial plans
- Coordinate asset repair with other community repairs and projects (e.g., road maintenance)

Measures

To gather information on asset condition and maintenance requirements, it is necessary to use the measures most appropriate to the utility goals. Below are several measurement areas, with specific example metrics for each area.

ASSET INVENTORY

These measures allow utilities to better know how far along they are in the inventory process. These metrics function as first-steps for a larger inventory improvement plan.

EXAMPLE METRICS

- Inventory completeness rate: $\text{total number of critical assets inventoried} \div \text{total number of critical assets owned and powered}$
- Condition assessment coverage: $\text{total number of critical assets assessed and categorized (in a time period)} \div \text{total number of critical assets}$

SYSTEM RENEWAL/REPLACEMENT

This measure provides information on asset renewal rates over time. The measure should incorporate utility goals and the acceptable levels of risk for different kinds of assets.

EXAMPLE METRICS

- Asset replacement rate: $\text{total number of key assets replaced per year} \div \text{total number of key assets}$
- Asset fund replacement rate: $\text{estimate replacement cost of key assets} \div \text{total dollar amount in asset replacement reserve fund}$

WATER DISTRIBUTION/COLLECTION SYSTEM CONDITION

This measure offers information on the number of breaks or leaks. The condition of a distribution or collection system is important for public health, customer service, financial viability, and asset management.

EXAMPLE METRICS

- Leakage or breakage frequency rate: $\text{total number of leaks (or breaks) per year} \div \text{total miles of distribution piping}$
- Service outage rate: $\text{hours or number of (unplanned) service disruptions per year} \div \text{total number of operation hours}$

INFRASTRUCTURE PLANNING & MAINTENANCE

Planned maintenance is preventative and predictive maintenance, but does not include reactive maintenance (i.e., repairs in response to a system failure). Planned maintenance is performed by a regular schedule and predictive maintenance is performed when certain warning signals are triggered.

EXAMPLE METRICS

- Planned maintenance ratio by hours: $\text{hours of planned maintenance} \div (\text{hours of planned} + \text{reactive maintenance})$
- Planned maintenance ratio by cost: $\text{cost of planned maintenance} \div (\text{cost of planned} + \text{reactive maintenance})$

Example Practices for Infrastructure Stability at Rural and Small Systems

The practices listed below are drawn from the [Rural and Small Systems Guidebook](#) and the [Moving Toward Sustainability Roadmap](#) document. They are examples of practices that utilities have implemented to improve their performance in the area of Infrastructure Stability.

Establish emergency maintenance procedures.

Support ongoing training and certification/licensing requirements for maintenance staff.

Create photographic documentation of assets to compare conditions over time.

Track operating system parameters (e.g., pressure).

Link maintenance requests/work orders to asset inventory.

Map critical infrastructure/assets (e.g., GIS-located mains, hydrants, valves).

Resources

Highlighted below are several practical and free resources that provide information for utilities on how to improve Infrastructure Stability. For a longer list of resources covering more information on specific areas of utility management, please see the *Rural and Small Systems Guidebook to Sustainable Utility Management: Appendix III*.

<https://www.rd.usda.gov/files/RuralandSmallSystemsGuidebook2016.pdf>

Capital Improvement Plan (CIP) Tool for Water and Wastewater Utilities

This tool is a starting place for small utilities to create easy-to-understand CIPs. The tool includes example data, and helps utilities think about the connections between rate increases, financial reserves, and capital investment.

<http://www.efc.sog.unc.edu/project/capital-planning-resources-water-and-wastewater-utilities>

Check Up Program for Small Systems (CUPSS) Asset Management Tool

CUPSS is a free, easy-to-use asset management tool for drinking water and wastewater utilities. It can help you keep a record of your assets, schedule required tasks, better understand your financial situation, and create a tailored asset management plan.

<https://www.epa.gov/dwcapacity/information-check-program-small-systems-cupss-asset-management-tool>

Getting Your Project to Flow Smoothly: A Guide to Developing Water and Wastewater Infrastructure

This is a comprehensive guide to running an infrastructure project, designed for a project manager or utility board member. The advice is thorough enough to provide clear directions for each phase of a project, though specific details will vary between utilities and projects.

<https://rcap.org/wp-content/uploads/2016/01/RCAP-Getting-Your-Project-to-Flow-Smoothly.pdf>

Sustainable Infrastructure for Small System Public Services

This planning and resource guide provides worksheets, examples, case studies, and resources on water conservation, energy efficiency, and renewable energy for small utilities. It is designed for small utility leaders who are seeking to save on operating costs. It also includes a step-by-step process for utility decision-makers wanting to operate increasingly efficient systems.

<http://www.map-inc.org/uploads/5/2/2/1/52214049/rcap-sustainable-infrastructure-guide.pdf>

Taking Stock of Your Water System: A Simple Asset Inventory for Very Small Drinking Water Systems

This is an EPA brochure with detailed information and sample forms on how to conduct an asset inventory. The brochure is designed for small water systems, and helps create a standardized approach to asset inventories.

<https://www.epa.gov/sites/production/files/2015-04/documents/epa816k03002.pdf>

