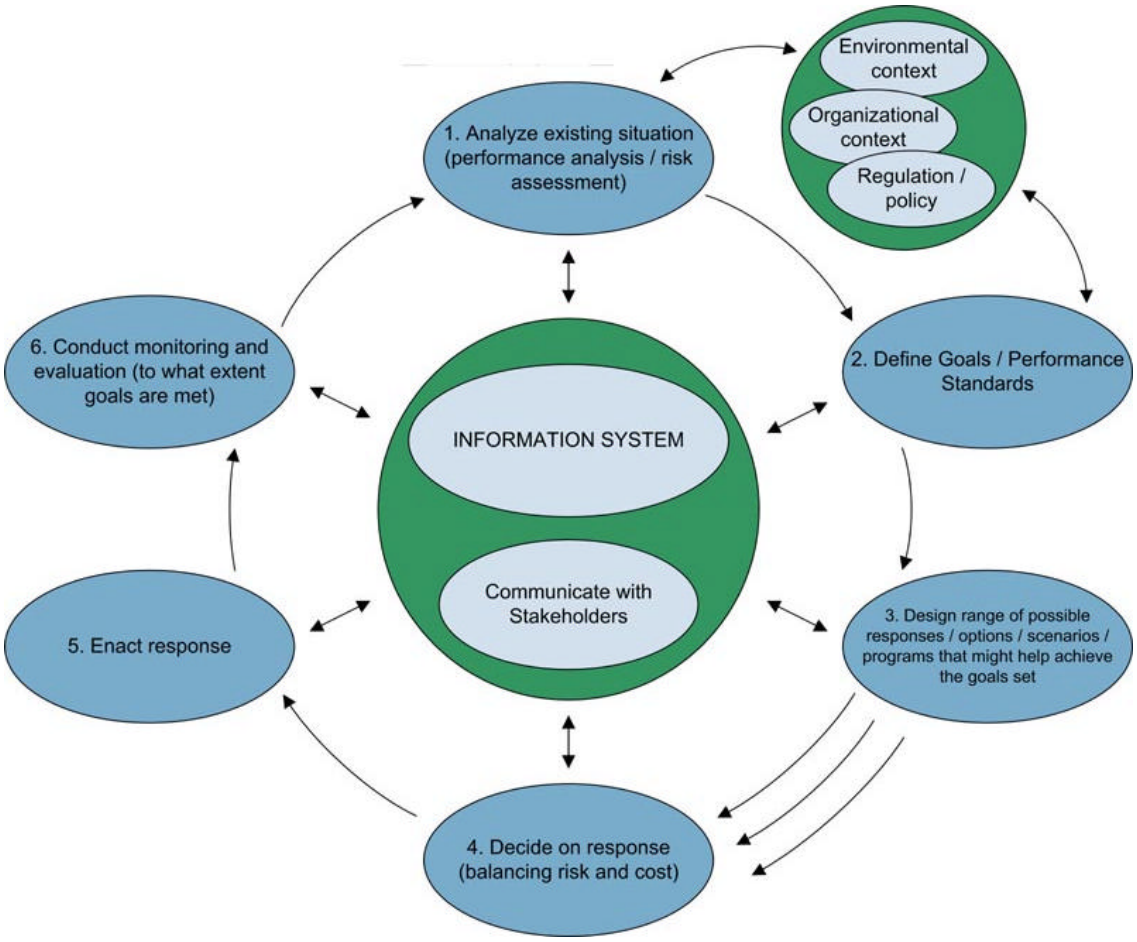
National Decentralized Water Resources Capacity Development Project

Executive Summary



Decentralized Wastewater System Reliability Analysis Handbook

Stone Environmental, Inc.
Montpelier, Vermont

June 2005

Decentralized Wastewater System Reliability Analysis Handbook

Submitted by Stone Environmental, Inc. Montpelier, Vermont

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National Decentralized Water Resources Capacity Development Project (NDWRCDP) Research Project

Final Report, **June 2005**

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EXECUTIVE SUMMARY

Project Background

Decentralized systems are a permanent part of the wastewater infrastructure. Understanding how to improve the performance of these systems is crucial to allocating the often-scarce resources available for hardware and management. While using an asset management framework for centralized wastewater system management has become common in some countries, asset management has not been typically used in the decentralized field.

Asset management is based on a simple idea: Find out what your assets are, where they are, what condition they are in, and how they affect your ability to meet performance requirements; then use this information to make decisions about investing in new assets and maintaining existing ones.

Primary barriers to using asset management in the decentralized field have been the lack of information about the reliability of decentralized wastewater systems and components or capacity to evaluate that performance against engineering, ecological, public health, and socioeconomic goals. Removing these barriers will help realize the use of asset management to evaluate the effects of different management approaches and to choose the least-cost way of meeting performance goals.

Developing a framework through which a practitioner may select appropriate asset management and reliability assessment tools and then understanding the tools available to practitioners represent the critical elements of this project. This handbook was developed to allow the results of this work to be easily incorporated into the decision-making of communities, regulators, and the design community. A list of future research needs, data needs, and additional useful tools are also incorporated into the handbook.

The Framework

The framework provides an overarching process to guide handbook users to the tools best suited to help them manage the reliability and cost of their particular decentralized wastewater treatment system(s). The framework guides the users through a step-by-step process, alerting them to different issues they will need to consider and directing them to an appropriate set of tools relevant to their situation for each one. Use of these tools will assist in optimal management of the assets and risks associated with decentralized wastewater treatment.

The framework provides a generic process applicable to most situations, though three points qualify this statement. First, real-life situations do not always occur in simple logical steps, and some aspects of the process may have already occurred when a user picks up the handbook. Despite this, a user will be able to use the framework to identify the missing parts of the process that will help accomplish the best management of the reliability and cost of the system(s) in question. Second, iteration of some steps may be required before further steps can be completed. Third, different tools will be applicable with different US EPA management models, and some tools will be applicable differently, depending on the US EPA management model.

The Tools

With the framework in place, one method of thinking through the inputs and choices is provided at a broader level. To implement the principles of asset management, the decentralized wastewater industry requires a specific set of tools to help a decision maker gain the appropriate information to improve decision-making. This project identified three broad sets of tool types that are useful for asset management.

The focus of this project was on reliability and costing tools, with less effort applied to information systems. To date, a large suite of tools believed to be applicable to the decentralized wastewater industry has been identified. A subset of these tools is presented in detail in this handbook, providing the target audience(s) with information necessary to determine whether the tool is a good choice for their situation.

The reliability tools in this handbook (failure curves, process reliability, failure modes and affects analysis, and geographic information systems) provide specific tools for understanding the useful life of system components, developing preventative maintenance programs, designing treatment trains to assure performance reliability requirements, troubleshooting system problems, determining environmental and human health impacts from system failure, assessing appropriate project designs, and tracking information.

The costing tools in the handbook (life-cycle costing, activity-based costing, and the risk-cost model) provide ways for users to fully understand the true cost of alternatives and assist decision-making processes based on the cost of accomplishing tasks and understanding the consequences of non-performance. These tools allow decision makers to determine how best to allocate resources on the most critical maintenance activities, to ensure that fiscal resources provide reliability, and to protect environmental, human health, social, or property values as determined by the jurisdiction.

Additionally, the handbook incorporates case studies and examples to highlight places where the tools have been used or what benefit their use may have entailed, had they been used.

Intended Audience(s)

The work of this project has application for a wide range of audiences. How the information, tools, and framework are used will vary by audience depending on their needs and specific circumstances. Practitioners, maintenance management entities (which have no formal, long-term responsibility for the wastewater treatment systems), responsible management entities (RMEs, which either own the treatment system or the permit for it), regulators, and policymakers make up the predominant possible users, though some manufacturers may have interest as well. While they are not a primary audience of this work, homeowners should be the ultimate beneficiaries of better decision-making by having the most reliable and cost-effective treatment and dispersal options available to them.

Practitioners, maintenance management entities, and RMEs would likely use specific tools in the handbook to achieve greater cost-effectiveness, fewer maintenance requirements due to greater reliability, or some combination of both. Regulators, policymakers, and some RMEs would likely be interested more in the framework and the tools that consider cost and reliability issues more broadly, though they may also be interested in specific tools to address current issues of concern to their jurisdictions.

Data Needed to Use the Tool(s) and Costs of Using the Tool(s)

Data needs for application of the tools of this project vary widely. In some cases, the data will exist and be simple to acquire, while in others, little or no data will exist and data will need to be developed for successful application of the tool. Similarly, the cost of implementing the use of these tools will vary. In many cases, the cost of using the tools will be limited to the time it takes for a person to learn how to use them. In others, data acquisition, information management systems necessary to manage the data, and assistance to interpret the data will be required.

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