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# NEW FEDERAL FINANCING DIRECTIONS: DECENTRALIZED WATER RESOURCE INFRASTRUCTURE

by

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# ABSTRACT AND BENEFITS

Decentralized water infrastructure systems offer great promise for:

- Enhancing the performance of existing infrastructure
- Assuring long-term sustainability in water supplies and ecosystems
- Providing the following community benefits:
  - Energy savings
  - Improvements in air quality
  - Creation of green spaces
  - Restoration of streams, aquifers, wetlands, and habitat
  - Stimulus for new green companies and jobs

However, federal financing programs were designed to support the conventional centralized infrastructure of long-distance water, stormwater, sewer lines, and large treatment plants. For the potential of decentralized systems to be realized in the United States, these programs need to be altered in three fundamental ways:

- Restore research and development and demonstration project funding in water resource infrastructure
- Require integrated water supply and water quality management plans as conditions for all federal water project subsidies
- Support the installation of decentralized systems on private property by expanding eligibilities in the public infrastructure pools of funding, as well as in tax and other incentives for property owners

These recommendations emerged from a series of workshops conducted by the Coalition for Alternative Wastewater Treatment (CAWT). They are based on efforts to identify market failures and leverage points in the water sector. They support, in particular, recommendations for institutional changes and public education and outreach insights and strategies described in related White Papers.

The initiatives are intended to build upon earlier work by a variety of organizations that urged an opening of federal financial support programs to include decentralized water resource infrastructure. The three main recommendations in this White Paper can increase the effectiveness and impact of such support. This paper also identifies federal agencies and programs along with actions that can be taken to implement these recommendations.

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Chapter 1

# RESTORE RESEARCH AND DEVELOPMENT AND DEMONSTRATION PROJECT FUNDING IN WATER RESOURCE INFRASTRUCTURE

## Funding History

The 1972 Clean Water Act established a framework of water quality standards for the nation's surface waters. The Act required installation of best management practices (BMPs) for point-source effluent under a federal regulatory system—the National Pollutant Discharge Elimination System (NPDES).

Large federal subsidies (75% of capital costs) were also provided for sewer collection and treatment plant projects under a construction grants program. This framework strengthened the central hard path engineering paradigm of sewer systems and treatment plants. The general idea was to protect public health by moving wastewater far from its source.

Innovation was built into the Clean Water Act primarily through:

- Research and development (R & D) programs authorized in 1972 at $100 million per year (over $300 million in current dollars)
- 1977 Amendments incorporating an additional subsidy and federal guarantee (15% more) for innovative and alternative systems

Many of these systems were decentralized cluster systems or constructed wetlands in small communities (EPA 1989). Numerous new technologies were streamed into the construction projects built with federal grants. Many ideas are said to have emerged from federally-funded research carried out in universities, often by graduate students, who later developed technologies and carried them into production by setting up their own companies (Conversation with Julian Sandino, CH2MHill).

In the 1980s, these innovation strategies in the Clean Water Act were largely phased out. The Reagan Administration argued that research was the role of the private sector and the states (National Research Council 2004). In 1987, the Federal Construction Grants program was replaced by a revolving loan system—the Clean Water State Revolving Fund (CWSRF). The CWSRF dramatically reduced the federal share to national capital expenditures from 75% of capital costs to the equivalent of about 25% of combined capital and interest repayments. The CWSRF also dropped the Clean Water Act's provision for innovative and alternative systems.

Research funding in water and wastewater also declined precipitously from the late 1970s to the early 1990s (U.S. General Accounting Office 1994). The Reagan Administration assumed that the states and the private sector would pick up the slack in declining federal investments, but this has not been the case. The National Academy of Sciences has issued several reports in recent years that describe the per capita decline since the 1980s in water-related R & D funding by the federal government (National Research Council 2001 and 2004). Funding has also shifted substantially from support of basic, long-term research to support of agency mission-related and short-term research projects (National Research Council 2004). In particular, there has been a decline in assistance for technology-related research and development, and most of the remaining funding for water-related technology innovation is in the Department of Defense (National Research Council 2004).

Other than a modest small business program (Small Business Innovation Research [SBIR]) or occasional funding for special technologies, such as arsenic removal, the US Environmental Protection Agency (EPA), for all intents and purposes, has no technology research and development program to support water resource-related work in universities, research institutes, or the private sector. Most of the agency's research budget goes to monitoring, studying environmental and health effects, and meeting the short-term research needs of its own regulatory programs—not to exploring far-reaching sustainable technology innovations and reform.

The hope of the 1980s that states would mount substantial research programs in water infrastructure-related topics has not been realized. California is an exception, with new research programs intended to address energy and water shortages and to promote new companies and job development for both domestic and international markets (Burtis *et al.* 2004). Seattle is a large city that has also been investing resources in piloting stormwater retention systems and studying how they can be used as alternatives to big-pipe solutions (Seattle Public Utilities 2003). But these and scattered other research projects in states and cities across the country are insufficient.

The decline in water infrastructure-related science has created a glaring gap in the US in comparison to other countries. This gap was highlighted in 2006 by the announcement of an agreement between Singapore and the Massachusetts Institute of Technology (MIT) to partner in water infrastructure and other areas of research over five years (*Tech Talk* 2006). This is MIT's first research facility outside of Cambridge, Massachusetts, and their shift of research overseas can be seen as an indication of the lack of adequate funds in the US.

## Market Failures in the Decentralized Water Field

Several of the market failures specific to the decentralized water field that lead to an under-investment in research are:

- **Barriers to Innovation**—While most of the creativity and innovation in integrated decentralized water infrastructure is occurring at local levels, the barriers to innovation are severe. Incentive funding of decentralized projects is needed to help overcome these barriers, which include:
  - An engineering bias against decentralized systems
  - Siloing of local agencies
  - Siloing and narrow, mission-driven agendas of federal and state programs affecting local government
  - Indifference of most of the public
  - Restrictive local ordinances
- **Fragmentation**—Local codes and ordinances vary dramatically from one state, county, or town to the next, making markets for new technologies extraordinarily fragmented. Large corporations and venture capitalists with ample research budgets stay out of the field (Hoover *et al.* 1998)
- **Non-proprietary designs**—Many decentralized technologies are soil-based designs that are non-proprietary, so private companies cannot exclusively capture the benefits of any research. For example, research results on landscaping for stormwater retention, shallow trenches for wastewater treatment in soils, low-impact development systems, and other technologies could be used by any designer. They are not embedded in specific pieces of equipment that a manufacturer would produce. Therefore, no strong incentives exist for private firms to invest in this research
- **Basic research**—The private sector under-invests in basic research that could lead to fundamental redesigns in decentralized water infrastructures because such research is expensive and high-risk. An individual company cannot usually capture all the benefits of the research through exclusive patents. Such research is appropriately conducted at non-profit universities, research institutes, or government laboratories, where public benefits and costs are properly aligned (Congressional Budget Office 2002)
- **Institutional and socio-economic research**—Private companies do not invest in research on essential components of a transition to decentralized water systems, such as long-range assessments of water quality futures or regulatory, management, or financial reform at all levels of government

## Problems of Under-Investing

Under-investment in research creates the following problems for decentralized water advocates and innovators:

- **Restricted choices**—Advocates have fewer decentralized technologies to choose from than they would if public funding were generating more laboratory research. A recent example is the need to address nutrient input from septic systems into coastal ponds. Even advanced treatment units cannot meet the stringent standards required in many areas. Research at the University of Waterloo in Canada to mimic natural riparian zone functions in a wood-chip-based onsite system has led to superior nutrient removal, but more research of this type is needed (Lombardo 2006).
- **Lack of performance data**—Data on the performance and reliability of decentralized technologies across the "water chain" (supply, use, treatment, reuse, and disposal) is also sparse, since so few have been permitted or installed, even on an experimental basis. In a Catch-22, systems are then viewed by regulators, engineers, and local officials as higher-risk than they would be if more monitoring studies had been conducted
- **Unclear benefits and costs**—The multiple benefits and costs of various soft and hard path approaches are not well-articulated or documented, particularly the externalities of water resource infrastructure for the ecosystem, public health, and community aesthetics and well-being
- **Absence of technical, institutional, and regulatory options**— Communities lack the knowledge for picking optimal technologies and regulatory approaches (break-out) because so little research has been done across the water chain and at multiple scales
- **Lack of examples that reduce risk for various participants in the sector**—Risk aversion pervades the water resource infrastructure sector and decisionmakers, such as elected officials. The public needs to see concrete examples of innovative approaches. Engineers and utility managers, in particular, need to develop greater comfort with innovation approaches
- **Scale issues**— Demonstration projects should provide data on multiple levels. More is known about the performance of distributed systems (rain gardens, onsite wastewater systems) at the individual lot level than at the subdivision or community-wide level
- **Siloed perspectives**—Demonstration projects (and pilot projects) are needed that integrate decentralized water with sustainable energy, agricultural reuse, and other infrastructure fields more generally. This broad view of infrastructure is developing overseas

## A Decentralized Water Research Agenda

In both the "Viable Business Model" workshop in Palo Alto, California, and the "Final Synthesis Workshop" in Washington, D.C., participants discussed research needs and opportunities that would support the market reforms that were discussed. They recommended a significant increase in federal funding for research and demonstration projects. In particular, at the January 19, 2006, workshop, they ranked funding of pilot and demonstration projects as one of six top priority recommendations for advancing the field.

Several earlier workshops have highlighted the potential for science and technology research to upgrade and alter the basic modes of water and wastewater treatment. A 1998 WERF workshop discussed the potential, for example, of gene sequencing to introduce new micro-organisms into treatment units to provide better performance (WERF 1999). Decentralized water research and development topics identified in a 2002 workshop included:

- Demonstration that decentralized technologies and management work reliably at the site level and, cumulatively, at the watershed level
- Cost comparisons between centralized and decentralized paths
- Community decisionmaking tools
- Model integrated regulations, codes, and plans
- Tools to enhance public awareness and education (Nelson 2003)

More recently, the CAWT November 10, 2005 workshop discussed the role of biomimicry approaches, or studies of how natural systems may be solving water purification, capture, and recycling in better ways than manmade, engineered systems. Typically, new ideas emerge from collaboration among biologists and engineers (Benyus 1997). Biomimicry research on natural membranes that are superior to current technologies is underway in Europe and Asia, but not in the US (Wilderer 2006) Finally, the January 19, 2006, "New Strategies and New Alliances" workshop prioritized research needs into three groups, based on the number of dot votes each research need received from the participants.

- High-priority projects
- Medium-priority projects
- Low-priority projects

### High-Priority Projects (10 or More Dot Votes)

- Support for pilot and demonstration projects in federal facilities and in local communities
- Research on benefits and costs of decentralized and centralized approaches and pricing or other mechanisms to better align local decisions with long-run environmental and economic sustainability

## Medium-Priority Projects (3–5 Dot Votes)

- Doing basic, long-term research—Initiate research in water, wastewater, and reuse applications of biomimicry, bio-technology, nano-technology and other leading edges of science
- Developing a multi-faced business case—The efficiencies and innovations that a robust private sector could bring to the emerging decentralized water field, albeit it with appropriate environmental and public utility regulations setting the framework
- Documenting limitations of hard path water infrastructure—Develop 50-year projections on water supply and quality, and explore the impact of alternative infrastructure paths, including the use of decentralized infrastructure to both complement and substitute hard path projects
- Doing research on marketing and public values—See White Paper: *Public Education and Outreach Strategies in Decentralized Wastewater Management*
- Defining the "value proposition" for decentralized water—Consider better terms than "integrated decentralized water resource infrastructure," which were considered neither clear nor compelling to the uninitiated. Research how to frame the field in language that will both educate and interest experts and the public

## Low-Priority Projects (2 or Fewer Dot Votes)

- Technology performance evaluations—Research infrastructure options that integrate some or all systems across the water chain, at "multiple scales" (individual site, neighborhood, city, watershed), and in diverse settings (rural Greenfield development, suburban areas, and cities)
- National Center or Laboratory of Excellence—Fund the formation of several Centers of Excellence at universities or research institutes to coordinate basic and applied research in decentralized water infrastructure
- Domestic and international research review—Fund comprehensive surveys of emerging research and new applications of integrated and decentralized infrastructure in developed countries, such as Japan or countries in Europe and in developing "leap frog" economies, such as those of China and India
- Political analysis of players and interests
- Research on leverage points, including government funding cycles, current vs. future development, new regulatory requirements, infrastructure repairs
- Water/energy nexus—use of water in power plants and use of energy in water infrastructure
- Research on regulatory barriers and obstacles at local, state, and federal levels
- Watershed planning tools—Study a broad range of potential institutional reforms, including watershed management, decentralized system management and financing structures, and local performance-based codes and ordinances

Appendix A lists federal departments and agencies with water-related research programs, along with examples of decentralized system projects they have funded. Efforts should be made to brief these agencies on the emerging decentralized water paradigm.

Chapter 2

# REQUIRE INTEGRATED WATER SUPPLY AND WATER QUALITY MANAGEMENT PLANS AS A CONDITION FOR ALL FEDERAL WATER PROJECT SUBSIDIES

The "Final Synthesis Workshop" on January 19, 2006, explored the question of how to tie federal subsidies and permits to an integrated water supply and water quality plan in a watershed. As one of its six top priorities, the workshop recommended the requirement that local projects could only be funded if they were included in an integrated water resource management plan.

The problem of siloed and segregated water resource management was highlighted by presentations in the workshop series:

- Peter Shelley from the Conservation Law Foundation described the unintended consequences of a regional sewer, treatment plant, and ocean outfall grid in Eastern Massachusetts—depleted groundwater levels and dried-up streams
- Andy Lipkis of TreePeople described the discovery in Los Angeles that siloed water and stormwater bureaucracies were wasting millions of dollars on transporting fresh water from the Central Valley and channeling stormwater out into the ocean, when green infrastructure in the city could retain stormwater for reuse, as well as provide other community benefits, such as reduced heat island and air quality improvements
- Jim Stebbins of Project Design Consultants described a water-centric subdivision plan for Monterey, California, that was blocked by cautious agencies with authority over separate pieces of the proposal

Federal funding programs contribute to this lack of integration by not requiring an examination of impacts prior to awarding grants or loans. Once again, the solution is to require an integrated water supply and water quality plan to have been developed in a watershed or region, and evidence shown that the particular project is consistent with that plan before funding is granted.

- California has recently tied an integrated water resource planning requirement to a new grants program for communities (California Department of Water Resources 2004)
- Ohio has attempted to coordinate federal funding from various sources with sustainable local projects. The coordinated funding program requires communities to consider water projects in the context of broader growth and development issues
- Electric utilities could be required to submit a full-cost analysis of the impacts of new power plant construction or rate increases prior to approval by the state's Public Utilities Commission.

Federal regulatory programs, particularly the NPDES, also drive enforcement agencies to ratchet down on and drive pollutant sources into the NPDES system. Alternatives must be found to incorporate the assessment of externalities and the consideration of decentralized alternatives, for example, through such requirements as "decentralized portfolios," which are similar to renewable energy portfolios.

Organizations examining the federal role in the water supply side of infrastructure have developed similar concerns about federal funding patterns. During 2005 hearings about the future of the Bureau of Reclamation, testimony was submitted describing findings of a 2005 National Water Policy Forum, which was funded by nine separate federal agencies, including the Departments of Agriculture, Defense, Interior, and Commerce, and the EPA (American Water Resources Association 2005). One of four major findings of this forum was the need "to address the Nation's water issues in an integrated manner, focusing not on single isolated projects but on programs that present watershed-level solutions." (American Water Resources Association 2005) One version of how this requirement could be implemented is in a provision in the proposed Rural Water Supply Act of 2005.

## Recommended Actions

- The Office of Management and Budget (OMB) had convened an inter-agency group several years ago to examine the problem of lack of collaboration among federal funding programs, but decided not to pursue any remedies. The case that this lack of collaboration is having a severe impact on watersheds needs to be much stronger. Combining with groups such as the National Water Policy Forum on the water supply side could buttress this argument
- Consider how asset management requirements (Governmental Accounting Standards Board Statement No. 34) for life-cycle analysis might help force integrated planning
- Examine whether integrated planning could be incorporated into already existing National Environmental Policy Act (NEPA) requirements
- Suggest to the EPA that they promote the concept of integrated planning with state funding agencies and use California and Ohio as models
- Incorporate issues of integrated water planning into discussions about the mission of a potential Water Commission authorized by Congress
- Support the installation of decentralized systems on private property, by expanding eligibilities in the public infrastructure pools of funding, as well as in tax and other incentives for property owners

Chapter 3

# SUPPORT DECENTRALIZED SYSTEMS ON PRIVATE PROPERTY

The third recommendation for federal funding reform is a concerted effort to expand eligibilities to include grants and loans for homeowners with wastewater or stormwater systems on their properties. The homeowner would retain ownership of the treatment unit, but a public easement would be arranged for the life of the grant or loan. This expanded eligibility was made for the CWSRF in the 1990s, but has not been expanded into other subsidy programs in a variety of agencies.

The significance of this question of eligibility stems from the Palo Alto workshop discussions on viable business models for management. At that workshop, it was recognized that homeowners are unlikely to turn over ownership of their treatment system to a public utility. They are more likely to agree to public ownership when the unit is at a nearby cluster field.

At the beginning of the workshop, the author introduced various concepts from the market literature, which in general would predict the dominant pattern of early adopters being seen in the decentralized system management field. In general, based on the nature of the service being provided, the emergence of small, private companies for individual homeowner maintenance on private property makes sense. On the other hand, management of cluster systems with treatment off of homeowner's private properties has emerged in the public and private utility sector.

Michael Porter's book, *Competitive Strategy: Techniques for Analyzing Industries and Competitors* (Porter 1980), suggests that small, local providers will be the market model when:

- Personal service is provided—Customers tend to have a perception that individualized, responsive service declines with the size of the firm
- Business depends on local image and local contacts
- There is a diverse product line and customization to individual users—Larger companies have a tendency to standardize products and services
- There is a heavy creative content—such as architecture or landscaping

Onsite wastewater system management, in these regards, is similar to the services of a local electrician or plumber. The homeowner appreciates the freedom to choose their own contractor, and the contractor enjoys dealing with the unique personality and needs of the homeowner.

In contrast, Porter's work suggests that larger utilities or companies can emerge when the service is not personal and the product is standardized across customers. Therefore, it is not surprising that utility management, or Responsible Management Entities (RMEs), would be emerging for cluster systems. For cluster systems, the utility model, in effect, mimics (at a smaller scale) the existing work of municipal utility staff who are familiar with large-scale pipe, pumping system, and treatment plant maintenance in public properties and rights of way, and have minimal involvement with individual property owners.

The early adopter literature also offers insights for the emergence of decentralized management services and institutions. Systems that entail optional choices by individual customers are easier to develop than collective systems. More affluent and more educated communities are likely to be early adopters. And, the simplicity of the model and compatibility with existing approaches facilitates early adoption. These factors add additional support for the pattern being seen of a gradual evolution of individual onsite management from the current norm of homeowner responsibility for maintenance of septic systems to professional management by Level 2 or 3 private companies hired by homeowners, who retain continued ownership over their private systems.

On the other hand, cluster system management services by public or private utilities evolve easily from both the homeowner association model of common maintenance of package treatment plants and from a downsizing to the neighborhood level of the central system approach of utilities. New developments are also more likely to see the emergence of RMEs than are older, existing neighborhoods.

The US EPA has presented five models for decentralized wastewater system management that would allocate responsibilities for planning, design, installation, inspection, and operation and maintenance in various ways among the homeowner, public or private management entities, and oversight environment and health agencies (EPA 2004):

Table 3-1: Models for Decentralized Wastewater System Management

| Level | Management Model | Description |
|---|---|---|
| One | Homeowner Awareness | Education |
| Two | Maintenance Contract | Homeowner contracts with qualified technicians |
| Three | Operating Permits | Renewable permits to homeowner |
| Four | Responsible Management Entity (RME) Operation and Maintenance | Permit issued to an RME, but continued ownership by homeowner |
| Five | RME Ownership | Systems are owned, operated, and maintained by the RME, thereby removing responsibility from the property owner |

Only scattered examples of these and other hybrid models have been implemented across the country in recent years.

## Appendix A

# FEDERAL AGENCIES AND PROGRAMS THAT COULD SUPPORT MORE DECENTRALIZED RESEARCH

Each of the federal departments and agencies has a different core mission, but that core mission can intersect with the decentralized water field in useful ways. Following are examples of how agency missions can support decentralized projects (Coalition for Alternative Wastewater Treatment 2006). The programs that currently offer the greatest promise for expanded support are discussed.

### Department of Agriculture

The USDA has been charged to promote rural development as well as agriculture. Since the mid-1800s, the USDA has funded research, education, and extension or outreach services in land-grant universities. The US Forest Service has also been developing an urban forestry program related to water quality. Examples of projects funded in recent years include:

- A New England Onsite Wastewater Training Program at the University of Rhode Island
- Stormwater and low-impact development guidance documents developed by the National Nonpoint Education for Municipal Officials (NEMO) Network based in Connecticut
- Revitalizing Baltimore project to involve citizens in restoring green space and protecting the urban watershed

Programs that could be tapped in the USDA include:

- Cooperative State Research, Education, and Extension Service (CREES)—Integrated Research, Education, and Extension Competitive Grants Program
- National NEMO Network
- Regional Water Quality Coordination Program
- Forest Service—Urban Forestry

## Department of Commerce

The Department of Commerce sponsors research in National Oceanic and Atmospheric Administration (NOAA) coastal and Sea Grant university programs, funds a National Estuarine Research Reserve network, and supports technology research in the National Institute of Standards and Technology. Examples of decentralized projects include:

- Research on nutrient removal in onsite systems in the Waquoit Bay National Estuarine Research Reserve watershed on Cape Cod
- Grants for decentralized technology development from the Cooperative Institute for Coastal and Estuarine Environmental Technology in New Hampshire
- Workshop on sources of water quality impairment, including septic systems, in Santa Monica Bay, California

## Department of Defense

The DOD sponsors the Federal Network for Sustainability and pilots environmental technologies on military bases through its National Environmental Technology Test Sites (NETTS) Program. Examples of decentralized projects include:

- A Fort Lewis sustainability program, including a goal for zero discharge of wastewater into Puget Sound and 75% reduction of water use by 2025
- A Congressional line-item appropriation for research on dual-flush toilets

## Department of Energy

The DOE is exploring the energy-water nexus and is collaborating with the EPA on water-efficiency and reuse standards. An example of a decentralized water project is:

- Guidance on best management practices (BMPs) in water reuse and reclamation in buildings

Programs that could be tapped in the DOE include:

- Energy Efficiency and Renewable Energy (EERE)
- Energy-Water Nexus Roadmap Program—The National Laboratories

## Department of Health and Human Services

The HHS's Centers for Disease Control (CDC) investigates health hazards associated with water quality. Examples of research include:

- Studies of water treatment devices and of the public health impacts of septic systems
- Centers for Disease Control-National Center for Environmental Health (CDC-NCEH)

## Department of Housing and Urban Development

HUD supports pilot-testing and guidance on housing technology in its Partnership for Advancing Technology in Housing (PATH). Examples of its investigations of water-related technologies include:

- Guidance on low-impact development practices, piloting of aerobic treatment units, and web-based newsletter and technical information services provided by the National Association of Home Builders Research Center in Maryland

## Department of the Interior

The Department of Interior supports reuse studies in the Bureau of Reclamation, and a host of watershed and water quality research projects in the US Geological Service (USGS). The Interior Department also funds the National Institutes for Water Resources, with institutes in each of the fifty states. Examples of funded projects include:

- A National Xeriscape Demonstration Program in Texas, Arizona, Nevada, Colorado, and North Dakota
- US Geological Survey (USGS) studies of onsite system impacts on the sole-source aquifer in Deschutes County, Oregon
- Studies of stormwater technologies and low-impact development practices at the North Carolina Water Resources Research Institute

Programs that could be tapped in the Department of the Interior include:

- Bureau of Reclamation–Desalination and Water Purification Research and Development, Water Reclamation and Reuse Program
- Water 2025 Challenge Grants
- USGS—National Institutes for Water Resources (in each state)

## Department of Transportation

DOT funds projects in stormwater runoff and "green highways" mitigation. An example of a decentralized project includes:

- Federal Highway Administration collaboration with stakeholders to consider trading systems from highway runoff with low-impact development subdivisions.

## Environmental Protection Agency

The EPA has created program areas and initiatives in green building, sustainable technology, nonpoint source remediation, decentralized wastewater management, research, and demonstration projects. Examples of funded projects include:

- P3 Award: People, Prosperity and the Planet Student Design Competition for Sustainability—A university competition for sustainable technology and policy, including stormwater, energy efficiency, and green building designs
- Environmental Technology Verification (ETV) projects on nutrient removal in onsite systems
- Region 2 support of Green Building programs in New York City
- Region 4 support of studies on land development in North Carolina
- A Sustainable Infrastructure initiative which has sponsored the development of a water-efficiency program of labels and standards called Water Sense
- Management of National Community Wastewater Demonstration Projects designated by the Congress
- Sponsorship of workshops, conferences, and information clearinghouses in such fields as low-impact development, nonpoint source pollution, watershed management, and decentralized wastewater management and regulations

Programs that could be tapped in the EPA include:

- Green Building Program Workgroup
- Collaborative Science and Technology Network for Sustainability
- Non-Point Source Implementation Grants (319 Program)
- Targeted Watersheds Grants Program

## White House

The White House has issued executive orders for "greening" government buildings and management practices, and the President's Office of Science and Technology Policy is reviewing the activities of federal agencies in the broad "water availability and quality" arena

- Federal Government Green Building Initiative and Greening the Government Through Leadership in Environmental Management
- Office of Science and Technology Policy—Subcommittee on Water Availability and Quality

## National Academy of Sciences

The NAS sponsors studies in water science and engineering, and in urban sustainability. Examples of imminent projects include:

- Studies of the effectiveness of stormwater Phase 2 BMPs and international infrastructure innovations, including in water
- Science and Technology for Sustainability—Urban Sustainability Initiative
- Water Science and Technology Board

## National Science Foundation

The NSF supports a variety of ecosystem-monitoring programs, science and technology centers, and engineering projects. Examples of projects funded include:

- Sponsorship of a conference on water systems in cities of the future
- A grant to the University of Rhode Island Coastal Institute to integrate graduate education and research in nonpoint source pollution
- Science and Technology Center support for the University of Arizona, which has been researching semi-arid hydrology and riparian areas

Programs that could be tapped in the NSF include:

- CLEANER, WATER, NEON Initiatives
- Integrative Graduate Education and Research Traineeship Program (IGERT)
- Directorate of Engineering

## Small Business Innovation Research

The SBIR program, as an inter-agency effort, supports innovative technology development and commercialization.

## Conclusion

It is evident that decentralized industry and environmental advocates have been unaware of the full extent of involvement by agencies other than the EPA. Nevertheless, researchers and advocates at the local level often search out and combine grants from multiple agencies. For example, the University of Rhode Island, a leader in the decentralized water field, has secured funding for decentralized wastewater research, education, and demonstration projects from the EPA, US Department of Agriculture (USDA), National Oceanic and Atmospheric Administration (NOAA) in the Department of Commerce, and the National Science Foundation.

### Inter-Agency Coordination

The plethora of agency missions and programs provides the opportunity for expanded support of a research and development and early adoption phase for the decentralized water field. A challenge is to achieve greater impact and save time and money through coordination of the efforts of the separate agencies. Several suggestions, from those that are achievable in the short-term to those that are possible once the case for change has been made, are:

- Appointment of staff in the EPA's Office of Water to coordinate decentralized water-related programs within the EPA
- Prioritization of water infrastructure issues in the EPA's Sustainable Research Strategy
- Organization of a conference of research and development programs (and recipients of grants) in departments and agencies that fund water projects, including the following previously mentioned projects:
  - EPA's Office of Research and Development
  - USDA's CREES program for land-grant universities
  - DOE's energy-water nexus
  - Commerce Department's National Estuarine Research Reserve Program, Sea Grant, and CICEET
  - Interior Department's USGS and Bureau of Reclamation research
  - HUD's PATH program
  - DOD's sustainability research
  - NSF
- Reinvigoration of OMB's inter-agency group on federal funding of local water-related infrastructure across a wide variety of agencies, including:
  - EPA
  - USDA
  - Commerce
  - HUD
  - FEMA
  - Army Corps

## Appendix B

# EXISTING FUNDING PROGRAMS

The following agencies have existing funding programs (Coalition for Alternative Wastewater Treatment 2006).

## Environmental Protection Agency

### Clean Water State Revolving Fund (CWSRF)

The CWSRF is the friendliest to decentralized approaches of all the federal funding programs studied. A 1996 agreement between the EPA and the States set in motion a process by which innovative approaches became eligible for funding over time. These approaches include:

- Decentralized wastewater projects
- Smart growth initiatives
- Low-impact development (LID) systems
- Water conservation

As a result of this agreement, a system was created whereby organizations receiving loans could in turn lend money to private homeowners for systems on their property. Parts of this expansion in eligibilities required a ruling by the US Treasury that public monies could be used on private property if there was an easement to inspect the treatment system during the life of the loan.

In spite of innovations in this program, the CWSRF has been a particular target of the Office of Management and Budget's (OMB) budget-cutters, falling from a high of $1.35 billion several years ago to a recent $850 million. This drop is in contrast to relatively level funding for rural water/wastewater projects in such departments as USDA. In addition, while the EPA has ruled that decentralized projects are eligible, and has allowed for innovative funding mechanisms such as linked-deposit programs, few states have gone along with these provisions. American Rivers has examined these difficulties in the Great Lakes States and is working to promote changes at the state level.

### Safe Drinking Water State Revolving Fund (SDWSRF)

Congress began several years ago to allow increasing percentages of the SDWSRF to be used for source water protection, which could include decentralized stormwater and wastewater projects. A key barrier to this use of funds and the reason why funding has been lagging, is that projects on private property are specifically disallowed.

### EPA Section 319 NonPoint Source Implementation Grants

This program covers funding for decentralized system projects. However, recently EPA has set aside half of the budget (about $100 million) for watershed planning studies, and monies are not available for construction projects.

### Construction Grants in EPA Appropriations

A list of local projects designated each year by the Appropriations Committees based on requests from Congressmen and Senators reached a peak of several hundred million in the FY2006 bill. The 1972 CWA federal construction grants program, which is used as authorization for these projects, had been available only to publicly-owned treatment works (POTWs). However, a ruling was made that the national community demonstration projects included in the line-item list for a number of years could cover costs of construction of onsite wastewater systems on private property (with a requirement for a public easement). In the recent bill there has been an occasional listing for what appear to be decentralized systems. However, this funding stream continues to be for conventionally-engineered projects.

## Department of Agriculture

### Rural Utilities Service (RUS)

The RUS water/wastewater funding is directed at low-income rural communities. Most of these communities do not have centralized water, sewer, or stormwater systems and would be ideal candidates for decentralized approaches. However, the RUS has a long history of supporting public (or non-profit community) facilities and is particularly averse to assisting privately-owned systems. RUS is attempting to absorb decentralized technologies into its program by supporting construction of small cluster systems, including constructed wetlands, in a few states such as Minnesota. Secondly, RUS points out that grants are available to homeowners directly for treatment systems on their property through the modest low-income grant and loan program available to low-income homeowners.

## Housing and Urban Development—Community Development Block Grant

HUD–CDBGs and loans are available for low-income community water and wastewater projects, where infrastructure is argued as necessary for economic development and revitalization. CDBG funds are also only available for publicly-owned treatment works.

## Department of Commerce

Economic Development Administration (EDA) grants for water and wastewater projects to assist in economic revitalization are also only for publicly-owned treatment works.

## Department of Interior

### Bureau of Reclamation

Rural water projects have been funded for years as line-items in Congressional legislation. As a result of OMB Program Assessment Rating Tool (PART) reviews urging rationalization of this approach, Rural Water Supply Act legislation has been introduced in the Congress, which would create a new funding program. As stated above, this legislation would require inter-agency coordination and would allow watershed planning to be a factor in the awarding of grants. The Commissioner of the Bureau also suggested in testimony that allowance of federal development of the engineering plan could introduce innovative decentralized approaches, such as local desalination of brackish groundwater, rather than a local preference for conventional water piping systems.

### Army Corps of Engineers

Numerous water and wastewater projects have been authorized in water resource bills. While few have been funded in appropriations bills, Taxpayers for Common Sense has pointed out a review of listed projects, which suggests that all conventionally-engineered publicly-owned treatment works.

## Federal Emergency Management Flood Mitigation Assistance Program

### Inter-Agency Coordination of Funding

The OMB convened an inter-agency task force several years ago to discuss water and wastewater infrastructure financing. Several concerns had emerged about the tendency of federal funding programs to require and reinforce conventional engineering solutions, and to support individual projects without examining externalities and impacts in the larger watershed. OMB concluded that the time and effort to build a collaborative funding approach across agencies appears to outweigh the benefits of integration, and the Task Force has not met in more than a year.

Chapter 4

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