

The Future of Stormwater

The Water Environment Federation held a meeting of stormwater experts and leaders on June 21 and 22, 2011. These professionals represented the public and private sector as well as non-profit, research and academic viewpoints. The focus of the event was on open discussions of macro-level stormwater issues and current needs for stormwater practitioners. The identified challenges are presented below.

Leadership

While many disparate groups across the country represent the stormwater field at a local, state or regional level, there is no group or organization adequately representing this field at a national level. This lack of leadership weakens the stormwater sector's ability to champion a direction through coordinated policy engagement with the regulatory community or fostering innovation in the field. Participants agreed that national leadership could enrich the level of professionalism of stormwater practitioners and bring together specialists from a variety of backgrounds into the universe of stormwater management.

Vision

Currently Clean Water Act requirements are the main driver in developing stormwater management programs; however, the act does not spell out a clear end goal that holistically addresses the many challenges facing the water sector today. This is a critical time to create a stormwater vision that proactively lays out a framework that goes beyond merely meeting regulatory requirements. Rather, such a visionary framework should advance stormwater management to address dimensions beyond water quality as outlined in the "Messaging" section of this document.

This vision should also recognize that stormwater management may not always present a "zero sum game" where increased treatment necessitates a related increase in design, construction, and operation and maintenance costs. Recent projects using approaches such as green infrastructure, low impact development and environmental site design show that innovative stormwater management can reduce runoff volumes, promote healthy and stable hydrologic conditions and be cost effective as well as aesthetically superior to projects using standard construction methods and traditional stormwater management.

Messaging

Current public education and outreach efforts focus primarily on touting the water quality benefits of stormwater management. However, this message does not always resonate strongly with the public who are subject to a barrage of messages competing for their attention. Effective communication provides the public and elected officials with a compelling reason to act with the understanding that these reasons are likely to vary locally and by audience. Other benefits of stormwater management (i.e., economic growth, urban revitalization, aesthetics, flood control, protection of infrastructure, and public health and safety) should be highlighted to more effectively resonate with the diversity of interests. Also, any message on stormwater management should be backed up with technical information in order to manage expectations.

Stormwater management infrastructure is uniquely tied to the landscape and the public in ways that water/wastewater infrastructure is not. Traditional infrastructure—pipes, pumps and treatment plants—are less visible to the general public, while stormwater infrastructure, such as bioretention facilities, ponds and water quality swales, are often highly visible to the public. This relationship offers a unique opportunity to engage and facilitate public discussions of paramount importance and should be utilized in stormwater programs across the country.

Costs and Benefits

Currently, available information on costs and benefits related to stormwater management are inconsistent and incomplete. Since policies and management practices based upon compromised data sources are inherently flawed, costing information reflecting whole life cycle costs will enable better comparisons among the various stormwater management options. Similarly, the use of *Triple Bottom Line* analysis, which measures environmental and social benefits and costs as well as economic aspects, should become commonplace when developing costing data used for decision making. This type of analysis provides a more complete picture of costs and benefits to society by more accurately capturing the many co-benefits related to stormwater management practices, including urban economic revitalization, reduced energy demand, enhanced public health and increased protection of ecosystem services.

Effective comparisons requires setting a standard costing metric for all facets of stormwater management, including planning, design, construction, operation & maintenance, and monitoring. New research studies are examining willingness-to-pay for aspects such as enhanced aesthetics as well as other benefits/costs that are less easily monetized, including ecosystem functions, public health and safety, and energy efficiency and conservation. Funding is needed for these types of valuation studies to further the case for non-monetized parameters.

Funding

While the water sector as a whole is under-funded, stormwater programs are particularly challenged in this respect due to limitations on the development of user-funded, fee-based programs. Many of these limitations are the result of state legislation or local laws that specifically prohibit the formation of user-fee based programs that recover stormwater management costs. While stormwater management is a service required to maintain clean water sources and ensure public safety from flooding and pollution, this need may not be readily apparent to elected officials. Therefore, funding for stormwater should be elevated to reflect the vital role these services play in meeting societal needs, similar to other basic services such as drinking water, wastewater and electricity.

Stronger ties between stormwater pollution sources and costs incurred by their contributions are needed to establish equitability and fairness in financing stormwater management services. Currently, many pollutant contributors do not pay for their impacts, which unfairly shift the burden of payment on others or reduce overall funding for stormwater management services. All pollution contributors should share in the cost of services provided and impacts realized from stormwater management improvements. Also, innovative methods, such as private-public partnerships, should be explored to address funding challenges.

Education and Training

Stormwater professionals at all levels can benefit from more training and continuing education, and many in the field believe that a certification program could heighten recognition of stormwater professionals. The stormwater

field is relatively new, and it draws from a variety of technical backgrounds, such as engineering, science, law, administration, landscape architecture, biology, inspectors, operations, and field technicians. Experience has illustrated that stormwater management cannot be viewed as a one-size-fits-all profession.

Other water sectors (e.g., wastewater and drinking water) are tied to mechanical systems that respond to static, predictable inputs and variables through a controlled process. Inputs and influences on stormwater systems are highly variable and episodic, by nature, subject to variables, such as soil type and conditions, climate and seasonal variations in weather, dominant vegetation, land use, and pollutant loadings and sources. Given these complexities, boiler plate approaches are not appropriate or effective for stormwater solutions. Therefore, training and education is needed to provide stormwater professionals with the knowledge and skills required to develop creative and successful solutions for the diversity of situations encountered. Lastly, education on stormwater management should go beyond those who work in the stormwater field directly, targeting decision makers as well as the general public (see Messaging section for more information).

Along with training and continuing education, a nationally-recognized certification program that would help to elevate the stormwater field and its professionals should be considered. Ideally, this program would be national in scope and broad enough to capture the needs of technician/field level professionals as well as design and construction professionals. An increase in peer-reviewed publications, technical guidance, and instructional material is needed to support a certification program of this nature.

Collaboration

The stormwater field is influenced by professionals from varying backgrounds that may not necessarily be accustomed to working together. This diversity of involvement, while powerful, creates a challenging collaborative environment where the various specialists may be unfamiliar with others' technical language or professional norms. The goal of the stormwater field is to improve and enhance stormwater runoff and mitigate the impacts of these flows on natural waterways. To meet this objective, the following must happen:

- Planners, hydrologist, geotechnical engineers, and landscape architects must evaluate and site controls in settings that provide optimal conditions for success;
- Stormwater design engineers must develop technically sound and sustainable solutions;
- Landscape architects must ensure that designs are aesthetically pleasing and that vegetative palettes used are site-appropriate;
- Contractors must install controls with precision and respect for environmental processes;
- Inspectors must verify that designs have been constructed as intended and that the site has not been comprised by undue loss of vegetation or soil over-compaction;
- Operations and maintenance staff must ensure the continuing function of controls for long-term treatment (including volume control, where applicable) and public safety;
- Lawyers and environmental advocates must evaluate legal decisions and ensure that the spirit of stormwater management is protected in federal, state and local laws and regulations;
- Policy-makers must track stormwater-focused policies and ensure that these policies are based upon peer-reviewed science ;
- Administrators must advocate for adequate funding, reasonable permit conditions, and strong programmatic support for stormwater management; and

- Decision-makers must understand the many benefits of stormwater management and communicate these to the public, and also provide stormwater managers with the necessary tools to implement a successful stormwater program.

To ensure that all of the above occur, it is imperative that strong collaborative ties are forged and maintained across the various sectors with interest in and an impact on the stormwater field as well as those professionals who support it.

Research and Data Needs

Innovative solutions are often based upon cutting-edge research, and there is currently strong demand for cost-effective treatment controls to support the nascent and growing demands of stormwater management. This fact suggests that there is a strong need for research in many areas, including:

- BMP performance
- Reuse technologies (e.g., rainwater harvesting)
- Stormwater management solutions in challenging environments (e.g., urban, high groundwater, narrow right-of-ways)
- Filter media
- Pollutant loading fate and transport
- Groundwater impacts due to increased infiltration
- Modeling tools to design and size green infrastructure BMPs
- Source controls
- Source identification and diagnostic techniques

Research in these and other topics is crucial to technical progress in the stormwater field.

Policy Engagement

Decision makers do not always equate stormwater at the same level as other drinking water and wastewater issues, resulting in policies that reflect this disparity. As federal, state and local stormwater programs evolve, the next generation of stormwater policies should reflect stormwater management as an integral component of 21st Century Infrastructure – a new infrastructure paradigm stressing sustainable approaches that provide multiple benefits. This orientation differs from existing approaches that target single delivery service needs with little thought given to overlapping or competing services provided. One example is the disconnect that exists between flood control and water quality treatment infrastructure. Currently, flood management controls and stormwater management controls are not holistically integrated, reflecting the programmatic separation in these sectors. The 21st Century Infrastructure approach would seek to identify techniques that address multiple challenges and service delivery needs. For instance, integrating green infrastructure into a watershed will not only treat water quality and reduce high-frequency flooding, but it also provides many other environmental and social co-benefits. Furthermore, green infrastructure reduces the need for, and the cost of, traditional stormwater management and flood control infrastructure. Policy makers, in crafting approaches to rebuild our aging infrastructure, must gain an awareness of the significant role and opportunity that stormwater management can play in the new generation of modern infrastructure and natural resource protection.