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Local Government Stormwater Financing Manual:

A Process for Program Reform

Prepared by

Environmental Finance Center
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This project was managed and directed by the ***Environmental Finance Center (EFC)*** at the University of Maryland in College Park. For twenty years EFC has served the Mid-Atlantic region and is one of ten regional centers located throughout the country that comprise the Environmental Finance Center Network. These centers were established to assist communities in addressing the how-to-pay issues associated with resource protection. One of the EFC's core strengths is its ability to bring together a diverse array of individuals, agencies, and organizations to develop coordinated, comprehensive solutions for a wide variety of resource protection problems. The EFC has provided assistance on issues related to energy efficiency, stormwater management, source water protection, land preservation, green infrastructure planning, low impact development, septic system management, waste management, community outreach and training. Working to facilitate this process is at the core of the EFC's mission and skill set. Visit us at: www.efc.umd.edu.

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Preface

This manual was inspired by and written for local government leaders. Though effectively managing urban stormwater runoff requires leadership and bold decision-making at all levels of government, it is at the local level where the most significant and substantive stormwater investments will be made. And, it is at the local level where the most innovative, effective, and transformative financing programs are being developed and implemented. Our goal with this manual is to provide local leaders with the foundation for establishing and growing effective stormwater management programs that maximize the value and impact of every dollar invested in their communities.

Public sector financing in general, and stormwater financing specifically often appear to be inaccessibly complicated and technical to even experienced public officials. Therefore, rather than try to address the myriad of issues associated with stormwater financing, our strategy was to provide a foundation for local officials to move forward by focusing on perhaps the most important financing attribute: leadership and the ability to move communities towards effective action.

Our intent was not to produce a static document. Rather, it is our intent to use this manual as the launching point for a dynamic financing resource that will develop and grow along with the burgeoning stormwater financing industry. To that end, this manual is the first in a series of resources to be developed by the Environmental Finance Center that will address important financing issues and opportunities, including:

- Reducing costs through the use of performance-based financing;
- Establishing effective stormwater rebate and credit programs;
- Using markets and offsets in an urban environment; and,
- Maximizing stormwater benefits through the use of green infrastructure practices.

We hope you find this manual useful as you develop and establish your stormwater management program. For more information on the Environmental Finance Center, please visit us at www.efc.umd.edu.

Manual structure:

This manual is divided into four parts:

1. An introduction, which asserts that a paradigm shift is underway in stormwater finance, and local government staff have a critical role to play in leading that shift;
2. A description of why stormwater management and finance are being transformed and why local governments are at the center of that transformation process;
3. A policy/program development model that was created by Bryson and Crosby (1992) and is applied in the manual to the development of stormwater policies and programs; and,
4. A set of appendices, including:

a. A description of the risks of leading change on big problems, such as transforming stormwater finance systems, and methods for managing those risks;
b. Results of focus group interviews that ground the manual on situations being faced by local government staff;
c. A technical note for experienced readers on setting stormwater utility rate structures; and
d. A list of acronyms and their meanings.

Readers may want to devote their attention to particular sections of the manual. For example, those who are experienced in the dramatic shifts underway in stormwater management may want to pay more attention to the model than to the description of why stormwater management and finance are being transformed. Likewise, a reader already immersed in finding a solution to a stormwater problem may want to focus on the "Creating a Solution" phase of the model. A cautionary note, however: creating an effective solution is dependent on having accomplished two prior phases, "Gaining an Initial Agreement" and "Formulating the Problem."

In sum, this manual provides, for local government staff, background information about a paradigm shift underway in stormwater management and a process model for being effective leaders in their jurisdictions to create policies and programs to finance that shift. Our goal is to encourage and empower your leadership efforts.

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Introduction

Interdependencies between local jurisdictions are becoming more obvious (we all are downstream from somebody); state and federal authorities are extending permitting requirements to additional communities; scientists are predicting more extreme storm events as a result of atmospheric warming; and all of these changes have emerged in the context of growing anti-tax/anti-government sentiments and a political system which experiences difficulties in fixing long-run problems, such as funding for the maintenance and expansion of stormwater infrastructure.

Why What Local Governments Do about Stormwater is Important

Stormwater services have long contributed to the health and welfare of people living in communities, from small towns to large cities. The American federal system of governance invests significant land-use authority, including that for stormwater management, in local jurisdictions. Additional decentralization has occurred in some jurisdictions because private homeowners' associations have been given responsibility, with local government oversight, for maintaining stormwater improvements. Since their beginning, local governments have provided protection against stormwater floods, first by digging ditches and then by installing pipes, and often the ditches and pipes discharged directly into streams and rivers; many still do.

Your jurisdiction likely owns land. State and federal authorities might also own properties within your boundaries, but most land in most jurisdictions in the Chesapeake Bay Watershed is held by private property owners. Likewise, most land transactions – the purchase, sale, and use of land for places to live, work, and play – are accomplished via the private market. With extensive private land ownership and ubiquitous market transactions for land use, the questions for local government staff are:

- Why should government be in the business of providing stormwater services?
- Why not leave stormwater management exclusively to the market?

The answers to these questions are:

- **Unless government provides stormwater services, those services will not be made available to the extent that people and nature demand them.**
- **And unless <u>your</u> government provides them, those stormwater services will not reflect the unique social and political relationships characterizing your community.**

Private property owners will make reasonable efforts to protect their assets against potential ravages of stormwater by locating buildings on dry areas, grading the ground away from structures, and installing and maintaining roofs, gutters, and downspouts. They may minimize their use of lawn fertilizers in the recognition that stormwater runoff often carries nutrient pollutants into bodies of water. Stormwater management across a built community, even a small town, involves, however, a large system of interdependencies across parcels of land; how one property owner behaves about stormwater can and likely will affect his neighbors. Additionally, no private property owner has an economic incentive to provide stormwater services for his neighbors; this is so because there is no cost-effective way to exclude people who would enjoy privately-produced stormwater services without having paid for them.

Stormwater services are public goods, and unless government provides or subsidizes them, most likely a community will suffer the consequences of their absence.

Your local jurisdiction, moreover, is the primary government provider of stormwater services. Local governments are creatures of their states, and they are subject to national stormwater regulations under the U.S. Clean Water Act (CWA) of 1972 and later amendments. The American federal system of government recognizes for purposes of governing land use, however, that local jurisdictions are in a unique position to understand the physical and social qualities of a place, including:

1. Its system of surface and ground water that has been afforded by nature;
2. The presence and quality of existing stormwater infrastructure;
3. Who is responsible for maintaining that infrastructure; and,
4. Local citizen's political preferences for what local public services should be provided and how they want to pay for those services.

As a local public official, therefore, you are significantly and uniquely responsible for stormwater services and their finance.

Changing Stormwater Values, Services, and Organizational Forms

The shift underway regarding stormwater management reflects our increasing awareness of the environmental consequences of stormwater – its impacts and its benefits, both existing and potential. Changing values about stormwater are based on progress in science. Most notably, the U.S. Environmental Protection Agency conducted a broad, national study of stormwater in the late 1970s and early 1980s (EPA, 1983). That study, known as the Nationwide Urban Runoff Program, found high levels of heavy metals, coliform bacteria, and nutrients in urban stormwater. The study indicated also that various Best Management Practices (BMPs) – particularly detention basins, wet basins, and wetlands – are effective means for reducing stormwater pollutants.

Local governments are responding to new values forged by improved science by removing pollutants prior to discharge and by using stormwater to protect local ecosystems, recharge groundwater, enhance parks and recreation sites, and increase local landscape aesthetics. To ditches and pipes, local governments are adding networks of open spaces, known as ***green infrastructure***. Such networks – which include combinations of forest preserves, parks, rain gardens, wetlands, green roads, roofs and parking lots, and other open spaces – are being used, increasingly, to manage stormwater and to improve its quality. Managing stormwater by green infrastructure implies changing how local governments are organized and how they relate to outside individuals and groups: jurisdictions are adding ecologists, planners, economic developers, and other types of local government employees to their traditional corps of stormwater engineers, and they are partnering with neighboring jurisdictions, land developers, private engineering firms, non-profit organizations, and individual citizens to create stormwater management networks. See ***Appendix A*** for a more thorough description of the impact of green infrastructure on the stormwater financing process.

These changes in values, additions to services, and reforms in organizations and relationships are occurring in the context of growing urbanism in the United States. While not exclusively an

urban issue, stormwater is primarily a problem in built communities. The urban population of the U.S. is now more than 82 percent of the total population and is growing at a rate 1.3 percent per year (United Nations, 2011). The rate of land conversion, from rural to urban uses, is exceeding, moreover, the rate of urban population growth. Using satellite maps, researchers have estimated that in the Chesapeake Bay Watershed, for the period 1990 to 2000, impervious surface areas grew by 61 percent, and that growth came at the expense of natural resource lands: forests; agricultural property; and wetland areas (Jantz, Goetz and Jantz, 2005).

Legalities

Changing scientific knowledge and community values are the bases for evolving government regulations on stormwater. Congress passed the CWA in 1972. In 1990, based on the Nationwide Urban Runoff Program findings, the Act was amended to regulate stormwater in larger local jurisdictions: communities, that is, with populations greater than 100,000. These larger jurisdictions are known as Phase I Communities. In 1999 the regulations were extended to smaller jurisdictions known as Phase II Communities. The extension of regulations to Phase II communities included many more jurisdictions. In the State of Maryland, for example, ten large and medium-size jurisdictions are Phase I locales, whereas approximately 60 cities and towns, with populations between 1,000 and 100,000, are Phase II jurisdictions (Maryland Department of the Environment, 2013).

The EPA regulates stormwater through the National Pollutant Discharge Elimination System (NPDES), which addresses discharges from three potential sources: municipal separate storm sewer systems (MS4s), construction activities, and industrial activities. A MS4 is a conveyance or system of conveyances that is owned by a public entity – such as a township, municipality, or county – which collects or conveys stormwater. In order to discharge stormwater into their MS4s, Phase I and Phase II Communities must obtain, usually, a permit. Permits for Phase I jurisdictions require site-specific technical control measures that are relatively more intensive than are measures required in permits for Phase II jurisdictions (EPA, July 2013). Most states are authorized to be the permitting authority across their jurisdiction.

Phase II control measures include six requirements – also known as Minimum Control Measures (MCMs) – of every jurisdiction seeking a permit. BMPs are required for each MCM, as are: (1) measurable goals; (2) a timeline, including interim milestones and descriptions of when measures will be taken; and (3) the designation of the person or persons responsible for implementing the stormwater program. The MCMs are:

1. **Public education and outreach**. Communities must implement, with BMPs, a public education campaign to distribute education materials or otherwise to reach the public to describe the effects of stormwater and how runoff can be reduced.
2. **Public participation and involvement**. Regulated MS4s need to comply with applicable state and local requirements for open meetings and public information.
3. **Illicit discharge detection and elimination**. Communities must find and eliminate, as best they can, illegal discharges of stormwater into their MS4s – either from direct or indirect sources.

4. **Construction site runoff control**. This MCM requires communities to adopt effective sediment, erosion, and waste controls for applicable construction sites.
5. **Post-construction runoff control**. Regulated MS4 communities must develop and implement strategies, including long-term maintenance and operations of structural and non-structural BMPs, for controlling post-construction runoff.
6. **Pollution prevention and good housekeeping**. Regulated MS4s must develop plans to reduce stormwater runoff from municipal operations that include BMPs, municipal employee training, and measurable goals.

Chesapeake Bay Requirements: The Chesapeake Bay region has been rather uniquely impacted by aggressive water quality regulations and policies over the past decade. Those impacts are now being felt at the local level in regards to stormwater management requirements. In 2010, consistent with the CWA and in coordination with the states and the District of Columbia (DC) in the Chesapeake Bay Watershed, the EPA established a "nutrient and sediment pollution diet" for the Bay. The diet is known as the Chesapeake Bay Total Maximum Daily Load (TMDL), or Bay TMDL. Concurrent with the development of the Bay TMDL, the EPA required the Bay watershed states and DC to develop watershed implementation plans (WIPs) in order to gain "reasonable assurance" that the Bay jurisdictions will achieve nutrient and sediment reductions needed to implement the TMDL. The Bay watershed states are currently working with their respective local jurisdictions to establish and implement WIPs.

Responding effectively to the NPDES MS4 permit requirements, both Phase I and Phase II, and to the Bay WIPs, is inherently difficult and likely to be expensive because:

1. The physical, chemical, and biological qualities of stormwater are complex and costly to assess;
2. The quality and flow quantity of stormwater are costly to control; and,
3. Water quality improvements will depend on changes in the behavior of property owners and public employees.

Challenges for Local Government Officials

The impacts of urban stormwater runoff cannot be ignored. One acre of paved parking space creates sixteen times the runoff for a meadow of the same size (Oregon Environmental Council, 2007). Large volumes of runoff erode streambeds and banks; threaten the flooding of buildings; and imperil roads, bridges, culverts, and other infrastructure. Scientific findings indicate that in built areas, runoff often carries heavy metals, pesticides, fertilizers, bacteria, hydrocarbons, and sediment. Such pollutants destroy habitat, kill plants and animals, fill navigation channels, plug groundwater injection systems, and pollute groundwater itself. Adjusting to the new understanding about the environmental impacts of stormwater implies that stormwater management is becoming more complex. To the technical problems of engineering conveyance systems, stormwater managers are taking on adaptive problems, which require changes in the behavior of government and citizens toward their environment. This change in stormwater management is no less than a paradigm shift, the challenge of which is, for local government officials: How can we create and pay for efficient and effective behavior changes, processes, and organizations to manage stormwater?

Turn the coin over, however, and view stormwater as an asset. When well managed, stormwater replenishes the earth, both on the surface and underground. Water is necessary for plant and animal life. It is a key factor in the aesthetics and enjoyment of a place. It is fundamental to a local economy, including its industry, commerce, and tourism. The challenge to local officials from this perspective is: ***How can we turn a necessity, perhaps in the form of a permit required of our jurisdiction by the state, or the demands of environmentally interested citizens and groups, into a possibility, the opportunity of which is to enhance the asset value of stormwater in our locale?***

For most taxpayers, however, stormwater management is something of a mystery. Runoff appears to be a natural occurrence, and stormwater infrastructure to control for flooding is largely hidden underground. As local government official in Pennsylvania commented, "People care; they really do, but they need to become more educated about what runoff does and what stormwater management means." Taxpayers also need to consider what responsibility they bear for runoff problems.

Complicating your answer to these challenges is the fact that there is no such thing as a free lunch. Adding environmental services to stormwater management and investing in stormwater as an asset involves costs. Paying for more stormwater services decreases the opportunity for providing other public services or for leaving more money in the pockets of citizens and businesses.[1] Moreover, the common context of local governance in America is daunting at this time: engineers and economists report that the bill due for deferred maintenance of physical infrastructure across the nation is huge; and citizens are resisting taxes and expressing anti-government sentiments, even while they make additional demands on the public sector. Faced with such challenges, elected officials tend to focus their efforts on surviving in the short run, staying viable until the next election or until retirement, at which time long-run problems become the responsibility of someone new to the job. Overcoming the biased towards short-term decision-making will require committed and influential long-term leadership.

[1] According to economic theory, local government decision makers should invest in stormwater services to the point that the additional benefit provided is equal in value to the additional cost incurred. The decision is complicated, however, by the fact that benefits of improved stormwater services will extend beyond local jurisdictions' boundaries; these "external benefits" of stormwater management provide a rationale for the involvement of state and local governments in the decision. Hopefully, too, with benefits extending to others, costs will be shared by others. An additional complication arises because benefits and costs will extend over time, and decision makers must evaluate the provision of benefits for people living into the future while incurring costs in the present.

Being an Effective Change Agent for Stormwater Finance: An Overview of Five Phases to Gain and Exercise Influence, with Lessons Learned

Never doubt that a small group of thoughtful and committed citizens can change the world; indeed, it is the only thing that ever has.
Margaret Mead, Cultural Anthropologist

All organizations by design are the enemies of change, at least up to a point; government organizations are especially risk averse because they are caught up in a web of constraints so complex that any change is likely to rouse the ire of some important constituency.
James Q. Wilson, Political Scientist

Our communications were primarily about the city's stormwater needs, current and future, and about what consequences the city could expect from inaction.
Water Resources Department Staff, City of Lynchburg, Virginia, 2013

In essence, stormwater finance refers to a set of mechanisms, which governments can use to obtain the resources they need to pay for stormwater services. Optional sources of revenue include taxes, fees, grants, and loans. When choosing among the mechanisms, decision makers employ criteria such as cost of administration, fairness among payers, initial yield, and flow of revenue over time. There are tradeoffs to be faced when choosing one mechanism over others. Usually, policy-makers choose to combine mechanisms.

Stormwater finance is more than a set of mechanisms, however. Decisions about stormwater finance involve economic and political considerations such as, "What stormwater services should we provide, given that we have limited resources to pay for the many services we want to provide? How do benefits and costs differ across those services? What does the EPA/state mandate require us to fund? What would be the most cost-effective program to achieve our stormwater goals? What would be the economic impact of improved stormwater services in our jurisdiction? And, with citizens distrustful of government and hostile to paying more for the services we provide, how do we minimize negative reactions to doing more?"

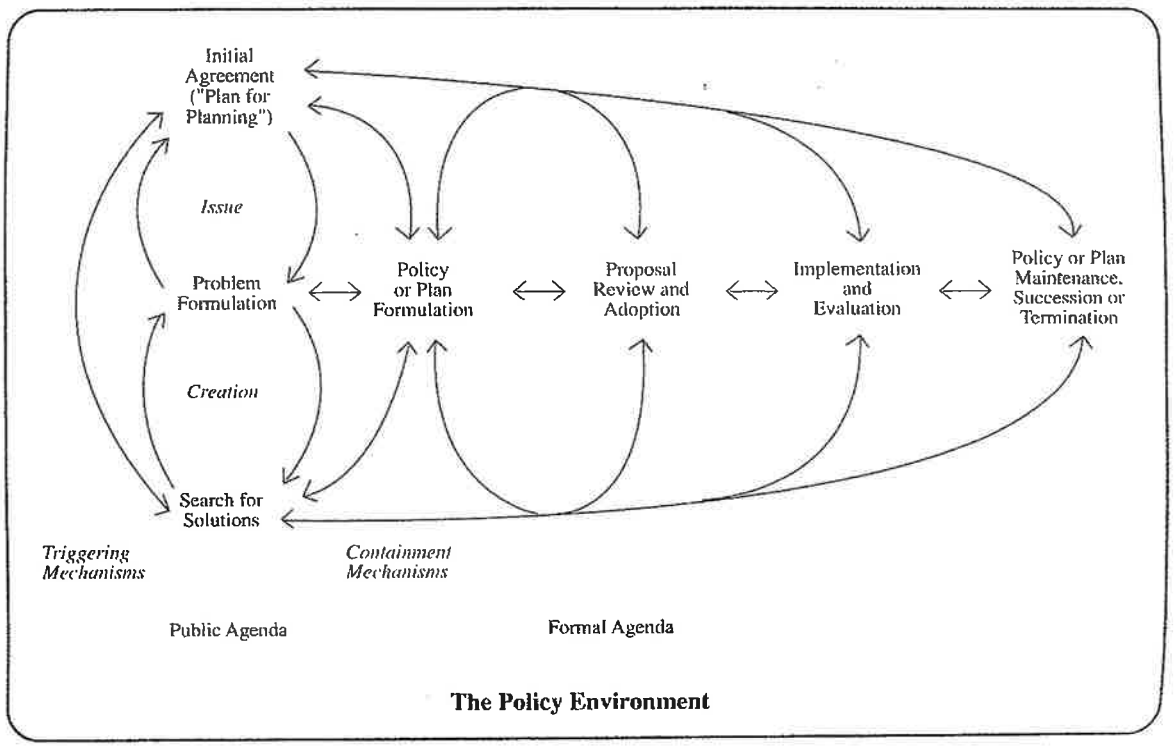
To help your jurisdiction solve the complicated issues emerging for stormwater finance, you will need to consider how you can gain and exercise influence – how you can be an effective change agent. The process begins with thinking about the stormwater problems that your local government faces and what your role as a change agent should be.

A Stormwater Policy and Program Reform Model

To be an effective change agent for stormwater finance in your community means you will take a lead role in one or more of five phases of a local policy-making, program-forming process.[2]

The phases should not be viewed as a linear, lock-step process but rather as an orienting framework to assist your thoughts and actions. Flexibility is required to apply the process to a particular situation and jurisdiction. The five-phase model is shown in Figure 1, introduced afterwards, and examined in detail in the sections that follow:

Government Policy/Program Development Model



[2] The five-phase model is based primarily on the work of Bryson and Crosby (1992) and, secondarily, on a similar five-phase model provided by Cyres and McClelland (2013) regarding the development and implementation of a stormwater utility.

Five Phases to Change Public Policies

As is shown in Figure 1, the first three phases – Gaining an Initial Agreement, Formulating the Problem, and Creating a Solution – constitute an interactive process by which stormwater management problems are assessed and at least one solution gains a place on your jurisdiction's agenda. The five phases are:

Phase 1: Gaining an Initial Agreement. This preparatory phase involves bringing together an informal group of people to reach an agreement that changes in your jurisdiction's stormwater services are needed. You and others may be dissatisfied, for example, with:

a. The adequacy of resources to provide and maintain the infrastructure needed for traditional services such as flood protection;
b. Funding to provide new services involving environmental protection and enhancement;
c. Your jurisdiction's responses to external mandates;
d. Services needed to adjust to increasing stormwater risks attributable to warming of the earth's atmosphere; or,
e. The adequacy and fairness of existing stormwater finance mechanisms.

Typically, the first members of your group will be staff colleagues from within your jurisdiction, but as you search for information and agreement across your community, you will want to expand the group to include stakeholders, either as members of groups or individual citizens. With the formation of your group of staff and stakeholders, you may decide to seek information and resources from private consultants, state and federal agencies, university experts, and representatives from non-profit groups. After your group has achieved an initial agreement that you share a dissatisfaction about the status quo in stormwater services, a belief that your concerns are important, a sense that the consequences of not addressing those concerns is unacceptable, and a conviction that your jurisdiction is positioned to take action, you are ready to formulate the problem.

Phase 2: Formulating the Problem. A thorough understanding of your stormwater problem, or nest of problems, will allow you to avoid conflict about the need for new policies.[3] Clearly defining the problem will help you develop a vision for where you want to head, share ownership of the effort, find good solutions, and identify criteria for policy success. Commonly, when people take the lead in defining an adaptive problem – that is a problem which will require, for its solution, changes in people's behavior – they can expect resistance. For example, if the problem is formulated as the need to create a new financing mechanism for stormwater services in your jurisdiction, resistance can be expected. Change agents should anticipate resistance and know how to minimize their professional and personal risks. Formulating the problem often involves the creation of and work by an advisory committee.

[3] Although problems sometimes come tangled in a nest, for this manual the intertwined set is termed "a problem."

Phase 3: Creating a Solution. This phase involves searching for the scientific, engineering, legal, financial, and organizational mechanisms that will be required to solve the problem. Temptations to be avoided are to make the search too simplistic, short, or shallow (March and Simon, 1958). To create a stormwater finance solution, you will conduct detailed analyses to:

a. Determine the costs and benefits of the existing stormwater program;
b. Estimate what the costs and benefits would be with program improvements that are needed;
c. Measure the gap between the two;
d. Identify optimal funding mechanisms to bridge the gap; and
e. Predict the consequences for each of the optional mechanisms.

When it comes to deciding how to pay for additional stormwater services, no two local jurisdictions are identical; there is no "one-size-fits-all" preferred mechanism. Many local governments, however, are turning to fees, implemented through stormwater utilities of various designs, as their preferred option for adding to stormwater services. We discuss fees in more detail in latter sections of the report.

Phase 4: Communicating the Solution and Developing Support. This phase involves clarifying and explaining, for decision makers and the public, what should be done, and facilitating political influence for approval of the program. Careful attention to the details of a proposal means it will be viewed by decision makers and the public-in-general as technically, politically, legally, and ethically acceptable. A proposal for reforming stormwater finance will be strong insofar as it reflects the goals, concerns, and interests of key stakeholders. At the end of this stage, elected officials will make a decision about if and how your jurisdiction will move forward, and, with approval of the solution, your leadership role will shift from being an advocate for the adoption of a program to becoming a change agent for implementing it.

Phase 5: Designing Implementation. For change agents, this phase involves applying administrative skills and coordinating with others to smoothly, rapidly, and effectively implement a decision. For stormwater finance, you will apply your skills to implement the revenue-gathering mechanism that has been chosen by your government. You will coordinate with the agencies and staff people in your jurisdiction whose work relates to stormwater services and finance, and with property owners as revenue and stormwater service providers. Two basic strategies for program implementation are "forward mapping" and "backward mapping," and the two can be applied together, either directly or in stages. (Forward mapping is, in essence, linear, top-down planning for the future; backward mapping means identifying a preferred behavioral outcome to be achieved and working backwards to consider what actions are needed to produce that outcome.) Ideally, too, your implementation plan will become a "living document"; that is, you will evaluate it periodically and be flexible enough to incorporate learning-by-experience into it. Sometime in the future – with shifting values about stormwater, the imposition of new mandates, perhaps, and changing technology – you can expect your jurisdiction will decide that the policies and programs should be significantly altered or terminated.

At that time, another round of change will be in order, and the task will be, again, to gain an initial agreement about what to do.

Gaining an Initial Agreement

It must be considered that there is nothing more difficult to carry out nor more doubtful of success, nor more dangerous to handle, than to initiate a new order of things. For the reformer has enemies in all those who profit by the old order and only lukewarm defenders in all those who would benefit by the new order, this lukewarmness arising partly from fear of their adversaries, who have the laws in their favor, and partly from the incredulity of mankind, who do not truly believe in anything new until they have had actual experience of it.
Niccolo Machiavelli, Sixteenth Century Italian Political Philosopher

The MS4 Permit is a hammer that opens the door to stormwater management reform.
Borough and Township Staff, Lancaster County, Pennsylvania, 2013

Working initially with your staff colleagues, bringing in stakeholders to form a informal group, then involving private consultants, state and federal agencies, representatives from non-profit groups, and university consultants, your task is to gain an initial agreement that your jurisdiction's stormwater program should be changed. Perhaps you have recently received a MS4 permit requirement; perhaps you are sensing pressure from environmental interest groups to promote green infrastructure; or perhaps, like staff officials in Lynchburg, Virginia, you have simply concluded that stormwater management has become an "administrative and financial challenge" of sufficient concern that you should initiate reforms.[4] Gaining an initial agreement can be time consuming: as Bryson and Crosby (1992, p. 137) wrote, "The more numerous the decision makers, the more divergent their interests, the less they know about possible changes and the reasons for undertaking them, the more time-consuming and indirect the route to an agreement will be."

Collaborating with Others

Once you have introduced the idea of reform to other staff members in your jurisdiction, you will want to gather and share information with stakeholders; the combination of staff colleagues and stakeholders will be your initiating group. Your group's first objective will be to develop a preliminary, common understanding of scope of your stormwater problem and of what reforming your services might mean in practice. Following that common understanding, you will want the group to develop a commitment to the change effort, i.e., an agreement to begin reform. To be successful, the process of gaining an initial agreement requires a committed initiator, a courageous champion, and an official sponsor (One person or a single group may be all three). The following guidelines provide more details:

> **Initiate and champion the process of policy change**. Some person or persons must "start the ball rolling" by initiating the idea of stormwater management reform and then "keep it rolling" by championing the cause of reform. If your jurisdiction must comply with a MS4 Permit or with a Chesapeake Bay WIP, negative reactions may exist in the community. If that is the case, the initiator(s) will be responsible for starting a process

[4] See Appendix B.

that reflects legal reality and is a constructive response. If you are considering taking on a leadership role, it will be useful to take stock of your personal leadership qualities: Why do you feel compelled to work on the stormwater issue? What qualifications and skills do you have to contribute? What personal difficulties might hamper your work? What is your assessment of the other people involved? What are your strategies for preventing personal burnout? And, what beliefs and values will sustain you through difficult times? When large, adaptive changes are needed in stormwater finance, such as a shift in the funding mechanism from ad valorem property taxes to a stormwater utility, a champion can anticipate resistance to the change. If you expect or experience stiff resistance, strategies for managing your risks are explained in Appendix A.

Focus on building an effective initiating group. To initiate stormwater management reforms, you will want to discuss among staff within your jurisdiction: (a) who has knowledge, outside of the staff, that you need; and, (b) equally important, who has a stake in the issue. Stormwater stakeholders include persons or organizations are affected by stormwater services your jurisdiction provides, or could provide. Routinely, stormwater stakeholders would include:

a. Citizens who serve on your jurisdiction's advisory groups – for example, planning and zoning, parks and recreation, beautification, trees, etc.;
b. Sympathetic elected officials and the staff who assist them;
c. Members of interested groups such as the business community and environmental organizations;
d. Large landowners such as churches, hospitals, and schools; and,
e. The various departments that have significant stormwater responsibilities in your jurisdiction.

A useful technique is to brainstorm a list of the stormwater stakeholders and then to note their goals and expectations, how well the status quo meets those goals and expectations, how important the success of your reform effort would be to them, how they can influence the policy change effort, and what they can contribute to the effort. Fellow staff members, knowledgeable people outside of your government, and key stakeholders are the people you will work with to form an informal initiating group.

Form an advisory committee. If your initial agreement is tending toward making major reforms to your stormwater services and finance, to gain the ongoing advice and support of stakeholders, likely you will want to create a formal stormwater advisory committee. The committee can be used as a forum for consulting, negotiating, or buffering among individuals or groups. Criteria for selecting people to serve on such a committee are to choose individuals who are: knowledgeable; constructive thinkers; and technical experts. In recognition that some people will have more interest, time, and opportunity to contribute to the work of the committee than will others, it may be useful to form an overall committee – likely including top-level, stakeholder decision-makers whose endorsement of committee conclusions would be helpful – and an executive group that will engage more fully in the detailed work of the committee. A balance exists between making the committee large enough to represent all key

stakeholders, and small enough to operate efficiently; again, forming a two-level committee can help achieve that balance.

Promote effective committee work. Some ideas useful for achieving committee effectiveness are to:

a. Secure, prior to forming the committee, resources that will be needed for the work;
b. Involve participants in writing a mission statement – what the work of the committee will entail;
c. Establish objectives, again with participant involvement, and including a time line;
d. Meet frequently enough to achieve the objectives, but not so frequently that committee members become exhausted;
e. Focus the discussion during meetings by using a written agenda;
f. Gather information, as needed from private consultants, state and federal agency representatives, university experts, and others;
g. Dedicate staff resources to gather the information and documents needed for committee meetings;
h. Record and distribute, prior to meetings, minutes from the previous meeting; and
i. Use media and community events to transmit information to stakeholders, decision makers, and the general public.

Take time for vision work. At some point in the work of the committee, you will want to write a vision statement for the future of stormwater services and finance in your jurisdiction. Typically, the committee vision will reflect the shared experience of framing and reframing the stormwater problem. An effective vision statement will animate the future of stormwater management in your jurisdiction.

Understand that gaining an initial agreement is the first major decision point in the policy-making process. If and when you are able to achieve agreement among key stakeholders, it makes sense at that time to move forward with formulating, in depth, your stormwater problem.

Lessons Learned

Lessons learned about gaining an initial agreement and about the four additional phases of the model that follow, draw on various sources. References to the Town of Bel Air, Maryland, to Boroughs and Townships in Lancaster County, Pennsylvania, and to the City of Lynchburg, Virginia are based on focus group interviews conducted in those communities in 2013 (See Appendix B). References to the Towns of Berlin, Ocean City, and Oxford, Maryland, the Cities of Bowie and Salisbury, Maryland, and Lancaster County, Pennsylvania are based on reflective case studies done by staff members at the Environmental Finance Center at the University of Maryland in 2013. And references to various other local governments are based on sources in the literature, as identified in the text of this manual.

- Stakeholder recruitment should involve a consideration of who has an interest and who has influence. **Towns of Ocean City and Oxford, Maryland**
- Techniques to involve people should be creatively employed. **Towns of Berlin and Oxford, Maryland**
- Collaboration builds capacity and lends transparency. **Town of Oxford, Maryland**
- When reforming stormwater finance, key public and private champions should be engaged and committed. **Cities of Ocean City and Salisbury, and Towns of Berlin and Oxford, Maryland**
- We started working on stormwater management by briefing our elected officials about our concerns and forming a stormwater advisory committee (SWAC) made up of stakeholders. **Water Resources Department Officials, City of Lynchburg, Virginia**
- We reached out to the public to inform citizens about the work and results of the SWAC. **Water Resources Department Officials, City of Lynchburg, Virginia**
- A factor in our success in reforming stormwater finance was communicating, honestly and consistently, with elected officials and the public. **Water Resources Department Officials, City of Lynchburg, Virginia**
- MS4 Permits are hammers that open the door to stormwater management reform, but they can also create negative energy that needs to be redirected in constructive ways. **Borough and Township Officials, Lancaster County, Pennsylvania**
- A challenge in getting people to address stormwater issues is a highly individualistic attitude ("It is my property") among landowners. **Borough and Township Officials, Lancaster County, Pennsylvania**
- Leadership tasks for gaining an initial agreement are to: establish an atmosphere of trust; reward achievement of tasks; recognize that leaders and followers influence each other; and nurture inter-organizational networks. **Bryson and Crosby (1992)**.

Formulating the Problem

Whatever the locus of action, from national government down to precinct, whether in an executive body or a legislative committee, some participants are almost sure to start with favorite, long-developed schemes. Their inclination will be to ignore whatever seems not to fit and to define the problem as one calling for solutions they have handy.
Richard E. Neustadt, Political Scientist and Ernest R. May, Historian

At this point in time, the Town knows it must comply with state and federal regulations...but it is unclear what specific actions will be required.
Staff, Town of Bel Air, Maryland, 2013

Must you comply with a MS4 regulation? Do you have unresolved flooding issues? Are there water quality concerns in your jurisdiction? Some problems are common across local governments, while others will be unique to your community. Improving stormwater finance in your jurisdiction means developing a deep understanding of the problem you face.

Benefits of a Clear Formulation

A clear identification of the stormwater management problem is important for many reasons. It will:

1. Allow your advisory committee the opportunity to agree on how to respond;
2. Help decision makers become convinced they should authorize solutions; and
3. Build political support across a community for the program you will eventually propose.

Defining the problem carefully will also help you assess stakeholder groups, so as to understand their attitudes, identify differences among them, and provide criteria for measuring the degree to which program options would satisfy their interests. If, during this phase, conflict begins to emerge among stakeholders in your advisory committee, you can focus the discussion constructively by framing the problem as a question in the form of: "How can we (accomplish the interest of Stakeholder A) while at the same time (accomplishing the interest of Stakeholder B)?"[5]

A Checklist of Questions[6]

This phase of the policy process should focus on problems, not on solutions. To assess your stormwater problem, in collaboration with staff members of your jurisdiction, private consultants, state and federal agencies, university experts, and others, as needed, begin by asking a series of questions:

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[5] This manner of problem framing was essential in developing a program to satisfy the interests of farmers and local governments, on one side, and environmental groups on the other over pollution being carried by public drainage ditches on Maryland's Eastern Shore. See Bell and Favero (2000).

[6] The Environmental Finance Center at the University of Maryland offers assistance about stormwater finance to local jurisdictions in Chesapeake Bay States. In this manual, the technical methods for formulating the problem and creating a solution draw on processes developed by the Center.

1. **What type of permit does our community have?** You may be a Phase I, a Phase II, or an unpermitted jurisdiction. Permitted communities, either Phase I or Phase II, must comply with certain federal and state regulations. Unpermitted communities may also have local stormwater problems, such as flooding and environmental degradation, and decide to address their problems in a fiscally sound manner.

2. **What is our state's structure for local government stormwater management?** Each state has different stormwater regulations and different methods of enforcing EPA mandates. Also, governing structures differ among states. For example, in Maryland, counties have broad authority for stormwater management, but municipalities, like countries have Home Rule – meaning local jurisdictions have the power to enact any legislation not prohibited by the state. In Pennsylvania, many small municipalities have stormwater authority, and Virginia is a Dillon Rule State – meaning a municipal government has the authority to act only when:

    a. Power is granted in the express words of a statute or the charter creating the municipality;
    b. The power is necessarily or fairly implied in, or incident to the powers expressly granted; or,
    c. The power is implied as essential to the declared purposes of the municipality.

    Structural differences among states have stormwater finance implications:

    a. Home Rule States have the greatest leeway in implementing and funding stormwater programs, and where strong counties exist, smaller jurisdictions may find it advantageous to partner with counties in their stormwater programs;

    b. Where local governance is significantly decentralized, such as in Pennsylvania, small jurisdictions are challenged to coordinate across jurisdictional boundaries, with potential efficiencies and watershed interdependencies in mind, to achieve economies of stormwater program size; and,

    c. In Dillon Rule States establishing funding mechanisms can be more problematic.

3. **What is the dominant use of land in our jurisdiction?** The degree of urbanization in your jurisdiction will determine the nature of your stormwater program. As the portion of land devoted to roads, roofs, and parking lots increases in a community, the risks of flash flooding and runoff pollution also increase, and the space available for detention and infiltration declines.

4. **What is driving change in our stormwater services?** Common drivers are:

    a. EPA/State NPDES mandates to achieve a minimum level of compliance;
    b. Public preferences regarding, for example, flooding, tourism, natural resource protection, and environmental stewardship; and,
    c. Government initiatives to relate stormwater management to achieving various public goals such as historic preservation, flood prevention, and environmental enhancements.

5. **What program or set of services does our jurisdiction currently have?** If you work in a jurisdiction that has established a single stormwater program, it may be relatively easy to learn who is in charge, how the program works, where records are kept, and what is included in regulatory documents such as an MS4 Agreement or a WIP requirement. If a single program has not been established, stormwater services are likely being provided in a piecemeal fashion, and to determine what set of services relate to stormwater management you will need to gain access to departmental budgets and capital improvement programs, and to interview colleagues in your jurisdiction who provide the pieces of a program; in so doing, you will want to get a general idea of how much your jurisdiction spends on stormwater services and how costs are broken down by department or activity. In determining what program or set of services you have, you will gather data from within your jurisdiction and from contractors you have hired previously; the data should include all relevant written information such as permits, memos, annual reports, existing policies and procedures, and budget materials dating back at least five years, where possible.

6. **How well are we performing?** Once you know what stormwater program or set of services you have, you can evaluate its structure, current capacity, and trends in funding levels by gathering information from staff and contractors. Your interviews will be with engineers, GIS personnel, planners, water resource managers, etc. Standards and expectations provide the metrics for evaluation, and they may be:

    a. Imposed by your EPA/State permit;
    b. Advocated by your citizens; or
    c. Set by your government.

    You will want to ask questions such as: How cost effective is our program: i.e., where can we streamline stormwater services? If we have a Phase II Permit, how are we doing on each MCM? Are there local groups or organizations that could help manage stormwater? And, are we utilizing those organizations? Answers to "How well are we performing?" should be written into a level of service document and include the following categories:

    a. Operations and maintenance;
    b. Stormwater quality;
    c. Water quality/quantity management;
    d. Green infrastructure;
    e. Program leadership;
    f. Design;
    g. Engineering;
    h. Enforcement; and
    i. Capital improvements.

7. **Looking forward, what targets do we need to set?** The EPA/State permit, if you have one, and/or expectations of your citizens, and/or your government's goals explicitly state, or imply, a set of program targets. To clearly express and document for your

records your jurisdiction's targets, you will want to ask what your jurisdiction needs its stormwater program to accomplish.

8. **What are the gaps between the stormwater program our jurisdiction currently has and the targets it needs to reach?** You will want to ask: Are we doing everything required of our permit (if ours is a permitted community) or our WIP? What is the gap in program (if a Phase II community) for each of the six MCMs? How do our efforts compare (if an unpermitted community) to an "ideal" program – that is, if we had an unlimited budget to accomplish what we want to achieve?
9. **With what program could we close the gaps?** As you assess your problem, you will begin to formulate a plan to close the gaps. You will want to ask what actions you need to take on each MCM (if you are a Phase II Community), and what actions you need to take to achieve community goals (if you are an unpermitted community). In sum, you will want to develop a preliminary vision for a preferred program and a preliminary estimate of capital improvements, operations and maintenance, and personnel costs.
10. **How will we pay for that program?** Here we come to the nub of the issue for most jurisdictions. There are traditional funding mechanisms: real property taxes; grants; and fees to recover program costs such as to pay for inspections. You may well find, however, that traditional mechanisms are insufficient to pay for the program you have envisioned, and that you must employ a non-traditional mechanism. Many local jurisdictions are in this situation and are turning to a stormwater utility option, which allows them to impose fees on all or most all properties in their community.

As a means to communicate your answers to the ten questions, you will find it useful, likely, to prepare a document that articulates your understanding of the problem. A clearly written statement will help your advisory committee understand why a solution is needed and coalesce to support it. Such a document can become the focus for discussions among your jurisdiction's staff, the advisory committee, other stakeholders, state and federal authorities, technical experts, and your elected decision makers. Those discussions will be necessary as you move forward to create a solution.

Lessons Learned

- Water Department officials were able to impress on Stormwater Advisory Committee members the need for new thinking about: the funding shortfall that would be created by the MS4 Permit requirement; and the opportunities that increased funding would provide to solve environmental issues. In this way they helped the committee members envision a path, via a stormwater utility, to a better future. **City of Lynchburg, Virginia**
- In Pennsylvania, the Chesapeake Bay is commonly viewed as being "downstream" and, therefore, not of concern. Thus in defining the problem, it is important to focus on local benefits of stormwater management. **Borough and Township Officials, Lancaster County, Pennsylvania**
- Be sure this phase emphasizes problems or needs, not solutions. **Bryson and Crosby**

- There can be a problem with the term "problem." Some people find the word offsetting or discouraging. It may be useful to talk in terms of "challenges" or "opportunities." Likewise, you may want to initiate discussion by talking about "assets" before talking about problems. Whatever terms you decide to use, aim for articulations of the situation that are inclusive, motivating, and not directed, prematurely, to particular solutions. **Bryson and Crosby**
- Frame problems with words such as, "How can we…" so that they can be solved. **Bryson and Crosby**
- Prepare and distribute a final report that outlines the problem to be addressed. **Bryson and Crosby**
- Do not promise stakeholders that all of their problems will be solved. **Bryson and Crosby**

Creating a Solution

The essence of leadership in any polity is the recognition of real need, the uncovering and exploiting of contradictions among values, the reorganization of institutions, where necessary, and the governance of change.
James MacGregor Burns, Historian

To effectively respond to stormwater problems, we should take a holistic, systems approach.
Borough and Township Staff, Lancaster County, Pennsylvania, 2013

Creating a solution for stormwater management involves identifying gaps between: (1) how your jurisdiction currently operates – as revealed by the understanding and evaluation of your existing stormwater management program; and, (2) your target level of services – as determined by your anticipated needs. To close the gap between the two will require resources. Thus creating a solution also involves developing a budget, estimating your future revenue needs, and finding ways to pay for the solution. Phase II jurisdictions intent on complying with their permit will want to analyze actions needed to take on each MCM that your permit requires: Public Education and Outreach; Public Participation and Involvement; Illicit Discharge Detection and Elimination; Construction Site Runoff Control; Post Construction Runoff Control; and Pollution Prevention and Good Housekeeping. Unpermitted jurisdictions will assess what actions are needed to achieve community values and goals. All communities will want to consider technological fixes for the near future and water-sensitive planning and urban design for the longer term. All jurisdictions will also want to take into consideration the risks being imposed on communities by the warming of our atmosphere, including increased probabilities for extreme precipitation events and for storm surges in coastal areas.

To a significant degree, creating a solution for your stormwater management problem can utilize economic tools (Nees, 2013). Improved stormwater services may provide economic consequences – such as new jobs and higher incomes – for your community, and these can be estimated by using input-output analysis.[7] Using cost-benefit analysis, you can compare program options to determine the soundness of optional investments. And cost-effectiveness analysis is useful for analyzing how well a BMP or set of BMPs would achieve a desired goal. To apply cost-effectiveness analysis in a Phase II community, for example, you would, as suggested by Reese (2013):

1. Define what your jurisdiction must do to bridge your program gaps, keeping in mind the need to have a program under each of the six MCMs;
2. Define the universe of possible solutions with the end product being a set of BMPs or more preferably a set of environmental conditions; note the costs that would be required to implement options in the set, so as to eliminate inefficient solutions;
3. Ask, for the remaining options, if the increment in environmental benefit that each would provide is worth its incremental cost, and eliminate those for which it is not; and,

[7] The Environmental Finance Center at the University of Maryland uses an input-output model called "IMPLAN" to estimate community or regional economic impacts of stormwater programs.

4. Configure the program by blending the remaining BMPs into a cohesive set, seeking synergy and practicality.

Likely, creating a solution will involve many meetings, usually small ones, in which you consciously aim at finding answers to your problem. A three-part search process has proven useful for solving many public policy issues, and it should help you identify a solution for your jurisdiction's stormwater problem (Bryson and Crosby, 1992). The parts are:

1. Scan broadly for ideas and examples that go beyond normal search channels;
2. Conduct a narrow-gauge search for specific components of optional solutions; and,
3. Combine the two into a detailed prediction of the consequences of your options.

Conducting a thorough search for a preferred program solution will have several benefits for your community. It will avoid "satisficing" behaviors such as conducting a search that is too simple, short, or shallow; or latching onto the first solution that comes anywhere close to solving the problem. It will help you refine and re-conceptualize your situation. And it will enhance the boundary-spanning ability of participants; that is, it will help stakeholders to put themselves into the others' shoes.

Determining Costs

The suite of activities you identify for your preferred program will require resources. For each action in your program, there will be a related cost. Projecting a ten-year budget is a useful method to estimate resource allocations. As shown by Throwe (2013) your estimate for costs should take into consideration:

1. Capital projects – both gray and green BMP investments and, perhaps, projects to reduce your impervious surface area;
2. Personnel;
3. Operations and maintenance; and,
4. The support equipment, technology and materials needed for day-to-day operations.

To arrive at true costs, some allocations must be estimated from the budgets of related programs such as planning, environmental protection, wastewater treatment, parks and greenways, and roads. There may be opportunities to reduce costs by engaging the public in implementation, such as by offering incentives for private landowners to install BMPs on their properties, collaborating on educational efforts with groups whose missions are to improve the environment, or partnering with other jurisdictions, and thereby achieving economies of size for your program (Reese, 2013). Ultimately, you will arrive at a total estimate for the net cost your jurisdiction will bear for an improved stormwater management program, and you can then ask the question, "How are we going to pay for this?"

Review of Stormwater Management Costs. In the urban environment, it is often difficult to find appropriate property and unconstrained physical space adjacent to individual development projects to mitigate water quality impacts. This problem is especially acute in areas where land development, utilities, and other infrastructure severely restrict the feasible construction of water quality treatment.

In such areas, as an alternative, reliance is often placed on installing underground manufactured treatment devices, which have specific maintenance requirements and can be very expensive. Location of on-site treatment is often not compatible with existing landscapes or land use contexts. Finally, the proliferation of many small water quality mitigation sites results in questionable environmental benefits, substantial project development and regulatory review cost and increased demands for maintenance.[8]

The stormwater management requirements associated with the Chesapeake Bay restoration effort will exacerbate these issues in urban communities. In order to reduce overall implementation costs to the maximum extent practicable, it is necessary to understand the factors and variables that influence the cost of stormwater best management practices (BMPs). We begin with a look at specific cost categories, followed by an analysis of the variables that influence specific BMP costs.

Cost Categories. Based on review of the literature, we have separated the total cost of stormwater BMPs into the following categories: land costs, pre-construction, construction, capital costs, operation and maintenance, and program administration. These cost elements encompass the majority of costs associated with stormwater BMPs.

Land: Managing stormwater in urban areas is complex and potentially expensive for a variety of reasons, not the least of which is the cost and limited availability of land. In fact, the cost of land is often the most significant variable impacting stormwater BMP costs (see EPA 1999). Clearly, land costs can vary widely among communities (see King 2011), as well as within communities. As a result, land costs can significantly influence the potential impact of market tools such as stormwater banks and in-lieu fees.

In general, land valuation is based on an estimate of the *highest and best use* of the land, i.e. the use of the land that is reasonably probable, legally permitted, physically possible, economically feasible and results in the highest value for a property. The estimated market or appraised value of land can vary, significantly at times, from the *value-in-use* and the *investment value* of land. The *investment value* of land is the value of land to the owner or prospective owner for investment or operational objectives, and the *value-in-use* is the value to one particular user of the net present value of the cash flows that the land is expected to generated for a particular activity under a specific use. These differences between investment value, value in use, and market value of land provide motivation for buyers and sellers trade in the market place.[9,10]

Key components of land costs include:

- Easement costs. Projects that are installed on private lands without fee simple purchase will require a property easement to ensure adequate operations and maintenance (O&M) over the life of the practice. This results in two corresponding cost issues. First, eased

[8] *Water Quality Mitigation Banking.* Final Report. December 2009. Submitted by: Anil K. Agrawal,The City College of New York, New York, NY 10031; Andreas Fekete, RBA Group; Fred Scherrer, RBA Group; Bryan VanderGheynst, RBA Group. Region 2 Transportation Research Center.

[9] Joseph F. Schram, Jr. (January 2006). Real Estate Appraisal. Rockwell Publishing. P 36. ISBN 978-1-887051-25-5.

[10] International Valuation Standards, 2011.

property must always be restored to as-good or better condition after O&M activities. Second, an easement essentially results in loss of use or loss of development rights to the property owner.

- Opportunity costs. An opportunity cost is the cost of an alternative that must be forgone in order to pursue a certain action. As it pertains to the valuation of land, the opportunity cost of land is the cost to the owner of giving up the utility generating uses of the property when the land is taken out of service. In a stormwater setting, opportunity costs are associated with the devaluing of land when it is taken out of service and is repurposed for stormwater treatment with regards to previous or potential land use. The derivation of opportunity costs involve making an assumption that a property owner faces increasing opportunity costs for land that is taken out of service for other uses (Thurston 2006).

  The opportunity cost and associated value of land is often not considered in many BMP cost assessments, and as a result, BMP cost estimates are often significantly undervalued. However, it is important to distinguish between land valuation, opportunity cost and accounting or realized cost. The King and Hagan report correctly incorporates the value of developable land—either public or private—into BMP cost estimates. However, developable public land only becomes an accounting or realized cost if the forgone activity would have actually occurred and would have resulted in some sort of revenue or cash flow to the community. Many publically financed best management practices are installed on lands that are technically developable but are not slated for development in the foreseeable future, if ever. Therefore, there is no revenue cost to the community.

- Land acquisition and transaction costs. Acquisition costs are site specific and depend on the type of BMP being installed. Components of the cost to acquire land include time to identify land, legal fees, commissions and brokerage fees, title search fees, appraisal fees, governmental fees, and settlement fees.

Pre-construction costs: Before construction can begin, remediation sites have to be prepared. Pre-construction costs are incurred before the BMP can be installed, and include: surveying; design work; permitting; geotechnical testing; and transaction costs, including legal fees, time to acquire and identify project site, and land acquisition (addressed above).

Site conditions significantly influence pre-construction costs associated with urban best management practices. Mitigation projects in urban environments often require significant site preparation, including demolition activity. Finally, as with any permitted construction activity, there are sediment and erosion control activities that must be accounted for including silt fencing and sediment trapping. Pre-construction costs average between 10-40 percent of overall construction costs (see King and Hagan 2011).

Construction: The primary cost of any best management practice is the actual construction and installation. Construction costs consist of the cost of excavation, primary erosion and sediment control, control structure installation, appurtenances costs, landscaping, and BMP specific installation costs. Expenditures for professional and technical services required for the construction of the stormwater BMP are also included in construction costs. Construction costs are dependent upon the BMP being installed, and can vary widely (see King and Hagan 2011).

As with pre-construction costs, site conditions have a significant impact on the variability of construction costs. Hydrology, soil type, and topography can result in significant variations in construction costs from site to site, which will potential impact banking and in-lieu fee programs.

Cost of capital: Cost of capital must be considered for any capital project, such as stormwater management. Cost of capital is defined as the opportunity cost of the funds employed as the result of an investment decision; it is equivalent to the rate of return that a business or institution could earn if it chose another investment with equivalent risk. Included in the cost of capital calculation is the cost of debt. King and Hagan used a uniform rate of 3 percent over a 20-year borrowing period. Please note that the cost of capital can vary from site to site or institution to institution, depending on the party securing the credit and also depending on risk differences.

Operations, maintenance, and asset management: Operation and maintenance costs (O&M) are post-construction activities that provide upkeep for stormwater BMPs. Re-occurring annual costs include site inspection during and after construction, labor, materials, energy, landscape maintenance equipment, structural maintenance, dredging, disposal of sediments, and litter removal. Additionally, determining O&M costs requires an estimate of the useful life of the BMP, as well as an estimation of the discount factor to be used in the derivation of an annualized BMP O&M cost. The level of O&M required will depend on the complexity of the BMP. Erickson et al. (2009) performed a survey of stormwater BMP maintenance practices and found that constructed wetlands and porous pavements required more informed maintenance than other BMPs because of the level of complexity of the technology. Typically, O&M costs are estimated as a percentage of base construction costs, ranging from <1-20 percent depending on BMP and level of maintenance adopted (EPA 1999). Over time, operations and maintenance costs can actually approach the level of initial construction costs.

O&M costs actually represent one of the key benefits associated with stormwater banking and in-lieu fee programs. Though it is important to incentivize onsite mitigation to the maximum extent practicable, many advanced best management practices, including small scale green infrastructure projects, can require significant operations and maintenance, which can be difficult and expensive to monitor for performance. By consolidating many small scale disturbances into a large-scale BMP, local governments can significantly reduce O&M costs while at the same time ensuring the long-term performance of the project.

Additionally, determining O&M costs requires an estimate of the useful life of the BMP to be made and as well as the estimation of a discount factor to be used in the derivation of an annualized BMP O&M cost.

Stormwater asset management: A key component of an effective operations and maintenance system is infrastructure asset management. Once a community has installed infrastructure to handle its stormwater, the next step is to manage the stormwater infrastructure in the best way possible to ensure the assets are kept in proper operational order, will last as long as possible, and are replaced when necessary. This type of management is called "Asset Management." Asset Management represents a way of thinking about assets in a strategic way

so that they are sustained over the long-term at the lowest overall life cycle cost while meeting the needs of the community.

Although it may sound complicated, it doesn't need to be. Asset management is a self-educating process and can be done by any organization. The process relies on what you already know about the assets and uses the resources available to you. Just starting the process is the best way to learn about asset management. Because it is an on-going, long-term process, it is always possible to make adjustments to the asset management activities over time. See ***Appendix C*** for a more thorough discussion of the benefits of stormwater infrastructure asset management and the processes for establishing an effective and sustainable asset management program.

Revenue and Funding Options and Criteria

There are many revenue and funding sources for added stormwater services, including: fees for review of permits and development inspections; general property taxes and special district assessments; grants; loans; and utility fees. Some sources are appropriate for meeting capital costs, some for operations and maintenance (O&M) costs, and some for both (Throwe, 2013). Table I illustrates five options and their potential use in meeting capital and O&M costs:

TABLE I

Funding Options for Stormwater Programs

SOURCES OF FUNDING	CAPITAL COSTS	O&M COSTS
Bonds	Yes	Yes
Fees for Permit Reviews and Inspections	No	Yes
General Property Taxes and Special District Assessments	Yes	Yes
Grants	Yes	No
Loans	Yes	No
Utility Fee	Yes	Yes

In deciding which funding source, or combination of sources, to use, local officials can apply criteria for their choice by answering the following questions (National Association of Flood and Stormwater Management Agencies, 2006):

1. Is it legal?
2. Is it equitable in the sense that: (a) it is proportional to the level of services that payers receive; and, (b) that it takes into consideration the needs of special groups of payers?
3. Is it sufficient to meet costs?
4. Is it flexible (adjustable to changing conditions)?
5. How costly is it to administer during the initial set up and for ongoing oversight and maintenance? (For example, what are the data requirements, and how compatible is it with existing data processing systems?)

6. How consistent is it with other local funding and rate policies?
7. How stable a source of revenues is it? and,
8. Can it be used to create opportunities and incentives for payers to reduce their contributions to stormwater by changing their behavior?

There are, again, a variety of mechanisms that municipalities can use to fund their stormwater programs. The two most common funding options, general fund appropriations and stormwater service fees, are discussed below.

General Fund. Most communities have traditionally funded stormwater management from taxes paid into their general funds. The general fund is a government's basic operating fund and accounts for everything not accounted for in other funds, such as a special revenue fund or a debt service fund. There are, of course, advantages to using general funds to support stormwater programs. Most communities have established revenue and debt programs, which makes the process of supporting new and expanding programs familiar and uncomplicated. In addition, financing through the general fund allows local leaders to consider stormwater financing relative to other community priorities. There are, however, several significant drawbacks to expanding stormwater management activities through general fund financing.

In most communities there is great competition for general fund dollars between municipal programs; using the general fund revenues to support growth in stormwater obligations requires communities to either increase taxes or divert existing resources to the stormwater program. Compounding resource availability issues is the fact that stormwater management improvements typically have a low priority in many communities, unless the municipality is reacting to a recent major storm event or regulatory action.

Another deficiency of financing stormwater management through the general fund is the lack of transparency of the general fund financing system. The total cost of stormwater management is not readily apparent when these costs are dispersed among general fund departmental budgets. This is especially true in those communities that do not have stormwater programs with clear budgetary authority, which makes it difficult to determine where financing decisions related to stormwater management are being made. In addition, as stormwater management costs increase, general fund budgets are often not increased in parallel to meet those needs.

There is also the issue of equity and fairness in the financing system. Tax-exempt properties do not support any of the cost of stormwater management, even though it can be shown that many of them, such as governmental properties, schools, colleges, and universities are major contributors of stormwater runoff. Finally, general funds are primarily supported through property taxes, which are based on assessed property value. The cost of stormwater service to individual properties bears no relationship to the assessed value of the property. Therefore, this method of recovering stormwater management costs is more often than not inequitable.

Stormwater Utilities

Many local governments that are responsible for stormwater management continue to face escalating costs at a time when General Fund revenues are either stagnant or declining. To address this challenge, many communities are creating stormwater utilities to provide

dedicated funding for this critical community service.[11]

A stormwater utility is a financing mechanism that imposes user-service fees on owners of properties that create runoff; the utility is administered separately from general property taxes. Many local governments across the country are shifting their stormwater financing from management from (often) disaggregated general fund supported programs to fee-based enterprise programs and/or utilities. In the 1970s stormwater utilities were viewed as novelties in a few western states; by 1994 there were about 100 utilities; and by 2013 the number had increased to more than 1,400 utilities, across 39 states and the District of Columbia (Western Kentucky University, 2013). With the number of MS4 permits growing, and, in the Chesapeake Bay Region where WIPs being imposed by the Bay states, the number of stormwater utilities can be expected to grow at an increasing rate.

Stormwater utilities and enterprise programs provide several distinct advantages over tax-supported programs. Unlike taxes, utilities:

1. Are more equitable in the sense that they can be used to link fee levels to the service benefits that payers receive;
2. Can provide an opportunity and incentives for payers to reduce their fees by installing BMPs on their properties;
3. Can be dedicated to stormwater services only, and need not compete for allocations with other programs and obligations; and,
4. Can be designed to obtain payments from tax-exempt properties – such as churches, hospitals, public properties, and schools.

In most states, stormwater utilities are legal, although in some, they require special voter approval. The legality of utilities has been challenged in courts of law, but when the utilities meet certain legal standards, almost invariably their lawfulness has been upheld. The operative legal standards are: (1) the fees charged must be fair and reasonable; and (2) the fees must bear a substantial relationship to the cost of services and facilities (American Public Works Association, 2003).

It can be useful, in establishing a stormwater utility, to think of it as an "umbrella" under which your community can address its local stormwater problems, priorities, and practices (National Association of Flood and Stormwater Management Agencies, 2006). No two umbrellas are identical. Your stormwater utility, should your search for a solution to your stormwater problem lead you create one, can be used to generate funding that is adequate, stable, equitable, and dedicated solely to stormwater functions. It can be a vehicle for coordinating or consolidating stormwater responsibilities that have been dispersed, previously, among several departments. And, it can help you to develop a program that is comprehensive, cohesive, and consistent, year-to-year.

If you decide to recommend a stormwater utility to decision makers and the public in your jurisdiction, your design of this solution should provide answers to the following questions (New England Environmental Finance Center, 2005):

[11] 2012 Stormwater Utility Survey. A Black and Veatch Report. Page 4.

1. What expenses will it cover?
2. What will be the start-up strategy?
3. What organizational structure will be used to administer it?
4. How will it be implemented? And,
5. How will user fees be structured?

Structuring user fees is a technical effort that involves considerations of the bases for fees, fee levels, approaches to different types of property, exemptions, and credits. If you are already knowledgeable about the basic functions of stormwater utilities, you may want to read Appendix C, which contains a technical note about structuring utility fees. Experiences across a variety of utilities and documented by the American Public Works Association (2003) provide guidelines for structuring fees. The guidelines are that fees should:

1. Be tied in a reasonably accurate and technically defensible manner to a measure of the impervious area or other indicator of runoff volumes from property parcels;
2. Utilize an accurate database for determining charges and preparing bills;
3. Distinguish among classes of properties – such as residential, commercial, and industrial – to reflect differences in stormwater services they require;
4. Distinguish within classes to set fees in proportion to the contributions that parcels make to the total runoff generated by their class;[12]
5. Be legally and politically acceptable;
6. Provide a procedure for appealing charges;
7. Be flexible in the sense that they can be modified with a reasonable amount of effort;
8. Generate adequate revenue to meet program costs; and
9. Require no more than reasonable expenses to implement.

In practice, most stormwater utilities charge fees for government property and for tax-exempt properties such as churches, hospitals, and schools, but some provide partial credit for tax-exempt properties. Some utilities also charge for agricultural and undeveloped land. Some offer rebates for categories of users such as churches or the elderly. Most give credit for the installation of on-site BMPs that detain, retain, or store runoff, but some set a maximum percent for the credit and limit it to a certain number of years. Some offer credit to schools that provide education about stormwater management. Variations reflect local community values and confirm there is not a one-size rate structure to fit all communities.

Enterprise fund accounting.[13] A stormwater utility relies on an accounting system or process known as an enterprise fund. An enterprise fund is a form of accounting that utilizes a separate fund or cost center for a specific purpose.[14] Enterprise funds are generally sustained by revenues generated within a specific department. Under enterprise accounting, the revenues in

[12] Note, however, that using a flat fee instead of distinguishing among properties within a class requires less internal capacity to structure the fee system, reduces the burden of administration, and minimizes the risk of billing errors (Throwe, 2013; see also Appendix C). The key question is: "How much variation in stormwater contribution is there among parcels within the class?"

[13] This section was adapted from the website the Pioneer Consulting Group website: http://www.municipalconsultants.net/enterprise_fund_accounting_systems.aspx

[14] http://www.waynegov.com/site/default.aspx?PageType=19

expenditures of services are separated into separate funds with its own financial statements, rather than commingled with the revenues and expenses of all other government activities. Common types of enterprise funds are public utilities including water, wastewater, trash disposal, and increasingly stormwater management.

Establishing an enterprise fund does not create a separate or autonomous entity from the municipal government operation. The municipal department operating the enterprise service continues to fulfill financial and managerial reporting requirements like every other department.

The Enterprise Budget. Once an enterprise fund is enacted, a budget is usually subject to the appropriation process. The enterprise budget includes both revenue and expenditure estimates.

Revenues: Similar to any operating department, revenue estimates are prepared. These may include user charges and fees, investment income, and any other enterprise revenues. Enterprise revenues are often required to be used to support the expenditures of the enterprise fund only, rather than to support ongoing municipal operations or subsidize the general fund. However, this restriction varies from state to state. In some jurisdictions, enterprise revenue can be transferred to the community's general fund with the support of the appropriate governing bodies.

Costs: The costs associated with operating a stormwater enterprise fund are varied and encompass a broad spectrum of administrative, environmental, legal, and capital functions, including:

- **Direct costs** are those associative directly with the enterprise fund. Generally these include salaries and wages of the enterprise employees, other operating expenses and contractual payments. These expenditures will be appropriated in and incurred directly by the enterprise fund.
- **Indirect costs** are those costs that cannot be directly or exclusively assigned to one service. Enterprises often benefit from expenditures made by the general fund. For example, the collector, whose salaries paid by the general fund, make process enterprise user billed payments. We recommend that these indirect costs be identified and allocated to the enterprise fund using clearly established formulas to prorate the expense among departments.

  Because indirect costs are appropriated in the general fund, and operating transfer is made by the auditor/accountants to reimburse the general fund from the enterprise fund. Ideally, these operating transfers are made monthly to ensure that the enterprises transferring revenues to provide for the general fund expenditures as they are made. All operating transfers from the enterprise fund are credited to the general fund's cash account; at no time is an operating transfer made to replenish an operating department appropriation.
- **Employee benefits** include health and life insurance, FICA and medical expenses, workers compensation, unemployment insurance, and pension and retirement costs. These expenditures are generally budgeted in the general fund (or insurance trust funds) for all

employees, including those of the enterprise fund. Therefore, the enterprise portion of these expenses, like the indirect costs, must be allocated to the enterprise fund.

- **Legal and borrowing costs** may be appropriated or budgeted for directly in the enterprise on area. These include debt service costs (principal, interest and temporary borrowing costs), bond counsel expenditures relating to an enterprise debt issuance and/or financial service costs relating to a bond and the bonded prospectus. Alternatively, these expenditures are currently provided for in the treasurer's or debt service budgets and must be allocated to the enterprise fund appropriately.
- **Capital expenditures or improvements** are items generally found in a capital budget such as construction or major repairs, equipment or acquisitions. While these items may be reviewed and recommended generally by the capital planning committee, it is advisable that the capital expenditures for the enterprise are voted separately from the general fund's capital expenditures.
- **Emergency reserve**, like the general fund reserve fund, there is an appropriation available to meet unanticipated spending needs that may arise during the course of the year and require immediate action. Following the same guidelines set forth in the general fund, the reserve may be transferred by the city council/finance committee action rather than having to wait for the next scheduled legislative meeting. There should be no direct charge for the emergency reserve rather the auditor/accountant should transfer the amounts to the line item as stated in the approved transfer. At the close of the fiscal year, any remaining balance in this emergency reserve would close to the enterprise fund balance.
- Another cost of the enterprise not included in the operating budget is **depreciation** of the fixed assets and infrastructure. While it is not a budgetary item, depreciation should be considered by the community when preparing a cost analysis to determine charges and fees. Depreciation is calculated in order to recognize the annual expense associated with the use of an asset is a given reporting period. In general, depreciation is calculated by dividing the purchase price of the asset by its useful life. If the asset has outstanding debt and a debt services is already budgeted, depreciation is not included in the costing analysis because it would result in a double counting of expenses.

What are the Advantages of Enterprise Fund Accounting? A community may account for a certain level of services in the general fund, special revenue fund or an enterprise fund. The advantages of using an enterprise fund rather than the other two methods are as follows.

- *Demonstrate total cost of service*: With all the direct, indirect (e.g., interdepartmental support, health and insurance costs) and capital cost of providing the service in a consolidated fund, the community will be able to readily identify the true cost of providing a service, in this case, for water supply, storage and distribution.
- *Provide useful management information:* With the consolidation of revenues and the cost of services and information on the operating performance (positive or negative) of the fund, the community will have useful information to make decisions on user charges and other budgetary items. The community will be able to analyze how much the user fees and charges support the services and to what extent if any tax levy or other available revenues

are needed to subsidize the enterprise fund. The community will also be able to include the fixed assets and infrastructure of the enterprise as assets in the financial statement and recognized the annual depreciation of these assets.

- *Retain investment income and surplus:* Unlike services operating in the general fund or a special revenue fund, all investment earnings and any other operating surplus is retained in the enterprise fund rather than returned to the general fund at year-end. Once a surplus is certified as available (similar to free cash), it may be used to fund operating, capital or debt service costs associated with the enterprise.
- *Provide better ability to implement capital improvements:* The enterprise fund will allow the Department providing the service to better plan for and implement capital improvements, because these needs can be forecasted and integrated into the long-term financial management of the Department.

Lessons Learned

The Charles River Watershed Association (CRWA) investigated stormwater utilities adopted since 2005 in three New England municipalities – Newton, Massachusetts; Reading, Massachusetts; and South Burlington, Vermont – and the results of the study offer examples and lessons for other jurisdictions that are considering forming a stormwater utility (CRWA, 2007):

> **Newton, MA** established a fee structure, in only five months, with just two classes of properties – residential and other – and without distinguishing among types of properties within the residential class because analysis of a random sample of residential properties by the city's staff showed the range of impervious surfaces among such properties was small. The elderly are eligible for a discount, and, at the time of the study, the municipality was developing a credit program for BMPs that provide groundwater recharge. Fees are added to water supply bills, which are issued quarterly, and administration of the utility is housed in the engineering division of Newton's Department of Public Works.
>
> **Reading, MA** established its utility with the advice of representatives from several town committees and the general public. The city used high resolution ortho-photography to analyze the impervious area of parcels within its boundaries. The average impervious area for residential parcels was determined to be an "equivalent residential unit" or ERU. (For a detailed definition of ERU, see Appendix C.) Fees for single and two-family homes are set at a flat rate. Fees for multi-family, commercial, and industrial properties are based on their amount of impervious area, divided by the ERU. Undeveloped land is not charged a fee. Utility fees go into an enterprise fund, which, with additional contributions from general tax revenues, pays for the city's entire stormwater management program. Fees are added to the water bill, which is issued quarterly.
>
> **South Burlington, VT** covers an extensive area and contains numerous property types, sizes, and land uses. Staff from the city's Department of Public Works and Planning Department led the design effort for the utility. The staff involved:

a. A consulting firm to determine the budget for existing stormwater services being provided by the municipality;
b. A stormwater advisory committee to establish priorities and estimate a proposed budget for improved services; and
c. A technical advisory team that used satellite imagery to determine impervious areas of property parcels and geographic information systems (GIS) technology to estimate an ERU and fees for each parcel.

The fee structure involves a flat fee for single family homes. Multifamily, commercial, and industrial properties are charged according to their percent of imperviousness, calculated as the number of ERU for each property. The city offers credits for BMPs and for educational programs. Fees are added to the quarterly water bill. South Burlington administers the program by means of a stormwater division, which was created within the city's Department of Public Works.

The Charles River Watershed Association concluded its study of the three municipal utilities with several recommendations, based on lessons learned:

- To avoid the need to make major modifications and adjustments later, take an adequate amount of time to plan for the utility. Newton's five months to start-up meant no credit procedures were in place when the utility began, and some commercial and industrial property owners questioned the equity of rates, which they viewed as having been hastily conceived. Significant amounts of time are needed to investigate the budget for current stormwater services, to create an equitable rate structure to generate the amount of revenue need for the preferred program, and to establish needs and priorities of a stormwater program for the community.[15]
- Internal and public education should be provided prior to start up. Staff training is needed once a plan for administration of the utility is developed; coordinating the administration of credits across city departments, for example, was a particular challenge for the municipalities that offered credits. Also, if fees are applied to city-owned property, departments operating on parcels of city land should be informed, prior to when fees are issued, about why they need to contribute from their budgets to the utility. Public education is needed to explain the rationale and method for fees, particularly prior to the first billing.
- Fees that use the amount of impervious surface area as a significant factor provide a stable revenue source.

Additional Lessons

- Within a watershed, no local jurisdiction can do effective stormwater management alone. **Borough and Township Officials, Lancaster County, Pennsylvania**
- Having a sustainability plan in place for our jurisdiction complements our effort to reform stormwater management. **Town Officials of Bel Air, Maryland**

[15] Ideally, much of the work to establish the needs and priorities for stormwater management in the community will have been done while gaining an initial agreement and formulating the problem.

- Stormwater management should involve public-private partnerships whereby private landowners become engaged because they see it is to their advantage to do so; they see stormwater management as a way to increase the value of their property; and both parties share information and, therefore, build trust. **Borough and Township Officials in Lancaster County, Pennsylvania**

When you have created a solution to upgrade and finance stormwater services for your jurisdiction, you will need to concentrate on communicating with decision makers and the public to develop the political support your solution needs to become official policy.

Communicating the Solution and Developing Support

Greater than the tread of mighty armies is an idea whose time has come.
Victor Hugo, Nineteenth Century French Poet

To gain the support of elected officials, make a success story look like it was their idea.
Borough Official, Lancaster County, Pennsylvania, 2013

Although you may have created a great solution for financing stormwater improvements in your jurisdiction, much work remains. Next you must develop a plan or strategy that – because it demonstrably addresses the problem in a technically workable, economically efficient, politically acceptable, and legally and ethically defensible fashion – convinces decision makers to support it. You may encounter unexpected barriers in this effort, but as Louis Pasteur, the Nineteenth Century French chemist said, "Chance favors the prepared mind."

Advocating for a Dedicated Funding Mechanism for Stormwater

Of course, there are several common ways used to pay for stormwater such as impact fees, bonds, a tax, general funds, or even grants, but nothing seems to be as effective at providing sufficient revenue or is as equitable as a stormwater utility fee. Let's assume the solution your community decides to pursue in order to meet increasing stormwater costs is a stormwater utility. Creating a utility is going to be a big decision mainly because collecting fees from property owners is a nontraditional means for gaining revenue; and administering a utility will require reorganizing local government operations. In general, making big public decisions requires strong coalitions of stakeholders to convince the public and elected officials that their proposed plan for implementing a dedicated funding mechanism such as a stormwater utility fee for stormwater merits their full support.

Who are the potential stakeholders? It could be a variety of organizations, citizens, or businesses that make the foundation of your community. In some cases, the initial stakeholder group may consist mostly of internal municipal staff that has stormwater as a component of their day-to-day job. It could also be the church minister, the head of a local watershed organization, the president of the chamber of commerce, the middle school principal, or the neighborhood association vice president. Ideally, it could be members from all of these groups that represent different sectors of the community.

A useful method for communicating with stormwater stakeholders is to work with them on writing a plan of action or a strategy that will effectively educate and engage the community and elected officials and articulate the need for improving the level of funding for stormwater. In a series of meetings of stakeholders and, likely, over several iterations of updating or modifying your strategy, you can reach joint decisions about how a utility would work and what resources are required to succeed. Your goal will be to achieve a shared belief among stakeholders that theirs is a joint endeavor, a coalition for positive change. Coalition members do not need to agree with every detail of the document, but in the end, they should agree to

support it. In fact, you should anticipate that there will be areas of your strategy that are not accepted or supported by everyone involved and approaches for reaching consensus by the majority of the group should be discussed early on. Because creating a utility is a big decision, you may find it helpful to gain the support of some stakeholders by phasing the utility in over several stages. As you write, you will want to monitor, as much as possible, attempts to create counter strategies and efforts to dilute yours.

To help guide development of the proposal, analyze the arenas for decision-making. Such analysis may suggest, for example, that you include an elected official in writing the document; likewise, you may find it advantageous to include staff members who work directly with decision makers. Also, draw on and incorporate the results of your previous work in gaining an initial agreement, formulating the problem, and creating a solution. Most importantly, continue to pay attention to the goals, concerns, and interests of stakeholders so as to cultivate a winning coalition.

You should be willing to accept improvements to the strategy and should express that willingness to stakeholders keeping in mind this is a team effort if successful implementation of a dedicated funding mechanism is the end result.

If you are a staff member in your jurisdiction, you have an opportunity to play several important roles in developing the document and making it into a convincing strategy to form a utility. You can help:

1. Identify stakeholder participants;
2. Convene and provide logistical support for meetings;
3. Prepare documents, such as research on what other communities have done, options for group consideration, draft improvements, and organizational support that keeps the process moving forward;
4. Affirm your intention to help implement the utility once it has been adopted;
5. Demonstrate that the strategy is coming from well-informed sources;
6. Illustrate how the proposal is tailored and adapted to your community;
7. Assure technical feasibility and quality;
8. Elucidate the resources required for administration;
9. Clarify how the utility will be cost effective; and
10. Explain how other options were considered and why they were not adopted.

Ultimately, it will be the elected officials who will decide whether or not your jurisdiction will create a stormwater utility. You should be prepared and willing to take the time to continue working on a strategy until it has attracted a winning coalition. If, by the end of this phase, the necessary coalition has not formed, to continue working on the utility you must consider cycling back through the previous phases of formulating the problem and creating a solution. When you succeed, you will move on to the next phase – designing for implementation.

Lessons Learned

- A persuasive argument for creating a stormwater utility is: Everyone contributes to stormwater; therefore, everyone should pay for it. **Water Department Officials, City of Lynchburg, Virginia**

- Political support is enhanced by having "homegrown information," e.g. stream monitoring data logger (HOBO) data from local streams, to make your case. **Borough and Township Officials, Lancaster County, Pennsylvania**
- A powerful positive message is to identify potential stream improvements as assets to the community for recreation – trout fishing, for example – historic preservation, and tourism and other forms of economic development. **Borough and Township Officials, Lancaster County, Pennsylvania**
- Bringing in speakers – i.e., credible experts – helps to communicate information to decision makers and the public. **Borough and Township Officials, Lancaster County, Pennsylvania**
- Draft a proposal that takes into consideration the results of the previous phases. **Bryson and Crosby**
- Accept as many modifications as improve the proposal, but do not sacrifice key solution components. **Bryson and Crosby**
- Make sure the proposal includes a budget estimate for implementation. **Bryson and Crosby**
- If significant opposition to the proposal arises, be prepared to create more opportunities for informal review of it. **Bryson and Crosby**

Designing for Implementation

You give an order around here and if you can figure out what happens to it after that, you're a better person than I am.
Harry S. Truman, President of the United States, 1945-1953

The challenge is how to coordinate stormwater services and standard operating procedures involving stormwater across all city departments. City employees should know not only what, but why certain practices create stormwater benefits.
Water Resources Department Staff, City of Lynchburg, Virginia, 2013

It is important to have a comprehensive program; every department has a relationship to stormwater management; staff should become aware, commonly, of this fact, and it should become a shared mindset.
Borough and Township Staff, Lancaster County, Pennsylvania, 2013

Your purpose in designing for implementation is to incorporate adopted changes to stormwater management in your local jurisdiction. Although the suggestions for a change agent in this section apply broadly to public program implementation efforts, assume your intent is to implement a stormwater utility to gather revenues for environmental improvements. Success will mean addressing implementation challenges, such as creating a cost-effective billing system, smoothly and rapidly. You will avoid major causes for failure such as:

1. Ideological resistance (perhaps because the program was mandated by your state authority);
2. Personnel problems;
3. Poorly designed incentives, both inside government and out;
4. Inadequate implementation resources to administer the utility;
5. Communications problems
6. Distractions created by new priorities; and
7. The absence of rules and resources to resolve the challenges.

Designing for implementation is a task on par with formulating a problem or creating a solution, and as such it deserves similar attention, effort, and strategic thought. Several methods will help ensure your success in the implementation phase:

Communication and Education

Creating an effectively designed dedicated funding mechanism such as a stormwater utility takes significant time, so it isn't uncommon to have a year or more pass following its adoption before it is fully implemented. By investing heavily in communications and education – for example, by working with the media and using signage on BMPs to inform citizens and decision makers about the new services that a utility will provide – you can avoid and reduce resistance during the start-up period by people who did not participate in the adoption of the utility or who have divergent attitudes.

Green infrastructure has distinct communication advantages over gray. Green is visual, while much of gray is underground; and green is attractive while, for that portion of the general public who are not civil engineers and concrete business people, gray is not. Green infrastructure also has significant educational possibilities. Not only is it visual and attractive, it is scalable, so that individual property owners can see how, as managers of their homes and businesses, they can assist in solving stormwater environmental problems.

It will assist your communication and educational efforts if you can develop a guiding vision of success and establish clear goals and objectives for your stormwater management program. For example, the City of Lynchburg, Virginia states that the "ultimate goal of its stormwater management program," which is now funded largely by its new utility, "is to help maintain its pristine water sources" – the James River and a nearby reservoir. On its website (*www.**lynchburg**va.gov/*), the city provides a slide show, which highlights its water sources and is titled, *This is Our River...Our Future...* A vision for success will relate to, but may not be the same as, the vision you created in the initial agreement or your strategy to take action. A vision for success will evolve as your program does. It will be your description of attainable excellence for the foreseeable period of time and act as your guiding principle; as such it will offer the public both a conception of success and an affirmation of your community's future.

Personnel

Implementation of a utility will be aided if the people who establish it are highly qualified, committed, and maintained as employees of your government by adequate compensation and the provision of career paths. Staff people who have been involved in previous phases that led to the adoption of the utility should be able to provide additional support throughout the implementation process. Your jurisdiction may include some employees who are not likely to aide implementation efforts, for whatever reason, and thus need to be avoided, worked around, or eased out of positions from which they could obstruct change. During the implementation phase, you will also want to assure close and frequent liaison with top administrators in your government. This may mean that you should find as many opportunities as possible to update, educate, and engage others who could influence the process. This includes getting in front of elected officials for brief updates and also making sure that information about the proposed fee structure or process is shared at regular internal staff meetings. There is a point where a little information goes a long way in terms of not overwhelming top administrators with too much data but it is important to keep them involved throughout the process and avoid last minute questions right before things are about to be implemented. Keep in mind that elected officials must be as knowledgeable about what is being proposed so that they can articulate to citizens and businesses why a dedicated funding mechanism is essential to the community and how it will be managed. If your elected officials and key staff can't explain it, you'll have a very difficult time getting the message understood and supported within the community.

Forward and Backward Mapping

Mapping implementation processes can be done in either in a forward or a backward manner; or, the two methods can be combined. Forward mapping is the typical top-down, linear

method, which sets goals and plans for future actions. The standard questions are: What will be done and by when? Who will be responsible? And what measures of success will be applied to planned actions?

Backward mapping, in contrast, is "bottom up." It begins with a statement of specific behaviors to be achieved at the lowest level of implementation. For example, you might state, "Residential property owners will receive their first billing statement for the utility by (a date certain) and at that time they will understand:

1. Why they are being billed;
2. How their fee relates to the volume of runoff from their property;
3. How they can reduce their fee by installing BMPs; and
4. In general, what fees other classes of property owners will pay."

This statement provides the backward-mapping team with a set of objectives such as: coordination measures across departments to set up billing and credit procedures; and educational programs for property owners. Next, the team can work back up through your governmental organization by asking the questions: "What units of our government can help achieve our objectives?" And, "What rules, resources, and relationships do those units need?" By beginning with behavioral statements at the lowest level of implementation, backward mapping readily brings to mind incentives.[16] Thus, for example, it raises the question: What credits, of a certain amount and time, would incentivize property owners of various classes to remove impervious surfaces, or install rain gardens or green roofs on their properties?

Interviews with staff officials of local governments in Bel Air, Maryland, Lancaster County, Pennsylvania, and Lynchburg, Virginia (See Appendix B) indicated, in all three places, that difficulties with the maintenance of stormwater BMPs installed on properties managed by homeowner associations (HOAs). The difficulties imply the need for a backward design, including consideration of incentives for property owners and managers of BMPs in HOAs, to improve their level of maintenance.

Ideally, your team will be able to combine forward and backward mapping in its implementation effort. The two are complementary methods and are much more likely to be effective when used together than when one is used alone.

Documenting Your Work

As with other phases of the policy change cycle, writing about your work and dating and saving documents is highly recommended. Documents will help focus the attention of people and organizations on important subjects for implementation. They will help to surface areas of common agreement and of needs for negotiation. They will preserve a record of progress, which you will be able to draw upon when communicating with others, such as state authorities or the EPA, and they will provide data you will need to assess progress in your implementation efforts.

[16] An emerging branch of economics focuses on incentives, popularly known as "nudges," to solve environmental problems and other social issues. See, for example, Thayer and Sunstein (2008).

Phasing in Program Changes

A common implementation strategy is to begin with what is easiest, most rapid, and most visually appealing. For example, you might quickly decide, internally, that stormwater fees should be issued via water bills, although the details to operationalize that decision are critical and may take a significant amount of time to work through. Deciding a billing procedure is not something that is visually appealing, but the green infrastructure you can create with stormwater utility fees can be highly attractive. Also, given the time required to create the utility, you can spend some resources, perhaps with your municipal planners in the lead, communicating and educating about visually and emotionally appealing concepts, such as using trees and plants to absorb and filter rainfall, and interconnecting greenways, wetlands, parks, and forests to capture water. You might decide to involve relevant advisory groups in your jurisdiction, as well as other citizens, in discussing and advising how to remove barriers to green infrastructure such as: parking requirements; road widths; storm sewer connection requirements; and low impact development practices. Other related topics for discussion could be: setting benchmark standards for on-site stormwater retention; requiring green infrastructure designs for government projects; and reducing impervious areas by various means, such as setting foot-print caps, and providing incentives for infill and compact development (See American Rivers, 2013).

Your local decision makers may be hesitant about implementing the stormwater utility. Focusing public attention on the ultimate benefits of the utility may help ease their concerns. If the decision makers remain hesitant, however, they may become supportive if implementation of the utility is staged – for example, by using a reduced fee during its first year of existence.

Lessons Learned

- Understanding how to create an effective stormwater utility billing system was complex beyond our expectations. **Water Department Officials, City of Lynchburg, Virginia**
- The most important lesson we have learned about creating a stormwater utility is that we need to hire people who are passionate about stormwater. **Water Department Officials, City of Lynchburg, Virginia**
- A major challenge for me is to make room for stormwater management among day-to-day responsibilities and avoiding having other demands on my time that crowd-out stormwater and put it on a back burner. **Township Official in Lancaster County, Pennsylvania**

Assessing Policies and Programs

History is one damn thing after another.
Robert Sherrill, Twentieth Century American Investigative Journalist

Always, always, always have a plan. And always, always change it.
John Rollwagen, Chief Executive Officer, Cray Research, 1985-1993

The shift in thinking that is needed across local government departments should be from ***reacting*** *to stormwater problems to* ***preventing*** *them, thus making problem sharing part of problem solving.*
Borough and Township Staff, Lancaster County, Pennsylvania, 2013

Congratulations! You have implemented a stormwater management innovation. Your work – as you would expect, however – is not over.

In the next phase of the policy cycle, you will review the policies and programs that you implemented to decide if they should be maintained, altered, or terminated. Various causes may prompt you to change course:

1. Insufficient resources may have been budgeted for the program by local authorities or granted from external governments or other resource providers. If additional resources cannot be obtained, the program will need to be altered or trimmed.
2. The stormwater problem may have changed. For example, with the warming of the earth's atmosphere, stormwater events are likely to become more frequent and severe. Sea level rise will also increase baseline risks for flooding in coastal communities. For some local jurisdictions, these long run risks may not have been considered adequately in the initial formulation of the problem.
3. The paradigm shift underway in stormwater management – based on new scientific evidence of the impacts and opportunities that stormwater creates for communities, added regulatory requirements by state and federal authorities, and increased citizen interest in stormwater as an environmental factor – will require significant organizational reforms within local governments and among jurisdictions located in the same watersheds. Learning new and effective ways to work together will involve trial, error, and, perhaps, adjustment.
4. The regulatory environment is dynamic. NPDES permits will be extended to more Phase II communities. In some watersheds, such as the Chesapeake Bay, TMDL requirements will be enforced by federal and state authorities.

Benefits and a Method

The main benefit of assessing the stormwater policies and programs you are implementing is that you will maintain responsiveness to your jurisdiction's stormwater problem. Also, with the paradigm shift in stormwater management, undoubtedly you will need to solve internal and

external organizational challenges. A third benefit is that effective assessment will help maintain the appetite and energy in your government for stormwater policy renewal.

Your assessment will involve meeting with a review group, likely to include individuals from the group you created when you gained the initial agreement to reform your stormwater management policies and programs. The group will discuss indicators of effectiveness, drawn from your implementation plans, including the indicators of success developed during the forward mapping exercise and behavioral indicators identified during the exercise in backward mapping.

Lessons Learned

- Real impact comes only from a comprehensive approach to watershed management. **Borough and Township Officials, Lancaster County, Pennsylvania**
- For the long term, data management – particularly the integration of data sets, auditing the system for errors, and backing up all components of the system – is and will continue to be a large concern for the department. **Water Department Officials, City of Lynchburg, Virginia**
- Information can be gathered using HOBOs to monitor water conditions such as temperature and the presence of chemicals. **Borough and Township Officials, Lancaster County, Pennsylvania**
- A significant challenge in our jurisdictions is getting homeowner associations (HOAs) to adequately maintain stormwater BMPs on their property. **Borough and Township Officials in Lancaster County, Pennsylvania; Town Officials of Bel Air, Maryland; Water Department Officials in the City of Lynchburg, Virginia**

Conclusion

We are the leaders we have been looking for.
John M. Bryson and Barbara C. Crosby, Hubert H. Humphrey Institute of Public Affairs, University of Minnesota, 1992

Communicating often and with accurate information is critical.
Water Resources Department Staff, City of Lynchburg, Virginia, 2013

Local government staff officials who work on stormwater management in the context of the paradigm shift now underway will face a variety of challenges – some of which have been outlined in this manual. In responding to those changes, consider the following suggestions:

1. **Build your knowledge base**. You will want to keep abreast of changes in the underlying science, the technology of gray and green infrastructure, and the regulatory climate of stormwater. Also, you will want to build strong relationships so as to understand the perspectives held by people involved at every level – colleagues and stakeholders in your jurisdiction, officials from other communities that are responding to similar challenges, and people in related state, federal, and regional organizations. The resulting knowledge base will make you a more effective participant in the stormwater policy cycle, and it will enhance your credibility among your jurisdiction's elected officials and appointed staff.

2. **Assess your personal leadership qualities**. Think through your capabilities, particularly what will motivate and sustain your effort through challenging times.

3. **Cultivate relationship within your initiating group**. This is the group that will: gain an initial agreement to work on stormwater; reach an understanding about the essence of the problem; help develop a solution and advocate for its adoption; and help to do the detailed work of implementing and evaluating a new approach. At every phase of the process, the quality of group relationships will be essential to move the process forward.

4. **Articulate compelling reasons to move forward**. As you reach out to people beyond your initial group, think about what motivates them and will compel them to join your cause.

5. **Think about the process**. You are invited, of course, to apply the policy change model described in this manual to your situation and community. Do not think of the model as cookbook recipe, however. Because every community differs by its physical, economic, political, and social qualities, your community is unique. Adapt the policy model insofar as it is appropriate, and improve on it as needed.

6. **Keep in mind the benefits of your work**. As was noted in the introduction to this manual, as you effectively tackle stormwater issues during this time of paradigm shift,

you will benefit your professional work, your home jurisdiction, and the people and natural resources found in your watershed.

The Environmental Finance Center at the University of Maryland (www.efc.umd.edu/) has a broad mission to work with local governments to solve stormwater and other environmental finance problems. We know about your challenges and welcome your questions, ideas, and invitations to work together.

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Appendix A: The Impact and Benefits of Green Infrastructure in Stormwater Financing Programs

Green infrastructure is an approach to resource management decision-making that considers the interaction between natural areas and the built environment and looks to use natural systems to address environmental and social priorities. And while the body of research is still emerging, this approach also appears to have the potential to address economic needs as well. Because green infrastructure can yield a number of benefits, the reason communities turn to this approach is varied. At the regional scale, green infrastructure tends to refer to the network of natural areas that provides habitat, flood protection, cleaner air, and cleaner water. At a more local or site scale, green infrastructure often refers to stormwater management systems that mimic nature by soaking up and storing water.

In urban settings green infrastructure is primarily viewed as a method for addressing stormwater impacts, particularly those tied to water quality and quantity, while simultaneously delivering a host of other benefits. In these applications, green infrastructure relies on a combination of vegetation, soils, natural processes, and rain harvesting to manage wet weather and create healthier, more livable communities. When stormwater planning and the implementation of site-scale green infrastructure practices takes into consideration how these applications interact and function as a larger system, the impacts to water quality can be significant, and often at a cost that is less than an approach that relies on gray infrastructure alone.

The benefits of a green infrastructure approach. A green infrastructure approach to stormwater management uses practices that slow runoff allowing water to soak into the ground, enabling nutrients and contaminants to be absorbed and treated by vegetation, and reducing the frequency of peak flow events. From an ecological and quality of life perspective, this translates into less runoff, fewer sewer overflows and pollutants in streams, more opportunities for groundwater recharge, and fewer flooding events. From a financing perspective, this means fewer instances of damage to public and private property, reduced water and energy usage and treatment costs, and increases in the available water supply. Green infrastructure practices also tend to have lower capital costs than their gray counterparts.

In addition, green infrastructure has the capacity to deliver benefits beyond those related to water quality and quantity. Incorporating green infrastructure into local stormwater programming can address community priorities related to air quality, recreation, public health and safety, economic development, energy conservation, transportation and a host of social concerns. This means the return on an investment in green infrastructure spans well beyond the improvements to water quality and quantity management.

Green infrastructure can be a vehicle for meeting regulatory requirements for local governments, as well. As communities grapple with combined sewer long term control plans, stormwater pollution discharge permits, and total maximum daily load requirements, many are turning to green infrastructure as a cost effective way of meeting their water quality obligations. In fact, jurisdictions across the country – Portland, Los Angeles, Cleveland,

Milwaukee, Philadelphia, New York City, and others – now specifically require a green infrastructure approach in the agreements that guide their regulatory compliance programs.

The challenges of a green infrastructure approach. While a green infrastructure approach to addressing stormwater needs may reduce costs, it is not without its challenges. While the multiple benefits of green infrastructure make the approach appealing and suggest inherent efficiencies, the learning curve it can present to local agencies can be significant.

Traditionally, local governments have relied on separate agencies and departments to deliver the host of services that green infrastructure benefits can achieve. The need to coordinate planning processes, share project implementation and administration responsibilities, and possibly even blend budgets across agencies and departments presents a substantial change in approach and requires a level of innovation that local staff can be hesitant to take on.

The most effective green infrastructure efforts begin with an inventory of natural assets, which requires and understanding and capacity for GIS – to collect, manipulate, and analyze geographical data – that many local governments lack. This GIS capacity becomes even more critical in communities developing fee systems for stormwater management and green infrastructure activities. The ability to accurately assess a parcel's impervious surface lays the foundation for more equitable fee structures that are more closely based on a property's contribution to runoff.

In addition, for green infrastructure practices to operate at the scale necessary to benefit stormwater and water quality management programs can require a good deal of land. Not only are suitable sites significantly harder to come by in major urban areas, the cost to acquire that land can be far beyond anything feasible for local governments.

Finally, the long-term operations and maintenance schemes for green infrastructure are vastly different from their gray counterparts. In most cases, the local agency or department responsible for the management of water resources is rarely prepared to take on the responsibility of managing trees, soils, plants, and other green infrastructure assets. This can lead to the need to retrain staff or develop outside contracts for services existing procurement procedures are ill-equipped to handle.

Impacts to local stormwater programs. Green infrastructure will not replace gray infrastructure solutions; however, there are a number of advantages to incorporating green and gray infrastructure into stormwater management programs, many of which have financing implications. Integrating green and gray becomes particularly efficient when considered at the planning stage of efforts. A green infrastructure approach also provides the opportunity to leverage local capacity and revenue streams tied to ancillary benefits and engage private sector resources.

An emerging body of research indicates that under the right circumstances many communities can expect a significant return on their stormwater programming investments in the form of dollars churning in their local economies. In some cases this is a direct result of the installation and maintenance of green infrastructure practices, while in other cases it can be attributed to additional tourism that stems from the revitalizing of attractive, vibrant downtowns, the

restoration of a small town, main street character, or the preservation of natural areas that make a community a recreation or outdoor sporting destination.

Green infrastructure is a stormwater management approach with the capacity to reduce implementation costs, deliver benefits that serve multiple community priorities, engage the private sector and spur behavior change through the marketplace, and provide return on investment to local economies. As an institution that advocates for the efficient use of limited resources, the EFC's approach to financing stormwater management is to advance and expand the implementation of green infrastructure, and this guidebook has been designed accordingly. We believe that green infrastructure can contribute to the resilience of a community's economy, environment, and local way of life in a very powerful and meaningful way.

Case Study: The City of Lancaster, Pennsylvania

The City of Lancaster serves as the county seat of Lancaster County and is home to some of the largest employers in the region including Lancaster General Hospital, School District of Lancaster and Lancaster County Government. The City's population is just over 59,000 people with a population density of nearly 8,000 persons per square mile. Most of the City is within the Conestoga River watershed, a tributary of the Susquehanna River; the Susquehanna River watershed is the largest major tributary draining the 64,000 square mile Chesapeake Bay watershed.

Water Quality History. The adverse impacts of uncontrolled stormwater runoff are exacerbated in communities with combined sewer systems (CSS) where stormwater and sanitary sewage flow through the same system of pipes. Lancaster is one of about 770 cities with a combined sewer system. Eighty-five percent of the time, the City's Advanced Wastewater Treatment Facility (AWTF) is able to manage and clean the volume of wastewater in the system. However, intense rainstorms often cause about 1 billion gallons of untreated wastewater to overflow into the Conestoga River, much of it runoff generated from impervious surfaces including buildings, streets, alleys, and parking lots.

When CSSs were being built across the country in the 19th and early 20th centuries, they were considered a highly efficient method of treating all forms of waste from urbanized areas, because they collected stormwater, municipal wastewater, and industrial wastewater all in the same pipe and conveyed them to a facility to be processed before discharging the treated water into nearby waterways.

The total land area served by the CSS is 2245 acres, representing about 45% of the land area of the City. In addition, portions of Manheim Lancaster Townships also drain into the City's CSS. The remaining areas of the City (2591 acres) drain into a separated storm sewer system.

Local Priorities and Water Quality Goals. In May 2010, the City began developing Pennsylvania's first Green Infrastructure Plan (GI Plan) for a Third Class City. Completed in 2011, the 25-year plan outlined strategies to install green infrastructure practices throughout the City, including porous pavement, infiltration and bioretention systems, green rooftops, rain gardens, and rain barrels. The GI Plan promotes an approach that achieves multiple benefits by incorporating stormwater management features into infrastructure renewal projects along with improved aesthetics, increased urban tree canopy, reduction of urban heat island impacts, and

other community improvements, all of which is the key to transforming the City into a sustainable healthy community.

Guided by the mission to provide more livable and sustainable neighborhoods for City residents, as well as to reduce combined sewer overflows and nutrients, the GI Plan was a broad collaborative effort, evaluating specific topics including impervious cover, likely project sites, grant funding, potential benefits, and the policies and actions needed to institutionalize green infrastructure in the City. Further analysis identified more than 50 existing and possible green infrastructure demonstration projects in various locations with the potential to remove an estimated 21 million gallons of urban runoff from the combined sewer system per year. The GI Plan sets forth the following goals:

1. Strengthen the City's economy and improve the health and quality of life for its residents by linking clean water solutions to community improvements (e.g. green streets).
2. Create green infrastructure programs that respond comprehensively to the multiple water quality drivers (e.g. TMDL, CSO and stormwater regulations) to maximize the value of City investments.
3. Use green infrastructure to reduce pollution and erosive flows from urban stormwater and combined sewer overflows to support the attainment of the Watershed Implementation Plan for the Chesapeake Bay and to improve water quality in the Conestoga River.
4. Achieve lower cost and higher benefit from the City's infrastructure investments.
5. Establish Lancaster City as a national and statewide model in green infrastructure implementation.

Based on these five goals, a series of policy objectives were developed emphasizing a results-oriented, inclusionary process that involved partnerships of government, residents and businesses in effectively planning and implementing green infrastructure strategies and demonstration projects. Additional policies addressed the need to further reduce nutrient and sediment loads that ultimately flow into the Chesapeake Bay, and incorporate green infrastructure as a component of the City's Long Term CSO control plan and SWM programs.

In order to implement the GI Plan, the City conducted an evaluation and assessment that required a three-step process:

1. Evaluate impervious cover by type and land ownership.
2. Identify potential green infrastructure project sites and grant funding for early implementation to understand the cost and benefit of each.
3. Determine potential city-wide benefits, and provide actions and policy direction to institutionalize green infrastructure throughout the City.

A green infrastructure calculator was developed to evaluate the potential stormwater benefits and costs associated with green infrastrcture implementation at two levels: approximately a 5-year period and a 25-year period. Major inputs to the calculator included:

- Impervious area by type;
- Implementation levels (by percentage of area managed);

- Runoff capture volume;
- Annual rainfall; Annual impervious runoff coefficients;
- Average redevelopment rate;
- Green infrastructure loading ratios;
- Unit green infrastructure costs (total and marginal); and,
- Typical event mean concentrations for stormwater and combined sewer overflow (CSO) discharges. The results of this modeling exercise are summarized in the following table.

Green Infrastructure Runoff Reductions

Parameter	5-year Implementation	Long-term Implementation
Impervious area managed by GI (acres)	221	1,265
Average annual runoff reduction (million gal/yr)	182	1,053
Average annual total suspended solids (lb/yr)	252,000	1,475,000
Average annual total phosphorus reduction (lb/yr)	4,800	27,800
Average annual total nitrogen reduction (lb/yr)	10,700	61,600
Total marginal cost	$7,800,000	$77,000,000
Total capital/implementation cost	$14,000,000	$141,000,000
Marginal cost per gallon CSO reduction ($/gal)	$0.06	$0.10
Total cost per gallon CSO reduction ($/gal)	$0.10	$0.18

The Cost Benefits of a Green Infrastructure Approach. Though the City has been proactive in investing in projects that reduce CSS overflows, including investing over $30 million in the past 12 years on a variety of "gray infrastructure" projects and practices, a significant amount of untreated combined sewage continues overflowing into the Conestoga River. The City's approach to addressing these runoff issues will be to implement an infrastructure system that effectively links grey and green practices and approaches.

Experiences in other communities has shown that focusing inclusively on gray infrastructure options for addressing CSOs can be expensive to construct and maintain, while serving the single purpose of holding CSO volume for later treatment. The cost of one storage tank alone in the City's northeast section is estimated to cost $70 million, while managing only 10% of the City's annual CSO volume. To store and treat the current CSO volume is estimated at more than $250 million in construction costs, not including the annual operational costs in energy and personnel to run the new system.

When the GI Plan is fully implemented over the next 25 years, the citizens of the City of Lancaster will realize more than $100 million in savings. The estimated cost to store and treat the billion gallons of annual overflows utilizing traditional "gray infrastructure" would be well over $250 million, while the cost of equivalent "green infrastructure" is anticipated to be approximately $140 million.

Learning by Doing: Implementing the Green Infrastructure Plan. Perhaps the most impressive part of the City of Lancaster's Green Infrastructure Plan is that the plan is turning into action. The City has moved forward with a variety of green infrastructure projects including: green alleys and streets, porous parking lots, green roofs, and green enhancements to several parks incorporating a wide variety of green infrastructure techniques including porous paving, cisterns, rain barrels, tree trenches, rain gardens, and other forms of bioretention. The sites are a combination of City-owned properties, School District of Lancaster and other institutions, residential dwellings, as well as commercial and industrial properties. To date, more than 130 green infrastructure projects have been completed, are under construction or in the concept or design stage. When all these projects are completed, an estimated 100 million gallons or more of stormwater runoff will be kept from entering local watersheds per year.

In several locations throughout the City, more than 25 alleys and numerous streets have been redesigned or reconstructed, or are in some stage of being reconstructed to utilize a variety green infrastructure techniques. Several of these alleys are common alleys where all adjacent property owners hold a common share of the alley. The remaining alleys on the demonstration project list are City rights-of-way. One **green alley** alone can capture and infiltrate from between 200,000 and 1,500,000 gallons of rainwater annually. The Plum and Walnut intersection project integrated green infrastructure with traffic circulation and pedestrian safety enhancements to control nearly 1.5 million gallons of stormwater annually.

Several **green parking lots** in the City as well as on the Franklin & Marshall University campus underwent full renovation using green infrastructure technologies including permeable paving, infiltration beds, tree trenches, and rain gardens. In addition to capturing stormwater these projects included repaving, planting trees, improved lighting, and organized parking placement. Combined, these parking lots are estimated to prevent nearly 2.3 million gallons of stormwater from entering the sewer system on an annual basis.

Green roofs have been constructed on three School District of Lancaster Elementary Schools, three buildings on the Franklin & Marshall University campus, several private commercial buildings and Lancaster City government facilities including the recently completed City Hall addition for a total of more than 95,000 square feet. In addition to eliminating some 1,800,000 gallons of stormwater every year, these green roofs should extend the life of the roof, and reduce heating and cooling expenses.

Four **recent green** park improvement projects, Sixth Ward Park, Brandon Park, Crystal Park and Rodney Park incorporate a variety of green infrastructure techniques. The park improvements focused on park amenities like basketball courts, play equipment, picnic areas, restroom facilities and water features resulting in a rain gardens and new porous basketball courts to manage more than 6,000,000 gallons of stormwater from park areas and adjacent streets.

As of November 2013, 38 green infrastructure projects have been completed or are under construction for a total estimated annual rainfall capture of more than 20,000,000 gallons. Another 16 projects are in the design phase that when constructed will capture more than 6,000,000 gallons of rainfall annually.

Establishing a Multifaceted Initial Funding Strategy. The total project cost for developing the Green Infrastructure Plan was $140,000. The project was partially funded through a $70,000 Department of Conservation and Natural Resources, Community Conservation Partnership Program, Environmental Stewardship Fund grant. Live Green, a Lancaster-based nonprofit environmental organization focused on improving the environment in urban settings, provided $10,000 in matching funds while the City contributed $60,000 through a Capital Bond.

The City has received well over $10 million in grants and low interest loans from federal, state and local sources. A $7 million low interest PENNVEST loan is being used to design and construct the many demonstration projects as well as for leveraging additional grant funds administered by the National Fish and Wildlife Foundation (NFWF); the state departments of Environmental Protection (DEP), Community and Economic Development (DCED), and Conservation and Natural Resources (DCNR), and Lancaster County. These funds are being used for creating the "stormwater utility" and constructing and installing the many demonstration projects, including green streets and alleys, permeable parking lots and basketball courts, street tree plantings and expanding the City's urban tree canopy, green roofs, and vegetated curb extensions.

In order to fully implement the GI Plan and institutionalize green infrastructure as a part of normal development and redevelopment activity, the City is in the process of establishing a Bureau of Stormwater, which will administer the Stormwater Management Fee Program. This impervious area based fee will allocate the costs of stormwater management and water pollution control based on the amount of impervious surface area on each parcel. Commonly known as a "stormwater utility," this would apportion the costs of controlling CSOs and stormwater based on each parcel's proportionate use (as determined by impervious area) of the wastewater collection and treatment facilities. This allows for the reductions in a bill if a property owner installs green infrastructure to manage his or her impervious area and reduce flows to the CSS.

Establishing a Sustainable Fee-Based Financing System. Though the City has very effectively leveraged existing revenues with grants and other funding opportunities, long-term implementation success will require consistent and dedicated revenue streams. To that end, in the first quarter of 2014, the City's new Stormwater Management Fee (SWM Fee), based on a property's impervious area, will be rolled out. The fee will be assessable on all property within the City, including commercial, single-family residential, educational and faith-based, as well as all levels of government. The fee will provide secure funding source for the administration of the Green Infrastructure Program. One program objective is to create a GI Grant Fund that would incentivize improvements on private property by funding the marginal cost of the green portion of those improvements. Hand-in-hand with the grant fund will be a credit program to allow property owners a rebate on a portion of their SWM Fee for taking measures to reduce the amount of stormwater leaving their property and entering the City's sewer system.

Appendix B: The Risks of Resistance And How to Overcome Them

The paradigm shift underway in stormwater management implies that finding funding solutions for many stormwater problems will require more than "business as usual" technical fixes. The solutions will require behavioral changes among both service providers and the public. Predictably, addressing complex problems which require behavioral changes engenders resistance to change and thus creates risks to those who initiate problem-solving efforts. There are methods, however, for reducing and avoiding such risks.

Technical and Adaptive Problems

As you clarify a problem of how to finance stormwater improvements, you will realize that the problem is one of two basic types. It will be, fundamentally, a **technical problems or an adaptive problem** (Compare Heifetz and Linksy, 2002). Technical problems require, for their solution, the application of current know how, and they can be administered by existing authorities. For example, a local jurisdiction faces the problem of how to pay for modest growth in expenses for existing stormwater services and decides that it should do so by imposing a small increase in the tax rate for real property. Staff members who estimate the additional expenses and, once a decision by elected officials has been made, implement the property tax hike have straight forward tasks: apply current know-how; and use standard operating procedures for doing the work. Theirs is a technical problem.

Adaptive problems require, for their solution, learning new ways of working and involving the people with the problem to be part of the process of reaching solutions. The inherent difficulties and expenses of adjusting to MS4 permits and the Chesapeake Bay TMDL, of incorporating environmental values into stormwater management, and of adjusting to the increased risks of severe storm events resulting from the warming earth surface and atmosphere are likely to be adaptive problems. For example, the complexity of governance and magnitude of costs that are being mandated by the EPA/State Governments Phase II Permits and the Bay WIPs will prompt local jurisdictions to consider new ways of gaining revenues and involving landowners in solving the problem. Consider, however, the personal and professional perils of assuming the role of a change agent for solving adaptive problems, particularly adaptive stormwater finance problems.

The Perils of Leading Adaptive Problem-Solving Processes

Adaptive problem solving in local governments and other organizations necessitates the hard work of questioning assumptions and beliefs. It requires that local government officials and citizens give up habitual ways of thinking and acting and begin to behave in new ways. When people are faced with the task of solving an adaptive problem, say for example, the task of effectively and constructively reacting to Phase II Permit requirements, they can be expected to avoid and oppose the task. They might resent the EPA and the state authority that requires the

permit and rant against the authority instead of solving the problem; they might resist taking on the costs implied by the permit; and they might oppose creating a new funding mechanism.

A local government staff member who advocates for creating a new mechanism for stormwater finance takes on this role at his or her own peril. As an agent of change in a situation where local officials and citizens may well want to avoid and oppose a new mechanism, the staff person will put his credibility and position on the line. He or she may need to push for new thinking and behaving in a manner that others view as "going beyond his or her authority."

Change agents in organizations that face adaptive problems can easily become unpopular. They can be marginalized by the organization. Their efforts can be diverted or attacked. Such are the perils of leading adaptive problem solving processes. There are, however, some practical ideas for responding to resistance and avoiding perils, and, local officials are using the ideas to protect themselves as they move forward to solve stormwater finance problems. Strategies, as provided by Heifetz and Linksy (2002), and examples from the City of Lynchburg, Virginia Water Department demonstrate effective responses.

Practical Ideas and Lessons Learned for Avoiding Perils

Get on the Balcony. To get on the balcony means to remove oneself, from time to time, from the problem-solving "dance on the floor," and, thus, be able to observe the problem from another perspective. Because not everything about an adaptive problem necessarily requires new ways of working and allocating responsibilities, getting on the balcony helps a change agent to identify and move to solve technical challenges that are bundled into a problem which is basically adaptive. Getting on the balcony also helps the change agent to read the behavior of decision makers for clues about their preferences. And it helps a change agent to gather information about what people elsewhere are doing to solve the problem. For example, in the City of Lynchburg, officials from the municipal Water Department are involved in committees and organizations related to stormwater management in the Commonwealth of Virginia and the Chesapeake Bay Region. Their involvement has provided information about how other jurisdictions are financing new stormwater improvements and services, and it has enhanced the credibility of Water Department officials in their relations with elected officials in the city.

Hold steady. Using this strategy, the change agent will be willing to take the heat, if need be, patiently allowing the problem to ripen, if more time is needed to develop gain an agreement to act, and continuing to focus people's attention on the need and opportunity to solve the problem. In Lynchburg, the Water Department staff realized in about 2003 that stormwater management methods needed to be reformed. At that time, the department began to "do its homework" and build support for reform among elected decision makers and the public. By 2009, the stormwater problem had ripened sufficiently, and the department moved forward aggressively to form the Stormwater Advisory Committee (SWAC) and make the case to elected officials and the public that the consequences of inaction were unacceptable.

Think politically. This strategy may involve several actions:

- Finding and cultivating partners who share your concerns and values;

- Reaching out to understand the thinking of and build relationships with people who are actively or potentially opposed to your thinking;
- Accepting responsibility, if need be, for your own agency's contributions to the problem;
- Acknowledging the loss of cherished ideas that will need to be abandoned; and
- Modeling the kind of behavior that will be needed to solve the problem.

In Lynchburg, the Water Department formed the SWAC as a "cross section of stakeholder groups in the city" which, with staffing assistance from the department, formed a consensus to establish a stormwater utility. The SWAC then presented this policy recommendation to the elected officials of the city.

Orchestrate the conflict. To implement this strategy, the change agent will, to the extent possible, create a holding environment wherein conflicts can be worked through, where the temperature of conflict about the problem can be stoked or dampened, and where an appealing vision for the future can be created. A tactic for orchestrating the conflict that is advocated by some organizational development specialists is to focus attention on the positive – appreciating what an organization does well – rather than on eliminating what it does badly. For more information on a positive approach to problem solving in organizations, see *Appreciative Inquiry Commons* (2013). Lynchburg's SWAC provides an example of a holding environment. In staffing the SWAC, Water Department officials were able to impress on committee members the need for new thinking and working to solve the funding shortfall that would be created by the MS4 Permit requirement and the opportunities that increased funding would provide to solve environmental issues. In this way they helped the committee members envision a path, via the stormwater utility, to a better future.

Give the work back. In following this strategy, the change agent will help decision makers understand the need for the community as a whole to take responsibility for solving the problem. As an official in the Lynchburg Water Department said, "Everyone creates stormwater, so everyone should help to pay for its management." In giving the work back, the change agent would also minimize his or her interventions, making them as short and simple as possible, making brief observations, instead of issuing lengthy pronouncements, and asking questions, instead of giving answers.

Appendix C: Stormwater Infrastructure Asset Management

The following was contributed by Heather Himmelberger, Director of the Southwest Environmental Finance Center at the University of New Mexico. Himmelberger is a registered professional engineer with 27 years of experience working with water and wastewater utilities and in the environmental arena. Himmelberger has been providing training and implementation assistance in Asset Management since 2005 all across the country. She completed an interactive asset management training manual that includes over 200 video clips that has been used in trainings throughout the U.S.

There are five core components that make up an asset management program. These components are not linear – they can be completed in any order – and they are very interrelated. The five core components are: current state of the assets, level of service, criticality, life cycle costing, and long-term funding. A brief description of each of these components is contained below.

Current State of the Assets

A fundamental aspect of the overall asset management process is determining what physical assets make up the system. In this component, it is necessary to answer the following questions:

- What assets make up the stormwater management system?
- Where are the assets located?
- What is the useful life remaining of each asset?
- What is the value of the assets?
- What is the current condition of the assets?
- Does the asset require energy?

This step involves taking an inventory of your assets so that you know what components are in your system. You will also want to collect information on the assets you own, such as: date of installation, condition, serial number, manufacturer, suggested maintenance, type of material, size, etc. The information can be stored in a computer program, such as a spreadsheet or database, or it can be stored using a commercial product specifically designed for asset inventory. This component also involves developing a map of your stormwater assets so you know where your assets are located.

Level of Service

It is important to know what you want your assets to provide for your community. We refer to this as the level of service. This is the step where you state what it is you want your assets to do. For example, you may want your assets to be able to contain a storm of a certain size without flooding streets.

Level of service is directly tied to cost. Higher levels of service mean higher cost. It is important for community members who will be paying for installation and upkeep of stormwater assets to

understand this connection. If they want you to provide a higher level of service, you can do that, but it will cost them more money. The more directly the community members understand this connection, the easier it will be for you to receive the money you need to install and maintain your assets.

Criticality

Not all assets are equally important to the system. Some assets are going to be much more important than others. It is important to be able to identify those assets that are more critical because those assets require more attention. There are two components of criticality: how likely the asset is to fail and how serious the consequence is if it does fail. An asset that is highly likely to fail and will cause serious consequences if it does fail is much more critical than one that is unlikely to fail and it doesn't matter if it does.

Once the assets that are more critical to the system are identified, extra efforts can be made to ensure that these assets are properly maintained and are replaced when needed to prevent catastrophic events from happening.

Life Cycle Costing

Once assets are installed, there are two major activities related to them. One is the operation and maintenance (O&M) of the assets and the other is replacement of the assets. O&M represents those day to day activities that are done to the assets. We know that doing more preventative and routine maintenance on our assets can help extend their life, but we also know that these activities take time, money, and resources to complete. Therefore, we have to balance what to do, when to do it, and which assets to do it on. The best way to make these decisions is to consider the criticality – or risk – of the assets. We want to focus our preventative maintenance program on those assets that are most critical to the system. We don't want these assets to fail, so we want to do all we can to prevent the failures.

At some point, all assets will have to be replaced. The question always arises of when to replace the assets. Similar to the situation with the O&M activities, it is important to think of risk when considering asset replacement. Those assets that are of greatest risk or criticality should be replaced sooner before a failure occurs and those assets that are low risk should be allowed to fail prior to replacement.

Long-term Funding Strategy

Managing assets always requires adequate funding. Funding is needed to perform routine and preventative maintenance, to hire and pay for staff, to repair assets, and to replace assets. It is important to determine how much money is needed to properly sustain the stormwater assets over time and to have a means of obtaining the needed funds. There are many ways of getting the necessary revenues. No matter what method is used, it is important to involve the community members who will benefit from the stormwater assets in the process so that they are supportive of the revenue generating approaches used. They need to understand that the assets are providing a service to them and that they need to pay for this service. The more directly they understand this connection, the better able the community will be to collect and maintain the necessary revenue.

Getting Started

The best way to get started with asset management is to just do it. Choose one area that seems reasonable to you and start there. For example, if the community does not have a map of its stormwater assets, that might be a great place to start. A map can be completed at any sophistication level from a hand-drawn map to a map using free software, such as Google Earth or Mapquest, all the way to a Geographic Information System (GIS) map.

Once you jump into asset management, you will learn what information you need to have and then you can start collecting it. As you collect the information you need, the program will improve. You can start with any of the five components and you will naturally be led to each of the other components.

Measuring Progress

It's very important to measure the progress of your program. You want to be able to tell your staff, your elected officials, and your community members how well your program is working. One tool to help measure progress is the Asset Management IQ tool. This tool is a series of 30 questions that are all multiple choice with a score of 0 to 5 points per question. The 0 point answer indicates that nothing is being done in this area and the 5 point answer shows the organization is at the level they need to be for that item. It is recommended that a community undertake the IQ test at the very beginning, prior to starting any activities in asset management, in order to establish a baseline. Then, the IQ can be repeated on a routine basis, such as once a year, to measure the improvement in asset management implementation. Because the 30 questions are divided into six sections (one general section and one section for each of the five core components), by comparing scores from the individual sections, it is possible to tell how the community has improved in each part of the process. This tool can identify strengths in the program – places where the community is doing very well in asset management implementation as well as weaknesses in the program – places where additional activities may be required. The IQ tool is available on-line through the Environmental Finance Center Network.

Resources

There are many resources to help a community establish an asset management program. One tool is the Environmental Finance Center Network's A.M. KAN Work! tool. This tool was developed with funding from the Kansas Department of Health and Environment (KDHE) and is meant to be a self-help guide. It contains video clips of communities who have engaged in asset management activities to provide opportunities for peer to peer learning. In fact, one of the best resources for any community is another community that is also engaged in asset management. It is important to reach out to other people who are engaged in asset management and share experiences, advice, what worked well, and what didn't work so well. Sharing this type of information can really help you advance your own program.

Appendix D: Results of Focus Group Interviews

During the summer of 2013, eleven local jurisdictions, all located in the Chesapeake Bay Watershed, provided information for the manual. On July 23, 2013, twelve local officials, representing nine boroughs and townships located in Lancaster County, PA, gathered at the Warwick Township Offices and participated in a focus group interview about stormwater management in their jurisdictions. Officials from the City of Lynchburg, Virginia and the Town of Bel Air, Maryland participated in similar interviews on July 30, 2013 and August 6, 2013, respectively. The names and affiliations of the officials who were interviewed are shown on the final page of this report. Philip Favero facilitated the meetings for the Environmental Finance Center.

Almost all of Lancaster County, PA – with a population of about 520,000 people located in 18 boroughs, 44 townships, and unincorporated areas of the county – drains into the Chesapeake Bay Basin via the Susquehanna River Watershed. Lynchburg, a municipality of about 50 square miles and 77, 000 people, is located on the banks of the James River near the geographic center of Virginia. Bel Air, a municipality of approximately 10,000 people, is the county seat for Harford County, located northeast of Baltimore City, and was developed, in part, because several streams run though the Town, and these offered potential for water-powered industry in the late 1700s.

During the interviews, participants provided answers to eight questions. At the beginning of the meeting, the facilitator provided the questions on a handout. Questions were then considered, one-by-one: the facilitator asked the officials to write their answers and led a discussion about how the officials had responded. During the discussion, the facilitator took notes and, at the end of the interview, collected the handouts containing written answers.

Responses to questions provided during discussion, as summarized by the facilitator, are shown below in regular type, interview by interview. Answers written by participants, but which were not included in the discussions, are shown in italics. To improve clarity, while at the same time preserving content, the facilitator edited some of the respondents' written answers, adding modifier words for explanation, and spelling out full names for acronyms.

Q1 What are the major stormwater issues or concerns in your jurisdiction?

Lancaster County, PA: Issues and Concerns

a. Our township is now including "stormwater quality" – e.g., sediment-loading – as well as "stormwater quantity" – e.g., management of dam facilities – to the set of services for which it is responsible. This change in services implies significant additions to management complexity and budget expense.
b. Even though, as the permit holder, we are ultimately responsible for stormwater services, we are coping with a "fragmented system of implementation," which involves multiple homeowners associations (HOAs) that have responsibility for maintaining stormwater control facilities. This fragmented system requires much staff time and financial outlay on our part, including time for education because of the high turnover rate of the people responsible for the HOA facilities.

c. Given changes in the set of stormwater services we are providing, we must respond to many questions and concerns from citizens, as well as from our elected officials.
d. *I am concerned that we work with our neighboring municipalities but without knowing the age or condition of their stormwater infrastructure.*
e. *Not having the support of the board of supervisors to manage the costs of stormwater systems.*
f. *The need for more education; manpower to handle the issues; and how to persuade developers who do not want to "think outside of the box" that green stormwater management ideas will yield results that will be to their own benefit.*
g. *Roadway flooding, maintenance of private facilities, and stream-bank restoration, especially in agricultural areas.*
h. *Financing and education about financing for both residents and public officials.*
i. *The attitude "my cost, their gain." Poor soils. The need to envision a holistic approach.*
j. *Aging stormwater infrastructure and the lack of public awareness about it.*
k. *The quantity of stream-bank restoration we face; these are big projects that cost a lot of money. Also, addressing developers vs. agricultural properties.*
l. *We are without a holistic approach to stormwater; the township engineer, only, reviews proposals. I'm also concerned about how we will find the staff time needed to manage overall stormwater systems in the township.*

Lynchburg, VA: Issues and Concerns

a. An important concern is increasing the environmental awareness of how we live, for everyone in Lynchburg, and how we operate, for elected officials and city employees.
b. Another concern is meeting the need for water quality improvements in the city.
c. We must comply with mandates – e.g., the Municipal Separate Storm Sewer (MS4) permit – and meeting goals – e.g., the Chesapeake Bay Watershed Implementation Plan (WIP).
d. A long-term issue is that of maintaining and improving the stormwater infrastructure.
e. *Obtaining adequate funding.*
f. *Hiring sufficient staff.*
g. *Coordinating interdepartmental operations.*

Bel Air, MD: Issues and Concerns

a. At this point in time, the Town knows it must comply with state and federal regulations, including Phase II NPDES Permit requirements and WIP requirements for the Chesapeake Bay, but it is unclear what specific actions will be required of the Town. We are hoping to receive more guidance from the State of Maryland.
b. As an urbanized place with very little open space available, the Town will be challenged to find areas sufficiently large enough to treat stormwater on an efficient scale.
c. In Bel Air, home owner associations (HOAs) are legally responsible for maintaining all of the private stormwater BMPs in Town. When an HOA does not perform its maintenance responsibilities, the Town must intervene to do the work; and when we do so, we bill

individual property owners in the HOA for their portion of the cost. Some property owners are resisting paying the fee; that results in a lien on their property and, ultimately, a tax sale of the property. Likely, those resisting paying their bills do not realize there will be significant legal costs to retaining their property when it is included in a tax sale.

d. *We are concerned about where the revenues will originate to begin projects.*

Q2 How did those issues get on your jurisdiction's agenda for action? (In particular, what role did staff officials have in the process?)

Lancaster County, PA: Agenda for Action Process

a. Staff is critically responsible for identifying issues. A major effort involves meeting with HOA representatives; we feel responsible for having HOAs be proactive and take preventive actions.
b. We want to avoid a "screaming meeting." To do so requires staff efforts, with the board, to orient and educate our elected officials and to demonstrate that they need to care about stormwater issues.
c. State permit requirements and fines imposed for noncompliance have gotten the attention of elected officials and citizens.
d. The discussion about the budget provides an important opportunity for getting stormwater management on the agenda; the staff has been successful in encouraging a slight increase in funds for stormwater services.
e. *Public Works staff members evaluate projects and gather pricing information, which is then taken back to the Public Works Commission for recommendation and onto elected officials for funding. Sometimes these projects take a back seat, however, to other programs.*
f. *Manager and staff get complaints, monitor systems, and address problems.*
g. *We issue violation notices after trying to speak with property owners regarding maintenance problems.*
h. *The MS4 Permit renewal brought many stormwater issues into the forefront with staff and elected officials. Staff needed to be educated, to educate the board and public, and to begin the technical work.*
i. *Usually issues arise because of problems in the municipality; note: this is a reactive, not a proactive approach.*
j. *Stormwater services play a significant role among the services we provide but must compete against other public issues for action.*
k. *The increase in costs for capital projects to address stormwater management gets these services on the agenda during budget discussions. MS4 regulations have been a wakeup call for everyone and made stormwater management a priority.*
l. *Continued updates through participation in the Lancaster County Clean Water Consortium and the Environmental Finance Center.*

Lynchburg, VA: Agenda for Action Process

a. Work on the MS4 permit goes back for a decade, but in 2009 the Water Resources Department concluded that stormwater management was an increasing administrative and financial challenge, and we started to "do our homework" to gather more information.
b. We began a series of briefings of the elected officials, initially during a City Council retreat, to provide council members with information.
c. We also created a stormwater advisory committee (SWAC), made up of 25 citizen stakeholders, who represented a cross section of the community.
d. And, we began to increase our public outreach to all citizens through the media.

Bel Air, MD: Agenda for Action Process

a. Primarily, changes in stormwater services are being driven by state legislation.
b. We also have some citizen groups at the county and regional level who are advocates for stormwater services to serve environmental values.
c. And we attempt to coordinate our work with Harford County officials.
d. Although we are in a time of uncertainty, the Town staff brief our elected officials to inform them, as best we can, of state and federal regulations, guidance for compliance from state authorities, and our local options to treat stormwater and pay for those services.

Q3 How was information gathered to support action?

Lancaster County, PA: Process for Gathering Information

a. We gather information from the Internet, where we can view what other jurisdictions are doing.
b. Stream monitoring data, using data loggers (HOBOs) to monitor water conditions such as temperature and the presence of chemicals, are important tools. HOBOs can be used to create a local and credible data base which offers proof of problems and "without-with" test results for stormwater control devises. (At least one government represented in the interview provides its data base to the public via its website.)
c. Public and private organizations have provided information and conducted studies. (Organizations mentioned during the discussion and included among written answers were: Lancaster Clean Water Consortium; Lancaster County Conservation District; Lancaster Farmland Trust; Lancaster County Planning Commission; private engineering and environmental firms; and watershed groups.)
d. By listening to citizen complaints.
e. By field observations.
f. By consulting with internal experts, e.g., the Public Works Staff and the Borough Engineer.
g. Sharing data among neighboring local governments, either by visiting neighbors directly or through public meetings, forums, and seminars.

Lynchburg, VA: Process for Gathering Information

a. We strengthened our internal database by drawing on our in-house expertise and collecting additional data, e.g., by gathering data on the types and areas of land parcels contributing to stormwater runoff in the city.
b. We looked to the experiences of other jurisdictions. (Being involved in statewide committees and associations – e.g., groups concerned with stormwater management in Virginia and with the Chesapeake Bay cleanup – not only provided information about state policies and about what other municipalities are doing, it also strengthened our credibility with city decision makers.)
c. We employed a private consulting firm that had provided advice, previously, to other jurisdictions regarding stormwater management and asked them to review existing services and costs.
d. We incorporated citizen input to our data base for decision making.
e. We gathered information from various sources, including: previous studies of stormwater services in Lynchburg; the Virginia Municipal Stormwater Association; agencies of the Commonwealth of Virginia; stormwater utilities in other jurisdictions; our SWAC; and the Virginia Stakeholder Advisory Group for the state's WIP.

Bel Air, MD: Process for Gathering Information

a. At this point, we are seeking additional guidance about stormwater service improvements from the State of Maryland. Hopefully, we will be able determine the scope and costs of projects prior to being required to assess fees.
b. The science about the effectiveness of BMPs for reducing stormwater pollution seems thin.
c. Our recently developed sustainability plan includes multiple actions we will take that will reduce stormwater pollution through: the conservation of water resources; a water stewardship effort for Winters Run (the Town's major source of drinking water); natural resource conservation for Town parks and facilities; and reductions in environmental impacts by the reducing the use of motor-vehicles.
d. We have received some printed materials from the state and been involved in webinars, but we are seeking, from the state, more information about solutions to the problem.
e. The Town has the potential to study its stormwater needs by using GIS technology to determine which geographic areas have treatment, which have partial treatment, and which have no treatment. We could then overlay watershed areas onto treatment areas to target projects for service upgrades.
f. We lack the funds to conduct studies in the Town about what would work best to reduce stormwater pollution.

Q4 How was that information communicated to decision makers and the public?

Lancaster County, PA: Communication Methods

a. We bring in speakers, i.e., credible experts.
b. Signage for public observation is important. For example, a sign can explain what the stormwater Best Management Practice (BPM) at a project site is.

c. A recent "Watershed Expo" was helpful. It was a "family affair" marketed via the Internet, newspaper, and word-of-mouth; the Expo included various presentations and demonstrations, including one popular among children about the relationship between stormwater and living creatures. Also, the Expo was located near a stream, which provided a "teachable opportunity" for participants.
d. We realize we are interdependent with neighboring jurisdictions and seek to convey a consistent message across jurisdictions.
e. *Township staff has to continue to get out in front of the stormwater program and bring the board along.*
f. *We communicate through: newsletters; inserts in trash bills, flyers; involvement in the Lampeter Community Fair; a logo for EFC project on township vehicles; public meetings, reports, studies, e-mail messages, phone conversations, websites, tours, and a float in a parade; one-on-one with residents by explaining projects; on-going incorporation of stormwater into land development plans and building permits; partnerships with local watershed alliances; and by providing decision makers with regular updates, reminding elected officials that stormwater management is not going away.*
g. *We are applying for grants to educate and bring about behavioral change.*

Lynchburg, VA: Communication Methods

a. Working with the SWAC, we helped the committee to reach a general consensus, after which the committee made a presentation to the City Council. Included in the committee's recommendations was that the city should create a stormwater utility.
b. The Water Resources Department followed with its own recommendations to the council, which seconded the recommendations made by the SWAC, with the exception of a revenue gathering mechanism. (The SWAC recommended gathering revenues for stormwater services from a combination of property taxes and fees; the Department recommended the use of fees only.)
c. *The public was kept informed during the decision-making process in various ways: radio; newspaper; bill stuffers; and through interactive TV/the city website.*
d. *SWAC meetings were public, and information about them was made available on the city website. Public meetings and hearings were interactive and broadcast on the TV/city website.*

Bel Air, MD: Communication Methods

a. The Town is communicating with both decision makers and the public through individual conversations, group meetings, and outreach methods such as the Town website and newsletter.
b. *We briefed our elected officials during a recent retreat, where stormwater was emphasized, and also have provided briefings at several of the Commissioners' work sessions.*

Q5 How was political support for action by decision makers developed?

Lancaster County, PA: Developing Political Support

a. Careful listening is important.
b. Political support is enhanced by having "homegrown information," e.g., HOBO data from local streams, to make your case.
c. The permitting requirement and threat of being fined is the "hammer that opens the door," but that is inherently negative and should be followed up with positive messages.
d. A powerful positive message is to identify stream improvements as assets to the community for recreation, trout fishing, for example, historic preservation, and tourism and other forms of economic development.
e. To gain the support of elected officials, make a success story look like it was their idea.
f. The various methods of communicating, as shown in responses to Q4, provide answers to Q5 also.
g. *Proposing changes to the budget gets attention.*
h. *Public support can be developed through demonstrated action.*

Lynchburg, VA: Developing Political Support

a. The Water Resources Department did its homework and communicated honestly and consistently with decision makers.
b. Our communications were primarily about the city's needs, current and future, and about what consequences the city could expect from inaction. (The City Council eventually approved the stormwater utility by one vote.)
c. Implementing a credit/rebate program for the stormwater utility will have significant political appeal.

Bel Air, MD: Developing Political Support

Negative reactions, including reactions by some in the business community, to Harford County's compliance with Maryland House Bill 987, which requires the imposition of a stormwater fee, imply there is not strong local political support for stormwater fees.

Q6 How have you organized in your jurisdiction to implement policy and program decisions?

Lancaster County, PA: Organizing for Implementation

a. It is important to have a comprehensive program; every department has a relationship to stormwater management; staff should become aware, commonly, of that fact, and it should become a shared mindset.
b. The shift in thinking that is needed should be from reacting to stormwater problems to preventing them, thus making problem sharing part of problem solving.
c. Stormwater management should involve public-private partnerships whereby private landowners become engaged because they see it is to their advantage to do so; they see

stormwater management as a way to increase the value of their property; and both parties share information and thereby build trust.

d. *We have involved key staff members – Public Works, Building and Engineer – to work with EFC to compile data, prepare a MS4 Plan, establish implementation goals, and write a plan for Board adoption. We have also checked with efforts being done by other agencies and townships.*
e. *We are trying to link all aspects of the township together – stormwater projects, zoning permits, oversight of development, administrative "paperwork," grant-writing and volunteers. A comprehensive, systems approach.*
f. *Working with staff, consultants, and our neighbors to establish policies that will benefit our community.*
g. *FCC – Flood Control Committee – Council Subcommittee is appointed; make sure it gets funded.*
h. *With a small staff, it is important that the manager, zoning officer, and public works department all have ways to help implement: enforcement of rules, outreach to community, physical improvements with projects, etc.*
i. *Show private property owners the data; get them excited as to why they need to spend money – marketability for developers, for example.*
j. *Working on adopting a new stormwater ordinance. Comprehensive watershed management is our goal.*

Lynchburg, VA: Organizing for Implementation

a. This is a work in progress. The challenge is how to coordinate stormwater services and standard operating procedures involving stormwater across all city departments. City employees should know not only what, but why certain practices create stormwater benefits. We have formed a working group of stakeholders from all of the affected departments so that everyone's concerns can be addressed.
b. Included in the working group are: Assessor; Billings and Collection; City Manager's Office; Communications and Marketing; Community Development; Economic Development; Finance; Fire; Information Technology (particularly GIS); Parks and Recreation; Public Works (particularly representatives from services involving streets, leaf collection, and infrastructure maintenance); and Water Resources.
c. *An organization that we realize should be more integrated into the city's stormwater management effort is the local public school system.*

Bel Air, MD: Organizing for Implementation

a. We have begun with some actions that are incorporated into our officially-approved sustainability plan.
b. If funds were available, we would like to conduct a GIS study of treatment and watershed areas and of the preferred locations for BMPs.
c. We also want to study alternative technologies for how to treat stormwater in an almost fully built-out community with not much open space.

Q7 From your professional experience, what has been the most significant stormwater-management challenge you have had to overcome?

Lancaster County, PA: Most Significant Challenge

a. How to pay for services is paramount.
b. Data management is essential.
c. Turnover among HOA personnel who are responsible for stormwater controls is frustrating.
d. For some people in Pennsylvania, the Chesapeake Bay is commonly viewed as "downstream." It is important, thus, to focus on local benefits.
e. A highly individualistic ("It is my private property") attitude among landowners can be problematic.
f. I'm challenged to make room for stormwater management among my day-to-day responsibilities. I attempt to avoid having other demands on my time that crowed-out stormwater management and put it on a back burner.
g. Getting elected officials to embrace it is a challenge.
h. Making stormwater a priority for work flow and policy makers.
i. Educating the public and elected officials on the importance of stormwater and the watershed. Changing the behavior/habits of the public.
j. Budget, data management, staff time.
k. Communicating with residents who have specific stormwater facilities on their properties and for which they are responsible.
l. Money. We have been challenged in figuring out cost-effective ways to manage and treat stormwater, especially in how to integrate it into public works projects.
m. Regulatory agency support and guidance.
n. Getting coworkers – township employees – to understand the importance of why we are spending funds to clean up streams and stormwater facilities. Why don't they care about water?

Lynchburg, VA: Most Significant Challenge

a. Creating a utility billing system, including designing the mechanism for collection, has been a significant challenge; we have successfully implemented what we believe to be a good system, but we realize we need to continue to improve it; for example, calculating impervious surface areas and auditing of the system for data errors are continuing challenges.
b. (Some positive qualities of the billing system for the City of Lynchburg stormwater utility were mentioned in response to the question.) Those qualities included the following items:
    - The city has authority to cut-off the water supply to properties that have not paid their stormwater fees. This authority has contributed, likely, to a high collection rate, almost 100 percent of fees assessed; this rate is well above what some comparative communities are achieving.

- Many properties that contribute to stormwater service needs, but which are exempt from paying property taxes, are being assessed fees for the utility. Such properties include, for example, colleges and universities, hospitals, and churches.

c. The city is also investigating, as nudges to behavioral improvements in stormwater management by property owners and managers, the use of credits and rebates of utility fees.
d. For the long term, data management – particularly the integration of data sets, auditing the system for errors, and backing up all components of the system – is and will continue to be a large concern for the department.
e. Although the problem in Lynchburg is not of the same magnitude as it is in some other jurisdictions, we face the challenge of communicating with those people in HOAs who have responsibility for maintaining stormwater management systems. In some cases it is difficult to locate the maintenance agreement for purposes of using it as an enforcement mechanism.

Bel Air, MD: Most Significant Challenge

a. The most significant technical challenge is treating stormwater effectively in an urban area that does not provide open spaces to install facilities and where some soils are poorly suited for infiltration.
b. How to maintain BMPs located on private properties – e.g., residential developments with HOAs – is a real concern.
c. *Getting HOAs to take proper ownership, including financial responsibility, of stormwater facilities in their communities.*

Q8 What has been the most important lesson you have learned?

Lancaster County, PA: Most Important Lesson Learned

a. We cannot effectively manage stormwater alone. It is a multiple jurisdiction, watershed-wide issue. We all are interdependent with our neighbors.
b. People are interested; they do care; the key is education.
c. *We need to have consistent and persistent actions and messages.*
d. *Getting more people to take ownership of the program makes them be invested in the outcome.*
e. *Teamwork makes it easier and offers surprising results.*
f. *Real impact comes only from a comprehensive approach to watershed management.*
g. *Stormwater matters.*
h. *It takes community buy-in to make a stormwater program successful.*
i. *You can do anything with the public's support.*

Lynchburg, VA: Most Important Lesson Learned

a. The lesson would be that understanding how to create an effective billing system is complex beyond expectations.
b. We need to hire people who are passionate about stormwater.
c. *Communicating often and with accurate information is critical.*
d. *Everyone contributes to stormwater; therefore, everyone should pay to help manage it.*

Bel Air, MD: Most Important Lesson Learned

a. The public is poorly educated about the need for stormwater service improvements.
b. The state is pushing regulations, but the science behind stormwater treatment methods is thin.
c. *Retrofitting for stormwater treatment is costly; we are paying dearly for mistakes made twenty years ago.*
d. *Statewide, if we are going to make progress in stormwater management, we must do a better job at education on all levels.*

PARTICIPANTS

Lancaster County, PA

- Cathy Rathman, Engineer, East Cocalico Township
- Dan Zimmerman, Township Manager, Warwick Township
- John Haldeman, Public Works Director, Rapho Township
- Joellyn Warren, Director of Community Development, West Lampeter Township
- Justin Evans, Director of Community Development and Public Outreach, Penn Township
- Mark Heister, Township Manager, East Cocalico Township
- Phil Mellot, Assistant Public Works Director, Manheim Township
- Ron Youtz, Township Manager, West Hempfield Township
- Sara Gibson, Township Manager, Rapho Township
- Stacie Gibbs, Zoning Officer, Borough of Mount Joy
- Sue Barry, Borough Manager, Borough of Lititz
- Tom Strubel, Public Works Director, Borough of Mount Joy

Lynchburg, VA

- Erin Hawkins, Water Quality Manager, Water Resources Department
- Greg Poff, Assistant Director, Water Resources Department
- Tim Mitchell, Director, Water Resources Department

Bel Air, MD

- Chris Schlehr, Town Administrator
- Kevin Small, Director of Planning and Community Development
- Randolph Robertson, Director of Public Works

Appendix E: A Technical Note on Structuring Stormwater Utility Rates

Setting stormwater utility rates is a data-intensive process. Ideally, your jurisdiction will have data of sufficient quantity and quality to support a straightforward approach. In this note, that ideal situation is presented first, and then complicating factors are introduced. The note draws on a project report by the Environmental Finance Center for the City of Salisbury, Maryland (2013).

The basic technique for establishing a stormwater utility rate structure is to base fees for individual properties on measures of impervious surface areas. This method means that fees will correlate with the volume of stormwater which different properties create and thus embody a measure of fairness: that is, "polluters pay."

Types of Stormwater User Fees.[17] There are three basic methods that stormwater utilities use to calculate service fees. These are sometimes modified slightly to meet unique billing requirements. Impervious area is the most important factor influencing stormwater runoff and is therefore a major element in each method.[18]

Intensity of Development (ID): This stormwater cost allocation system is based on the percentage of impervious area relative to an entire parcel's size. All parcels (including vacant and undeveloped properties) are charged a fee on the basis of their *intensity of development*, which is defined as the percentage of impervious area of the parcel. Rates are calculated for several ID categories.

- *Advantages:* The ID method accounts for stormwater from the pervious portion of parcels; therefore, it can be more equitable than other billing methods. It accounts for completely pervious parcels and therefore can allow vacant/undeveloped parcels to be billed. Even if a parcel's impervious area is increased slightly because of minor construction modification, it would not like result in a significant enough change to merit moving the parcel into the next higher ID fee category. This reduces the time required for staff to administer the program.
- *Disadvantages:* Parcels are grouped into broad categories. Parcels are not billed in direct proportion to their relative stormwater discharges. This method can be more difficult to implement because parcel pervious and impervious areas need to be calculated. It is also more complicated to explain to customers than more common billing methods.

Equivalent Hydraulic Area (EHA): Parcels are billed on the basis of the combined impact of their impervious and pervious areas in generating stormwater runoff. The impervious area is charged at a much higher rate than the pervious area.

- *Advantages*: The EHA method accounts for flow from the pervious portion of parcels; therefore, it is often seen to be more equitable than other methods. It also accounts for

[17] The following section is based on a fact sheet developed by the U.S. Environmental Protection Agency: "Funding Stormwater Programs." January 2008. EPA 833-F-07-012. Updated facts and data have been provided and cited where appropriate.

[18] Establishing a Stormwater Utility in Florida, Florida Association of Stormwater Utilities, Chapter 4, Rate Structure Fundamentals.

undeveloped/ vacant parcels and allows them to be billed. It is perceived to be fairer than the ID method because parcels are billed on the basis of direct measurements of pervious and impervious areas to which hydraulic response factors are applied to determine a unique EHA for such parcels.

- *Disadvantages:* Because pervious area analysis is required in addition to impervious area, this approach requires more time to determine the total number of billing units. It is also complicated to explain to customers.

Equivalent Residential Unit (ERU): The most widely used billing method is the ERU system. An ERU is usually the average impervious area on a single-family residential parcel, although some communities define it as the average of all residential parcels. Fees for non-residential properties are proportional to the ratio of the parcel impervious area to the ERU. National surveys show that the mean was 3,050 square feet impervious with a standard deviation of 2,134 square feet.[19]

To calculate a fee, a representative sample of parcels is reviewed to determine the impervious area of a typical parcel. This amount is called one ERU. In most cases, all parcels up to a defined maximum total area are billed a flat rate for one ERU. In some cases, several tiers of residential flat rates are established on the basis of an analysis of parcels within defined total area groups.[20] Having such a tiered, flat-rate approach improves the equitability of the bills sent to homeowners. The impervious areas of commercial parcels are usually individually measured. Each commercial impervious area is divided by the impervious area of the typical parcel to determine the number of ERUs to be billed to the parcel.

- *Advantages:* The relationship (or nexus) between impervious area and stormwater impact is relatively easy to explain to the public. The number of billable ERUs can be determined by limiting the parcel area review to impervious area only. Because pervious area analysis is not required, this approach requires the least amount of time to determine the total number of billing units.
- *Disadvantages:* Because the potential impact of stormwater runoff from the pervious area of a parcel is not reviewed, this method is sometimes considered to be less equitable than the Intensity of Development (ID) or Equivalent Hydraulic Area (EHA) methods because runoff-related expenses are recovered from a smaller area base. This method could still be used to charge a fee to all parcels, pervious as well as impervious, to cover expenses not related to area, such as administration and regulatory compliance.

Distinguishing among Types of Parcels

All jurisdictions contain a variety of property uses or types. Typically, communities will contain some combination of the following types:

1. Residential Single Family Dwelling
2. Residential Condominium
3. Residential Townhouse

[19] Western Kentucky University Stormwater Utility Survey 2013. Page 2.

[20] For example, Anne Arundel County Maryland has a tiered fee system based on zoning classification.

4. Residential Apartment Units
5. Commercial
6. Agriculture Not a Single Family Dwelling
7. Industrial
8. Exempt Commercial
9. Exempt Non-Commercial

Because different types of properties create different volumes of runoff, to structure your utility rates according to the polluter pays principle, you will need to distinguish among and base your rates on types of properties in your jurisdiction.

Setting Rates for Different Types of Properties: Using a Tiered System

When you calculated your ERU, if you found only small variations in impervious surface areas among single-family parcels, you are justified in setting a flat rate for that type of property. Setting a flat fee will ease your administrative burden and reduce the risk of making billing errors. Small variations in imperviousness coefficients may justify, also, extending the flat fee to related types of properties such as residential condominiums or townhouses.

Doubtlessly, however, variations in impervious areas will be significant when residential property is compared with non-residential, i.e., when residential is compared with commercial and industrial parcels. Given sufficient data and technical capacity, including the use of geographic information systems (GIS) methods, a jurisdiction would have the ability to base its fees for non-residential parcels on empirical estimates of the impervious area that is unique to each parcel. Lacking that ability, however, local governments can use a tiered-rate structure that: (1) distinguishes between residential and non-residential property; and (2) assesses fees based on parcel size. To distinguish between residential and non-residential properties, national coefficients for runoff, by property types, are available; for example, the national coefficient for commercial property is .85, meaning that, currently, on average, 85 percent of surface area of commercial properties is impervious. To assess fees using a tiered system, areas of parcels, as measured in square feet, may be used, and categories of area established; for example, commercial properties could be categorized into properties with more or less than 40,000 square feet; in this case, commercial parcels of more or less than 40,000 square feet would be assigned fees using two different rates.[21] Thus, for this example, 85 percent of the area of a commercial parcel of less than 40,000 square feet would be assigned a certain fee; but 85 percent of a parcel in the same use, but with more than 40,000 square feet of area, would be assigned another, higher, fee. Because it is demonstrably fair, building the local capacity to estimate the impervious area of each parcel, instead of using national averages and a tiered system, is preferred and recommended. If a jurisdiction launches its utility using a tiered rate system, it can build a data base and technical capacity, over time, to enable a shift from a tiered system to one that is parcel specific.

[21] The example of plus or minus 40,000 square feet categories comes from the tiered system established for the stormwater utility in Salisbury, Maryland. See Environmental Finance Center, 2013.

Using ERUs to Establish Fees

ERUs, if they are available, can be used to obtain revenues sufficient to a jurisdiction stormwater program budget. Assume, for example, that the ERU for a given jurisdiction is determined to be 3,344 square feet, and the total number of ERU in the community, for all types of properties, is 10,000 square feet. If the revenue needed for the annual stormwater program budget is $400,000, the rate would be set at $40 per ERU, per year: $40 X 10,000 = $400,000. If a commercial parcel in the community has 10,000 square feet of impervious surface, or three ERU, the annual bill for that property would be $120.00. Typically, employing a tiered rate system, which requires less data and local technical capacity, or employing an ERU system, which requires more data and capacity, are two different approaches to creating a utility rate structure.[22] When a community has the ability, either at the outset of a utility or over time, using the ERU approach is preferable because fees are demonstrably related to runoff volume.

Exemptions. Using utility fees to pay for stormwater services, instead of using ad valorem taxes, implies that all properties, including those that are tax exempt, are subject to fees; the polluter pays principle applies in that all properties create runoff. In creating a utility rate structure, jurisdictions decide if they should treat all properties the same, or if they should make adjustments in rates for certain types of properties. Some jurisdictions, for example, have relieved all or some fees for land that is vacant, is used for agriculture or public roads, or is owned by nonprofit organizations or the elderly.

Local jurisdictions should cautiously consider making exemptions for different kinds of properties. The consequences of making exemptions are: (1) the connection between land that creates stormwater volume and land that pays for stormwater services is compromised; and (2) the revenue stream needed for stormwater services will be reduced. If they are not considered justifiable or fair, exemptions will be judged to be discriminatory. And the exemptions-revenue tradeoff could undercut the budget needed to provide adequate stormwater services.

Credits. Another issue which local officials must consider when structuring a utility rate system is whether or not to grant credits to property owners for stormwater improvements they make to their lands. For example, should you provide credit to residential property owners for installing BMPs, such as rain barrels, rain gardens, or vegetative buffer strips along streams? Or, for developers and commercial and industrial property owners, should you provide credits for permeable pavement, tree canopy improvements, or the installation of stormwater detention basins?

Credits are provided by some stormwater utilities for approved practices that reduce the impacts of stormwater on a property or in a community. Some states require credits for approved practices, but some do not. In states where credits are optional, some utilities grant them, but some do not. Practices that have received credits include various improvements and activities to reduce the quantity of runoff, improve runoff quality, conduct outreach programs to the public, or provide educational programs about stormwater. Some utilities also provide credits in cases of financial hardship.

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[22] A few jurisdictions have created stormwater utility rate structures that combine tiered and ERU systems.

If local governments have the option to consider stormwater utility credits, the consequences of so doing should be considered. Credits help to define, for the public, the difference between a fee, which is based on runoff, and a property tax, which bears no such relationship. Credits also create incentives among the public to become aware of practices that reduce runoff and to undertake such practices on their properties. Like exemptions, however, credits reduce the stream of revenues and thus should be considered with caution. Establishing a fair, easily understood, and effective credit program also requires administrative resources.

Rarely are credits provided for 100 percent of the applicable fee. Credits are usually correlated with the cost, size, and degree of sophistication involved in the creditable practice and are initiated by a written application submitted by a property owner. Typically, credits require verification by the local authority, are granted only when the property owner who applies is current on payments of stormwater bills, and are applicable for a limited number of years.

If credits are to be granted, an enforcement policy to review applications for accuracy and to inspect practices for functionality should be established before the opportunity for credits is made public. The enforcement policy should also include consequences for failing to meet or maintain standards and a notification period included for property owners to correct such deficiencies in practices that have received credits. Lastly, any credit policy should be explicit and documented.

Additional Complications in Setting Utility Rates

Even when a local jurisdiction has the ability to create a utility rate structure using ERU, state requirements can complicate local efforts to do so. In the Commonwealth of Virginia, for example, state authorities have established, at this time, a challenging time line for local governments to create stormwater program upgrades. In communities that are considering the creation of utilities to provide dedicated streams of revenue to fund the upgrades, little time is available to gather the data needed to create more than a tiered, flat fee utility rate structure.

Another complicating factor arises because of interdependencies among local jurisdictions. In creating utility rates, jurisdictions naturally look at fees being charged by their neighbors to guard against being "out of line" and thus risking the loss of commercial and industrial firms to nearby jurisdiction. Note also, however, that having neighboring jurisdictions that are establishing stormwater utilities offers an opportunity for local governments, that is, neighboring jurisdictions can use intergovernmental contracts to achieve economies of size in programs. For example, a collection of jurisdictions may be able to join together to contract for the services of a single private firm to help establish the databases needed to form their utilities. That type of contract could be a win-win for both the firm (more revenues) and the local jurisdictions (lower costs). Additionally, the jurisdictions might contract among themselves to administer a utility program. Intergovernmental contracting is a way to preserve the integrity of local jurisdictions, allowing them, thus, to create policies that reflect local tastes and preferences for public services while at the same time achieving economies of size in providing those services.

Appendix F: Acronyms and their Meanings

BMP	Best Management Practice
CRWA	Charles River Watershed Association
CWA	U.S. Clean Water Act
EPA	U.S. Environmental Protection Agency
HOA	Homeowners Association
HOBO	A data logger that records measurements, at set intervals, over a period of time
MCM	Minimum Control Measure
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
TMDL	Total Maximum Daily Load
WIP	Watershed Improvement Plan