

DIFFUSION OF INNOVATIONS: HOW LOCAL GOVERNMENTS SHAPE PUBLIC
POLICY TO PROMOTE PROGRESSIVE STORMWATER MANAGEMENT

By

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Chapter One: Problem Statement

Background

Urbanization throughout the United States is continuing to grow at an alarming rate. As population grows and sprawl extends the borders of cities, the natural environment is often compromised to build roads and buildings. The serious environmental problems associated with urban development are steadily gaining attention amongst citizens, environmental groups, and the government.

Urban development drastically alters the landscape. Roads, homes, commercial and industrial buildings replace native vegetation with impervious surfaces. Increased traffic and industry contribute to air pollution. As development dominates a larger percentage of the landscape, the native ecosystem endures significant impacts. Water quality suffers greatly from such changes. Traditionally, native plants naturally convey stormwater by slowly infiltrating and releasing it back into the ground. Early American cities, however, found that impervious surface area prohibited water infiltration. As a result, urban flooding became more common during rain events. Public works specialists then developed a method of rapid stormwater treatment that has been duplicated in most industrialized cities.

Converting a site from a natural to a developed state increases the effectiveness of the drainage system by compacting soils, then collecting and conveying runoff using impervious surfaces and pipes. This change significantly reduces a site's ability to absorb precipitation, thereby increasing the volume, frequency, and velocity of runoff leaving the site (Landers, 2004). Despite their efficiency in conveying runoff, these

traditional stormwater systems have posed serious environmental threats to water resources.

More than thirty different studies have documented that stream, lake, and wetland quality is reduced sharply when impervious cover in an upstream watershed is greater than ten percent (United States Environmental Protection Agency, 2000). This pollution results from stormwater draining off rooftops, streets, and sidewalks. On its way to storm drains and sewers, runoff picks up nutrients and pollutants such as nitrogen, phosphorus, oil, grease, heavy metals, pet waste, and trash. These pollutants impair water quality and degrade the riparian systems that many plant and animal species depend on for survival (United States Environmental Protection Agency, 2000). In addition, runoff travels much faster through engineered stormwater systems than if it were infiltrated by vegetation. This rapid conveyance of stormwater is then released into adjacent water bodies. Its subsequent effects are erosion, destruction of native plant and animal habitat, and impaired water quality. Policy makers are facing crises in many ways trying to address these problems.

Policy Solutions

An emerging policy concern is the issue of whether or not cities can be made environmentally sustainable. Cities struggle to deal with these crises in many different ways. At this time, there is no proven model for cities to consult when attempting to balance issues surrounding growth and environmental impacts. This situation forces cities to look for their own solutions or copy another government's "model" for guidance.

Governmental agencies use a variety of tools to lessen the impact of environmental problems. Instituting "best practices" and creating innovative policies is a

common approach that governments attempt to mitigate such impacts. The decentralized nature of the United States' intergovernmental system is an important variable in the treatment of environmental issues by allowing city and county governments to create their own rules. This format has certain advantages. Due to the large number of local governments, it allows for a great deal of experimentation. In the case of stormwater treatment, there are many cities implementing innovative policies to balance development and environmental needs. This experimentation leads to a variety of new ideas, policies, and practices. The decentralized system of government allows these trials to occur with minimal interference from federal authorities.

The federal government's power can be used to impose guidelines across all localities under its jurisdiction. Yet enacting federal stormwater treatment standards is not a likely undertaking for the federal government. In fact, it is unlikely that a preferred solution would be imposed on local governments for several reasons. Different regions of the country have distinct climates and native habitats. A standard stormwater solution may not work as well for Phoenix as it would in Seattle. Next, the cost of imposing a solution for every city to abide by would be extraordinary, especially when considering the fiscal limitations of most local governments. Most new programs, policies, and best practices have an economic cost. Also, local governments can be inconsistent in their application of new programs. The federal government cannot guarantee that all cities have a competent staff of planners, engineers, and public works personnel that is dedicated to instituting changes. Allowing individual governments to choose their own priorities ensures that program initiatives will reflect their own competencies.

Stormwater Innovation

There is currently a growing movement amongst local governments in the U.S. to minimize the effects of stormwater runoff. In 1992, the U.S. Environmental Protection Agency collaborated on a project with officials in Prince George's County, Maryland using "low impact development" (LID) practices to mitigate stormwater impacts of urban runoff. This project employed innovative site design techniques, such as using pervious paving surfaces and bioswales with native vegetation, to catch and slow down stormwater. It also constructed public works projects in a way that minimized impacts that road and street coverage imposed on the environment. Such examples include landscaping parking lots and creating narrower streets with curb cuts to direct runoff into natural drainage ditches.

In the years since Prince George's County's installation of progressive stormwater management designs, a new movement began to spread throughout urban governments, particularly in Washington, Oregon, and to some extent, California. A number of cities in these states adopted their own versions of innovative stormwater policies. These policies attempt to lessen the hydrologic environmental impacts of dense populations dominating a landscape that has been drastically altered from its natural state. Implementing stronger stormwater management policies is a trend that continues to gain attention from policymakers and concerned individuals, at the local, regional, and national level. To achieve rational objectives for preserving the environment, it is important to accelerate the process by which local initiatives are disseminated to other jurisdictions.

The implementation of environmentally friendly policies by local governments still does not occur on a widespread scale. In the last ten years, the U.S. has seen an upswing in agencies paying greater attention to the environment through their policies, practices, and construction and building standards. In the case of water quality, stormwater has gained an increasing amount of interest due to its documented negative impacts on native habitat and water quality. While Prince George's County receives recognition for its groundbreaking work with stormwater management, several local governments on the west coast have achieved significant praise for innovative stormwater policies and standards.

Many of the most well respected stormwater management innovations have occurred in the Pacific Northwest. More local agencies look to early adopters, such as Harbortown and Royal County, for guidance on how to manage stormwater and protect water resources. Early adopters play a pivotal role in trying new practices that later adopters can learn from and adapt to meet their own needs. This study may offer valuable insights on environmentally friendly policies in local governments, including reasons, processes, and important themes surrounding their creation. It further offers insight into the nature by which early adopters of policy innovations share resources and learn from each other.

Focus of Study

This relatively new movement of local governments adopting environmentally friendly policies has important implications on the public sector. There is not a substantial amount of existing research regarding the innovation of new environmental policies in local governments. The process by which these policies are created can shed

light into the reasons for their development and the process by which they are adopted. Rogers defines diffusion as “a kind of social change, defined as the process by which alternation occurs in the structure and function of a social system. When new ideas are invented, diffused, and are adopted or rejected, leading to certain consequences, social change occurs” (1983, p. 6). To understand this process, the researcher completed a case study of six governments that have implemented their own environmentally friendly stormwater policies. The research efforts will attempt to understand the adoption processes behind the creation and implementation of their new progressive stormwater management policies.

A diagram adapted from Everett M. Rogers’ and Richard D. Bingham’s models of diffusion will attempt to explain the internal and external factors affecting the adoption of new stormwater innovations. Although each organization possessed distinct differences in its respective diffusion process, the researcher expected all subjects to undertake four separate stages:

- 1) *Agenda setting*, where the agency recognized a demand for new stormwater management policies and standards;
- 2) *Information gathering*, to learn about different sources of innovative stormwater treatment, including personal knowledge, professional contacts, conferences, etc.;
- 3) *Exertion of persuasion/influence*, concerning influential agency members advocating new changes and sources of opposition; and
- 4) *Policy development*, where the decisions to create and implement the policies were made.

Interviews were used to put together a case study of six local governments with innovative stormwater management policies. A strategy called “elite and specialized interviewing” allowed interview subjects to convey detailed information about their respective agencies’ innovation processes. The purpose of the interviews was to learn

about sources of demand for new stormwater policies, the role of key individuals or “change agents,” and how policies were developed and implemented by the agency. Interview questions focused particularly on the four stages in the diffusion of innovations process. Travel limitations restricted the ability to interview additional agencies. Qualitative data analysis was conducted according to the four stages in the diffusion of innovations. A subset of scaled questions in each section allowed for quantitative assessments of several specific variables.

The document contains five ensuing chapters. Chapter Two contains a review of the literature, including background on diffusion of innovations, the role of change agents, organizational change in the public sector, and a brief history of diffusion research. An additional section addresses development, stormwater runoff, and water quality problems. Chapter Three outlines the researcher’s employed methodology. Research findings from the six interviewed agencies make up Chapter Four. Chapter Five includes a discussion of key findings related to stormwater policy innovation, followed by the conclusion and policy recommendations in Chapter Six.

Chapter Two: Literature Review

Introduction

The process by which organizations change is a field that has attracted an increasing amount of knowledge. All sectors, whether it is the federal government, a municipal organization, multinational corporation, or even a professional sports team, must be prepared to instill change to ensure that it will remain effective and evolve in its respective environment. There are obstacles, however, to implementing effective changes. Change may be impeded by insufficient resources, lack of organizational support, and inadequate research about how potential changes may affect stakeholders. A leading organizational change theory called “diffusion of innovations” has become a respected model for explaining and predicting change. Understanding innovation can contribute to policymakers’ understanding of organizational problem solving and the process leading to change.

Diffusion

Diffusion is described, and generally accepted, as “the process by which an innovation is communicated through channels over time among the members of a social system” (Rogers, 1983, p. 5). It is a kind of social change concerned with new ideas, defined as the process by which alternation occurs in the structure and function of a social system. When new ideas are invented, diffused, and are adopted or rejected, leading to certain consequences, social change occurs (Rogers, 1983).

Innovation

Academics and practitioners have varying interpretations of what innovation entails. Rogers describes innovation as “an idea, practice, or object that is perceived as

new by an individual or other unit of adoption” (1983, p. 11). According to Walker, an innovation is a program or policy which is new to those adopting it, no matter how old the program may be or how many others have adopted it (1969). Mohr’s definition simply states, “Innovation will be defined as the successful introduction into an applied situation of means or ends that are new to the situation” (1969, p. 112). Deutsch offers a more detailed description of innovation. He writes, “Innovation is the adoption on a relatively large scale of some invention or discovery. Innovation is the work of many people and is related to the adoption of some new invention or discovery on the level of behavior, or action” (1982, p. 19-20). The strength of Zegans’ definition lies in its straightforward approach that “innovation is the process of implementing an idea, or enacting a technology, novel to a given situation” (1992, p. 145). Each author, amongst those definitions stated by other innovation scholars, essentially shares a similar theme in that innovation involves the introduction of a new concept into a situation with the intent of improving the organization or program outcomes.

Organizations and their stakeholders cannot underestimate the importance of innovation. Change typically does not occur quickly. Many innovations require a lengthy period, often of some years, from the time when they become available to the time when they are widely adopted (Rogers, 1983). All organizations need to innovate in some capacity. For public policy organizations, democracy depends on innovating to solve major public problems and transforming politics (Sirianni & Friedland, 2001). Any organization that fails to engage in continuous improvement, or what the Japanese refer to as “kaizen,” risks falling victim to its complacency. A growing body of literature continues to reinforce the value of organizational innovation.

Diffusion of Innovations

Diffusion of innovations has been around for eons. As long as groups have faced obstacles requiring solutions, some type of innovation was necessary to survive. Such obstacles apply to both hunter-gatherers creating crude tools for hunting animals and a nonprofit organization seeking to increase its donations. Everett M. Rogers', "Diffusion of Innovations," is widely recognized as the definitive text of this relatively new field. Now in its fourth edition, Rogers states that Gabriel Tarde, a French judge around 1900, maintained "an analytical eye on trends in his society as represented by the legal cases that came before his court" (1983, p. 140). The purpose of Tarde's records was to explore why some innovations became institutionalized within society, while the vast majority were forgotten.

The inaugural study addressing innovation is Bryce Ryan and Neal Gross' 1943 study of corn farmers in Iowa. Their research sought to explain the process by which the farmers adopted new hybrid corn seeds for their farms. This study provided the foundation for academics in education, anthropology, medical sociology, marketing, geography, and rural sociology (Rogers, 1983). Nearly every academic field can apply diffusion of innovations to its respective research. A growing amount of political science literature can be found on diffusion at the federal, state, and local level of government.

Innovation Process

The innovation process begins with the recognition of a shortcoming or demand for a good or service not currently provided or the perception that an organization's current performance is unsatisfactory. "One of the ways in which the innovation-development process begins is by recognition of a problem or need, which stimulates

research and development activities designed to create an innovation to solve the problem or need” (Rogers, 1983, p. 135). The recognized problem or need can also be referred to as a performance gap, which is a “discrepancy between what the organization could do by virtue of a goal-related opportunity in its environment and what it actually does in terms of exploiting the opportunity” (Zaltman et al., 1984, p. 2). If an organization fails to identify a performance gap, innovation is unlikely to occur. Upon its recognition, organizational members can conduct a search for alternatives of action (Zaltman et al., 1984), particularly if they perceive some benefit to be gained by eliminating the performance gap (Downs, 1976). An organization seeking to innovate, however, must invoke a significant effort if it remains dedicated to closing the performance gap.

The innovation development process may appear cumbersome to those resistant or uncommitted to change. Rogers list six steps that must occur to effectively address performance gaps and promote organizational innovation (1983).

1. The diffusion process begins with recognizing a performance gap, which stimulates thinking to solve this problem.
2. Research must be completed to provide background on the nature of the problem and how it may be solved.
3. Development of an innovation involves “putting a new idea in a form that is expected to meet the needs of an audience of potential adopters” (p. 139-140).
4. “Commercialization” is “the production, manufacturing, packaging, marketing, and distribution of a product that embodies an innovation” (p. 143). This phase essentially requires persuading others that the proposed innovation will resolve the performance gap.
5. The decision-making stage involves choosing to begin diffusing the innovation to potential adopters.
6. The final phase in the innovation-development process is the discovery of the innovation’s consequences. At this point, it will be made clear if the solution to overcome the organization’s problem is effective or not.

Change Agents and Policy Entrepreneurs

The organizational innovation process usually features at least one individual who drives the initiative for change (Rogers, 1983). This person possesses the knowledge and means to inform and persuade other peers that his or her idea will benefit the organization. Diffusion research commonly refers to this person synonymously as a “change agent” or “policy entrepreneur.” According to Rogers, a change agent is a professional with a university degree in a technical field who possesses the required information to develop an innovation (Rogers, 1983). While not every change agent must have a degree, this advanced level of knowledge, may pose problems for the change agent, as he or she is often perceived as a “deviant from the social system” and is “accorded a somewhat dubious status of low credibility by the average members of the social system” (Rogers, 1983, p. 27). A change agent must work through organizational skepticism by working with others to facilitate the flow of information and explain that the innovation will benefit the organization.

In the innovation field, change agent and policy entrepreneur can be used interchangeably. A policy entrepreneur, according to Mintrom, “plays an important role in articulating innovative ideas of government agendas” (1997, p. 765). This individual possesses a high level of innovation knowledge and plays an integral social role, too. “Entrepreneurs link and match. They build support vertically, diagonally, and horizontally to overcome barriers” (Lambright, 1980, p. 337). The ability to work within the confines of the organizational social network and anticipate barriers is essential for a policy entrepreneur. Particularly in the policy arena, they work hard to “develop close ties with people through whom they can realize their policy goals and they seek to

develop convincing arguments for selling their policy ideas” (Mintrom, 1997, p. 765). Noting the similar roles of a change agent and policy entrepreneur, this study will use change agent as the preferred term for a person who actively facilitates new ideas and knowledge throughout an organization.

Marketing ideas, whether policy or otherwise, must be directed toward those individuals making organizational decisions. Entrepreneurs must not only aim to convince decision-makers that the innovation will solve a particular problem, but also are responsible for mobilizing others to “help secure the approval of the policy” (Mintrom & Vergari, 1998, p. 131). Polsby refers to this mobilization process as the creation of allies (1984). Dispensing information, working patiently with others to answer questions about the innovation, and ultimately persuading them of its effectiveness can help form strong alliances to push the innovation’s approval. Lambright writes, “Decisions to adopt, implement, and incorporate require coalitions” (1980, p. 337). Effectively mobilizing members of an organization requires more than just possessing technical knowledge of innovation or a new technology. “The greater the knowledge the policy entrepreneur has of the concerns of members of the internal network, the better the chances that he or she will be able to frame the policy innovation in terms that appeal to the network” (Mintrom & Vergari, 1998, p. 145). While the process of disseminating information, addressing concerns, and team building may take a long time to convince others that the innovation is legitimate, the literature places a high value on the importance of groups and alliances to achieve organizational change.

Innovation Characteristics

The proposed innovation of an organization must convince others of its effectiveness before a decision can be made to formally institute the change. This innovation must possess certain characteristics. One basic explanation of adoption implies the more compatible the innovation is with existing value and belief systems within the organization, the more readily it will be adopted (Zaltman et al., 1984).

Rogers outlines five characteristics that contribute to the rate at which adoption occurs, if at all (1983, p. 15-16).

- *Relative advantage* is the “degree to which an innovation is perceived as better than the idea it supersedes.”
- *Compatibility* refers to the “degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters.”
- *Complexity* is the “degree to which an innovation is perceived as difficult to understand and use.”
- *Trialability* is “the degree to which an innovation may be experimented with on a limited basis.”
- *Observability* is the “degree to which the results of an innovation are visible to others.”

An innovation that is perceived by others as having greater relative advantage, compatibility, trialability, observability, and less complexity will be adopted more rapidly than other proposed changes. If an innovation lacks in one of the five characteristics, its chances of adoption by decision makers are lessened. Zaltman et al. mimic this belief in their findings that “the more complex an innovation is in terms of operating, the less rapid its acceptance will be” (1984, p. 38).

Communication

Communication plays a significant role in the diffusion process. Policy entrepreneurs rely on communication to facilitate their specialized knowledge.

Organizational decision makers rely on communication networks to explore the potential ramifications of their decisions and their potential effects on the organization and its stakeholders. The communicability of an innovation exerts considerable influence on whether it is accepted (Zaltman et al., 1984). The ability to work with obstacles, especially with those who are firmly opposed to organizational change, requires patience and the exchange of information. Feedback is an important element of this exchange. To cope with anticipated and unanticipated problems, it is important to apply feedback mechanisms that can provide information as to when and where the problems emerge (Zaltman et al., 1984). In addition to ensuring that all members are informed about the proposed innovation, additional effort must be put into creating a sense of unity. The name given to an innovation often affects its compatibility, and therefore its rate of adoption (Rogers, 1983). If a name “sticks” and creates shared understanding, the innovation is more likely to succeed.

Communications are an important means for policy entrepreneurs learning about innovations. Rogers’ research found that “mass media channels are often the most rapid and efficient means to inform an audience of potential adopters about the existence of an innovation” (1983, p. 18). While there is no literature discussing different types of media, this may include magazines, trade journals, industry publications, and even television. Mintrom and Vergari’s findings disagree with those of Rogers. “Rather than rely upon mass-media channels or the outcomes of scientific investigations, most potential adopters base their judgments of an innovation on information from those who have sound knowledge of it and who can explain its advantages and disadvantages” (1998, p. 128). This contradicts the importance of mass media channels, instead stressing

interacting with people who have a strong grasp of the innovation. Walker stressed the importance of specialized communication networks to serve the purposes of providing information and a means to “expedite the interstate movement or transfer or personnel” (1969, p. 895).

Decision-Making

After receiving information and solutions about how to resolve a performance gap, the organization must make a decision to determine the innovation’s future. Rogers, again, provides an outline of the innovation-decision process. This process begins when an individual learns of the innovation’s existence, followed by a move to persuade others to adopt it. The decision to accept the innovation is followed by implementation.

Confirmation occurs when “an individual seeks reinforcement of an innovation-decision that has already been made” (1983, p. 20). At this point, the decision may be reversed if conflicting messages exist about the innovation. No other available research presents an opposing depiction of the decision process.

Group Characteristics and Innovation

The existing literature on diffusion has shown that group characteristics have implications on an organization’s ability to innovate. Mohr’s study of determinants of innovation in organizations presents several key findings about organizational culture and size. An organization is more likely to innovate when its environment is rapidly changing and takes place in a social environment with norms favoring change (1969).

Innovations will more easily take place when change is something valued, as opposed to being a source of fear. Large departments and organizations are less resistant to change because “their greater number of personnel gives them the flexibility of assigning at least

one full-time or half-time employee to each of a many great services.” They can also devote a higher percentage of their resources to nontraditional programs (1969, p. 122). Whereas large organizations have more employees and greater financial freedom, smaller groups are limited in their ability to attract specialized employees. Yet McGrath presents a conflicting view more congruent the stereotype of how bureaucracies operate. He found that “groups are likely to make very conservative decisions because extreme positions of individuals or factions within a group tend to cancel each other out” (1982, p. 65). In addition to the size of an organization, other predictors can be used to anticipate the level of innovation and how quickly a new idea is adopted.

In Rogers’ study of diffusion, he found that organizations tend to adopt innovations in a similar pattern. The diffusion of innovations followed an s-shaped curve over time, in which five classes of groups adopted new ideas at varying speeds. These include innovators, early adopters, the early majority, late majority, and laggards (1983). Innovations take time to become established. Once enough research exists and an increasing number of groups adopt the innovation, its popularity grows and paves the way for late majority and laggards to implement it. Rogers’ research found “earlier knowers of an innovation, when compared to later knowers, are characterized by more education, higher social status, greater exposure to mass media channels of communication, greater exposure to interpersonal channels of communication, greater change agent contact, greater social participation, and more cosmopolitaness” (1983, p. 206). Later adopters, he adds, “are more likely to discontinue innovations than are earlier adopters” (1983, p. 188). The research parallels how larger organizations, due to greater

financial and human resources, as well as larger communication networks, are better suited to adopt and remain committed to innovations than others.

External Forces and Innovation

In addition to the internal forces that shape organizations, the external environment also influences the manner and speed in which new ideas are diffused. Walker reported that cities are more likely to embrace organizational change than other areas. He adds, “There is evidence that change and experimentation are more readily accepted in the industrialized, urban, cosmopolitan centers of the country” (1969, p. 887). There is a noticeable research gap, however, in how the external surroundings affect organizational innovation, especially in local governments.

Bingham’s book, “The Adoption of Innovation by Local Government” highlights four central criteria shaping innovation. The first variable concerns organizational characteristics and relates to previously explored internal predictors of change. Again, agency resources, “particularly financial and personnel, are often believed to be conditions necessary for adoption” (1976, p. 12). Adding to the importance of personnel, Bingham found “size, [organizational] structure, and professionalism often affect innovation adoption. Factors such as diversity of tasks and number of occupational or functional specialists are likely to be correlates of organizational innovation” (1976, p. 11). Specialization of labor, a strong knowledge bank, and access to greater financial resources appear to promote innovation. A large organization can also have a negative effect in promoting change. According to Zaltman, high organizational complexity, because of potential conflicts, makes it more difficult to implement innovations (1984).

If an organization is structured to promote efficiency and maintains a sense of professionalism, it can more easily facilitate the development of innovations.

The remaining three variables readily address external factors influencing change. Community environment relates to “the two classes of variables that might influence innovation adoption: demographic variables and attitudinal, or cultural, variables” (Bingham, 1976, p. 5). Certain ideas will not appeal to all people. Social characteristics of the population, including education level, socioeconomic considerations, ethnic composition, and community culture contribute to how change is implemented by a local government. Affluent communities with better-educated citizens tend to be more engaged in democratic governmental processes. Furthermore, in areas with fewer pressing social problems, such as violence and poverty, the population may be more inclined to support issues like environmental protection.

To enact an innovation there also must be demand for it. Bingham’s definition of demand is vague, but it often stems from the community and organization’s recognition of a performance gap (1976). The organizational environment is the “relationship with other governmental units, the private sector as it affects the organization, and others similar entities.” For a municipal government, this environment may include local businesses, nongovernmental organizations, and additional governments working in the area.

Using the literature to identify internal and external forces that affect and shape innovations, the researcher designed a model (see Figure 2.1) to display the process behind policy innovation.

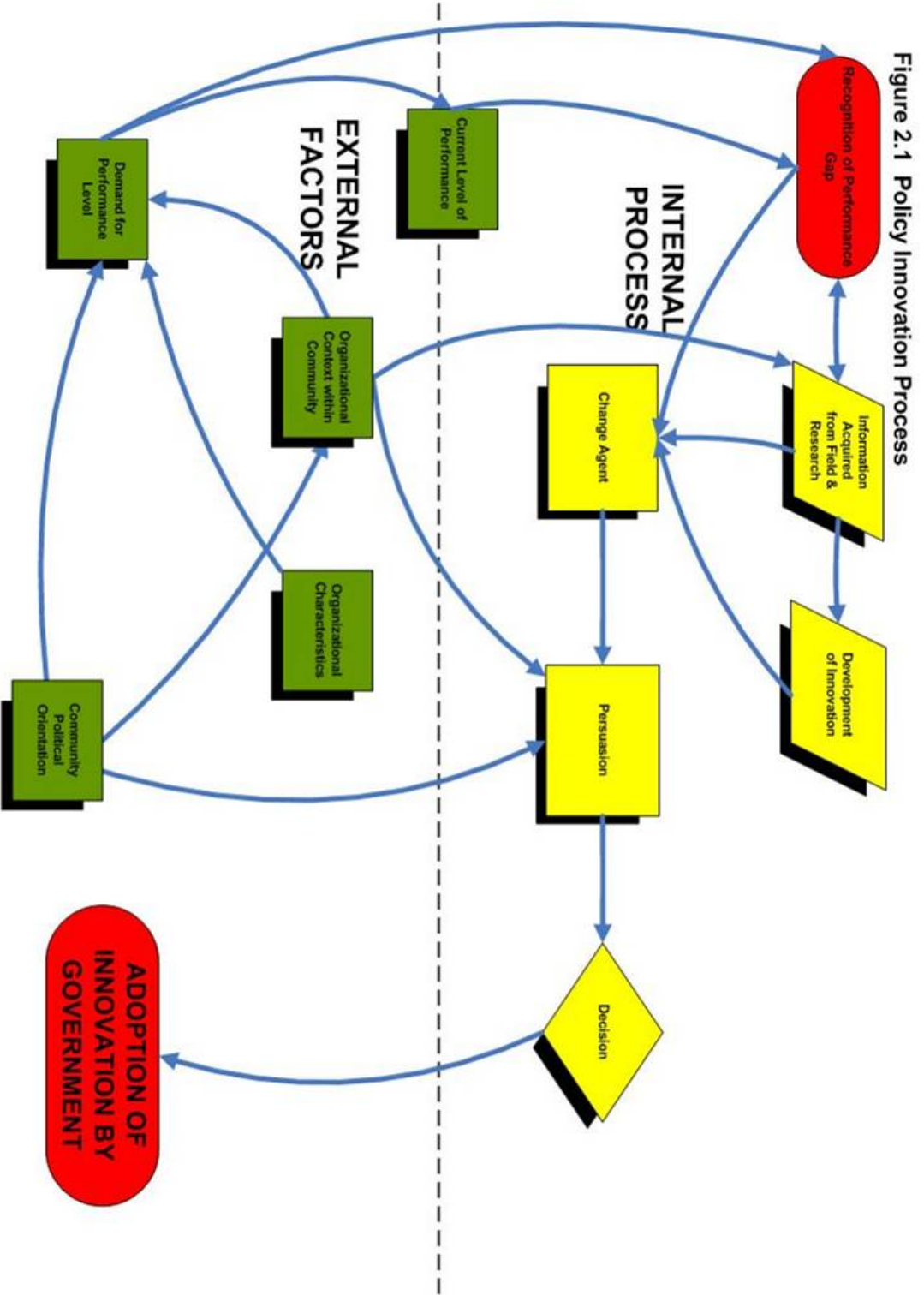


Figure 2.1 Policy Innovation Process

Adapted from diffusion models by Richard D. Bingham and Everett M. Rogers

Limitations of Diffusion of Innovations

Diffusion of innovations is well respected by academics and practitioners as a credible organizational change model. It is worth noting, however, that this theory is vulnerable to problems limiting other models of change. The literature points out several barriers that often plague innovation efforts. First, it should not be assumed that simply committing resources to implementing an innovation guarantees success. Many attempts fail, particularly when the “advocated innovation is simply not functional enough” and does not resolve the performance gap (Zaltman et al., 1984, p. 85). Time is another consideration when analyzing innovation. Polsby argues, “The most common mistake made by observers and participants who favor innovation is to give up too soon, to measure gains only in the very short run” and become discouraged (1984, p. 174). The speed at which innovations are adopted is equally important. Change should not be implemented hastily without consideration of its future implications. Blindly favoring innovation to the point where it is believed “that an innovation should be diffused more rapidly, and that the innovation should be neither re-invented nor rejected” can be problematic to an organization (Rogers & Shoemaker, 1971, p. 78-79). An organization that remains dedicated to resolving performance gaps will plan carefully, remain patient, and stay committed to its innovation throughout the adoption process.

Diffusion of Innovations Research

The spread of innovation and its application within organizations typically employs the use of qualitative research methods. Case studies allow researchers to investigate the conditions that give rise to innovation. Such variables may include recognition of performance gaps, demand from the community, means of persuading

decision makers, and the rate at which new ideas are adopted. The study of innovation has spread from its agricultural and sociology-based roots. Diffusion can be applied to all types of organizations or any other field that seeks to embrace change and new ideas.

Research on diffusion of innovations in the public sector continues to gain more attention. Internationally, Rogers and Kincaid completed a study about public family planning education in rural Korea. The results showed that the fastest rates of family planning innovations took place in communities with higher levels of mass media exposure, had leaders who were connected to the community, and maintained higher levels of change agent contact (1981). Koning's exploration of innovations in West Germany stressed the importance of guiding principles for new ideas in the public sector. He noted that steering political programs is "central to innovative policymaking," especially for influencing the necessary budget decisions to support new policies (1982, p. 147). A study in Canada explored variations in the diffusion of administrative innovations throughout the country's provinces and how adaptations were made to fit each province's needs, also taking into account the political influence of innovation. Amongst its key findings was that the "most technical of problems may become political if some interested group decides to make it so" (Gow, 1992, p. 450). Howard Leichter has completed research regarding the patterns and origins of policy diffusion in the United Kingdom's government (1983).

At the national level of the United States' government, Benjamin looked at federal policy innovation in an exploration of executive power. He found that innovations in the American constitutional system "led to the process of change in formal executive power" (1985, p. 75). Considerably more attention, however, is given to

innovation within the American states. In 1969, Walker initiated the inaugural study in this area. He inferred that generally new legislation is copied from other states. The study also reported, “The larger, wealthier, more industrialized states adopt new programs somewhat more rapidly than their smaller, less well-developed neighbors” (1969, p. 884). Savage examined the spread of policy innovation within a federal system. He was particularly interested in the “progressive and innovative nature of state government policies, creating indices of innovativeness by growth management, consumer protection, energy conservation, and education centralization” (1985, p. 20-21). The study’s findings reported that states such as California, New York, and Massachusetts tend to be policy innovators. Tyran and Sausgruber took their investigation of state innovation one step beyond Savage’s approach. Their study looks at “internal determinants” which are the “social, economic, political, and other characteristics of a state that determine a state’s innovativeness.” Furthermore, they explored a second group of “regional diffusion” and found the probability of a state adopting a particular policy, such as instituting state lottery programs, is higher if neighboring states have already adopted the policy (2005).

Local governments, particularly county and municipal organizations, are the primary focus of innovations in this study. The strengths of decentralization lie in its perceived ease of adaptability to local demands. When compared to centralized systems, “the innovations that decentralized systems diffuse are likely to fit with users’ needs and problems more closely” (Rogers, 1983, p. 337). Strumpf studied whether government decentralization increases policy innovation or not. He found that local governments have the advantage of allowing several different policies to be considered simultaneously.

The prospect of having organizations across the country conducting “experiments” allows governments to learn about new ideas, their political feasibility, and subsequent free riding off the experience of neighbors (2002). While local governments enjoy the freedom to test new practices, they also face significant limitations. Governmental fragmentation, lack of money, and absence of technical expertise were found to be barriers to implementing “large-scale, costly, and seemingly irreversible technologies” in local governments (Lambright, 1980, p. 333). This study also demonstrated the need which small organizations must rely upon central governmental units, noting “many large-scale complex technologies cannot even be contemplated by local governments without substantial intergovernmental aid at the front end of the innovation process” (1980, p. 334). The ability to educate employees contributes to local governments’ respective knowledge base about potential innovations. Acquiring knowledge through journals and national meetings allows the organization greater resources from which they can judge performance gaps, problems, opportunities, and innovations (Lambright, 1980). A local government with an educated staff that possesses the means to resolve problems lends itself to creating an innovative organizational environment.

Diffusion of Innovations and Progressive Stormwater Policies

Local governments across the country struggle to meet development demands while balancing environmental protection efforts. Water quality endures significant impacts from the increased development of the landscape. Many of the new materials and components used in land development contribute higher pollutant loads during rainfall and subsequent stormwater runoff. As impervious surfaces, such as concrete, asphalt, and rooftops replace native vegetation, natural stormwater absorption and

filtering processes performed by native vegetation are lost (Davis, 2005). Development also poses major impacts on stormwater runoff flows. Urbanization brings increased peak storm flows and decreased summer flows to streams, resulting from increased impervious surface and decreased groundwater infiltration (CH2M Hill, 2004). Research conducted in the Pacific Northwest shows that “approximately ten percent effective impervious area in a watershed typically yields demonstrable degradation, some aspects of which are surely irreversible” (Booth et al., 2002, p. 842).

Traditional stormwater management approaches exacerbate the problem by concentrating water and removing it from a site as quickly and efficiently as possible. “Roofs, gutters, downspouts, grades, driveways, roads, curbs, and gutters are generally designed to whisk runoff from a site and into a culvert, storm drain, or some other conveyance system” (Landers, 2004, p. 50). Since the 1980s, urban stormwater runoff has been recognized as a nationally significant source of water pollution and contributor to stream degradation (Girling & Kellet, 2002). The mobility of water and its distinction as a shared resource further complicates stormwater runoff problems. One city’s failure to ignore water quality negatively affects all other cities in the same watershed.

Citing the major effects of urbanization on water quality, an increasing number of local governments, such as Olympia, Portland, and Seattle, are currently adopting more stringent stormwater management policies. Many of these efforts can be coined as “progressive” management efforts and embrace the ideals of low impact development (LID). Coffman defines LID as a “systems approach using techniques that retain, detain, infiltrate, recharge, filter, use, modify runoff timing, and prevent pollution in order to maintain and restore an ecosystem’s hydrology and water quality” (2001, p. 8).

Europeans have embraced innovative development and site design techniques with the objective of reducing stormwater runoff and overloading storm sewers for decades (CH2M Hill, 2004). More recently, Prince George's County, Maryland pioneered domestic techniques designed to mitigate stormwater impacts in the 1990s (United States Environmental Protection Agency, 2000).

In the last ten years, a small but growing number of local governments have adopted their own innovative stormwater management policies. These agencies, many of which reside along the United States' west coast, promote LID principles. The governmental organizations autonomously chose to enact their own progressive stormwater standards, without direct orders from the federal government to do so. Several of these governments are renowned throughout the country for their innovative stormwater policies and standards. This study will look at these early adopters in light of the diffusion of innovative stormwater policies.

Chapter Three: Methodology

Overview

An interview-based case study approach was used to collect data for this research project. The sample included six local governments located along the United States' west coast. The researcher created a survey protocol with five key topic areas to collect data. Research interviews questioned members from each of the six agencies. These individuals possessed specialized knowledge of how their respective agencies created and implemented innovative stormwater policies. A conversational, open-ended interview allowed subjects to offer a narrative of the policy innovation process. A subset of scaled questions provided the basis for brief numerical comparisons between agencies. Subsequent review of government documents provided additional insight into the nature of these environmentally friendly policies. The data analysis looked for common themes and significant findings amongst the key topic areas.

Sample

The research sample consisted of six local governments, which had adopted innovative stormwater management policies. These agencies were selected based on their perceived level of progressive policies and standards to treat stormwater. Resource constraints dictated that the research sample be limited to Washington, Oregon, and California. Identification of these agencies employed two major approaches. The first strategy used professional networks to identify governments that had adopted progressive means to treat stormwater. The researcher's previous work experience provided information about various agencies implementing such innovative stormwater policies. The second tactic involved snowball sampling. E-mail messages were sent to several

local governments, requesting assistance to identify local governments with innovative stormwater policies. Pseudonyms were used to conceal the identity of the study jurisdictions.

Subject jurisdictions differ considerably (see Table 3.1). Although they are all local governments, there is a wide amount of variation in the budget, size, population, and annual precipitation among them.

Table 3.1 Government Characteristics

	Type	Population	Budget (in millions)	Area (miles ²)	Annual Precipitation
South Valley	City	145,000	500	40.5	46"
Royal County	County	1,800,000	474	2131	39"
Provincial	Regional	1,300,000	286	400	36"
Pioneer City	City	29,000	61	9.3	47"
Harbortown	City	551,000	2,690	145	36"
Sun City	City	87,000	432	8.3	13"

After identifying the sample agencies, the next step was to locate and obtain the cooperation of individuals who were knowledgeable of the innovation process. Identification of the individuals to be interviewed used methods similar to those used in locating agencies with innovative stormwater policies. The researcher maintained professional contacts with two individuals who agreed to participate in surveys. Snowball sampling through email communications with several agencies provided the names of individuals deemed to possess specialized information about how their respective agencies created and implemented new stormwater policies. This task often required interacting with numerous individuals from each agency to determine who

would be the most appropriate person to discuss the innovation process. The interview subjects included public works employees, a planner, and a landscape architect.

Interview Protocol

The survey protocol drew heavily from existing literature addressing the diffusion of innovations. The literature identified four key innovation areas to focus on during interviews. These areas include: agenda setting, information flow, persuasion and influence, and policy development flow. The script (see Appendix A) included a set of questions for each of these sections. The protocol's final section inquired about each agency's specific policy information. This includes items such as the respective policies stormwater provisions and standards, as well as timelines for future reviews, and policy updates.

The survey instrument used a "funnel" approach in each key area to acquire information from participants. This approach started with a general focus, working its way down to very specific, scaled questions. Each area contained a broad, open-ended question to learn as much as possible about the respective area of concern. The researcher used open-ended questions and a strategy called "elite and specialized interviewing." In elite interviewing, the investigator is willing to let the interviewee teach him/her about the problem, question, and situation surrounding a particular issue. This approach is adopted more often with influential and well-informed individuals (Dexter, 1970). Due to the subjects' specialized knowledge regarding innovation and stormwater issues, elite interviewing placed the researcher in a role concentrated on listening and understanding complicated policy processes.

Several questions that are more specific followed the initial general question. While still maintaining an open-ended approach, these probes were intended to acquire specific information not contained in the primary response. The final section of the funnel approach used numerically scaled responses to look at the relative impacts of different variables in the innovation process. Respondents were asked to rate, using a scale of one to seven, the impact of a number of variables thought to influence the innovation process. The responses provided a useful quantitative summary overview on the role of the variables.

A pilot interview was conducted to refine the survey protocol. During this interview, a research subject (with whom the researcher maintained professional familiarity) assisted in polishing the questions. This individual helped focus, organize, and refine the wording of the questions. Research data was collected from this individual during the pilot interview. A follow-up meeting took place to review important details and acquire additional information.

Face-to-face interviews were conducted to acquire specific information from each agency. After using professional networks and snowball samples to identify individuals with specialized information about policy innovation, appointments were scheduled to conduct interviews and collect data. All interview notes were taken by hand and transcribed after the meetings. The one-hour meetings had a conversational style. Although the survey protocol provided a guide to learn about each agency's particular innovation process, subjects were not limited to discussing only the scripted questions. Probe questions were used to fill in gaps.

Limitations

This research design has several identified limitations. Information was collected only from agencies along the west coast. Limited travel ability impeded the means to conduct interviews with other agencies with innovative stormwater policies, both in the Pacific Northwest and distant regions of the country. Travel restrictions made difficult researching public agencies with different climates, population sizes, and budgets. With the exception of one agency (two employees participated in the South Valley survey), interviews were conducted with a single person from each agency. This provided a possibly biased and limited view of the innovation process. Furthermore, this study only focuses on the innovation process of local governments that have implemented policies in “innovative communities.” These communities may not be representative of the average jurisdiction.

Although the research uses a small sample size, the methodology is perceived to be stronger than employing a closed-ended survey sample. Sending out surveys to all agencies with innovative stormwater policies can provide a substantially greater volume of data. Yet identifying all local governments across the country with progressive stormwater management policies and standards is a cumbersome task. A great deal of effort would be needed to identify appropriate individuals to include in the survey. Acquiring detailed data is also an obstacle with this approach, as general questions would adhere to the lowest common denominator. This would prevent agency-specific questions and result in possibly superficial questions. Also, surveys mailed out on a wide scale often have low response rates.

The employed methodology allows for a greater sample than performing two in-depth case studies. Looking at only two cases may provide data that are more detailed by including the perspectives of several individuals. This approach, however, does not allow as much variation in studying different types of local governments and their respective stormwater policies.

Analysis

The data analysis was completed with a mix of qualitative and quantitative methods. After completing meetings with each subject, interview notes were organized by key innovation area. The notes were then reviewed for shared or common themes and significant findings. Ratings from the quantitative analysis were presented in a format allowing easy comparisons between agencies and within each key area.

Chapter Four: Findings

Progressive Stormwater Management Policies

The interviewed governmental agencies possessed a wide array of stormwater management policies and standards. These policies deviate from the conventional means of collecting stormwater in a pipe or conveyance system to rapidly remove runoff from an impervious site, with little to no consideration of infiltration or pollutant removal. The concentrated runoff and accumulated pollutants would then be deposited into a nearby water body, with little regard for water quality. Many of the innovative policies do not require the use of environmentally friendly practices; their usage tends to be encouraged. The policies still represent progressive means to promote water quality and preserve habitat through stormwater management. Some of these items were included in stormwater management manuals, while other policies were in the zoning codes. The policies ranged from general requirements, such as minimizing impervious surface area, to specific levels of runoff that could leave the site.

Innovative stormwater practices included limitations on parking lots, using on-site controls (such as bioswales), and mandates to follow the stormwater management plan for maintenance standards. Best management practices (BMPs) and innovative designs, often employing plants and site conditions, are deemed highly effective and proven means to mitigate the impacts of stormwater runoff. The use of BMPs is a widely applied tool for governments use to employing innovate stormwater policies. Several agencies included technical assistance, education, and encouraged the use of innovative practices beyond those required to further promote new stormwater innovations. The

specific policies and standards respective to each agency are listed in Table 4.1 (See Appendix B for comprehensive list of each agency's innovative policies).

Table 4.1 Innovative Stormwater Management Policies

Innovative Polices and Standards	South Valley	Royal County	Provincial	Pioneer City	Harbortown	Sun City
Treat Stormwater Onsite	All development with impervious surface area (~3,000 ft ²) must treat stormwater onsite for rain events of 1"-2."	Lots less than 10,000 ft ² , landowner must manage a minimum of 10% of impervious area onsite by limiting impervious surface area and BMPs.	Requires codes and standards to allow and encourage onsite stormwater treatment.	Encourages onsite treatment.	Any development over 500 ft ² must manage stormwater onsite. The quantity of stormwater leaving the site after development shall be equal to or less than the quantity of stormwater leaving the site before development.	Developers must ensure projected runoff from a project is reduced by at least a volume equivalent to the surface area of all impervious surfaces times 0.75".
Low-Impact Development Practices	--	Allowed and encouraged. City requires some BMP usage.	Requires codes and standards to allow and encourage innovative site designs.	Encourages swales and pipeless conveyance systems to treat stormwater.	Encouraged and required through comprehensive list of BMPs and design specifications in stormwater management manual.	Encourages LID in developments with preexisting BMPs and construction standards.
Limits on Impervious Surface Area	--	Rural areas with forested land have to retain 60% of forested area. Rural landowners cannot clear more than 35% of land.	Requires codes and standards to allow and encourage impervious surface area to be minimized.	Places limits on the number of parking lot spaces and parking requirements. Allows shared parking facilities.	Development shall mitigate all project impervious surfaces through retention and onsite infiltration to the maximum extent practicable.	Encourages reduction impervious surface area by employing BMPs with innovative landscaping.
Land Acquisition	Part of stormwater management manual's policy to provide continuity for vegetation and wildlife habitat.	--	Possesses funds to purchase sensitive habitat areas.	--	--	--
Incentives	Discounted stormwater fees with reductions in impervious surface area.	Reduced stormwater fees for sites with reduced impervious surface area; grants are available for developments seeking to employ LID practices.	Allows increased site capacity and innovative site designs in sensitive habitat areas.	--	Discounted stormwater fees are limited to 35% of the basic stormwater charge and calculated on a sliding scale based on the extent and effectiveness of private stormwater management.	Discounted urban runoff fees in developments with reduced impervious surface area.
Technical Assistance	--	Offered; stormwater management standards can be changed to work with proposed innovative designs.	Offered	Offered; works with developers seeking innovative site designs, particularly for public works projects.	--	Offered

Agenda Setting

The issue of innovative stormwater solutions came to the agencies' agendas in a variety of ways. The Clean Water Act (CWA) weighed heavily in the decisions of South Valley, Pioneer City, and Harbortown to update how they treated stormwater. A provision of the CWA requires all cities larger than 100,000 citizens to apply for a National Pollutant Discharge Elimination System (NPDES) permit. This subsequently forces cities to monitor water quality and mitigate the impacts of urban runoff. Coupled with the CWA, South Valley also discovered valuable wetlands, thus reinforcing its motivation to protect water quality.

Reasons for policy innovation extended beyond the CWA. In Royal County, a local consultant discussed stormwater problems and solutions, including the environmental benefits of LID, with the agency's councilors. Sun City realized the need for stormwater solutions after people began getting sick after using area beaches. A local nonprofit organization, Clean the Bay, used an epidemiological approach directed toward the Environment and Public Works Department, to advocate for solutions to water pollution. Provincial's primary reason for creating new policies was the agency's objective to minimize development impacts on sensitive habitat areas in accordance with a state planning goal.

Subjects listed many additional factors leading to progressive stormwater treatment policies. South Valley mentioned the community's interest, including environmental groups and green builders, as important players. Sun City also was influenced by its community's best interest, especially since clean water is vital to its economic livelihood. Five to six million people visit its ocean pier each year, with many

millions more frequenting its adjacent beaches. Restaurants and hotels rely on clean water to run successful businesses. Provincial simply cited its subjection to pressure as an authority responsible for maintaining a healthy environment for future generations as a reason for creating environmentally friendly policies.

The decisions of other governmental entities affected the decisions of the remaining subjects. Royal County mentioned the federal designation of bull trout and a local Chinook salmon run as endangered species in its decision to create stronger environmental standards. Pioneer City, located along the Willamette River, received mandates stemming from Provincial's Title 3 legislation, which creates performance standards for water quality, flood management, and fish and wildlife conservation. The Federal Emergency Management Agency (FEMA) encouraged the city to enact higher stormwater runoff standards to minimize flood risks. It also benefited from lower flood insurance premiums after updating its stormwater policies.

Harbortown created technical stormwater solutions in response to lawsuits. The first suit cited sewer overflow problems occurring during heavy rainfall events where stormwater would overwhelm the sewer system and flush sewage into the Willamette River. The second case listed stormwater impacts as a major influence in the pollution of Fanno Creek in the Tualatin River Basin. The city updated its stormwater standards to avoid future lawsuits associated with water quality and urban runoff.

There are usually multiple reasons for creating new policies. The listed reasons for innovation represent a wide range of external influences. Yet, when asked if demand came exclusively from outside the agency, they also traced demand to internal factors. They all responded that forces within the agency weighed heavily in decisions to update

stormwater policies and standards. Each agency, with the exception of Provincial, listed staff as being the most influential power in the agenda setting process. Both South Valley listed the CWA and Sun City cited community interest as equally important variables in this process. Provincial listed community interest and elected official interest as the most significant factors affecting the decision to create new policies.

Each agency referred to important studies linking water quality to the need for new stormwater policies and standards. Half of the subjects completed research within their organization. The city of South Valley conducted several studies, including two that looked at water quality and habitat within the city and its adjacent water bodies. These studies complied with Oregon planning goal number five, which requires governments to protect natural resources, conserve scenic and historic areas, and open spaces. South Valley hired a private consultant to evaluate urban water quality and monitoring practices within the city. Royal County completed two studies, the first of which researched innovative treatment standards and cost estimates for new stormwater treatment practices. The other study explored benefits, limitations, and barriers to implementing LID practices, including compatibility with existing codes. Provincial staff conducted multiple studies, many of which researched harmful effects of development and consequent loss of wildlife habitat and impacts of water quality.

The remaining subjects did not conduct their own research, but still used external studies during the policy innovation process. Harbortown referred to the Tualatin River Basin studies that showed evidence of impaired habitat and water quality caused by urban runoff. Clean the Bay's study influenced Sun City by outlining the link between pathogens in the water and the number of people getting sick. Other state and federal

agencies conducted a wide amount of research linking urban runoff, pollution, and impaired water quality. Similarly, Pioneer City focused on many reports to attain valuable information about issues surrounding wildlife habitat and water quality. These authors included Oregon Department of Quality, Willamette River Basin Taskforce, the Bureau of Land Management, and the Oregon Watershed Enhancement Board. The relative impact of the various factors influence each agency's agenda are listed in Table 4.2.

Table 4.2 Factors Impacting the Agenda Setting Process

Agenda Setting									
	South Valley	Royal Co.	Provincial	Pioneer City	Harbortown	Sun City	Average	Low	High
Community interest	6.5	1	7	5	5.5	5	4.4	1	7
Elected official(s) interest	2	1	7	5	5.5	7	4.6	1	7
Agency leader interest	3	5	7	3	3.5	6	4.4	3	7
Staff interest	2	7	5	7	6.5	7	5.8	2	7
Previous stormwater issues	5.5	1	4	5	1	7	3.9	1	7

(1=Very little impact; 7=Great deal of impact)

Information

Each agency drew from an array of information sources when researching and developing new stormwater policies and standards. Royal County internally analyzed its existing policies and standards, looking for changes and improvements that could be made. Additional sources included LID work done in Prince George's County, Maryland (although precipitation patterns differ in the mid-Atlantic region) and Internet sources providing examples of jurisdictions working with LID. Collaboration served as an instrumental component for policy innovation. The Puget Sound Action Team (PSAT),

Washington Department of Ecology, and area jurisdictions such as Pierce County, Tacoma, Olympia, and Seattle worked together to create stormwater treatment models and adapting standards for local wants.

Harbortown acquired much of its information from technical and policy conferences focused on stormwater. Staff collected relevant information from as many sources as possible, including consultants. Harbortown coordinated with many agencies to acquire additional knowledge, including the American Public Works Agency, American Society of Engineers, American Society of Landscape Architects, Oregon Association of Clean Water Agencies (ACWA), and other trade and research organizations. The interviewed subject, a landscape architect, gained additional information from experimenting with rain gardens, bioswales, and a green roof in his own backyard.

The remaining agencies all shared similarities in the types of information sources they used. In recent years, they borrowed from Royal County and Harbortown's stormwater innovations. The city of South Valley used information from Prince George's County, ACWA, the Oregon Department of Environmental Quality (DEQ), Internet sources, trainings, and seminars to develop its stormwater management manual. The city staff received direct guidance from two landscape architects, Patrick Condon (with the University of British Columbia) and another with the City of Harbortown, URS consultants, and the Lane Council of Governments. For its newest stormwater policies, South Valley derived valuable technical knowledge from Royal County and Harbortown's respective stormwater management manuals.

Pioneer City's public works director cited Puget Sound's stormwater management manual as a valuable information source. Again, ACWA's provision of an informative newsletter, seminars, conferences, and an annual stormwater summit provided valuable stormwater research. When developing the actual standards and policies, Pioneer City hired a consultant. If the city conducted an overhaul of its current stormwater management manual, it would now refer to Harbortown's manual as its major information source. The city has designed several innovative public works projects with designs borrowing specifications listed in Harbortown's manual.

Sun City listed a number of primary information sources used in its policy innovation process, including publications by Center for Watershed Protection (CWP) and the LID Center. Both agencies provide information about methods to mitigate developmental impacts on water quality. Additional sources include conferences, the *Stormwater* trade journal, and Prince George's County publications. It also collected policy and information from the Texas Statewide Stormwater Quality Task Force, the Bay Area Stormwater Management Agencies Association. A consultant provided specific expertise for drafting policy language. As the city updates its encouraged development BMPs, it often refers to the Harbortown Stormwater Management Manual.

Provincial solicited information from many key sources, especially other public agencies doing innovative work, as well as CWP and PSAT. There was not a lot of internal knowledge about progressive stormwater management practices. Further policy information came from the Environmental Protection Agency, conferences, trade journals, and applied knowledge from consultants. A technical advisory committee of

area planners, in unison with a peer-review committee process with practitioners and a program group to work on stormwater issues, provided additional policy expertise.

Table 4.3 below shows that agencies used whatever available resources they could to learn about progressive stormwater solutions, especially referring to other governments’ policies. Royal County did not rely on other agencies’ policies and standards as heavily as others did. Citing Provincial’s recognized lack of technical expertise, it researched several sources beyond the agency to acquire innovative ways to mitigate hydrologic impacts. Trade journals received the lowest mean importance value, although agencies still recognized the value of information contained in these publications.

Table 4.3 Information Sources Used to Create Innovative Stormwater Policies

Information									
	South Valley	Royal Co.	Provincial	Pioneer City	Harbortown	Sun City	Average	Low	High
Other governments’ policies	6.5	2	6	7	7	7	5.9	2	7
Own information	5	6.5	3	5	6	7	5.4	3	7
Professional contacts	5	3	6	5	6	7	5.3	3	7
Conferences	5.5	5	4	7	7	5	5.6	4	7
Trade journals	3	2	5	4	7	5	4.3	2	7

(1=Very little impact; 7=Great deal of impact)

Persuasion and Influence

Progressive stormwater management policies and standards came to the agencies’ agendas in different ways. Staff led the initiative to revamp policies in some agencies, whereas the government council directed the need for changes in others. Common themes were observed in the role of persuasive and influential change agents throughout all governments and staff members, as opposed to council members, creating the specific

content of innovative policies. All agencies faced some form of internal or external opposition to the new policies, although it varied amongst each party.

Government councilors strongly affected the decision to develop progressive stormwater policies in Royal County and Provincial. After the local consultant brought LID to the attention of Royal County councilors in 1998, the ensuing political interest served as a catalyst for policy changes. The council, void of technical expertise regarding stormwater solutions, delegated the task of creating environmentally friendly policies to public works staff members. Upon receiving the assignment, the department director and stormwater engineer, who both shared a specialized knowledge and appreciation of stormwater issues, influenced the push for new policies. Other agency members possessing acute environmental or public works knowledge, such as wildlife biologists and engineers, reinforced the expertise to construct the policies.

Opposition to Royal County's stormwater policies came from rural citizens opposing governmental interference and instructions regarding how to manage their property. Public works and fire departments resisted the movement because of conflict involving road access and public works designs. Developers initially resisted the changes, but soon complied with the new standards. Some developers feared potential litigation if they posed a risk to endangered species affected by development. Developers soon found they could still make a lot of money with the new policies in place because of a thriving real estate market.

Provincial's purpose as a governmental agency includes the responsibility of addressing issues surrounding environmental impacts. Leadership within the council helped direct the development of environmentally friendly development policies. Several

members integral to change were identified at all levels of the agency. A key council member guided the innovation process by bringing the issue of developmental impacts on the environment. Upper management, planning staff, and an attorney also collaborated to draft the specific policies addressing hydrologic impacts and accompanying model code language.

Provincial faced both internal and external opposition to its new policies. Internal resistance came from debate regarding what the agency's role should be as a governmental body, particularly in relation to whether it should maintain responsibility for regulating the environment. External resistance came from landowners, homeowners, communities, business alliances, and citizens groups. Their concerns included whether or not the policies required additional costs, responsibilities, and extra maintenance required with the new development practices. Some parties expressed reluctance to adopt LID practices, citing that not all of them are proven, long-term solutions to mitigate the impacts of development and stormwater runoff.

Staff influence served as the primary driver leading to new stormwater policies. In South Valley, stormwater standards and policies are included as part of the public works department work plan. The public works director maintains responsibility for directing the projects. Its past engineering division manager and current city engineer served as the most influential change agents. The water resources manager, to a lesser degree, played a valuable role in advocating for increased attention to stormwater. All individuals possessed special knowledge and mastery of stormwater issues, which was essential for establishing credibility in initial planning stages and getting other staff

members to listen to proposed innovative policies. Agency position and status were both acknowledged as significant influences to ensure change was achieved.

South Valley did not experience significant opposition to its new policies. Staff spent a lot of time researching potential sources of opposition and resistance. They used education to win over citizens and show how stringent stormwater standards improve water quality. People could see the benefits and understand the importance of stormwater regulations and streamlined processes.

Clean the Bay, the local nonprofit group with whom Sun City's Environment and Public Works (EPW) employees maintain a working relationship, placed pressure on city government to mitigate urban runoff. With Clean the Bay's encouragement, the EPW department head assigned staff the task of creating policies and practices to reduce urban runoff and thereby improve water quality. The department head served as the most important figure to instigate change. He discussed the movement for new policies with councilors, keeping them updated throughout the creation process. He possessed specialized knowledge and maintained a respected status within the agency to exert influence so others listened about progressive stormwater innovations. Ultimately, his persuasive arguments, ability to "connect the dots," and maintain discussions with many different parties made him successful.

Resistance to new runoff policies was not a substantial problem in Sun City. Some property owners with large properties presented some opposition. Businesses also argued against the policies because impervious surfaces completely cover many commercial properties, thus resulting in higher stormwater fees. Generally, though, people supported the city's embrace of strengthened runoff standards.

The city of Harbortown's path leading to new stormwater policies is not as easy to trace. Water quality became an important topic following the lawsuits filed against the city. This issue moved slowly throughout different levels of the agency and other bureaus within the government. Eventually in the mid-1990s, the issue seemingly moved past its obstacles and staff members collectively pushed for change to improve standards and policies. Several staff "champions" and "pot stirrers" exerted their influence by firmly putting stormwater issues on the city's agenda. A particular landscape architect in the Bureau of Environmental Services used his informal influence to introduce others to new stormwater ideas. His own research, including professional contacts, literature, and experimenting with innovative stormwater practices in his backyard, led to a strong knowledge of what innovative policies could entail. After this architect talked to other key agency members possessing specialized understanding about stormwater as well as informal influence, they began working to satisfy their own ideas for progressive policies. These agency members then initiated dialogue with other peers and important managers. Sharing information sent new ideas moving throughout the agency. A significant observation was the importance of getting ideas down on paper, making them tangible and legitimate, and working with different agency stakeholders to show that proposed innovations are not extreme.

Harbortown primarily faced internal pressure for its new stormwater initiatives. Internal opposition came from other landscape and design architects, as well as civil engineers, because onsite management did not appeal to their preferred runoff solutions. These professionals typically prefer the idea of diverting stormwater runoff into a pipe and removing it off site as quickly as possible. Developers did not necessarily oppose the

policies because money was at stake. They wanted to be informed of their expectations and then worked with the new standards to pursue their development projects with as few complications as possible.

Pioneer City's staff led the movement for new stormwater policies. They also responded to Provincial's Title 3 requirements regarding water quality and flood management to create innovative standards. The public works director, in particular, initiated new policies and standards by using her experience and position of authority to influence and persuade others. In addition to complying with external orders, she took the opportunity to create stormwater policies that would be friendlier to the environment. Installing policies in compliance with Title 3 requirements made the innovation process flow relatively smoothly. Refusal to accept the new policies did not present a substantial problem. Developers initially resisted because they do not always easily adhere to new standards. Like many public works engineers, they are more inclined to think in terms of trying to convey stormwater off a site, instead of using valuable land to install landscaping to manage stormwater on site.

The quantitative findings (see Table 4.4) show that having a change agent, acquiring key agency members, and casting policies in a way that reflects the agency's mission all strongly contribute to policy innovation. Each separate factor averaged a value above 6, signifying a high level of importance in achieving organizational change.

Table 4.4 Persuasion and Influence in the Policy Innovation Process

Persuasion and Influence									
	South Valley	Royal Co.	Provincial	Pioneer City	Harbortown	Sun City	Average	Low	High
Change Agent	7	7	7	6	7	7	6.8	6	7
Innovation's link to agency mission	6.5	7	7	4	7	6	6.3	4	7
Acquiring key agency members	4.5	6	6	7	7	7	6.3	4.5	7

(1=Very little impact; 7=Great deal of impact)

Policy Development

Each of the participating agencies displayed similarities and distinctions in its decision-making process. In South Valley, the city engineer was the primary change agent. He decided to create the changes in its stormwater management manual and its latest stormwater policy. No specific information could be attained regarding the decision process affecting the stormwater management manual. For the city's latest changes, public works staff created the necessary policies and standards; a policy group reviewed and made suggestions regarding the changes. Following a public hearing in January 2006, the planning commission suggested a few minor changes. A public hearing in April 10 offered additional suggestions. The council will make a final vote on the changes in May 2006.

After the agency executive expressed his desire for increased environmental protection, Royal County's public works staff began developing new stormwater policies. The Water and Land Resources division within the department created the new changes, policies, and standards. In 2003, the agency executive changed some of the staff's policy provisions. That same year Royal County passed a model ordinance to authorize three

LID demonstration projects. These projects used LID practices, such as soil amendments, bioswales, open conveyance systems, and pervious pavers to treat stormwater onsite. Staff sent the final policies to council for approval in October 2004. The council required two to three minor changes before fully passing the new policies. The final vote was 7-6, split along partisan lines.

Provincial's decision to create and implement stormwater, and other habitat friendly development practices, came from its government council. To follow state law, it wanted to develop regulations for wildlife protection and restoration. The staff made recommendations on how to best mitigate development impacts on the environment in a way that is congruent with existing policies. In the late summer 2004, after the staff made its recommendations, council formally granted the approval of developing a plan to minimize environmental impacts of development. The council then passed a resolution in fall 2004 to list specific program elements and create habitat friendly development practices. This is when the agency decided to require its member jurisdictions to remove barriers for the innovative practices within their respective codes and plans, where practicable.

In May 2005, Provincial's first public hearing occurred. At this point, the model ordinance explicitly stated that habitat friendly development practices, including those addressing stormwater impacts, must be *encouraged* by all of its member jurisdictions. The council also made recommendations to the ordinance, with more in September 2005. It adopted the resolution in September 2005. The changes still need approval from the state's land conservation and development commission in fall 2006.

Pioneer City started looking at ways to improve its stormwater policies and standards in 1995. Public works staff worked on this project, with assistance from the community development department, to develop the necessary improvements. Next, the planning commission reviewed the stormwater policies and standards, making minor suggestions. The final step involved the city commissioners' review of the policies and own recommendations before approving them. The entire process took over a year, before formally adopting the policies in 1996. Pioneer City's planning department took a similar approach for implementing parking lot standards to minimize the amount of impervious surface area.

Harbortown did not maintain a direct path to passing its own stormwater policies. In the mid-1990s, after much stagnation, Bureau of Environmental Services staff started working on new stormwater solutions. Following a public review process, city council adopted the stormwater management manual in 1999, along with code amendments that created provisions for onsite stormwater management tools. The city auditor then reviewed these changes, as required by city code. Also in spring 1999, the city council established the Stormwater Advisory Council (SAC), whose members represent environmental, development, engineering, business, and community interests. One of the SAC's tasks included reviewing and making recommendations regarding changes to the city's stormwater management manual. The SAC presented its newest recommendations in April 2000 and August 2002. The Bureau of Environmental Services internally decided to facilitate stormwater innovation by retrofitting its first "green street" with an environmentally friendly design. These designs included curb cuts and bioswales to treat

stormwater runoff along urban streets. Since then, the department has retrofitted five additional streets with “green street” designs.

Sun City’s Environment and Public Works department head assigned the task of creating policy changes to staff, particularly its urban runoff management coordinator, in 1996. The staff created the policy changes, working directly with city attorneys to help develop model code language. A project report was compiled along with the model ordinance. City councilors read the draft ordinance, held a public hearing, and then completed a second meeting before voting. This is where the council, if needed, makes changes. Sun City used the same process to make amendments to its runoff BMPs.

Numerical data (see Table 4.5) show that agency staff played the greatest role in creating and implementing progressive stormwater innovations. Government council, on average, affected the policies more than public input did. It should be noted, however, that Harbortown refrained from allocating a value to the council’s role. Council influence also had the widest range of the variables. In Royal County, the council did not offer input into new stormwater policies, perhaps resulting in the subject’s perception that it played very little role in developing the policies. The council still played an essential role in this process by voting to pass and implement the new stormwater policies.

Table 4.5 Factors Impacting the Policy Development Process

Decision-Making									
	South Valley	Royal Co.	Provincial	Pioneer City	Harbortown	Sun City	Average	Low	High
Administrative input	7	5	6	7	6	7	6.2	5	7
Council influence	4.5	1	7	5	-	7	4.9	1	7
Public input	4	3	6	5	5.5	3.5	4.5	3	6

(1=Very little impact; 7=Great deal of impact)

Chapter Five: Discussion

Agenda Setting

The findings reveal that the move to create innovative stormwater policies often started with an impetus external to the agency. For example, lawsuits, a nonprofit agency, an external consultant, state planning goals, and federal legislation all served as drivers for agencies to search for, evaluate, and eventually implement policy innovations. These external influences were instrumental in bringing attention to performance gaps in the level of stormwater runoff management and its adverse impacts on water quality and native habitat.

Such external forces play a valuable role in setting the agenda for progressive policies. Yet, local governments played an equally important role by listening to the community and their respective external impetuses before pursuing new policies. The agencies, including staff members, executives, and elected officials, must be willing to take risks on policies that do not have proven effectiveness. Due to this uncertainty, staff members creating the policies need to have the freedom and support to research, design, and work with other professionals to learn as much as possible about the subject.

An equally important factor in setting the agenda for innovative policies is concern about environmental issues. Several interviews alluded to how a change agent within the agency possessed a passion for environmental issues. This is evidenced by a belief in environmental protection, relationships with a local conservation group, or willingness to experiment with innovative designs away from work in a backyard. Thus, it appears that when external demand for new environmental policies and standards exists, key staff members within the agency capitalize on this opportunity to fulfill a

desire for stronger protection. This observation is reinforced by staff interest receiving the highest ranked variable for agenda setting.

Information Sources

Information about innovative policies came from a variety of sources. The findings showed those other governments' policies, established professional expertise, professional contacts and conferences are all important sources of information in the development of alternative policies for treating stormwater. Trade journals also provided some of the agencies, such as Harbortown, Sun City, and Provincial with moderate information. Royal County, deemed by other agencies as an early innovator for its work with stormwater, did not look to other governments' policies as a source of expertise. No themes appear to indicate a relationship between the sources of information used and the jurisdiction size or budget of the organization. Each agency took seriously the risks and responsibilities involved in actively searching for as many sources as possible to create progressive stormwater management policies.

Change Agents

The adoption of policy innovations could not be done without the work of an effective change agent. Interviews rated the importance of an active change agent (mean value of 6.8 with a maximum of 7) as the highest ranking of any measured variable affecting the adoption process. As mentioned earlier, the change agent is passionate about environmental impacts and is willing to use his/her stormwater expertise, influence, and ability to work with others to ensure that the agency achieves its policy goals. The change agents identified in this study were integral in creating stormwater policies and

standards, in addition to working with other agency members, councilors, and external stakeholders to make certain that changes would be effective and accepted by the public.

Change agents are dynamic individuals. The study's findings found them to be concerned about environmental issues and dedicated to the task of creating new stormwater policies. Due to the need to work with multiple people, such as councilors, managers, and community members to inform and persuade them about the importance of increased stormwater protection, communication skills were essential for adopting policies. Patience was another quality that may have helped change agents convince their peers, community members, and opponents about the utility of new policies.

In addition to the possession of dynamic personalities, effective change agents benefit from their agency status. There is a positive correlation in having a position of power within the staff hierarchy contributes and others' willingness to listen. It is important to note, however, that status itself does not guarantee a successful change agent.

Policy Development

There are several considerations for a local agency attempting to successfully adopt innovative environmental policies. This study found that staff members drive innovation. They are responsible for conducting policy-related research, adapting policies and standards to local needs. The community must be willing to accept policy changes in order to minimize stormwater runoff impacts on the environment. Although local governments like Provincial and Royal County began working on innovative policies with instruction from councilors, each agency heavily relied upon its staff members. Staff members performed research, talked with experienced stormwater

practitioners, listened to other staff and community members' concerns, and exerted significant time and labor to adopt their new stormwater management policies. A supportive staff that favors policy change is essential to this process. Harbortown struggled to move forward in its efforts to enact higher water quality standards until staff members collectively embraced the task. Internal resistance may disrupt any efforts to enact higher environmental standards.

The staff generally has the primary responsibility of creating the specific innovative policies and standards. The decision making process also subjected the proposed policies to public review, allowing community members, businesses, and other groups to offer feedback. Each local government collected public comments, yet the findings show that this did not greatly affect the policies' content. Due to the innovative nature of the rules, most of the public was uninformed about progressive stormwater management. Although each local government received public opinions, the policies reflected staff visions of standards and regulations that would lead to increased water quality in the future.

The study finds that the elected officials played a much different role than agency staff in the innovation process. In some cases, elected officials instructed staff members to mitigate water quality impacts with new policies, while refraining from offering specific input to shape policy content. The importance of their role lies in being receptive to staff recommendations and voting to adopt new stormwater policies. Without elected officials who support innovative practices, a local government will struggle to enact meaningful solutions to protect the environment.

Successfully adopting policy innovations requires that the policies be constructed in accordance with the agency's value and belief system of its policy makers. For example, Provincial councilors debated whether or not their agency's role was to regulate the environment. Yet the early adopters of innovative stormwater policies share common characteristics. With the exception of suburban Pioneer City, all the others are urban governments well known for their attention to environmental issues and progressive policy orientation. With a history that values such philosophy, there is likely a predisposition toward adopting innovative policies with prescribed environmental benefits.

Simplicity is an advantage in the policy process. Rogers mentions that if innovations are to be successful, they must be relatively simple (Rogers, 1983). If new stormwater policies and standards are too difficult to explain, understand, and implement, they face greater obstacles to being effective. Also, the new policies must have some acknowledged advantage over competing policies, be consistent with present organizational policies, usable and observable (Rogers, 1983). If the policies are difficult for property owners to enact or if there are no informative references available, their implementation is severely threatened. This is perhaps why Royal County and Harbortown included BMPs and constructed their own projects using LID practices.

Most of the policies are permissive, as opposed to mandatory. This may be a result of resistance from powerful interest groups. Groups, such as developers and small businesses opposed innovative policies in Royal County, Provincial, Pioneer City, Harbortown, and Sun City. Policy opposition may have stemmed from a lack of simplicity and observability that impeded their ability to recognize that, for example,

using LID practices may actually provide economic incentives. One must recall that these policies are still at the forefront of progressive stormwater management. Passing new policies that require strict or unfamiliar standards for developers, businesses, and citizens to abide by may result in significant compliance problems. Over time, however, these policies can be strengthened to enact more comprehensive stormwater management solutions. By starting simply, a local government can update its policies to mandate compliance without penalties, before eventually requiring compliance and penalizing those not abiding by stormwater friendly policies.

Other Factors Contributing to Innovation

An agency's willingness to change depends on several factors. As mentioned, existing values and belief systems, in addition to agency history, play an important role in its willingness to change. Mohr found organizational cultures valuing progress and possessing larger staffs favor innovation (Mohr, 1969). Each agency appeared to have a predisposition toward change, by valuing and recognizing its importance for improving environmental standards. While data was not collected for each agency's staff size, the size of the jurisdiction and its annual budget suggest a relationship between size and willingness to change. Agencies serving larger populations tend to have bigger budgets and staff sizes. This allows the agency to pursue innovations, such as stormwater management, and then assign staff members to focus on such issues. Financial status also promotes change (Bingham, 1976). Royal County and Sun City, which serve urban areas with relatively affluent populations, have the specialized staff and financial resources to explore new stormwater innovations. A smaller agency, such as Pioneer City, does not

have as large of a staff to dedicate a person to work solely on stormwater issues without ignoring some other important work matter.

Community political environment contributes to political innovation. Often times urban areas, in addition to having larger budgets and specialized staff, are more willing to accept policy innovations. Walker noted that change takes place more in urban centers (1969). It deserves mention that Royal County, Harbortown, and Sun City are all located within their respective state's largest metropolitan area. Such jurisdictions maintain large budgets and staff sizes, possessing the means to allocate more resources for developing policy innovations. These urban areas also are home to "green-minded" citizens possessing relatively high education levels and socioeconomic status. Although enacting environmentally friendly stormwater innovations can benefit an entire city, such initiatives tend to be embraced more by privileged individuals with greater concern for environmental issues. The culture of each city is perceived by many to be progressive and embraces environmentally friendly policies.

The organizational context of each jurisdiction influenced the adoption of new stormwater management policies. Interactions with developers, nonprofits, consultants, businesses, and other governmental agencies (on local, state, and federal levels) all affected the innovation process. Their roles were valued for setting the agenda of bringing stormwater issues to the agency's work plan. Many of these same groups, especially developers, were also involved in the public input process leading to the adoption decision. While at first these groups displayed resistance, they still chose to adhere to new policies because the policies did not interfere with a prosperous real estate market. This raises the issue, however, of whether these groups accepted the policies

because they were so watered down that they no longer threatened the groups' economic interests.

An additional variable not mentioned in the reviewed literature or measured in the research findings section was the pride displayed by interview subjects. No questions addressed the element of pride in being an early adopter of stormwater innovations. Yet the subjects appeared proud to discuss the path leading to their respective agencies adoption of new policies. This held true especially for Harbortown, Royal County, and Sun City, as stormwater practitioners regard them highly across the country. They were willing to discuss their innovations at length and appeared to enjoy the opportunity to discuss what their agencies were doing to promote environmental quality. They prized the fact that they put environmental issues on the agenda and took risks to protect water quality using relatively untested methods.

Table 5.1 Key Elements Contributing to the Adoption of Policy Innovations

Agenda Setting	<ul style="list-style-type: none"> • The local government acknowledges an impetus for change after an external entity addresses the need for new policies. • Staff members seize the opportunity to adopt policy innovation.
Information Flow	<ul style="list-style-type: none"> • Staff members use as many resources as possible to research and develop the proposed policy innovation.
Persuasion & Influence	<ul style="list-style-type: none"> • A change agent uses his/her professional connections, technical knowledge, position of authority, and passion for the proposal to drive policy innovation by engaging agency stakeholders (e.g. other staff members, agency leadership, elected officials).
Policy Development	<ul style="list-style-type: none"> • Local government must begin with a relatively simple and understandable policy, cast in accordance to the agency's beliefs and values.
Other	<ul style="list-style-type: none"> • A positive relationship exists between an agency's innovativeness and the size of its staff, budget, and urban location.

Chapter Six: Conclusion

Comments on Innovation

Local governments continue to search for environmentally sensitive and cost-effective means to manage stormwater. A relatively small proportion of local governments, mainly on the west coast, have pioneered new approaches to this problem. Rogers (1983) stresses the importance of diffusing an innovation that is usable, accessible, and relatively simple for others to understand. Policies that meet these criteria stand the greatest chance of being adopted elsewhere.

Recognizing that environmentally sensitive stormwater policies are relatively new, it is reasonable to expect that they are at an early point in their diffusion trajectory. Thus, significant potential exists for the continued revision and refinement of these policies as their diffusion to other local governments unfolds. These refinements will likely enhance effectiveness, reduce cost, and improve implementation of environmentally friendly performances, thereby reducing barriers to adoption.

Key Themes for Diffusing Policy Innovations

The interviews and review of documents underlying this study reveals a useful set of principles for understanding the process by which local governments adopt innovative policies and practices. These principles include:

- *Gradual change*—Start with what is politically and practically possible. The initial policies will not necessarily be the most environmentally stringent and comprehensive. Over time, the policies will be reviewed and updated to reflect performance strengths and gaps.
- *Look to early adopters*—Local governments can learn much from the experiences of their peers. Several of the interviewed agencies received guidance from Royal County and Harbortown when developing their stormwater management programs. Subsequent adopters can benefit from existing information, such as code language and stormwater management manuals, to review options and

provide guidance during their respective innovation processes. Future adopters can also benefit from a greater range of successes, potential failures, and practices to adopt.

- *Draw on as many information resources as possible to learn about innovative stormwater management policies*—Conferences, other governments, trainings, publications, consultants, and any other available sources provide excellent opportunities to learn about innovative stormwater policies. Each of the interviewed agencies explored many different sources when creating their policies. The amount of available information will continue to increase as more agencies adopt innovative stormwater policies.
- *The most effective advocate for innovation is a well-informed, well-connected, and passionate staff member in a position of authority*—A change agent is essential for adopting innovative environmental policies. A consistent finding across this case study is that a change agent on the staff actively supported the policy innovation. Often holding a senior position in the organization, s/he used status, expertise, and interpersonal competency to “sell” the policy proposal.
- *Put together a knowledgeable staff that have access to information*—Staff members are instrumental to diffusing policy innovations. Staff members need to be able to draw upon existing literature and technical documents addressing innovative stormwater management in decentralized governments to adapt effective policies benefiting the environment while suiting both agency and its community stakeholders.

Policy Recommendations

Each subject in this study was selected because it was an early adopter of progressive stormwater management policies. These local governments adopted policies affording a level of environmental protection beyond the majority of their peers across the country. Yet it must be acknowledged that potential for improving policy efficacy remains within each agency. Many policies, including those referring to LID, are *encouraged*. In the future, progressive stormwater management may require such practices. While requiring stringent standards would have important environmental benefits, the public may not fully understand the importance of limiting impervious area

to promote water quality. After analysis of the agencies' current stormwater management policies, these areas must be built upon for future stormwater management policies.

- *Encouragement of innovative practices*—Encouraging the public to use low impact development and other innovative practices can help minimize stormwater runoff impacts, but will not achieve the same results as requiring their usage.
- *Requirements to manage stormwater onsite*—Onsite landscaping features, such as bioswales and pervious paving materials, can be used in many residential commercial and residential applications. These features can infiltrate stormwater and minimize collective stormwater impacts, especially in dense urban areas.
- *Incentives for reduced fees*—Introducing cost savings will motivate more property owners to take steps to reduce impervious surface area or manage stormwater onsite.
- *Provision of technical assistance*—Having reference materials about innovative stormwater practices can help disseminate information and educate developers and property owners. Agency staff should also work with the public help them comply with new policies and standards.
- *Include BMPs in stormwater management manuals*—Part of Royal County and Harbortown's innovation success lays in the thorough provision of BMPs in their respective stormwater management manuals. Making available examples of different innovative treatment practices, with design specifications, creates a solid foundation for developers and property owners to learn about different options available to them and facilitates the diffusion of their implementation.

Future Research

The local governments that have adopted innovative stormwater policies are leaders in experimenting with new ways to manage stormwater. Currently, many of the innovative policies are encouraged, while some of the agencies provide compliance incentives. Future studies may be able to provide a more thorough diffusion analysis by researching other local governments across the country that have adopted their own innovative policies. Studies may trace the evolution of innovative stormwater policies over time to see if they remain voluntary, or if they become mandatory with sanctions for noncompliance. Future research can also evaluate the effectiveness of stormwater

policies and offer insights into whether they achieve the goal of creating viable alternatives to reduce runoff and protect water quality. Such findings may help policy makers understand how to shape progressive policies and ultimately, contribute to making cities more sustainable.

Appendix A – Interview Script

I. Agenda Setting

1. How did the issue of alternative stormwater management policies come to your agency's agenda?
 - a. What were the sources of pressure for the agency to create new stormwater policies?
 - b. Was demand from outside or inside the agency?
 - c. Was a study completed that showed evidence of impaired habitat and water quality and that previous stormwater management was inadequate? If so, who conducted the study? What were its findings?

To what extent did the following factors impact the agenda setting process within your agency?

(1=Very Little Impact, 7=Great Deal of Impact)

- Community interest/demand
- Elected official(s) interest
- Agency leader interest
- Staff interest
- Shortcomings of previous stormwater management and associated environmental problems

Which of these influences was most instrumental in bringing attention to the need for new stormwater management policies and standards?

II. Information Flow

1. What served as your major information source when researching and developing new stormwater policies and standards?
 - a. What other sources, formal or informal, did you use to learn about innovative stormwater treatment?
 - b. Did you seek the expertise of any agencies or individuals? If so, who?

To what extent did the following factors impact the facilitation of information?

(1=Very Little Impact, 7=Great Deal of Impact)

- Other government's stormwater policies
- Own information developed from previous experience
- Professional contacts
- Conferences
- Trade journals

III. Persuasion/Influence Flow

1. How did this issue move throughout different levels of the agency?
 - a. Were there key members leading the push for new stormwater policies within your agency?

What was the primary source of influence for these individuals:

 - Special knowledge/mastery
 - Position/agency status
 - Informal influence
 - b. Were there any sources of opposition or resistance to new alternative stormwater management policies? If so, from who?

To what extent did the following factors impact the persuasion and influence process?
(1=Very Little Impact, 7=Great Deal of Impact)

- Casting innovation in a manner appropriate to the agency's mission
- Acquiring key agency members to establish issues' legitimacy
- A knowledgeable, persuasive agency change agent

IV. Policy Development Flow

1. Who decided to create the policy changes? Who decided to implement them?
 - a. Was this an administrative (e.g. planning/public works department) or council decision?
 - b. How many decision points were involved in the policy creation process? What were these decisions?

To what extent did the following impact the policy creation process?
(1=Very Little Impact, 7=Great Deal of Impact)

- Council input
- Administrative/staff (e.g. planning/public works/city manager) input
- Public input

V. Policy Information

1. What are the new policy's key provisions?
2. Will the policy be reviewed for effectiveness and be updated in the future?

Appendix B – Innovative Stormwater Management Policies

South Valley

- Incorporate flood control, stormwater conveyance, and water quality treatment into the City’s storm drainage system. Implemented by acquiring existing drainage channels and waterways.
- Maintain flood control, drainage, and water quality treatment capacities along the city’s stormwater conveyance corridors while protecting and enhancing the health, diversity and continuity for wildlife habitat, native vegetation, and endangered species.
- Develop and implement city programs and practices to carry out the goals and policies of the stormwater plan that conform to the South Valley Wetlands Plan.
- Post-construction standards: all development with impervious surface area (~3,000 ft²) will be required to treat stormwater onsite. There must be controls to treat water onsite for rain events of 1”-2.” This applies to all new development and significant redevelopments.

Royal County

- Rural areas with forested land have to retain 60% of the forested area and can clear only 35% of the land no matter the vegetative conditions.
- For urban areas, LID is encouraged and allowed with new development. It requires some BMP usage.
- For lots less than 10,000 ft², landowner must manage a minimum of 10% of the impervious area onsite.
- Places limits on the amount of impervious surface area for urban development.
- Incentives are established for sites reducing impervious surface area through reduced stormwater fees. BMPs include limiting the impervious surface area, using pervious pavers, bioretention cells, and rainwater harvesting.
- Grants are also available for development seeking to employ LID and convert impervious surfaces to pervious (though no parties have pursued these).
- Technical assistance is offered and manual standards can be changed to work with different green programs (e.g. green roofs that previously had no standards).

Provincial

- Title 13 requires jurisdictions to include language in their policies/codes to:
 - encourage the use of pervious materials,
 - use innovative site design,
 - landscape with rain gardens, bioswales, and other on-site treatment devices
 - minimize impervious surface area, and
 - disconnect downspouts from stormwater system to minimize stormwater impacts where practicable.

- Includes provisions for land acquisition, education, and technical assistance.
- Allows flexible site design to adapt development to natural site conditions.
- Provides site capacity incentives for avoiding sensitive habitat areas.

Pioneer City

- Encourage pervious materials in surface coverage areas.
- Stormwater management manual includes several BMPs for developers to use in unison with operations and permits. Encouragement has resulted in several innovative parking lot designs that use curb cuts, swales, and topography to slow water and naturally treat it onsite.
- Transportation system plan supports green streets practices.
- City encourages innovative designs and work with reasonable design strategies, as well as shared parking for multiple parties (where practicable). The community development director may reduce the required number of parking stalls up to 10% when it is determined that a commercial business center or multi-family project is adjacent to or within 1000 ft of an existing or planned public transit. If a commercial center is within one thousand feet of a multi-family project, with over eighty units and pedestrian access, the parking requirements may be reduced by 10%.
- Has strict landscaping requirements that encourage swales, and pipeless stormwater systems (especially for public projects).

Harbortown

- Stormwater management efforts should focus on maximizing source controls, use of vegetated pollution controls, and infiltration through surface infiltration/shallow subsurface facilities.
- For new and redevelopment, any project that creates or redevelops more than 500 ft² or makes a new connection to the stormwater system must manage stormwater onsite.
- The quantity of stormwater leaving the site after development shall be equal to or less than the quantity of stormwater leaving the site before development, as much as is practicable, based on the following criteria: development shall mitigate all project impervious surfaces through retention and onsite infiltration to the maximum extent practicable.
- Where onsite retention is not possible, development shall detain stormwater through a combination of provisions that prevent an increased rate of flow leaving a site during a range of storm frequencies as specified in the Stormwater Management Manual.
- Any development that contributes discharge to a tributary to the Willamette River, other than the Columbia Slough, shall design facilities such that the rate of flow discharging from water quantity control facilities for up to a 2-year storm does not lengthen the period of time the channel sustains erosion-causing flows, as determined by the Bureau.

- Facilities shall be designed to safely convey less frequent, higher flows through/around facilities without damage.
- Discounts are limited to 35% of the basic stormwater charge and calculated on a sliding scale based on the extent and effectiveness of private stormwater management.
- Provides a comprehensive list of BMPs, including design specifications, for developers to mitigate stormwater impacts of development.

Sun City

- Stormwater fee program charges each parcel based a calculation of land use, size, and runoff coefficient. The fee supports stormwater mitigation efforts.
- The urban runoff mitigation ordinance requires developers to ensure projected urban runoff from the project is reduced by at least a volume equivalent to the surface area of all impermeable surfaces times 0.75". Its main components are the inclusion of post construction BMPs to decrease impervious surface coverage, implementing BMPs to prevent runoff during construction, and “good housekeeping” standards to penalize those who do not comply with the policies.
- Sun City tries to promote LID. It has available information about to employ BMPs in landscaping and for streets, surfaces, parking lots, residential, commercial, & industrial developments.
- Completed the SMURF project in 2001. It is the first runoff recycling treatment facility of its kind, using filters and screening to remove grit, sand, and other particles; air bubbles to push oil and grease to the top of the water where they are skimmed; and then ultraviolet lights to kill bacteria and viruses, treating 500,000 gallons of runoff per day. The treated water is then used for landscape irrigation and indoor commercial building use.

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