Paying for Municipal Stormwater Services: A Case Study on Drivers of Stormwater User Fees in Three Massachusetts Communities

by

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Abstract

Urban stormwater is a major source of pollution in U.S. water bodies. Addressing the problem of stormwater pollution at the municipal level can be expensive, from infrastructure maintenance to implementing regulatory best practices. These needs have put pressure on municipalities to look for a stable source of revenue that extends beyond general tax appropriations for public works projects. In this context, stormwater user fees have remained a hotly debated topic in local budget discussions and national forums about stormwater management. In comparison to the rest of the country, the adoption of fees in Massachusetts communities is plagued by low uptake.

This thesis aims to understand the surprisingly small proliferation and early adaptation of stormwater user fees in Massachusetts by identifying the local drivers of fee adoption as an alternative to using local tax income in three communities: Chicopee, Fall River and Northampton. Through a descriptive case study approach using qualitative interviews and publicly available data, the research underscores four key drivers apparent in local fee adoption: financial pressure, local history, governance arrangements of budgets, and cost equity. Ultimately, communities face numerous tradeoffs that affect the momentum and intricacy of the fee adoption process. Lessons learned about the local drivers of stormwater user fees in these three cases are specifically applicable to the Massachusetts context, but can serve as a guide for other New England municipalities considering new fees.

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Chapter 1: Introduction

Urban stormwater is a major source of pollution in U.S. water bodies addressed at the local level. Every community ultimately deals with its stormwater infrastructure and effluence problems through a customized financing approach. Over the past two decades, the advent of stormwater user fees—often incorrectly dubbed as a "rain tax"—has remained a hotly debated topic in local budget discussions and national forums about stormwater management. According to a major stormwater financing database published by the Western Kentucky University in 2014, there are approximately 1,500 communities in the country with stormwater user fees; New England accounts for less than 1% of the national total and Massachusetts alone houses six of those twelve communities. Although stormwater user fees provide a new, stable source of revenue for managing stormwater programs that tackle urgent water quality issues and infrastructure improvements, the adoption of fees in Massachusetts communities is plagued by low uptake. In addition, more stringent stormwater management regulations were passed in Massachusetts in April 2016, expecting 75 percent of the communities across the state to respond with heightened planning and renewed budgetary focus on local stormwater concerns. Boston, the oldest, most populous and largest city in the state, is presently assessing the feasibility of stormwater user fees as a response to the changing regulatory context and a federal consent decree that mandates remedies on polluted discharges from existing storm drain and sanitary sewer systems (Goodison 2015; U.S. Department of Justice Office of Public Affairs 2012). As is the case with bigger cities and their ability to impact local trends, the adoption of stormwater user fees in the City of Boston could signal a greater regional impetus and acceptance of such fees within the state. Amid the backdrop of these current events, this study picks up where the database leaves off and provides a timely inquiry into the rationale for stormwater user fee adoption as a local financing approach in Massachusetts communities.

Scope

A recent stormwater survey of over 400 municipal managers, consultants and staff in New England conveys that stormwater runoff and drainage management were of very high concern to 56% of respondents and funding was by far the most highly ranked impediment to carrying out stormwater or drainage planning and implementation (New England Stormwater Collaborative 2014). More often than not, this funding impediment is influenced by a local government's interest and capacity to develop a dedicated stormwater program, which requires thought leadership, time and

collaborative effort across departments. Historically though, stormwater management has been viewed as the "organizational stepchild" and public agencies were never interested in it as a primary focus of their budgets (Apogee Research, Inc. and National League of Cities 1987, 104).

Traditional methods of funding stormwater projects have relied on federal and state grant money and local taxpayer revenue, which can become uncommitted and volatile from year-to-year. Administratively, day-to-day stormwater management functions that consist of operations and maintenance responsibilities are funded by a city or town's general fund, which is embedded within existing public works departments' (i.e. engineering, highway or flood management) budget allocations, often contending with higher priority public works projects. In addition to these organizational gaps, the changing funding landscape, inspired by national policy reforms in the latter half of the 20th century, has imposed enduring financial constraints on public works budgets as a whole—reduced federal grants coupled with taxpayer revolts have forced local jurisdictions to generate new ideas to help finance infrastructure, particularly stormwater (Apogee Research, Inc. and National League of Cities 1987, 9).

Although stormwater programs are funded via different means around the country, stormwater user fees have become a popular financing method adopted by local governments to cover both discretionary and federally mandated services (Peter Lehner et al. 1999). User or service fees are classified as payment to the government for expenses incurred in providing specific services, such as collecting and conveying stormwater to prevent flooding or managing other functions of an existing stormwater system. Stormwater user fee mechanisms vary across communities, so that accompanying financial and organizational (i.e. which department is responsible for administering the fee and implementing the services) terms reflect proportionately the breadth and vision of the local stormwater management program. Most commonly, fees are used to service the amount of stormwater pollution a property contributes to, based on the amount of runoff produced by its impervious surfaces (Conroy 2015). While user fees are generally considered a stable, equitable and publicly accepted financing mechanism, local attitudes may bar their application to finance a service traditionally supported by tax revenues, such as stormwater management (Gitajn 1984, 28).

In Massachusetts, some local governments have set a fiscal precedence with tax-based revenue approaches that has been difficult to overturn, especially due to the cumbersome nature of home

rule and its impact on municipal budgets and voting structures. Of the 351 communities in the state, 53 identify themselves as cities and 298 as towns; each form of local government follows different operating rules to sustain and fund conventional public services. If a new revenue source is to be adopted for any of those services, municipalities prepare by conducting due diligence tasks that may include researching an array of possible financing options for comparison; defining a new level of service to be provided; formalizing a thoughtful management plan to make strategic use of the revenue; and achieving public consent on a solution that is equitable and affordable for all affected stakeholders (e.g. public officials, institutions, businesses and people). This process can be particularly time-consuming and resource-heavy, reflecting the bespoke nature of local stormwater management approaches and regional planning inertia in Massachusetts. Therefore, understanding the drivers of existing stormwater user fee arrangements can provide insights on emerging financing trends and contribute to the intellectual foundation on stormwater planning needs in the region.

Research Question

This thesis aims to understand the surprisingly small proliferation and early adaptation of stormwater user fees in Massachusetts by identifying the local drivers of fee adoption as an alternative to using local tax income. I use a descriptive case study approach to explore this phenomena. Cases were chosen in early January as a subset of six communities that already had a fee in place as a dedicated source of stormwater revenue at the time. Within the sample size of six, three communities are studied here: Chicopee, Fall River and Northampton. Three were also excluded from this study for the following reasons: the Town of Reading and City of Newton were covered in-depth in multiple stormwater financing case studies done by the EPA, local watershed organizations, and planning agencies; the City of Westfield was unable to offer an interview, which was a major aspect of the research methodology here employed. To complement these cases of extant fee adopters, the study also includes perspectives from communities currently considering fee adoption. This latter effort was the result of a recommendation in conversation with Julie Conroy, Senior Environmental Planner at the Metropolitan Area Planning Council (MAPC)—the largest regional planning agency in the state—who helped illuminate that other communities were actively engaged in preliminary stormwater financing discussions. These exploratory assessments covered the City of Gloucester and towns of Ayer, Arlington, Belmont, Framingham and Shrewsbury, which put into context many current problems facing local communities.

Methodology

The case study is informed and framed by a variety of publicly available data sources. During the months of January through March, primary data were collected via phone and in-person interviews with key local government staff and other experts in the field of stormwater management. This includes directors and engineers from public works departments, environmental planners, and representatives from advocacy organizations. Thirteen interviews were conducted in total. Each interview lasted up to sixty minutes, with the intent of gathering standardized information on the following ten questions:

1. Which influencing factors began the conversation around stormwater user fees in your community? What were the primary considerations to be met?
2. Who were the stakeholders assuming primary responsibility around the issue of stormwater management?
3. How did you decide that a user fee was the right financing approach for the community? Did you consider other financing mechanisms?
4. Were there naysayers and what were they concerned about? What were the barriers to implementing the stormwater user fee?
5. How did the town build consensus for the fee?
6. How long did it take to establish the stormwater ordinance and fee? Please describe the research and planning process in detail.
7. What was the rationale behind the fee calculation?
8. Were there any implementation challenges faced after the fee was in place?
9. What benefits has the fee provided thus far?
10. What are the current issues related to stormwater in discussion by the town?

These open-ended questions were chosen to facilitate a focused interview experience and comparable responses for analysis. Specific interviewees were identified from their respective city or town websites, in combination with a snowball sampling method starting with Ms. Conroy at MAPC. Appendix 1 contains a list of interviewees for reference. In preparation for the interviews, all interviewees were provided with the background and scope of the research effort and list of questions ahead of time via email correspondence. Interview questions were posed in a conversational format so that interviewees could explain their local stormwater context and user fee narrative in a free-flowing manner. Archival data from city and town meeting minutes, budgets,

planning documents and annual reports, along with a diverse pool of local conference and workshop presentations completed the user fee profile for each case.

Theoretical Framework

In order to catalog the drivers of stormwater user fee adoption and identify statewide trends in the application of local approaches, this research employs a theoretical framework developed by Laurie Reynolds[1] that explains local government funding decisions. Reynolds, a practitioner and professor of law at the University of Illinois, acknowledges that local government funding decisions rest on a variety of case-specific considerations with some generalizations possible. In her work, user fees are defined under a broadly-termed category of "dues," or non-tax sources of revenue. She identifies numerous factors that may be important to a local government's choice between dues and taxes in any situation, four of which are particularly germane to organizing and contextualizing stormwater user fee adoption in Massachusetts (Reynolds 2004, 385–86).

1. **Lack of congruence between users and tax base**: Dues can make it possible to recoup the costs of service from groups that are tax exempt, catering to improvements in equity and fairness of charges imposed on the community.
2. **Local history**: The way a local government has funded services in the past may have a bearing on the perceived fairness of its choice between taxation and dues.
3. **Potential for specialization**: A dues technique offers several possibilities for administrative and budget specialization unavailable when general purpose governments collect general-tax revenues.
4. **Financial pressures**: With the growing prevalence of tax limits and externally imposed legal obligations, the increasingly dramatic need for more revenues coming from the local, state and federal level pushes local governments to adopt dues to fund infrastructure needs.

[1] Reynolds has focused on issues of local government law, school funding law, and regionalism, and has written various law review articles on those topics ("Laurie Reynolds" 2016).

Summary of Findings

In testing Reynolds' theory, case data for Chicopee, Fall River and Northampton provide evidence that corroborates the aforementioned four drivers of stormwater user fee adoption to different degrees. Each extensive community assessment of fee implementation validated, prioritized and expanded on the drivers comprising the theoretical framework. Key takeaways include:

- In all three cases, the most compelling reason for a municipality to support and implement stormwater user fees was financial pressure, arising from externally imposed legal obligations, regulatory and structural mandates from higher levels of government, and historical local gaps in infrastructure spending. Additional financial factors affecting user fee adoption include being able to leverage state sources of financing and responding to visible infrastructure problems in the community with new revenues.
- The fiscal history of a municipality can aid in predicting its affinity for user fees, but provides inconclusive information as a distinct driver of fee adoption. A stronger narrative around fee adoption emerges (in two of the three cases) when fiscal trends are examined under a broader umbrella of local history, inclusive of the types and quality of existing stormwater infrastructure and more importantly, the history of political progressiveness or lack thereof in local governance decisions.
- The potential to specialize fee administration by joining stormwater system needs with established sewer and flood control management approaches encourages financial and personnel efficiencies in all three budget-constrained communities. Establishing a new stormwater utility may be more advisable when a community is equipped with separate sewer systems, while integrating stormwater revenues into an existing utility or department can relieve administration costs in combined sewer communities. Ultimately, the extent to which municipal resources must be reorganized or augmented to create a robust local stormwater management program can be limited by the adoption of user fees.
- Although mitigating the payer discrepancy between taxed and untaxed users of local stormwater services never surfaced as a primary driver of fee adoption in the three communities, it served as a credible lever for persuading both governmental and non-governmental stakeholders to adopt fees. Those spearheading the fee adoption process recognized and promoted the idea that imposing the fee on everyone exerts fairness by spreading the costs of service across all stakeholders within the community. Once

implemented, the fee removed unwarranted subsidies for the use of local stormwater services and improved the accuracy of cost allocation based on a sounder imperviousness metric. However, the impact of new fees on improving equity among different consumer classes was difficult to assess given the limited scope of this study.

In summary, each community faced numerous local tradeoffs that ultimately affected the momentum and intricacy of the fee development process. Planning and implementation resources invested upfront were ultimately balanced with financial urgency, pre-existing political and administrative constraints, community perceptions, and time available for realizing the goals of establishing new stormwater user fees. Although these lessons learned are specifically applicable to the Massachusetts context, when assessed together they may serve as a partial guide for other New England communities considering new fees.

Impact and Limitations

Embracing a case study methodology for this research offered rich qualitative data on the three communities of interest. While this approach was useful in discovering a variety of considerations for stormwater user fee adopters and revealed noteworthy ideas for future research, it had some limitations:

- Even though broader themes were identified in the findings, they were inherently confined to the local sub-regions explored in Massachusetts and could be extended to New England at the most. Experiences were region-specific and could not be easily generalized to a larger sample of cases across the country.
- The qualitative nature of data captured and lessons learned preclude quantitative analyses of results, especially given the smaller sample size of the study itself. The choice of study design was not intended to support statistical methods of analyses or benchmarking against a comparison group. Instead, the methodology contributed to in-depth and broader understanding of the issues surrounding stormwater user fee adoption.
- Three cases became the focus of the study primarily because of interviewees' willingness to participate. Given the opportunistic tactic pursued in case selection, data collected may not be free of validity issues. Interviews conducted on the phone obligated quick rapport-building, which was challenging with some interviewees who may have preferred in-person conversations. The loosely structured interview format and compressed timeframe allocated

for each interview, coupled with the number of interviewees available to corroborate data for each case may have also affected the reliability of the study. Although data were cross-referenced with publicly available information of other forms external to interviews, speaking with multiple interviewees within each community could have introduced new knowledge and improved the evidence presented in cases.

These shortcomings may warrant future studies on stormwater user fee adoption to use a larger sample size, assume a different research method, or address a different type of research question for the methodology used herein.

The Stormwater Runoff and Pollution Problem

Stormwater is generated from rainfall and snowmelt, becoming runoff when it flows over land or the built environment without soaking into the ground. Picking up pollutants along the way, stormwater runoff can join with commonplace substances such as pet waste, leaves, soap, oil, pesticides from lawns, fertilizers, and many other sources of natural and man-made pollution. Most polluted runoff is collected and directly channeled into local water bodies such as creeks, ponds, lakes and rivers via miles of underground piped infrastructure. Unlike drinking water and wastewater resources, stormwater runoff is not treated and represents the single largest source of water quality impairments in the Commonwealth (Massachusetts Department of Environmental Protection 1997, 1). This problem of polluted stormwater runoff dates back to the mid-1800s and relates closely with Massachusetts' rapid urbanization trends since. In keeping pace with population growth of over six-fold (U.S. Census Bureau 2012) and economic expansion over the last century-and-a-half, real estate development has altered natural hydrologic systems and exacerbated the problem of stormwater runoff pollution—both the magnitude of runoff from impervious surfaces (roadways, parking lots and rooftops) and the concentration of pollutants in the runoff have increased, leading to higher runoff peak rates and volumes during wet-weather events, reduced groundwater and freshwater recharge, and greater discharge of pollutants to wetlands and water bodies (Peter Lehner et al. 1999). In simple terms, improper stormwater management has led to two non-exclusive problems that are worsened by the impacts of climate change: flooding and water pollution.

Figure 1: Stormwater Problems

Stormwater runoff flows over impervious surfaces and directly into local creeks and larger waterways. Photo Credit: Chesapeake Bay Program: https://flic.kr/p/8ScZ6J

Water quality monitoring shows that this outlet of Winn's Brook into Little Pond in Belmont has some of the highest bacteria levels in the entire Mystic River Watershed. Photo Credit: Alan Wirzbicki.

Sources: DiPasquale 2014; The Editorial Board 2015

Climate Change Impacts on Local Stormwater Ecosystems

The quantity and quality of water resources in the U.S. are affected by a variety of climate stressors, including increasing temperatures, changing precipitation patterns, and more frequently occurring extreme events. Climate scientists recognize these fluctuating weather conditions as impacts of climate change that have implications on many local issues, stormwater management being one of them. The Third National Climate Assessment published by the U.S. Global Change Research Program in 2014 identified the following climate considerations and pressures that may compel municipalities to invest in new stormwater strategies and infrastructure to protect human health and water quality (Melillo, Richmond, and Yohe 2014, 410, 425):

- The increase in heavy downpours could increase flood risk in mixed rain-snow and rain-dominant basins, and could also increase stormwater management challenges in urban areas.
- There is an imminent threat of increased inland flooding during heavy rain events in low-lying coastal areas, where just inches of sea level rise will impair the capacity of stormwater drainage systems to empty into the ocean and increase the vulnerability of homes and social infrastructure.
- Adaptation options that are being assessed in vulnerable locations include the redesign and improvement of storm drainage canals, flood control structures, and stormwater pumps.

As local decision makers look to preserve, improve and expand existing stormwater infrastructure, they face the added challenges of more frequent and intense storm, rainfall and snowfall events leading to increased flooding and stormwater runoff (McCormick and Dorworth 2011, 1). With tools and guidance from the EPA, states, and other invested stakeholders, local governments are expected to prepare for these natural hazards and safeguard the long-term sustainability of stormwater systems, thereby contributing to fewer disruptions in the local economy and improved human safety. A key aspect of this also includes working with federal emergency management and insurance protection programs to mitigate natural disaster damage through mapping and community engagement efforts. Local commitments on stormwater management are therefore expected to incorporate climate change adaptation and mitigation strategies yielding to major financial consequences. Ultimately, tackling the stormwater impacts of climate change requires thoughtful planning and coordination across sectors, notwithstanding leadership, intellectual resources and capital investments from cities.

The Evolution of Stormwater Systems, Policies and Financing

The connection between stormwater, the quality of local environments and the quality of life in communities is seldom readily apparent. Unless perceived as an immediate public hazard, such as a local flooding event that causes property damage or the contamination of water supplies due to poorly maintained drainage infrastructure, stormwater can be invisible. It has slipped under the radar as a subject of public interest, especially in the domain of environmental protection. What follows is a historical review of public sewerage systems, policies and financing tendencies to help illuminate why this might be.

Prior to the mid- to late nineteenth century, water supply, drainage and sanitation systems in America were individual responsibilities. Epidemics, often caused by water-borne diseases and poor sanitation, plagued cities in the age of miasmas[2] (Melosi 2008). Following quick developments in the public waterworks system, which placed high importance on access to "pure and plentiful" water, financial investments in underground wastewater systems were difficult for cities to justify until old cesspool-privy vaults began to fail (Melosi 2008). This technological clash between piped water-delivery systems and pre-sewer systems caused major flooding problems, elevating public health threats in support for the environmental sanitation movement. An engineering solution inspired by European practices, the combined sewer system, was introduced in the 1860s to handle both domestic waste and storm water in one large pipe. As knowledge about drainage systems and medicine matured into what sanitation scholar Martin V. Melosi (2008) refers to as the "Era of Bacteriology," municipal engineers took responsibility for providing basic water and sanitation services through large-scale project planning and centralized administration of sewerage systems. Bigger, densely populated cities favored combined systems due to the capital-intensive nature of permanent citywide infrastructure networks, while smaller cities and towns adopted separate sewer systems with two pipes—one for sewage and the other for stormwater (see Appendix 2 and 3 for illustration). "Sewers were expensive, and the decision to implement them was unlikely to sail through many city council meetings without some disagreement. In Boston, for example, sanitary projects absorbed about one-third of the city's total budget in the late nineteenth century" (Melosi 2008, 103). As their authority over construction and management of water infrastructure became more pronounced, local governments sought to fund projects by assuming debt or relying on tax

[2] During the age of miasmas, public health ideas blamed disease transmission on decaying matter, foul smells, and `bad air' (Melosi 2000, 1).

monies from general fund allocations. The exponential growth in municipal expenditures and bureaucratic expertise also created a perfect storm for the dawn of home rule, officially shifting political power from state capitols to city halls.

The industrialization boom fueled urban development by enabling the expansion of public waterworks and sewerage systems among other critical technological improvements. With newly constructed sewers discharging into nearby waterways and causing bacterial pollution, the basic practice of dilution was challenged. Public health concerns in the early 1900s placed an increasing emphasis on water filtration and pretreatment of sewage prior to disposal. Disinfection and systems management continued to be a local government responsibility, while regulation occurred primarily at the state level (Perch 2016). Basic state level regulation and interstate compacts on water pollution were introduced over the next few decades, but with lax enforcement. As city boundaries were being pushed out, the quick adoption of engineering marvels led to growing pollution concerns that demanded a more sophisticated environmental outlook on water quality from biological to chemical contaminants (Melosi 2000, 254). Most notably, public health and engineering deliberations were focused on "end-of-the-pipe" pollution problems—an unanticipated result of design choices made during the construction of combined and separate sewer systems—that continue to be the focus of modern day water quality regulations.

The economic slump caused by the Great Depression of the 1930s further exacerbated problems of water pollution. Overstretched water supplies and waning local sources of funding drew attention to regional and national interests in pollution control, paving the way for federal involvement in local issues. The New Deal provided an infusion of federal funds for developing wholesome public water systems including treatment facilities and distribution networks, especially for smaller communities (Association et al. 1976, 231–32). At the same time, the federal government began assuming greater responsibility for flood control programs. The U.S. Army Corps of Engineers took the lead in managing local flood relief and dam construction projects to protect communities from natural disasters. These events were closely shadowed by a series of national legislation on flooding and water pollution control principles that extended federal funding to states and local governments: The Flood Control Act of 1936, Federal Water Pollution Act of 1948, Federal Water Pollution Control Act Amendments of 1961, and Flood Insurance Act of 1968 (Association et al. 1976, 251; Melosi 2000, 255).

The mid-1960s set the stage for water pollution prevention and control through water quality and effluent standards—a first in establishing real legislative teeth on this topic. The Water Quality Act of 1965 was the lynchpin of federal pollution control and enforcement, critically impacting state level regulations that are in use today. It mandated states to adopt "satisfactory" interstate surface and ground water quality standards, develop plans to meet those standards, and abate pollution over a specified amount of time, all subject to federal review and approval. Although data linking pollution to polluters was largely unavailable, making the act ineffective as a regulatory tool in its nascence, it nonetheless served a symbolic purpose in elevating the importance of water quality for ecological health and recreational use (DC Bureau 2016). More importantly, the involvement of federal administration provided for the first time comprehensive planning, research, technical support, and financial assistance for sanitation sewerage to states and municipalities (Willrich and Hines 1967, 63–66).

At the same time, the federal government developed stronger social welfare programs (social security, employment, food stamps, education etc.) to eliminate rampant poverty resulting from the Depression era that shifted attention from much needed spending on infrastructure operations and maintenance—44 percent of total federal aid to state and local governments was earmarked for public works in the mid-1960s, while the amount dropped to 25 percent in 1980 (Bridges 1991, 203). Investments in water infrastructure declined as systems were aging and showing signs of deterioration. Indispensable monitoring of leaks and breaks escaped the attention of public officials after an initial emphasis on construction projects, in response to diminishing municipal funds subject to emerging anti-tax sentiments and caps on borrowing capacity. Rising demands on shrinking local budgets were further aggravated when the U.S. Environmental Protection Agency (EPA) was established in 1970, introducing a string of water quality regulations on specific contaminants that placed a majority of the compliance burden on municipalities (Melosi 2000, 258).

The Federal Clean Water Act (CWA) of 1972, an amendment of the Federal Water Pollution Act, became a defining moment in national water quality legislation history. It set pollution reduction goals in surface waters by mandating wastewater treatment and placing limits on discharges from

point sources[3] under the National Pollutant Discharge Elimination System (NPDES) permit program. Polluters were required to obtain a permit or license to discharge specific quantities of a pollutant into receiving waters. "The goals were meant to change the basic strategy of federal water quality management by replacing in-stream (ambient) water quality standards with limits on the discharge of pollutants from industrial point source discharges and municipal wastewater treatment plants (technology-based standards)" (Melosi 2000, 258). The act also provided wastewater financing in the form of grants, where the federal share of project costs was generally 55 percent and state and local governments were responsible for covering the remaining 45 percent (Copeland 2012, 2). These federal monies only subsidized new construction or major rehabilitation projects. As a result, some cities built larger treatment plants with higher engineering standards than they would have on their own. The proportion of federal aid increased at a faster rate than had cities' internally generated funds, making it difficult for local spending capacity to make up for the difference (Pagano and Moore 1985, 76).

Amendments to CWA in 1987 changed the federal financing vehicle from grants to loan programs, which increased the financial burden on local governments to 100 percent. These regulatory amendments were based on a renewed understanding of nonpoint source pollution[4] and stormwater runoff, different from the pandemic and point source concerns of previous decades. The Bureau of Census reported a 10% decline in federal public works outlays that was matched by no improvement in state disbursements and a mere 6% increase in local government expenditures (Apogee Research, Inc. and National League of Cities 1987, 5). In decades to follow, municipal jurisdictions were fraught with the twin constraints of reduced wastewater funding and added costs of complying with new stormwater laws that emerged without any promise of federal or state financial support.

Consequently, contemporary stormwater programs have evolved from single-purpose drainage systems to multipurpose programs, merging urban drainage, floodplain management and stormwater quality regulatory agendas, each with different financing paradigms:

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[3] "The term 'point source' means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, or container, from which pollutants are or may be discharged" (U.S. Environmental Protection Agency 2016a).

[4] "Nonpoint source pollution generally results from land runoff, precipitation, atmospheric deposition, drainage, seepage or hydrologic modification. Nonpoint source (NPS) pollution, unlike pollution from industrial and sewage treatment plants, comes from many diffuse sources" (U.S. Environmental Protection Agency 2016a).

> "Urban drainage was seen as a general purpose local service to remove excess water from properties and streets, which was appropriate to finance from the general fund. Floodplain management responsibilities were imposed on local governments, and federal grants were available initially to assist in their implementation. Stormwater quality regulations were imposed gradually, and became a mostly unfunded mandate" (Grigg 2013, 7).

The delayed emphasis on stormwater as a natural resource of regulatory interest accompanied by an already tight fiscal climate clouded its significance as a separate line item in local budgets; tax revenues showed trivial signs of growth in cities with burgeoning populations, never recovering from the budget squeeze of the late 1980s (Bowman, MacManus, and Mikesell 1992). Local governments, especially in Massachusetts, sought alternative means of financing stormwater management with non-tax sources of revenue as a last resort, lending to the slow growth of stormwater user fees. Although understanding of stormwater financing has matured since then, the topic attracts national attention even today (Kaye LaFond 2015), proposing important questions about organizational efficiency, financial change and public participation in stormwater management at the local level.

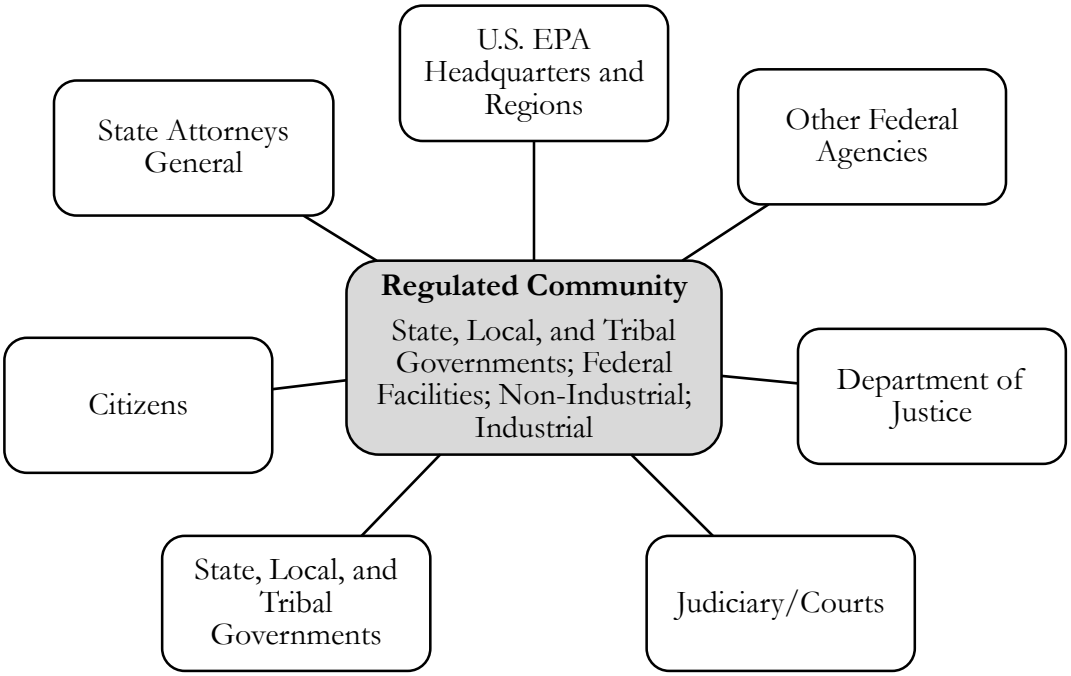
Contemporary Concerns in Municipal Stormwater Financing

The purpose of 21st century stormwater financing has been primarily associated with meeting the cost of water quality policy compliance and infrastructure management needs at the local level. Municipal stormwater management has become hyper-specialized and complex, influenced by an improved understanding of conventional and toxic pollutants, multiplying regulatory pressures, technical and non-technical solutions to pollution abatement, the changing landscape of public finance tools, and physical stormwater infrastructure conditions (Reese 2001). These contextual factors have isolated the actors who enforce policy at the federal and state level from the actors who implement them on the ground, setting the stage for diverse stormwater user fee financing approaches adopted by regulated communities nationally.

As shown in Figure 2, the EPA and other federal and state agencies play the role of regulators, set standards and amend policies on stormwater management, while municipalities comprise the regulated community. The capacity of local governments to effectively oversee those who are within their political boundaries in order to comply with stormwater regulations is disparate across communities and varies on a case-by-case basis, making it difficult to estimate or generalize local

costs of compliance. While local stormwater management programs are tailored to their individual needs, they are all guided by the broader stormwater policy context, which serves as a motivation for short and long term municipal finance decisions as outlined in the following section.

Figure 2: Key Actors in the Enforcement of Pollution Control Laws



Source: Esworthy 2014, 1

Federal and State Stormwater Policies Mandating Local Action

There are a variety of federal and state policies that shape local stormwater management. These include NPDES and water quality standards that apply to polluted water bodies.

1. The Federal NPDES Permitting Program

Stormwater pollution is defined and regulated under the EPA's NPDES permit program. NPDES issues permits to transport untreated stormwater into receiving water bodies from two municipal point sources of pollution: combined sewer systems and separate storm sewer systems.[5] Addressing and mitigating the water quality impacts of the overflow problem caused by excess stormwater is at

[5] Officially termed as Municipal Separate Storm Sewer Systems (MS4s) under the NPDES program. The term MS4 does not solely refer to municipally-owned storm sewer systems, but rather is a term of art with a much broader application that can include, in addition to local jurisdictions, State departments of transportation, universities, local sewer districts, hospitals, military bases, and prisons. An MS4 also is not always just a system of underground pipes – it can include roads with drainage systems, gutters, and ditches. (U.S. Environmental Protection Agency 2000b)

the core of the NPDES wastewater and stormwater permitting programs. Communities that have both types of (combined and separate sewer) systems deal with various aspects of the NPDES program as needed. Since the majority of current and future changes in permit compliance are heavily focused on separate sewer system discharges, the following section focuses solely on describing the national stormwater program.

The NPDES stormwater permitting program has been administered by the EPA in two phases:

- Phase I of the program was initiated in 1990 and applied to significant contributors of pollution—medium and large cities with populations of 100,000 or more. These cities were required to obtain individual MS4 permits for each polluting facility they own and develop tailored stormwater management programs to implement a variety of stormwater control best practices (i.e. educating and involving the public about stormwater impacts, detecting and eliminating illegal MS4 connections, managing runoff from construction sites, and good municipal housekeeping). Best practices, intended to reduce water pollution to the "maximum extent practicable" and help attain state-specific water quality standards, are tailored to a community's needs and make up a portion of the local government's annual stormwater budget along with other costs of acting upon NPDES permits. As of 2012, approximately 900 MS4s were regulated under Phase I according to EPA estimates (U.S. Environmental Protection Agency 2000b).
- Established in 1999, Phase II of the program expanded regulatory purview over small MS4s in urban areas with a population of at least 10,000 and population density of at least 1,000 people per square mile. Stormwater compliance was essentially extended to all MS4 communities that were not covered under Phase I of the program with a few exceptions. Regulated communities applied to be covered under a general permit[6], which accommodated for administrative efficiencies from an enforcement standpoint. General permits were also to encourage shared responsibility in stormwater program development and implementation between local MS4 operators; the intent was to promote regional approaches and cooperation of smaller polluters at the watershed scale to tackle the problem of water quality impairment (U.S. Environmental Protection Agency 2000a).

[6] "A permit which covers an entire class of discharges within a geographical area is called a general permit" (Dodson 1999, 14; U.S. Environmental Protection Agency 2016b).

The EPA has retained oversight over the NPDES program, while delegating permitting and enforcement authority to states that have requested it and met specific qualifications. For delegation to occur, the state must have passed authorizing legislation at least as stringent as the federal standard while demonstrating that it has adequate resources to run the program, which involves reviewing and approving environmental permits, monitoring and assessing noncompliance, providing compliance assistance and information to the regulated community and the public, conducting inspections, and taking enforcement actions (Esworthy 2014, 11). Local government authorities also play a role in permitting and monitoring, but generally act within the context of upholding states' requirements. Only four states—Idaho, Massachusetts, New Hampshire and New Mexico—are not delegated to carry out the stormwater permitting program. In these states, programs are considered jointly run by the designated state agency and EPA; the EPA's regional office becomes the enforcement arm directly responsible for preparing and updating stormwater permitting regulation for the state and assumes the costs of operationalizing the program. The potential implications of state delegation on local stormwater program financing are further explored in a later section of this research.

2. State Water Quality Regulations

The NPDES program is part of a larger federal effort to safeguard the health of U.S. water bodies under CWA. States are required to develop and adopt overarching water quality standards for each water body within their authority such that the particular water body meets expectations of designated uses (i.e. drinking, recreation, agricultural or protection of aquatic life) based on established criteria to protect those uses in conjunction with existing water quality conditions. Within this framework (as described in Appendix 4), states also develop lists of impaired waters every two years that are made publicly available, once approved by the EPA. These are waters for which existing regulations and controls are not stringent enough to meet the water quality standards set by states (U.S. Environmental Protection Agency 2015a). To address these impaired water bodies, states are required to prioritize and develop Total Maximum Daily Load (TMDL[7]) plans for them, with feedback from local government counterparts. The pollutant budgets projected in TMDL plans are yet another way of setting limits on point source pollutants generated by local

[7] A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards; based on scientific water quality monitoring and watershed modeling data, it determines a target for pollutant reduction and allocates reduction limits to source(s) of the pollutant, ultimately linking uses of the water body with causes of impairment (U.S. Environmental Protection Agency 2015b).

stormwater conveyances and feed into NPDES permits, such that those who seek permit coverage to discharge into impaired waters identify and incorporate TMDLs as relevant to them. Not only are municipal offices closely involved in the creation and implementation of TMDL plans, they serve as a point of contact in affected jurisdictions, and play an important role in improving the quality of impaired water bodies by integrating TMDLs into their Storm Water Pollution Prevention Plan (SWPPP) or Storm Water Management Plan (SWMP). All in all, local oversight can become overstretched in smaller communities where multiple layers of such CWA mandates apply. In states where EPA delegated authority is lacking, the burden may be equally steep for local EPA offices and concerned municipalities, making enforcement more expensive and challenging from a resource standpoint.

Public Budgeting Practices Endorsing Local Financial Transparency

Problems and practices in public budgeting have evolved with the escalating demands of urban growth, public policies and local constituencies. The foundations of American budgeting were rooted in achieving municipal fiscal control. Budgeting reforms transformed lump sum budgets representing little or no detailed information into line-item budgets with revenue and expense estimates in the early twentieth century, followed by performance measurement, goal-setting and an emphasis on results (Tyer and Willand 1997). As the role of government expanded, the budgeting process went beyond data collection to focus on achieving efficiency, accountability and transparency in the eyes of the public. Today, municipal agendas are a reflection of these changes and the growth of centralized urban infrastructure and services alongside changing fiscal relationships between federal, state and local governments. In adapting current-day stormwater budgets to accommodate various revenue sources, municipalities have tried to address administrative challenges with contrasting levels of clarity—embedding stormwater funds in existing public works line items, creating a new budget category for stormwater funds, or augmenting sewer accounts with new revenues from stormwater funds. In practice, these budget management approaches send a signal to the public about the significance of stormwater management in local financing decisions.

Chapter 3: Understanding Stormwater User Fees

Stormwater management is only one of the many services that local governments provide and raise revenue for. Americans have relied on their local governments to provide a myriad of staple traditional, municipal and urban services—total local spending has doubled and the local government workforce has increased by 45 percent over the past 25 years (Ingram and Hong 2010, 82). With an ever-expanding portfolio of public expectations, local governments are obliged to manage large sums of own-source revenue consisting of tax and non-tax income, sometimes leading to the creation of new organizational units with revenue raising powers such as special districts and utilities. "When a local government decides to provide a service, improve or construct infrastructure, or regulate private activity, the question of how to pay will generally be an important consideration. In simple terms, the first, most fundamental decision the government must make is whether to resort to taxation powers or to use a more narrowly targeted revenue device" (Reynolds 2004, 378). Local governments possess the authority to levy taxes to cover broad operating costs of everyday functions. Taxes collectivize the cost of service and spread it across the taxpaying population; they are collected without consideration of whether the individual taxpayer will benefit from specific services funded by the tax and ensure that services compete against each other in the local political process for a share of the general revenue pie (Reynolds 2004, 379). Property taxes are the most commonly collected form of local tax, while the authority of local governments to levy sales, income and other taxes vary from state to state.

User fees on the other hand provide one form of non-tax revenue and connect the payer to the receipt of specific government services. At a very basic level, "the fee signals that the individual beneficiary or group beneficiaries receive something beyond those services normally available to the general public and covered by taxes" (Baker 2010, 67). They present the local government with an opportunity to quantify the direct benefits or cost offsets generated by centralized municipal systems and public amenities. A non-tax charge that classifies as a user fee must qualify two conditions: the payer receives benefits commensurate to what is being paid for and the payee earmarks collected revenue to deliver only those activities or services that the fees are levied on, restricting what the revenue can be invested in. In some cases, user fees can be subject to public choice, such that the payer opts into a system or facility offered by the local government. For example, a new water connection might warrant upfront and recurring fee charges based on the actual consumption of

water. Access to accurate usage data and monitoring systems are therefore an important aspect of setting reasonable user fees. Traditionally, user fees have been generally accepted for transportation, water, sewage and solid waste collection services.

Advocates of user fee funded programs focus on their ability to promote economic and resource allocation efficiencies, enhance government accountability, and improve the basic principle of fairness (Duff 2004, 396). The premise of earmarking revenues to expenditures can improve the political viability of user fees. Critics propose that user fees can be more regressive (i.e. the burden falls more heavily on poorer segments of a community) than tax instruments if charges are constant across income levels and ignore relative differences in consumption of public services such as amount of garbage disposed or use of essential local utility services (Reynolds 2004, 380). The aforementioned argument has questioned the very nature of public provision as one that is inherently equitable and accessible to all. Critics also argue that adopting user fees for providing an existing public service can compromise the budgetary flexibility of the same service that was once fungible under tax stipulations within the city budget. While justifications for and against fees differ on a case-by-case basis, the flexibility of user fee programs cannot be overlooked—local governments may choose to fund activities through a combined application of both taxes and user fees. In some cities, general tax revenue might cover capital costs such as infrastructure construction and major repairs, whereas related operating costs may be covered by the user fee. Although economists have written extensively about the tradeoffs between revenue collection devices and basic conditions for local support of user fee programs, a historical perspective on the user fee movement offers valuable context for the ongoing stormwater user fee debate in New England.

User Fees as an Alternative Source of Local Revenue

The popularity of user fees as a revenue diversification mechanism for city financing reached unprecedented heights in the 1980s, triggered by federal cutbacks, fiscal devolution, restrictions on state and local borrowing capacity, and increasing mandated expenditures imposed on local governments. Although local reliance on property taxes declined, giving into other forms of sales and income taxes, the relative drop in tax revenue was adjusted by a corresponding growth in revenues provided by user charges and intergovernmental transfers (Gell 1979, 22). In 1984, user fee revenue for municipal sewerage services covered 50% or more of sewerage expenses for about 80% of all cities in the country with a population greater than 5,000 (Downing 1992, 516). The adoption

of sewer fees was not only influenced by the broad acceptance of user fees as a legitimate own-source revenue mechanism, but encouraging changes in national funding strategies—to prevent over reliance on federal monies and strengthen municipal budgets, federal construction grants for municipal wastewater treatment plants were made conditional upon cities collecting user fees instead of ad valorem taxes as a steady source of revenue for service provision (Walker 1974). The EPA published various guidance reports encouraging states, local officials and utility managers to build public support for user fees. One report specifically stated that "in the past, federal and state construction grants kept wastewater treatment costs artificially low," and another urged state regulators to think about "system solvency" based on "healthy user charges that support operation, maintenance, replacement and repayment" as federal funds replaced grant programs with loans. (Farmer and Rollins 1989) While state revolving funds were established for wastewater and drinking water, stormwater was dependent on fluctuating federal grants providing little financial stability for stormwater management. Given a lack of existing stormwater funding options and the successful proliferation of standardized user charges for wastewater financing as its precursor, a similar conceptual shift in stormwater financing followed suit in decades to come. The degree to which this shift occurred is nevertheless debatable across communities, as stormwater user fee programs have received mixed public support and assumed heterogeneous organizational regimes and fee structures across the nation.

Stormwater User Fee Statistics in the U.S.

Over the past two decades, the number of communities that have adopted user fees to manage stormwater has grown fourfold (Peter Lehner et al. 1999; Warren 2014). This may seem like an encouraging statistic, but a majority of communities still fund stormwater through property taxes paid into their general funds despite the increasing costs of stormwater programs—regulatory requirements (stormwater Phase I or Phase II), flooding concerns, water quality issues and population growth have triggered the need for multi-disciplinary yet streamlined stormwater plans and higher financial commitment from local governments ("Funding Stormwater Programs" 2009, 2). According to the EPA, user fees provide financial relief in a more equitable manner than taxes, by charging all contributors to stormwater runoff. This includes tax-exempt properties such as government offices, schools, universities and non-profit organizations that generally do not pay for public stormwater management services. User fees are typically based on the impervious area on a property and the most widely used method calculates a monthly or quarterly fee per Equivalent

Residential Unit (ERU). An ERU is the average impervious area on a single family residential parcel, although some communities define it as the average of all residential parcels; fees for non-residential properties are based on the ratio of the parcel impervious area to the ERU (Warren 2014, 2). In practice, communities have adopted many different types of fee systems ranging from flat to tiered rates based on impervious area or some other variable, reflecting either a proxy for stormwater management costs or actual outlays.

The Western Kentucky University's 2014 Stormwater Utility Survey compiled by Professor Warren Campbell and his students, is the most comprehensive and often cited report containing user fee statistics nationwide. Although the report does not specifically distinguish between stormwater "utilities" and "user fees," the data collected more accurately reflects communities with stormwater user fees, which is the interpretation adopted for the purposes of this research. Building upon a seven-year-long effort, the report's accompanying database provides a valuable summary of user fee adoption in U.S. communities based on web searches and phone calls to city offices, highlighting approximately 1,500 communities with varying stormwater user fee financing approaches. According to the data, the State of Florida recorded the highest number of communities with stormwater user fees at 159, followed by Minnesota at 139. The smallest community to adopt a stormwater user fee was Indian Creek Village in Florida, with a 2010 census population of 88. In stark contrast, the City of Los Angeles housing 3.7 million people also adopted a stormwater user fee in 1993. The report acknowledges that "no community is too small or large to have a stormwater user fee" and identifies a lack of clear statutory authority as a key obstacle to user fee adoption, while suggesting that user fee programs tend to cluster geographically (Warren 2014, 1, 14, 16). To further understand why user fees form more freely in some states than others, it recommends future research on factors affecting stormwater user fee adoption within states.

In response, this thesis is based on a descriptive analysis of the drivers of stormwater user fees in Massachusetts communities. The state was chosen because it is the highest population and most number of stormwater user fee communities in EPA's New England region. Among the nine other EPA regions, New England contains the fewest communities with stormwater user fees. Choosing to work within the State of Massachusetts also yielded to pragmatism, given the geographically accessible nature of the communities, knowledge base and network required for this research. Lastly,

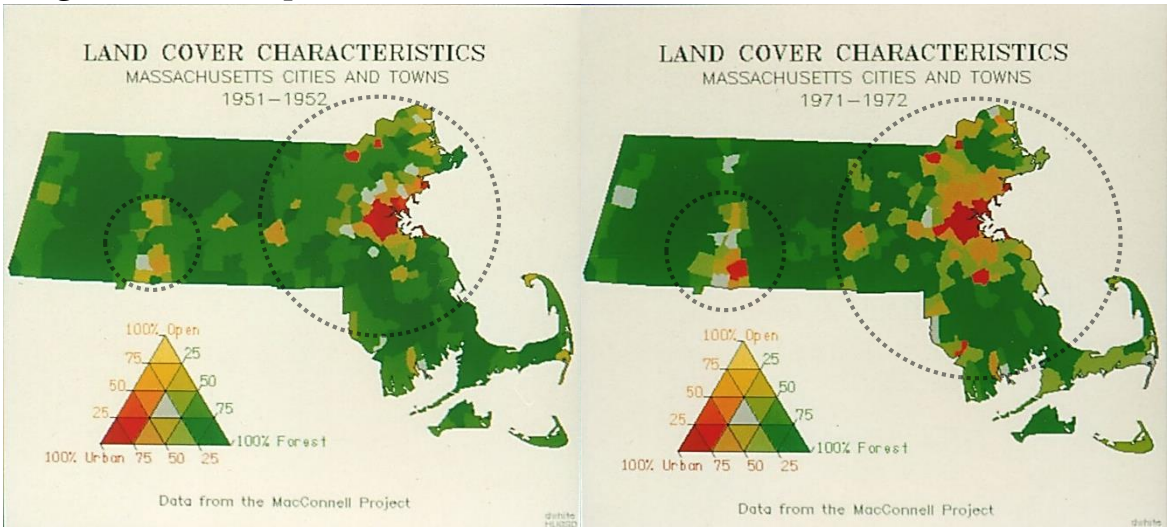
research published on the topic of stormwater user fees has not reported on drivers in relevant Massachusetts communities using the approach this study proposes.

Chapter 4: The Macrocosm of Stormwater Financing in Massachusetts

Stormwater is a watershed issue that extends beyond political boundaries. The natural course of stormwater runoff and its tendency to flow downhill can cause an uneven burden on both environmental and man-made drainage systems across municipalities. Receiving waters in the affected watershed can experience radically different flow regimes and introduction of pollution sources than they did prior to urbanization (National Research Council 2008, 109). In dealing with the costs of pollution, urban stormwater financing problems require the merging of local thinking and watershed level perspectives, where watershed boundaries are different from municipal lines of oversight (Wilkinson et al. 2014). The State of Massachusetts is divided into 28 watersheds and 351 municipal jurisdictions, which suggests a challenging governance environment for stormwater management. At the same time, urban growth has led to land use change and an increase in impervious cover that is reengineering the quantity and quality of stormwater drainage across the communities (Homa et al. 2013, 203). In trying to visualize this development over the past fifty years, a search for statewide data revealed discontinuous information about urbanization rates. A few maps and indicators were used to bring together various sources to provide an overview of land use change in Massachusetts, starting with Figure 3 in the early 1950s. Data from the Massachusetts Audubon Society's *Losing Ground* series published in 1987, 1999, 2003, 2009 and 2014 revealed increasing urban land use patterns over time: as of 2013, an estimate of 1.1 million acres were developed, representing 21 percent of the state, in comparison to 775,000 acres or 15 percent in 1971 (T.E. et al. 2014). Most of this development has occurred in the eastern half of the state. It confirms that expansion in residential, commercial and industrial development has transpired at the expense of agricultural and forested land. A brief chronological snapshot over the years leading to present-day concerns of sprawl is presented in Figure 4.

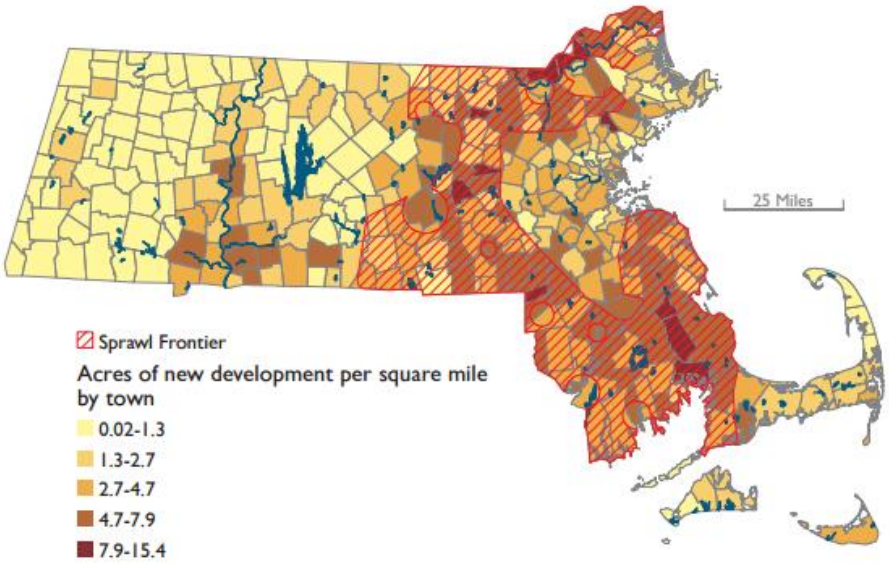
The urbanization narrative is not only interlinked with hydrology and impacts on stormwater, but also with the political makeup of local governance frameworks. Massachusetts houses some of the oldest cities in America, governed by actual and perceived state-specific restrictions on local decision making patterns as described in the next section.

Figure 3: Urban, Open and Forest Land Cover in Massachusetts from 1951 to 1972[8]



Source: White 1981

Figure 4: Recent Development Trends in Massachusetts, 2005-2013



Source: DeNormandie and Corcoran 2009, 4

[8] Data for these maps were taken from a series of publications by William P. MacConnell, Professor Emeritus of Forestry of the University of Massachusetts at Amherst, whose areas of expertise were aerial photogrammetry and remote sensing, forest and watershed management, and geographic information systems (University of Massachusetts Amherst 2007).

The Perceived Impact of Home Rule on Local Stormwater Management

Ten states in the U.S. follow the home rule system of political autonomy at the local scale, which took flight in the early 1900s as a response to a need for more local government authority and state delegation of power. Within the local sphere, there are four categories in which the state allows discretionary "home rule" authority: structural, functional, fiscal and personnel (National League of Cities 2013). Home rule authority was granted as a constitutional guarantee to cities and towns in Massachusetts in 1966, much after the first wave of adoptions occurred around the country. Although Massachusetts is considered a strong home rule state, municipalities here are far from autonomous and operate subordinate to the state. The stricter, more rigid composition and cumbersome administration of home rule in the state not only limits local governments' fiscal and policymaking power, but also limits regional cooperation on watershed issues as cities and towns resist efforts that impinge on their local control.

As a result, exercising home rule has become a catch-22 in Massachusetts; it has actually encouraged local governments to operate on an as-is basis to limit state oversight and make use of local discretion. Dealing with home rule simply becomes a test of local strength to stomach the uncertainty inherent in the home rule process—the choice between responding to transparent and uniform standards that are part of the state's general laws, no matter how arduous they are, or taking on a new process under home rule that may not reach the gates of success. According to a research report published by the Rappaport Institute for Greater Boston, "a review of the home rule provisions in the state's constitution, as well as the judicial decisions that have interpreted them, reveals that the state has one of the most restrictive home rule amendments in the nation. The state's limitations on home rule significantly impact the day-to-day activities of the region's municipal officials, structuring their choices and affecting the kind of policies they can pursue" (Barron, Frug, and Su 2004, xi). On the other hand, home rule plays a symbolic role and encourages localities to remain attached to their home rule sentiments even if the amendment does not work in practice. This further aggravates inter-local relationships and joint problem-solving within smaller regions of the state.

Although access to home rule signifies the local government's ability to act on its self-governing capacity in theory, the state can overrule any local decision on any matter at any time—the state's virtually unlimited power to overrule local action prevents a city or town from exercising the power

actually granted to it by home rule and subordinates local decisions to state enacted legislation (Barron, Frug, and Su 2004, 8). This is especially important in considering a local government's approach to financial growth. In Massachusetts, the state controls local tax rates and policies, with a bias toward property taxes for augmenting local revenue. Other forms of own-source revenue, such as fees, qualify under home rule only as long as the state law permits them. Stormwater user fees are an example of this. While Massachusetts passed state legislation authorizing municipalities to establish a stormwater utility and charge fees to cover stormwater services in 2006, only six communities have instituted stormwater user fees that are officially being implemented on the ground; many communities have passed local stormwater ordinances that give them the legal right-of-way to implement a stormwater user fee system, but have not yet acted upon it by charging fees or setting up a stormwater utility for managing revenue streams. Two potential reasons for this slow uptake may be embedded in the home rule puzzle: the complicated nature of the municipal budgeting process and cumbersome rules of operating under differing forms of local government.

Municipal Budgeting Process

State control over a local government's finances creeps into municipal budgeting practices that weaken local commitments to projects and services that are not pre-mandated or financially secured by the state. In Massachusetts, restrictions on local revenue-raising powers are amplified by expenditures that result from state provisions attempting to ensure minimum levels of quality for certain municipal services. Examples include a state law that mandates a minimum educational spending level for every city and town; a state requirement to provide health insurance to municipal employees through a specific state-approved system; and state regulations that control local public works projects (such as uniform wages for police officers at street construction sites regardless of project size or location) thereby increasing the local budgetary needs of unfunded mandates (Barron, Frug, and Su 2004, 33, 35).

In an ideal world, municipalities set budgets based on an independent assessment of local needs, which translates to cost estimates that must be aligned with some means to pay for them. In Massachusetts, local expenditures are a function of unfunded state mandates and a mélange of integral local government services not dictated by the state—the tug-of-war between expense categories creates pressure on locally initiated programs unless they are funded by exclusive sources of revenue, indicating separation from already-squeezed appropriations of state aid and local tax

revenue. While alternative revenue sources may be available, they are subject to different pathways of approval by the local government and its constituents in order to promote public buy-in and prevent aggravating legal repercussions. When these alternatives are focused on non-fiscal approaches that cut back on programs and personnel, local expenses can go up without any tangible increases in revenue collection. It is in this context of expense control and revenue augmentation that some communities have implemented stormwater user fees, while adopting different arrangements for financial earmarking and adapting to restrictions arising from their local governmental structure.

Form of Government

Home rule allows communities to choose their local form of government via municipal charters, but the state limits that choice in reality. A municipal charter defines how local government is organized and what its powers are, responsibilities public officials must take on, and relationships with constituents. Whether a municipality identifies itself as a city or town is defined within its charter, and this distinction affects the organization of local governance and the relationship between the municipality and the state. Table 1 provides a brief snapshot of the differences between Massachusetts cities and towns. "Under state law, cities and towns have different governmental structures… the impact of state statutes and procedural regulations may differ depending on the municipality's classification as a city or town. Town by-laws, for example, require the approval of the state Attorney General, whereas city ordinances do not" (Barron, Frug, and Su 2004, 3). Although home rule allows cities and towns to structure their government in any way they want regardless of what they call themselves, state legislature places restrictions on local governance choices based on population thresholds—for example, 55 percent of the communities in Massachusetts do not qualify for a city form of government as they have less than 12,000 local inhabitants[9]. When home rule is applied to charter-making, municipalities do not have to obtain state approval for the charter to pass as a local law, but the state-mandated process set forth for home rule charter adoption is complicated, time consuming, expensive and ridden with administrative burden. Between 1983 and 1993, only 57 percent of the charter amendments attempted in Massachusetts were ultimately adopted locally (Barron, Frug, and Su 2004, 4).

[9] Population data is based on ACS 2014 (5-Year Estimates).

Table 1: Basic Differences in Local Government Forms

City	Town
• Small legislative body such as a Council or Board of Aldermen, which meets frequently • Elected or appointed executive official such as a Mayor or City Manager	• Large legislative body that preserves the open town meeting or representative town meeting format and convenes annually (or a few times a year) • Small elected executive Board of Selectmen and an appointed administrator called a Manager or Administrator

Source: Massachusetts Municipal Management Association 2008

As per the 2012 U.S. Census of Governments, only 20 states still housed the town form of government. Within that subset, Massachusetts was the third-highest state with a larger proportion of towns over cities. Smaller towns are known to have a more cumbersome municipal decision making process due to voting norms and a less informed legislative body. In Massachusetts, 62 percent of the towns are forced to follow the open town meeting format (as they have less than 6,000 people), which acts as the legislative body of the town. All citizens are eligible to debate and vote on budgets, bylaws, bonding, and any topic that is up for discussion at the town meeting, regardless of their knowledge on those subjects. While some community members may be well-educated on town matters, others may veto a local policy such as the adoption of stormwater user fees simply because they are unaware or ill-equipped to handle specific issues of concern. Educating an entire town can be challenging for the elected Board of Selectmen or their appointed manager, who share executive authority in a way that can obscure responsibilities between them. The Board of Selectmen also appoint the town's department heads, such as those who lead the Department of Public Works (DPW), but this does not guarantee smooth decision making processes. In the Town of Ayer, when the new DPW Superintendent pushed forward a stormwater user fee that everyone seemed to be on board with, one member of the Board of Selectmen voted against the fee, destroying years of hard work and public education in the making. This was ascertained by Mr. Mark Wetzel, current Superintendent of the Department of Public Works in the Town of Ayer.

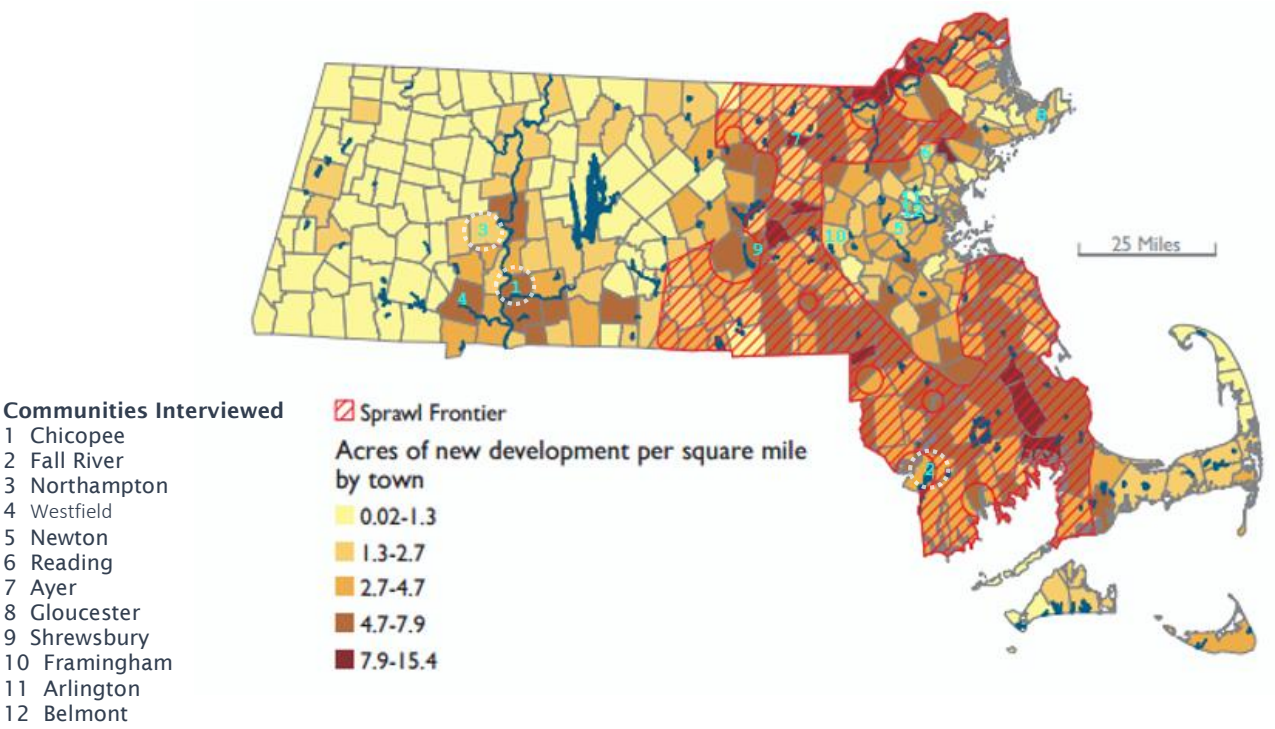
The Perceived Impact of State Policing Power on Local Stormwater Management

The Massachusetts Department of Environmental Protection (MassDEP) is the state agency designated to administer CWA programs for the Commonwealth, but does not have delegated authority to administer the NPDES program. Historically, MassDEP has fallen short on funding to

augment its scientific, human resources and information technology capacity for taking ownership of the permitting process; recent estimates have indicated an annual commitment of approximately $6 million for state program administration while the federal government has born the cost of running the program in Massachusetts (Massachusetts Coalition for Water Resources Stewardship 2016, 2). This continuing dependence on federal oversight is problematic because the sheer volume of permits reviewed by the EPA sets the program up for weaker enforcement, slower identification of vital pollution concerns, and local implementation of corrective measures. As of June 2013, the federal government was in charge of the permit issuance, compliance and enforcement for the 2990 NPDES permit holders in Massachusetts (Massachusetts Department of Environmental Protection 2013, 4). This number is expected to increase under the new permit requirements, which automatically extend regulatory purview over a majority of smaller communities in the state, based on a more expansive definition of the urban core as contributors of stormwater pollution. Advocacy organizations have argued that in comparison to the EPA, a state agency such as MassDEP would be better suited to focus on local water issues and approve permits based on tailored scientific evidence for water resource protection, employ timely regulatory action against non-complying entities, and educate communities on stormwater management best practices. State administration could also help improve the fragmented approaches adopted to finance stormwater management at the local level.

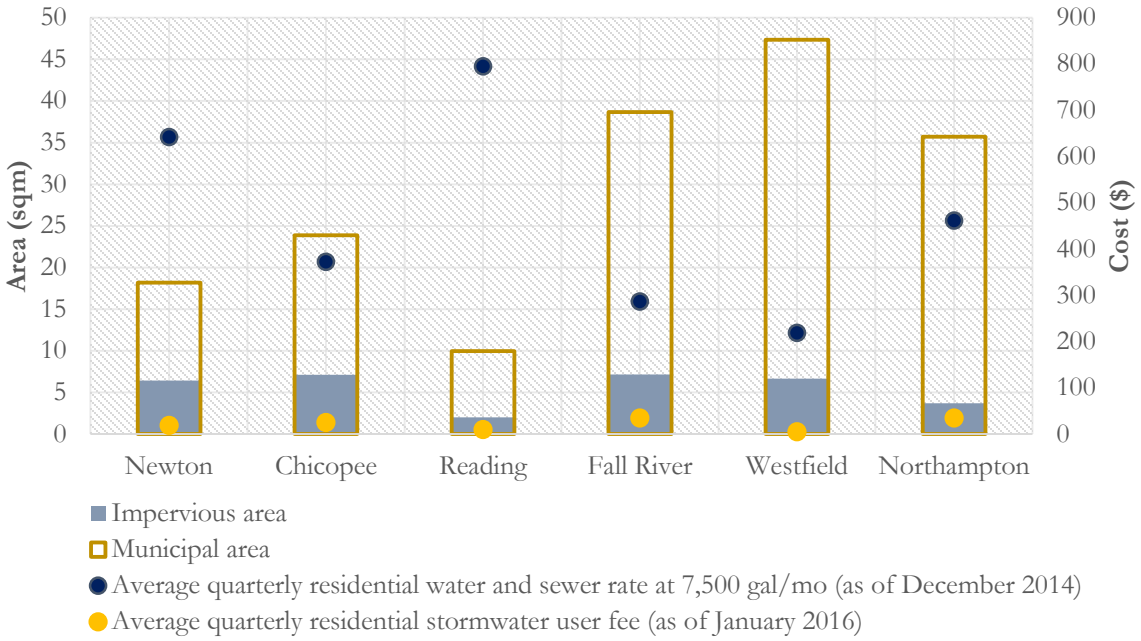
As of January 2016, six communities in Massachusetts had adopted and implemented stormwater user fees with established rate ordinances. These communities are regulated under a general permit for stormwater discharges as part of the NPDES Phase II program. As background, a map situating the six communities (and secondary cases of research) as urbanizing locations along with a summary of their impervious surface areas; average annual water and sewer fees; and stormwater user fees are shown in Figure 5 and 6 respectively.

Figure 5: Map Highlighting Primary and Secondary Case Study Communities in Massachusetts



Source: DeNormandie and Corcoran 2009, 4

Figure 6: Impervious Surface and Fee Profile of Case Study Communities in Massachusetts[10, 11]



Interviews with local government officials and analyses of planning documents, annual regulatory reports, budgets, public meeting minutes and media articles revealed a diverse set of drivers for stormwater user fee adoption. In order to catalog these drivers and better understand state-wide trends from the application of local stormwater user fees, this research uses a framework for local government funding decisions developed by Laurie Reynolds, which identifies numerous factors that may be important to a local government's choice between dues and taxes in any situation, as an illumination of a range of competing considerations likely to be relevant to the ultimate choice of financing technique for public use of government property or services (Reynolds 2004, 385–86). Although Reynolds describes ten factors in all, four of them seem particularly germane to organizing and contextualizing stormwater user fee adoption in Massachusetts:

1. **Lack of congruence between users and tax base**: A disparity between users of a government service and its tax base can make it more attractive to recoup the costs of service provided to the group that is not covered by the local government's taxing territory.

[10] Data for the average water and sewer rates were collected from the *Massachusetts Water and Wastewater Rates Dashboard* published by the University of North Carolina's Environmental Finance Center, funded by a cooperative agreement with the EPA (Environmental Finance Center at the University of North Carolina, Chapel Hill 2015). Impervious cover data are sourced from the EPA's NPDES website, dated as of March 3, 2010 (U.S. Environmental Protection Agency 2016c).
[11] Note that the annual residential stormwater user fee for Northampton is calculated as an average of the fees charged for the four residential tiers.

Where implemented, user fees have improved the cost equity of public services, as those who were not paying under a tax-based revenue collection system are now being charged for using centralized infrastructure and related local government provisions.

2. **Local history**: The way a local government has funded services in the past will have a bearing on the perceived fairness of its choice between taxation and dues. Communities that have historically relied on taxes or grant monies to fund specific public services may be less likely to cover those services under a non-tax based source of revenue, such as user fees. The political feasibility and legitimacy of new user fees may be jeopardized if the local fiscal context is unaccounted for while planning for changes in recuperation of service costs.
3. **Potential for specialization**: A dues technique offers several possibilities for specialization not available when general purpose governments collect general-tax revenues. For example, user fees can be earmarked for covering specific local services so that they ease budgetary constraints and relieve competing claims on general funds.
4. **Financial pressures**: With the growing prevalence of tax limits and externally imposed legal obligations, the increasingly dramatic need for more revenues pushes local governments to adopt dues to fulfil mandates from higher levels of government or fund infrastructure spending. Both regulatory and legal pressures ultimately translate into financial pressures ever-present in municipal budgets, so user fees may provide an additional source of fresh revenue in times of dire fiscal need.

Overview of Cases

From the potential sample of six communities, three cities were chosen as primary cases to trace the process and drivers of stormwater user fee adoption in Massachusetts over time. Table 2 summarizes the regulatory context in brief, highlighting stormwater permitting milestones that coincide with the implementation of fees in these communities.

Table 2: Summary of Regulatory Context in Case Study Communities

City name	Year fee adopted	Regulatory context
Chicopee	1998	• adopted fees in 1998, before Phase II permitting was established in Massachusetts • the City's stormwater ordinance came five years after the fee was put in place, just before the statewide stormwater utility and user fee legislation was instituted

Fall River	2006	• three years after the first Phase II general permits were implemented in the state, in the same year that Massachusetts pass its stormwater legislation
Northampton	2014	• six years after the first Phase II general permits expired, in anticipation of the new state permit

City administrators from Chicopee, Fall River and Northampton were interviewed; they provided detailed information about stormwater management and financing concerns in each city, with a historical overview of prevailing stormwater systems and resources available. Since administrators in Newton, Reading and Westfield were unable to provide interviews, they were excluded from this study. Newton and Reading have also been examined closely in prior case studies conducted by the EPA, MAPC and Charles River Watershed Association (CRWA[12]). Finally, exploratory assessments of secondary cases helped illuminate contemporary local stormwater problems and issues to account for in the primary cases. These secondary cases included the City of Gloucester and towns of Ayer, Arlington, Belmont, Framingham and Shrewsbury. However, data collected for these communities is not exhibited in case format due to the preliminary nature of local user fee discussions and modest extent of publicly available information; instead, lessons learned contribute to potential recommendations in the conclusion.

Each case begins with a descriptive profile of the community, followed by historical statistics on local own-source financing trends. Characteristics of the local stormwater user fee and narratives from the interviews are presented next, along with details about the administration and benefits of the new revenue stream. A broader list of possible services that can be funded by the fee is described in each community's local stormwater ordinance, which is publicly available on the respective city or town website.

[12] CRWA, formed in 1965, is one of the country's oldest watershed advocacy organizations in Massachusetts (Charles River Watershed Association 2014).

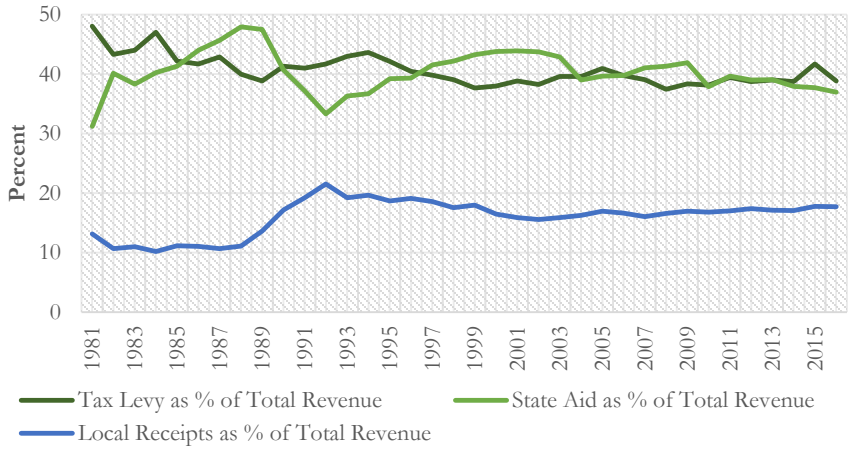
City of Chicopee

General Profile

Population (2010 census)	55,298
Municipal area (sqm)	23.88
Percent impervious	30%
Local government form	Mayor / City Council
Local governance of water resources	• Water Department • Water Pollution Control Department - Maintaining the sewers and drain system - Maintaining the flood control system - Monitoring industrial waste water - Stormwater pollution prevention - Treating the collected sewage
Existing enterprise fund accounts in city budget (as of FY2016)	• Water • Sewer
Stormwater infrastructure	Combined sewer community
Stormwater funding mechanism prior to adoption of user fees	Property tax monies (Public Works General Fund) and sewer user fee (Sewer Enterprise Fund)

The City of Chicopee is located in Southwestern Massachusetts and was formed in 1848. Local development activities impact two watersheds—the Connecticut River and its largest tributary, the Chicopee River. The City's only municipal wastewater treatment plant discharges to a point at the confluence of these rivers. From a financial standpoint, the City has typically rested on tax levies and state aid as sources of local revenue, often twice as much as it has on other non-tax forms of own-source receipts. As described in Figure 7, dependence on local receipts has remained fairly unchanged in the last decade with a minimal upward trend, at an average 17 percent contribution to total revenues. Given this fiscal context, it is interesting to note that Chicopee adopted stormwater user fees at a time when revenues from local receipts and state aid were on the decline in the late 1990s while tax revenues were more in favor.

Figure 7: Contributions to Local Revenue by Source in Chicopee



Source: Division of Local Services, MA Department of Revenue 2016

Fee Narrative

Year ordinance established	Adopted by the Board of Aldermen (now City Council) of the City of Chicopee in October 2003.
Year fee established	October 1998
Administrative structure	Sewer fee charged by the Stormwater Utility Bureau within the Water Pollution Control Department in the Wastewater Department.
Annual residential fee	$100
Annual non-residential fee	$0.45 per 100 sf or min $25 and max $160
ERU (ft)	2,000

Chicopee was the first community in Massachusetts to adopt a stormwater user fee. The city chose the fee as an additional revenue source to keep up with the costs of operating and maintaining its combined sewer system. As per MassDEP, Chicopee is one of the 23 combined sewer overflow communities with NPDES permits in Massachusetts, most of which are older urbanized localities such as Boston, New Bedford, Worcester and Springfield. The city had a very low sewer fee in 1998 ($1.6/100 cf in comparison to the state average of $3.5/100 cf[13]), as maintenance of the water collection system had not been a priority for the local administration. Mr. Quinn Lonczak, Project Supervisor of Chicopee's Water Pollution Control Department, stated in his interview that the city department began thinking about "what was going into the catch basins, and the Chicopee and Connecticut rivers" in the late 1990s and started investing in better pollution management tools.

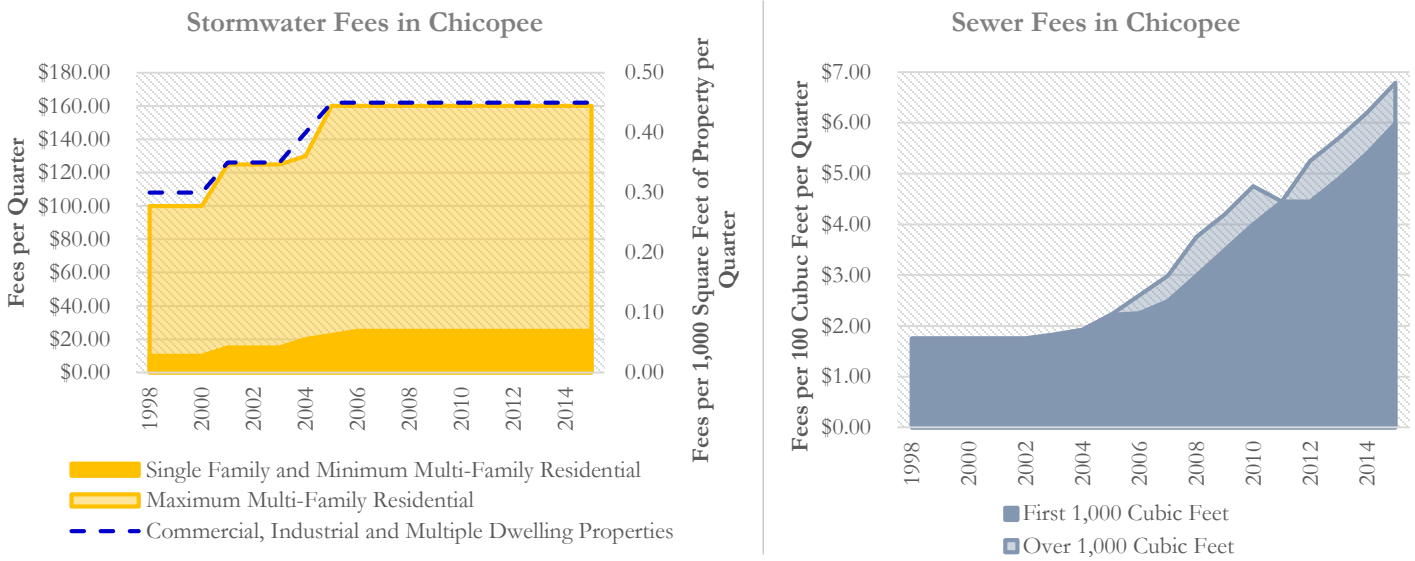
[13] Source: Annual Water and Sewer Retail Rate Surveys published by the Massachusetts Water Resources Authority (MWRA) Advisory Board

Establishing a flat rate stormwater fee of $40/year "was the city's way to put a dent in those maintenance tasks" and address common wet-weather sewer backups in neighborhood homes. Since the magnitude of the fee was relatively small and residents were concerned about a visible infrastructure problem, the impetus to pass a new fee was validated by voter sentiments. These factors probably contributed to local acceptance of the fee without a legal challenge, despite the fact that Chicopee's local stormwater ordinance was enacted five years after the fee had actually been implemented. Even though the existing legal framework in Massachusetts allowed municipalities to charge a stormwater fee or create a stormwater utility to manage new revenue flows, it was weak; Chicopee's pioneering efforts signaled the need for a clear state enabling legislation on the stormwater financing issue, which came much later in 2006 (Office of Water 2002, 319).

As shown in Figure 8, the fee remained fairly inexpensive until recently, when Chicopee's combined sewer overflow separation project took effect in response to a 2006 federal consent decree requiring the city to pay a fine of $115,000 and commence long-term upgrades to its sewer system to abate pollutant discharges from sewer overflows. Ensuing infrastructure upgrades have been financed mostly through the state's revolving loan funds from the EPA, but repayment of these loans have forced Chicopee to raise their sewer rates to a level that far exceeds rates in Western Massachusetts communities. In this situation, the stormwater user fee has served as a subsidizing income source to help mitigate sewer rate hikes and leverage state financing options for larger amounts of project finance funding.

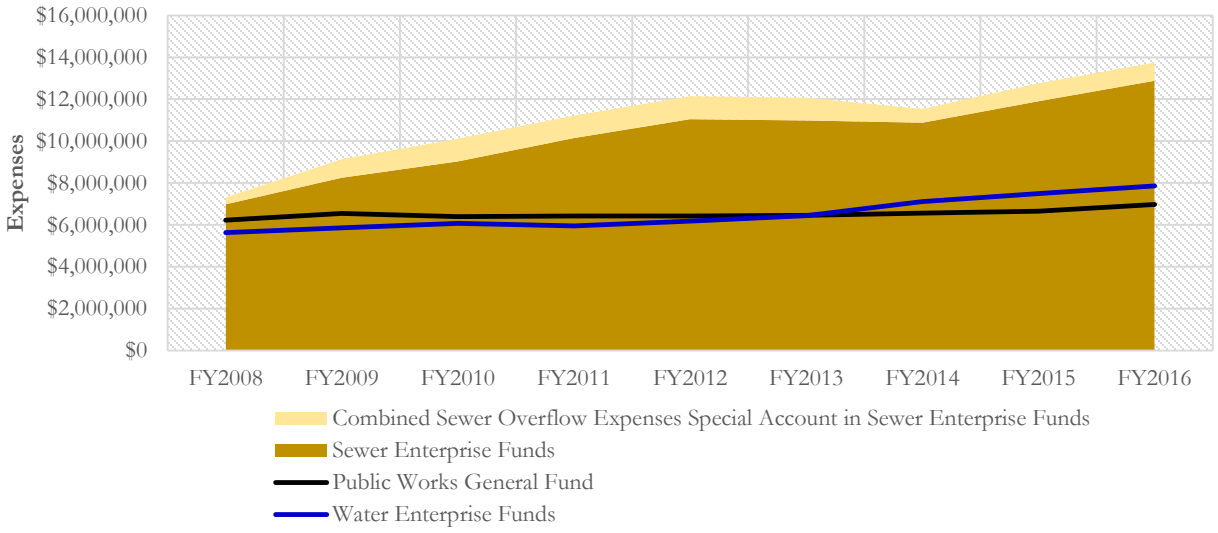
As Mr. Lonczak puts is, "everyone's a little more environmentally conscious today and people realize that it's not cheap taking care of all of this—it's a major process, a huge undertaking—think about all that water coming out of one place basically... we probably didn't do anything for the first 40 to 50 years because everything was working, but now our sewers are 100 years old and we are a combined system with two rivers, so addressing these issues has become our biggest expense."

Figure 8: Historic Stormwater and Sewer Rate Charges in Chicopee



Source: Water Pollution Control Department, City of Chicopee 2016

Figure 9: Illustrative Annual Stormwater Budget for the City of Chicopee



Source: Budget Worksheets for FY2011-16, publicly available on Chicopee's website.

Administration and Benefits of the Stormwater User Fee

According to the Chicopee Water Pollution Control Department, revenue from the stormwater user fee translates to around $1 million to $1.5 million of annual income and augments the city's revenue from sewer fees. This is depicted in Figure 9 as an illustration of the community's stormwater expenses. Instead of creating a separate account for stormwater management in the local

government budget, all stormwater and sewer related revenues collect in an existing general sewer fund, which is managed by the Wastewater Department. This administrative set up has improved the city's ability to undertake the following responsibilities more efficiently, while benefitting from expertise and resources already in-house:

- routine maintenance of the stormwater and sewer collection system to stop leakages and inflows
- purchase a city-owned catch basin cleaning vector truck bought in 2015 ($0.5 million)
- operate and clean catch basins
- educate the public about everyday water pollutants such as dog waste
- keep up with the city's MS4 compliance needs
- leverage state funds to tackle larger environmental concerns under the consent decree[14]

Since portions of the fee revenue may not get used during certain years, revenue may be accumulated over time to budget for a large expense such as purchasing a new truck for cleaning catch basins. Typically, earmarked budget line items in the city's general fund account cannot be swapped to cover other expenses if the money does not get used for the earmarked purpose. Moving the proceeds of the new stormwater fee revenue from categories within the general budget to a special account within the general sewer fund qualifies as a tradeoff in one sense—special accounts are narrower in scope, but allow for more revenue retention flexibility and financial commitment toward long-term planning efforts.

[14] Chicopee has already spent more than $135 million on CSO work, which is about 60 percent of the total expected cost of the project (Brown and Hamel 2014, 8).

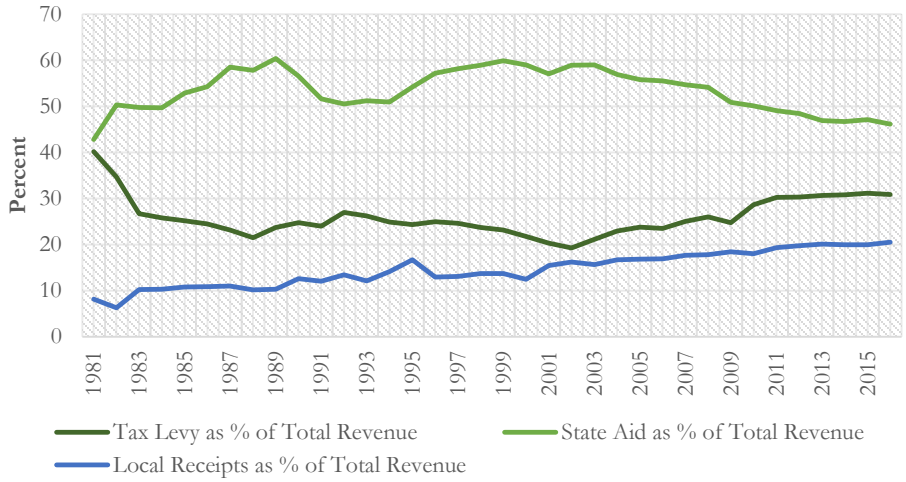
City of Fall River

General Profile

Population (2010 census)	88,857
Municipal area (sqm)	38.68
Percent impervious	18%
Local government form	Mayor / City Council
Local governance of water resources	Department of Community Utilities • Water Division • Sewer Division
Existing enterprise fund accounts in city budget (as of FY2016)	• Water • Sewer • Emergency Medical Services (EMS) • Sanitation
Stormwater infrastructure	Combined sewer community (greater than 85% of the city dates back to sewer construction from the 1850s, while newer perimeter outliers of the city have some separate sewer drainage systems)
Stormwater funding mechanism prior to adoption of user fees	Tax monies from the Public Works General Fund until 1982, followed by revenues from the sewer user fee.

Known for its growing local textile industry in the 19th century, the City of Fall River is situated along the eastern shore of Mount Hope Bay at the mouth of the Taunton River. The North Watuppa Pond, a large, spring-fed water body, cuts right through the center of the City and provides an abundant source of drinking water. The Bay is a receiving body of rainwater and treated sewage for the City, where combined sewer overflows have become a concern more recently. As described in Figure 9, dependence on local receipts shows an upward trend over the last decade, at an average 15 percent contribution to total revenues. Given this fiscal context, Fall River adopted stormwater user fees at a time when revenues from local receipts and taxes were on an incline and state aid was on a sharp decline.

Figure 10: Contributions to Local Revenue by Source in Fall River



Source: Division of Local Services, MA Department of Revenue 2016

Fee Narrative

Year ordinance established	New stormwater ordinance and regulations approved and adopted by City Council first in 2008.
Year fee established	July 2008
Administrative structure	Stormwater utility service fee (also termed as impervious fee or stormwater fee) charged by the Sewer Division of the Department of Community Utilities.
Annual residential fee	$140 (all residential properties from 1 to 8 units are charged at the base ERU rate)
Annual non-residential fee	$140 per 2,800 sf of impervious surface (all commercial and industrial properties are charged $35/quarter per 2,800 square feet of impervious surface)
ERU (sf)	2,800

Since the City of Fall River is a combined sewer community at large, stormwater management is closely linked to wastewater sewerage and current-day expenses date back to federal mandates from the past. The sewer fee itself was born in 1982, when the city expanded its wastewater treatment plant to accommodate for secondary treatment of effluent discharges into Mount Hope Bay, as required by the EPA and MassDEP. The cost of this expansion project was $55 million. In 1992, Fall River was put under federal court order to abate CSOs and reduce contamination in Mount Hope Bay. Since then, the city has expended around $190 million in capital funds on planning, designing and constructing its CSO Abatement Program, which includes further expansion of the

treatment plant to handle larger volumes of stormwater, new tunnel construction, and partial separation of infrastructure in CSO areas. According to Mr. Terry Sullivan, Director of the Community Utilities Sewer Division, "the breadth of the CSO project increased the sewer user fee dramatically… the new mayor wanted to avoid this massive increase to the sewer fee, so that's how the stormwater fee was born in 2008." In practice, the stormwater fee is embedded in the city's sewer rates, where sewer rates were reduced to reflect the difference between consumption of water and runoff from impervious areas.

The city's stormwater fee funds MS4 compliance issues, but that corresponds to a smaller portion of its stormwater expenses. A bulk of the stormwater revenue covers debt servicing for the CSO project—annual debt payments have amounted to approximately $9 million per year, which is about 45 percent of the city's sewer budget. Channeling the stormwater fee towards earmarked capital outlays is helping reduce the sewer budget deficit, while holding everyone equally responsible for contributing to stormwater pollution. Historically, properties without sanitary facilities were exempt from sewer payments; by implementing a storm fee based on impervious area coverage, these properties with large parking lots and many catch basins now have to pay the stormwater fee, even if they do not have a sanitary facility on site. As Mr. Sullivan confirms, "these properties used to pay nothing before… over the past years, residential water users and high-volume commercial and industrial users have shouldered a disproportionate and unfair burden." Although the stormwater fee has not changed since it was initially implemented and does not ultimately provide any additional streams of revenue, the city administration used the fee as a vehicle to achieve improved financial equity within the community.

The stormwater user fee was originally implemented relatively quickly (in less than six months) to meet financial needs for the forthcoming FY09 budget deadline. This was done under heavy public opposition, including non-profit groups who were unhappy about a new charge as they were previously tax exempt. According to Mr. Sullivan, around 1,000 appeals were made to the City, which the Sewer Commission responded to and held public meetings for. The City also dealt with billing errors due to rapid implementation, but those were readily corrected. When a sewer fee increase was later disputed during the 2010 budget meetings, the City created a Stormwater Taskforce comprising members of the public, representatives of the local economy, and the City Council. The taskforce considered alternatives for eliminating the stormwater fee and its impact on

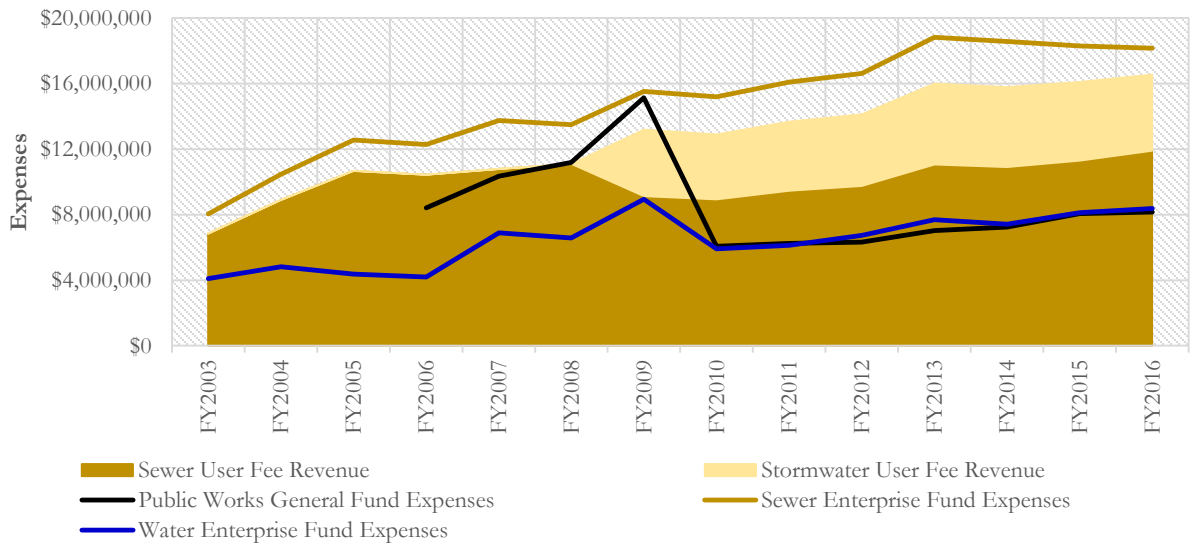
the sewer fee, but the stormwater fee was confirmed to be the least expensive solution and remained as is. The City also held public meetings to allay concerns and include the voices of local citizens. To quote Mr. Sullivan, "there is still some opposition today to the stormwater fee as people call it the 'rain and water tax'… others get it, as we have explained that the sewer fee would go up without a stormwater fee and for those people and properties that use a lot of water, they could potentially be paying a lot more than they are now."

Administration and Benefits of the Stormwater User Fee

Staff from the Sewer Division perform both stormwater and combined sewer system maintenance tasks that amount to around $4.5 million in expenses (as illustrated in Figure 11), such as:

- catch basin cleaning during the year (the city has around 1,700 catch basins)
- NPDES and other regulatory compliance needs
- mapping and documentation of sewerage inventories
- emergency response and flood control activities
- culvert cleaning, inspection and elimination of illicit discharges and connections
- assistance with dam maintenance projects

Figure 11: Illustrative Annual Stormwater Budget for the City of Fall River



Source: Proposed Operating Budget reports (FY09-16), publicly available on Fall River's website[15]

[15] Note: Due to unavailable public data, FY2003-2006 capture actual revenues; FY2007-2016 are budget estimates. The interview with Mr. Sullivan confirmed that 85 percent of the sewer enterprise fund expenses are covered by stormwater and sewer user fees, while the remainder comes from other fees and liens.

City of Northampton

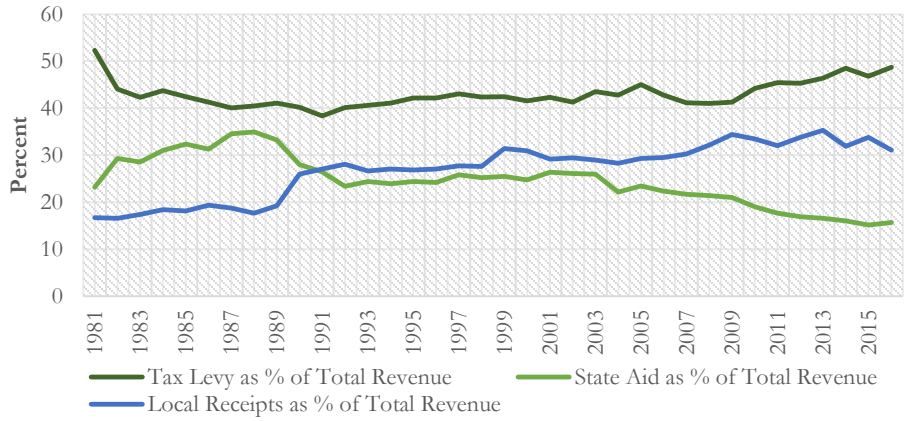
General Profile

Population (2010 census)	28,549
Municipal area (sqm)	35.70
Percent impervious	10%
Local government form	Mayor / City Council
Local governance of water resources	Department of Public Works • Water Division • Wastewater Division • Stormwater Division
Existing enterprise fund accounts in city budget (as of FY2016)	• Water • Sewer • Solid Waste • Stormwater and Flood Control
Stormwater infrastructure	Separate sewer community
Stormwater funding mechanism prior to adoption of user fees	Property tax monies from the Public Works General Fund

The City of Northampton, also known as "Paradise City[16]" for the natural beauty it is surrounded by, is bordered by the Connecticut River on the east. The Mill River, a tributary of the Connecticut River, runs through the center of the City and led to compounded flooding impacts during heavy rainstorms in the early-to-mid 20th century. Today, the City maintains flood control dikes and takes precautionary measures to protect the community from weather-related events. As described in Figure 12, dependence on local receipts has almost doubled over the last decade, contributing to total revenues at a rate of 17 to 31 percent while offsetting a similar decline in state aid. Given this fiscal context, it is not surprising that Northampton adopted stormwater user fees at a time when tax revenue and local receipts were on an incline.

[16] As described on Northampton's website.

Figure 12: Contributions to Local Revenue by Source in Northampton



Source: Division of Local Services, MA Department of Revenue 2016

Fee Narrative

Year ordinance established	March 2014
Year fee established	July 2014
Administrative structure	Stormwater and Flood Control Utility fee managed by the Stormwater and Flood Control Utility created within the Department of Public Works under the day-to-day supervision of the Director of Public Works.
Annual residential fee	$0.026066/sf of hydraulic area (calculated based on a property's impervious and pervious areas, and their impact on the city's stormwater and flood control systems) There are 4 residential tiers: Tier 1 = $66.21/year Tier 2 = $94.28/year Tier 3 = $130.07/year Tier 4 = $268.25/year
Annual non-residential fee	Calculated individually based on the property's actual areas of impervious and pervious surface.
ERU (sf)	n/a

The City of Northampton's sewerage systems were constructed over 100 years ago, assuming different population constraints and urbanization scenarios than that of current-day development. By the early 2000s, some areas of the City had chronic drainage problems and failing infrastructure, insufficient to meet the demands of a larger water system (Department of Public Works 2014). Along with the need to repair and replace aging infrastructure, the pending release of new MS4 permit requirements at the time was expected to increase the cost of monitoring and managing a

functional stormwater drainage system. Responsible for a flood control network of levees, floodwalls and diversion channels (that were originally built by the Army Corps of Engineers in exchange for long-term local government oversight of operations and maintenance needs), the City was also under a mandate to assess and upgrade its flood control facilities. These influencing factors began the search for new sources of local funding for stormwater management.

Northampton adopted a comprehensive two-year process for identifying, reviewing and formalizing its funding options, which began with an existing conditions technical assessment report that was prepared by a consulting firm in 2012. The City's Board of Public Works (now Public Works Commission[17]) took primary responsibility in moving the public discussion regarding the increased need for funding, working closely with local teams and decision makers. With approval from the City Council, a Stormwater Ad-Hoc Advisory Task Force of twelve members was created in early 2013. The task force considered four funding mechanisms,[18] ultimately recommending a stormwater and flood control fee and the creation of a new utility to the City Council. With initial support from the City Council, the Board of Public Works then drafted a stormwater ordinance for the local charter that defined the terms of the utility, fee formulas and a system of credits. This was done with the help of Board of Public Works subcommittees and ongoing public input. After a few months of public deliberation and review, the City Council passed the new ordinance in March 2014. After the fee was approved, the City faced two main implementation challenges—preparing an analysis to determine the invoices for about 11,000 properties and then incorporating the information into its billing software system—that took longer than expected and delayed the first fee collection process by four months.

Even with extensive public and stakeholder engagement mechanisms in place, imposing the stormwater user fee was not free of skeptics. According to Mr. Jim Laurila, Department of Public Works Acting Director and City Engineer, "some residents suggested that the City should oppose mandates from the Army Corps and EPA... some thought that there should be grants to take care of all needs… and some questioned why the City was considering a new utility when there were less

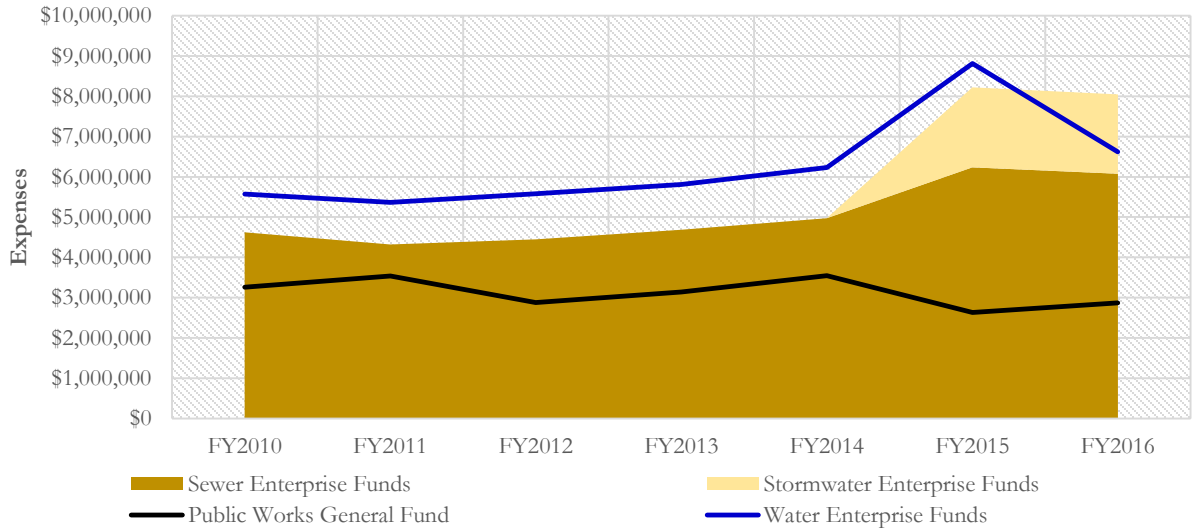
[17] Appointed by the mayor and approved by the City Council, the Public Works Commission is a volunteer member group that advises the Department of Public Works and the mayor on the city's public works service delivery, infrastructure management, and long-range planning (City of Northampton 2016).
[18] The task force considered the General Fund, tax limit overrides, new stormwater and flood control fee, and a combination of resources from the General Fund and a new fee as four potential sources of additional funding.

than ten in the entire state." These concerns came up in other local stakeholder interviews and are common across communities in Massachusetts, highlighting the need for regional collaboration and championing of stormwater user fees.

Administration and Benefits of the Stormwater User Fee

Northampton's stormwater and flood control fee has provided a more inclusive, equitable and consistent level of funding for a critical set of sewerage demands such as capital improvements, drainage and flood control system upgrades, increased operations and maintenance activities, and additional staffing needs. Tax exempt properties have been paying their fair share for using the City's infrastructure and services. The fee contributes to additional revenue expectations of $2 million per year (as shown in Figure 13) that are allocated directly into the stormwater enterprise funds instead of the general funds budget. The Department of Public Works confirms that residents have been particularly pleased with the flood control improvement projects completed thus far, while neighborhood concerns about the construction of new drainage outfalls are being addressed even today.

Figure 13: Illustrative Annual Stormwater Budget for the City of Northampton



Source: City of Northampton FY14-16 Proposed Budget reports, publicly available on the city website.

Chapter 6: Key Findings

In assessing the cases presented on Chicopee, Fall River and Northampton, it is clear that the four broad drivers of user fee adoption identified by Reynolds are evident in local stormwater financing decisions with varying degrees of importance as elaborated in this section. Table 3 provides a brief summary, followed by a more detailed narrative that establishes links between the drivers of fee adoption and augments the theoretical framework beyond Reynolds' prognoses.

Table 3: Fitting Theory to Organize Key Drivers of Stormwater User Fee Adoption[19]

Drivers of stormwater user fee adoption	Chicopee	Fall River	Northampton
Stormwater infrastructure	• combined sewer system	• combined sewer system	• separate sewer system
Lack of congruence between users and tax base A disparity between users of a government service and its tax base can make it more attractive to recoup the costs of service more equitably.		• improve cost equity	• improve cost equity
Local history The way a local government has funded services in the past will have a bearing on the perceived fairness of its choice of financing.	• dependence on local receipts and state aid declines with more emphasis on tax revenues; low flat fee established initially	• dependence on tax revenues declines while local receipts and state aid increase; higher flat fee established initially	• dependence on state aid declines while local receipts and tax revenues increase; progressive tiered fee structure established at the onset
Potential for specialization A dues technique offers several possibilities for specialization not available when general purpose governments collect general-tax revenues.	• undertake stormwater responsibilities more efficiently using existing resources • mitigate sewer rate hikes • more flexibility with revenue retention for long-term	• undertake stormwater responsibilities more efficiently using existing resources • mitigate sewer rate hikes • earmark revenue for capital outlays	• grow stormwater capacity with new utility • earmark revenue for capital outlays

[19] Text marked in green depict secondary drivers for user fee adoption in Chicopee, when the fee was increased in 2006 to more accurately represent costs of stormwater services.

	planning and spending efforts		
Financial pressures An increasingly dramatic need for more revenues inspired by tax limits, externally imposed legal obligations, mandates from higher levels of government or gaps in infrastructure spending pushes local governments to adopt dues.	• need for additional O&M[20] revenue source • visible aging infrastructure problems • offset infrastructure upgrade costs mandated by federal consent decree • cover NPDES compliance costs • leverage state financing options for larger amounts of project finance funding	• need for additional O&M revenue source • reduce sewer budget deficit • offset infrastructure upgrade costs mandated by federal consent decree • cover NPDES compliance costs	• need for additional O&M and staffing revenue source • visible aging infrastructure problems • offset infrastructure repair and upgrade costs mandated by federal government • cover NPDES compliance costs

Financial Pressure

The most compelling reason for a municipality to support and implement stormwater user fees was financial pressure, arising from externally imposed legal obligations, mandates from higher levels of government, and gaps in infrastructure spending. In Chicopee and Fall River, both combined sewer communities with aging infrastructure, the federal consent decree to abate CSO pollution mandated large capital investments to upgrade and improve existing sewerage, which introduced new stormwater-related expenses to city budgets. Similarly, Northampton faced federal mandates from the Army Corps to expend money on stormwater and flooding infrastructure improvements that had to be offset with new revenues. Having to take on new debt capital and make repayments over time clearly manifested in financial pressure; the public visibility of infrastructure problems only increased this pressure for new revenues. All funding options considered, user fees provided the most stable source of income to cover these long-term, recurring debt servicing costs.

In support of the case data, a conversation with Mr. Brad Stone, Conservation and Stormwater Coordinator for the Town of Shrewsbury, verified that stipulations in the new MS4 permit are "by far the biggest reason towns are considering adopting stormwater user fees." The costs of everyday operations and management of stormwater systems, along with the costs of fulfilling NPDES

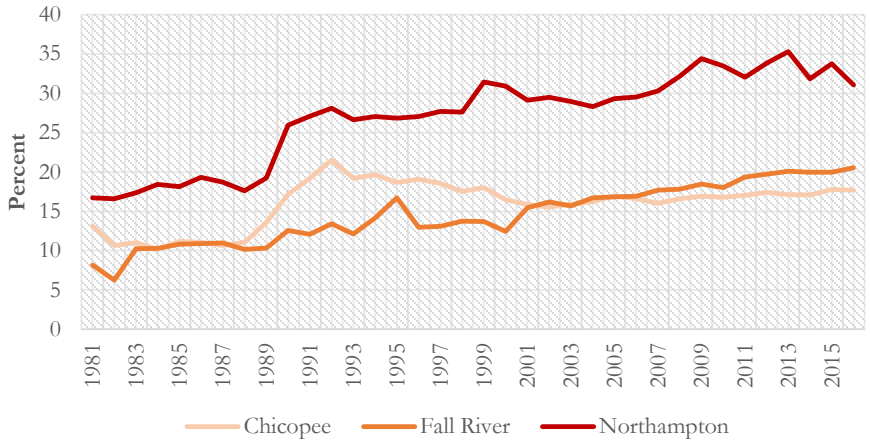
[20] Operations and Maintenance

monitoring and compliance activities (stormwater management best practices) added to the revenue urgency in all three communities, which ultimately created political momentum in favor of user fees.

Local History

The degree to which each city used taxes over local receipts (excises, license fees, permit fees, user fees etc.) as a revenue source may have affected the progressiveness of the adopted stormwater user fee structure, although it was never made explicit by interviewees. As per Figure 14, trends in revenue growth demonstrate that all three communities have supported an increasing use of local receipts over time; if interpreted as a proxy for user fees (as data on user fees alone was unavailable), Chicopee was the most "user fee averse" city compared to Fall River and Northampton. In line with this assumption, Chicopee adopted a very low stormwater fee at the onset that only partially covered its costs of service—this constituted a revenue share arrangement between tax monies and user fees, as a way of gradually introducing a new source of income to the community. Given the scope of this thesis, it is difficult to ascertain whether being the first to adopt a stormwater fee had any implications on the magnitude of Chicopee's fee itself, even though the municipality has increased its stormwater fee over the years. Reliance on local receipts was historically much higher in Northampton than in Chicopee and Fall River, almost 1.5 to 2 times more as a proportion of total revenue. In contrast, even though Northampton implemented the most progressive fee structure of the three cities, it was also the most dependent on tax revenue. These descriptive factors provide inconclusive data at best, such that local history as a driver of stormwater user fees is revealing at an individual rather than comparative level. Local history as a driver may need interpretation beyond fiscal matters, such as the quality of a community's existing stormwater infrastructure and political progressiveness of its form of government. This extension of the definition of local history surfaced as an important consideration in Massachusetts' user fee communities.

Figure 14: Local Receipts as Percent of Total Revenue



Source: Division of Local Services, MA Department of Revenue 2016

Potential for Specialization

Being able to collect and manage stormwater fees under exiting administrative structures may have helped alleviate the already high financial pressures in the two combined sewer communities. Not having to create a new stormwater utility with additional staffing expectations reduced redundancies and proved a practically sound solution for Chicopee and Fall River, as city administrators managing the sewerage required knowledge of both sewer and stormwater issues. The ability to customize governance of user fee revenue to local infrastructure and administrative needs helped mitigate sewer rate hikes, while providing Chicopee and Fall River with options to earmark revenue for managing pollution abatement issues.

Alternatively, Northampton created a new stormwater utility to manage fee revenue and grow staff capacity on MS4 issues. Although difficult to substantiate with certainty, it is interesting to note that creating a stormwater utility may be unrelated to the magnitude of revenue to be managed. Northampton and Chicopee realized revenues of similar magnitude with their varying governance structures, indicating that having flexibility in how anticipated revenues are managed may influence a town's adoption of fees. As validated by the two other MS4 communities (Newton and Reading) in Massachusetts with stormwater user fees, it may be that the type of stormwater infrastructure dominant in a community defines the governance structure adopted to manage the fee. Separate sewer communities may be more inclined to create a new stormwater utility given that sewer and stormwater issues are served by different underground networks, allowing the uncoupling of resource expertise and oversight from different departments.

Lack of Congruence between Users and Tax Base

Northampton and Fall River both cited improved cost equity as a factor driving the adoption of stormwater user fees. Cost equity manifested in two ways: payer inclusiveness promoted by the fee and fairness achieved by the method used to calculate the fee. At a basic level, all three communities improved inclusiveness by extending the fee to tax-exempt constituents. Although fees were set to capture the municipal cost of handling the stormwater management burden that each property assigns to the public stormwater system, in practice, communities adopted different methods for calculating those fees. To standardize the user fee calculation, Chicopee and Fall River adopted a flat fee (ERU method) based on the average impervious area that a residential property class contributes to as a representation of estimated runoff volumes and pollution generated by properties in that class. The ERU was then applied to non-residential units as well, serving as the base unit of measurement to determine the number of ERU's non-residential properties account for. On the other hand, Northampton chose a more precise method of calculating fees based on the impervious and pervious area of each parcel, which translated to higher annual charges for residential classes with larger property sizes.

Imposing the fee on everyone exerted one type of fairness by spreading the cost of service provision across all stakeholders within the community. Before the stormwater fee was in place, Fall River was charging a sewer fee only to those who had sanitary facilities on site, based on their water use; but sewer fee revenues were allocated to resolving both sewer and stormwater issues, in conjunction with general tax revenue funds for stormwater management. This placed an unfair burden on those who were using the sanitary system, as they were subsidizing the use of local stormwater services for everyone while also paying taxes. Once implemented, the fee was based on a sounder metric of imperviousness that accounted for fairness from a cost of service perspective. The extent to which the fee equaled the playing field for everyone was difficult to ascertain and could qualify as a question for future research. The fee also improved the transparency of stormwater budgets, contributing to more government accountability on projects of priority.

Each community faced local tradeoffs that ultimately affected the momentum and intricacy of the fee development process. Northampton took the most progressive approach of creating a tiered fee structure by using actual parcel data to estimate the impervious areas of local properties. This required a higher investment of time and money upfront for data collection, public engagement, and

program development. Risks to adopting Northampton's approach may have involved compromising on the integrity of parcel data in the interest of time, budgeting for long-term data monitoring costs, and slower implementation as a result of outdated or incompatible billing systems. In Chicopee and Fall River, the financial urgency, pre-existing resource constraints, community perceptions of a tiered fee structure, and time available for implementation may have led to a shorter fee enactment process.

Chapter 7: Conclusion and Recommendations

Since the turn of the 21st century, American municipalities have demonstrated an elevated interest in stormwater management and alternative financing methods for the provision of critical public infrastructure services. Challenges to financing much needed improvements in local stormwater systems under a changing urban context have manifested amid increasing budgetary demands, decreasing discretionary sources of funding, unpredictable climate impacts, and austere regulatory parameters protecting water quality. Meanwhile, local governments have resorted to stormwater user fees as a contemporary funding solution to address structural and policy dilemmas on the ground. In assessing countrywide trends for the uptake of stormwater user fees, the New England region is farthest behind and accounts for less than 1% of the national total with the State of Massachusetts as a leader on this issue.

A deeper evaluation of three Massachusetts communities—Chicopee, Fall River and Northampton—with stormwater user fees illuminated four influential drivers of local fee adoption in the state, including mounting financial pressures; political and structural history; potential for administrative flexibility; and lack of equity in recovering service costs from users of the stormwater system. While these drivers of stormwater user fee adoption are specific to the case study communities, learning about them can help improve the planning and implementation process for those within the larger Massachusetts and New England region considering fees. With the caveat that local problems are inherently difficult to generalize, other municipalities considering fees should assess the following recommendations in making the case for a new source of non-tax revenue and framing their own stormwater user fee narratives.

- Having clarity about local stormwater management demands and resources (financial, technical and human capital) necessary to meet those demands can dramatically improve the ability of a community to accept a stormwater user fee and achieve political feasibility for a new type of revenue stream. No two municipalities are the same, so picking up on lessons learned from local counterparts and reserving time for planning ahead of implementation can smoothen the fee adoption process—the EPA recommends a two-year timeframe to conduct initial feasibility analyses, follow through with a new stormwater ordinance, and finally charge new fees to constituents.

- Having impartial yet credible stormwater champions (such as Mayors) voice and articulate the urgency of local financial needs can help drive public and political approval of new user fees. Stakeholders indicating early buy-in can play a role in local stormwater committees to educate and engage with the public, and create momentum around a longer planning process that addresses key concerns before the fee is voted on. Leadership from larger cities can help build confidence for smaller ones to take action on stormwater financing issues, especially to encourage regional clustering (as referenced earlier in the discussion about the stormwater database) of user fees. Additionally, communities may be seeking a higher level of attention, support and feedback from the state to comply with their permits. This could be addressed by resolving the question around Mass DEP's authority to administer a centralized NPDES program and may improve the uptake of new stormwater financing approaches in the state.
- Corralling around a political window of opportunity external to stormwater can provide the needed push for stormwater user fees. Alternatively, presenting the additional revenue expected from the fee as a way to free up general funds for underfunded projects important to the community can also assist in making the case for fees. Two examples demonstrating this were unearthed in a recent EPA report: when a stormwater utility was being considered by Newton's Board of Aldermen, the city received national attention for spending $197 million to replace its high school and deflected attention from what was considered a much smaller stormwater funding effort; the Town Manager and the Board of Selectmen in Reading saw a stormwater fee as a welcome strategy to allocate additional general funds to key priorities such as schools without having to confront the challenges of raising taxes (Leiby et al. 2013, 42, 46).
- Creating a regional stormwater coalition or joining an existing one can provide staffing and financial relief for smaller MS4 communities that are required to meet expensive regulatory mandates. For example, the Town of Shrewsbury is part of the Central Massachusetts Regional Stormwater Coalition (CMRSWC), a three-year-old collaboration across 30 communities and the first of its kind. The coalition was initiated in 2012 under the Community Innovation Challenge (CIC) grant program funded by the Massachusetts Department of Revenue's Executive Office for Administration and Finance; it was organized as a local capacity building effort to help standardize stormwater operations policies and procedures, regional data management systems for stormwater mapping and inspection, and education and training materials for participating communities (Strause

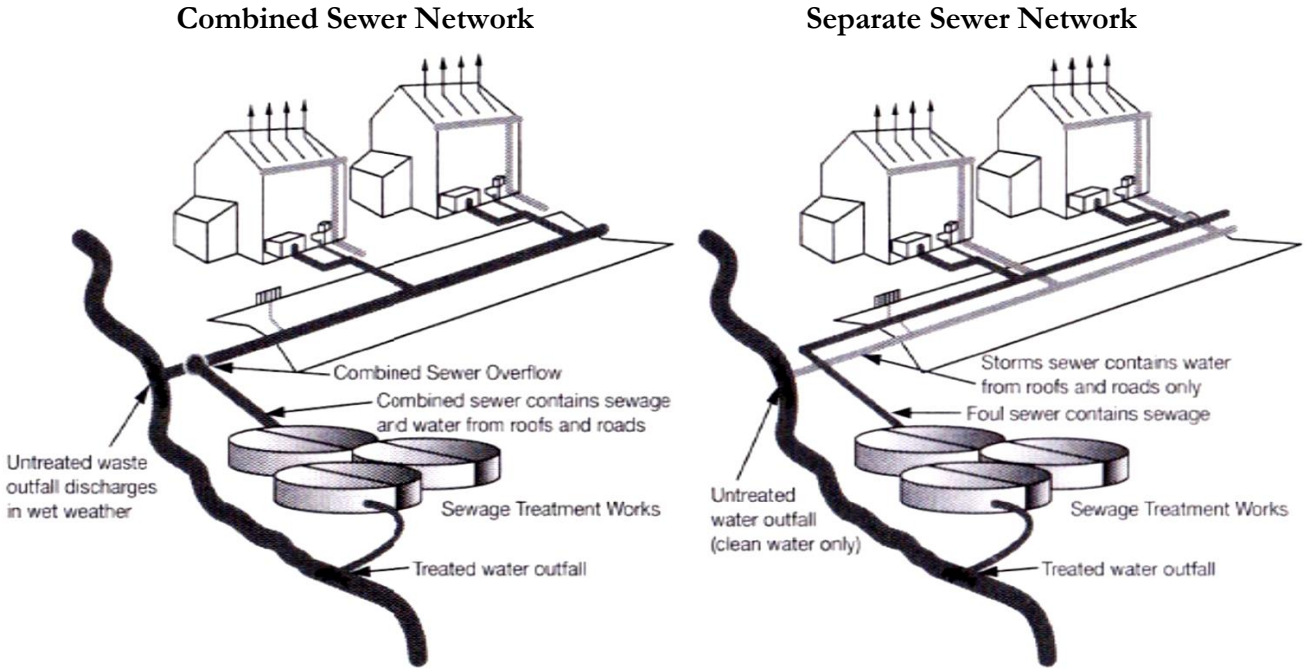
2014). The CIC program also funded the Northern Middlesex Stormwater Collaborative (NMSC), Merrimack Valley Stormwater Collaborative, Neponset Valley Stormwater Collaborative, and the Southeastern Massachusetts Stormwater Collaborative (SEMSWC) in varying degrees before it was terminated. Other potential sources of funding include grants from MassDEP and community contributions, which is how the CMRSWC is now funded—each community contributes $4,000 annually and MassDEP recently awarded the coalition a grant of $50,000. With continued funding, these regional coalitions can provide additional support for translating new MS4 permit and state water quality regulations to municipal compliance activities and costs, especially for the larger subset of first-timer communities.

Appendix

Appendix 1: List of Interviewees

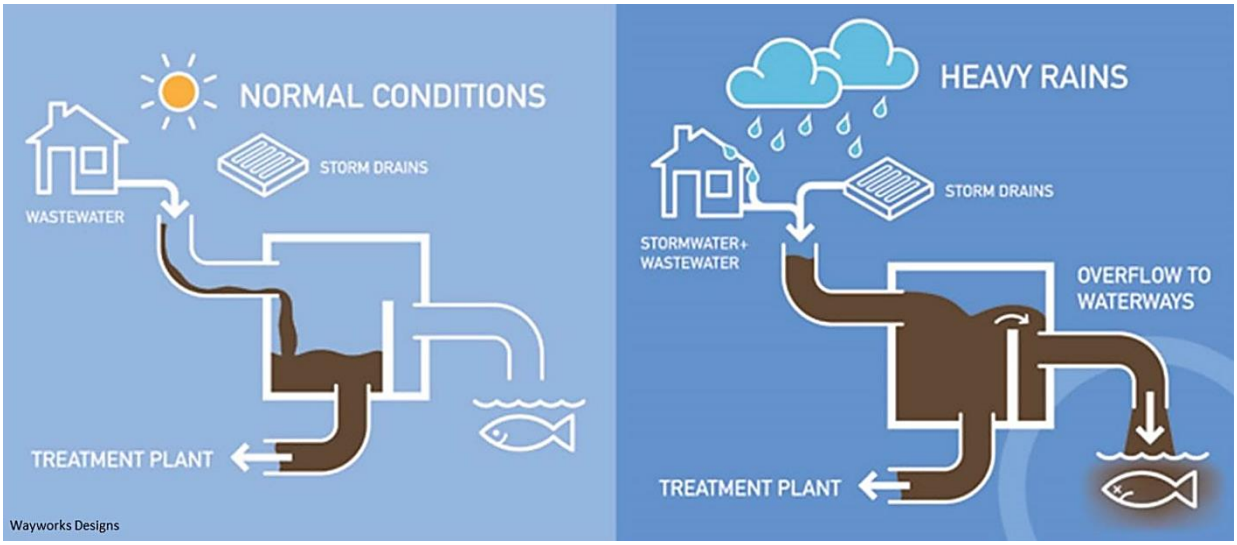
Name	Title and Affiliation
Anne-Marie Lambert	Co-Founder, Belmont Stormwater Working Group
Julie Conroy	Senior Environmental Planner, Metropolitan Area Planning Council (MAPC)
Lonczak, Quinn	Project Supervisor, Water Pollution Control Department, City of Chicopee
Michael Hale	Director of Public Works, City of Gloucester
James R. Laurila	Acting Director, City Engineer, Department of Public Works, City of Northampton
Terrance Sullivan	Director, Sewer Division, City of Fall River
Mark Wetzel	Superintendent, Department of Public Works, Town of Ayer
Wayne A. Chouinard	Town Engineer, Town of Arlington
Kerry Reed	Senior Stormwater & Environmental Engineer, Department of Public Works, Town of Framingham
Jeff Howland	Town Engineer, Town of Shrewsbury
Kristen Las	Assistant Town Manager, Town of Shrewsbury
Brad Stone	Engineer - Conservation and Stormwater Coordinator, Town of Shrewsbury
Joseph M. Flanagan	Director of Public Works, Town of Dedham

Appendix 2: Difference between combined and separate sewer systems



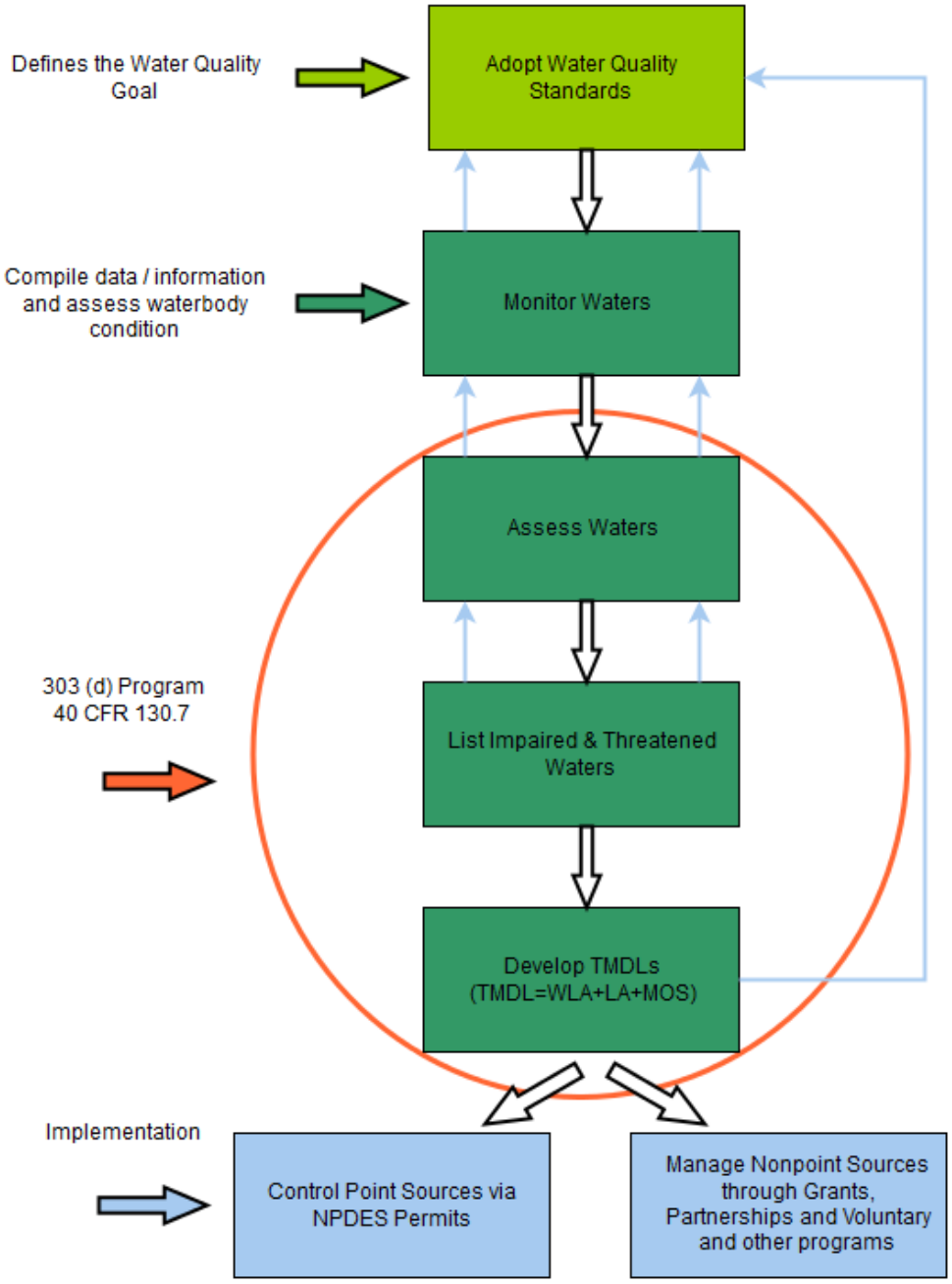
Source: Howes 2008, 47

Appendix 3: Illustration of Combined Sewer Overflows



Source: Housley 2016

Appendix 4: Water Quality-Based Approach of the Clean Water Act



Source: U.S. Environmental Protection Agency 2015a

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