

**Collaborative Governance in Wastewater Treatment:  
Implementing a Publically owned Pretreatment Plant**

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Environmental Studies Seminar

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## **I. Introduction**

Since the environmental movement started in the 1970's, the United States has made great strides in ensuring the protection of our environment. Despite this, the increasingly restrictive regulatory framework that exists for wastewater treatment can sometimes hinder the actual control of pollution. Particularly, industrial wastewater is a threat to human health and ecosystems. Unfortunately, areas in economic hardship are prevented from enforcing compliance for industrial users of their publically owned treatment works in fear of pushing the much needed industry out. A proposed solution to this problem is the creation of a Publically Owned Pre-treatment Plant that treats all of the areas industrial waste in lieu of the industries themselves. In order to establish a Publically owned pretreatment plant, we propose to use collaborative governance to limit the financial burden on municipalities.

## **II. Research Methods and Objectives**

The main objection of this project was to research and identify key potential actors in a collaborative governance effort with the final goal of implementing a Publically Owned Pretreatment Plant. The second objective was to create a video that could be shown to citizens, an important actor in collaborative governance, explaining the key facts and benefits that surround POPP. Building on the efforts of previous projects, we chose Springfield as a potential location for the POPP. Initial research methods included emailing and cold calling government agencies in Springfield, Massachusetts. Unfortunately, we received few responses and no agreements for interviews. We made

several trips out to Springfield to collect footage of the area for the video and to gain hands on, first person understanding of the area.

To identify potential players in a collaborative governance effort, we used researched databases to locate articles, journals and case studies on other instances of collaborative governance in and out of watershed management. After identifying key criteria for ideal candidates, we explored candidate profiles for both Non-profit NGO and for profit firms. Additionally, we used data polls from pew research center to help determine which level of government would be most suited to head the project and what sentiments citizens had towards the environment.

Lastly, we conducted an interview with Boston College Law professor, Zygmunt Platter, to utilize for the video.

### **III. Background: The Current State of Waste Water Treatment In the U.S**

#### **A. The Clean Water Act**

In 1972, Congress significantly amended the Federal Water Pollution Control Act of 1948. The Clean Water Act, as it is known today, was a response to public outcry over heavily polluted waters. In the year's prior, images of burning rivers filled the papers, as shown in *Figure 1*, horrifying citizens. In an effort to clean up U.S waters, The Clean Water Act (CWA) established a regulatory framework for pollution discharges into

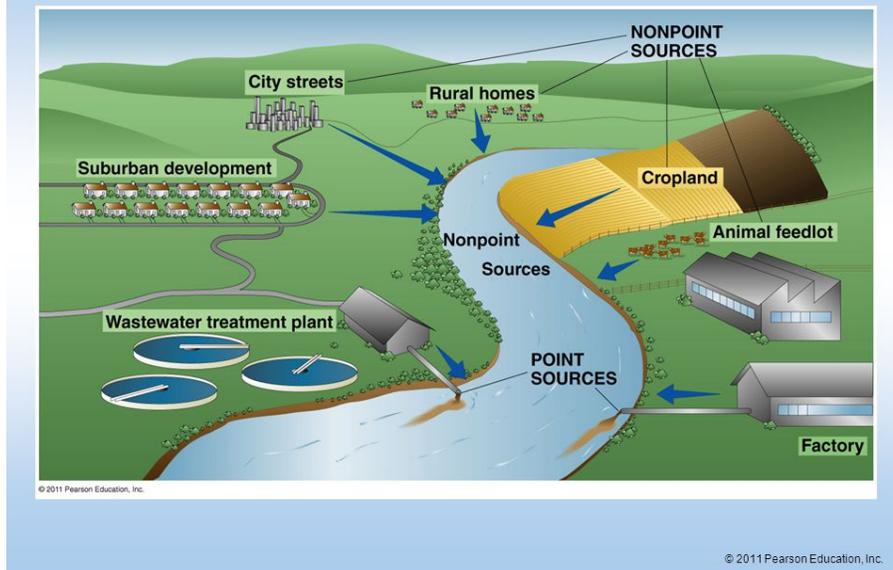
public waterways and for quality standards in surface waters. (EPA)



*Figure 1: On the Left: The front cover of the Cleveland Plain Dealer reporting on the June 22<sup>nd</sup> 1969. On the Right: Firefighters attempt to control the flames that engulfed the Cupoyogo River in Ohio on June 22<sup>nd</sup> 1969*

Under the CWA, there are two classifications of water pollution sources. A point source is a single, discrete stationary source such as a factory discharge pipe. Conversely, a non-point source does not originate from a single pipe but instead encompasses water that flows naturally from runoff over a large spread of land. *Figure 2* illustrates the examples of potential point and non-point sources. (CWA) Of the two, point sources are the more heavily regulated under the CWA. The Environmental Protection Agency (EPA), established via executive order in 1970, was vested with the power to oversee the implantation of the CWA, promulgating rules and regulations. (EPA)

## Point and nonpoint sources



*Figure 2: Examples of point source include wastewater treatment plants and factories. Examples of non-point sources include suburban development, city streets, rural homes, cropland and animal feedlots.*

### B. The National Pollution Discharge Elimination System

Section 402 of the CWA established the National Pollution Discharge Elimination System (NPDES). The NPDES permit program requires all point sources to apply for and acquire approval prior to discharging water into U.S. waterways.

The EPA has since delegated authority to 46 state governments to carry out permitting, administrative and regulatory tasks under NPDES. These states are called “authorized states” given that the EPA has “authorized” them to implement the permit program. The remaining 4 states, referred to as non-authorized states, have relinquished their oversight of the NPDES permit program to the EPA regional offices. (Figure 3) As one of the 4 non-authorized states, Massachusetts’s NPDES permit program is administered by the Regional 1 office.

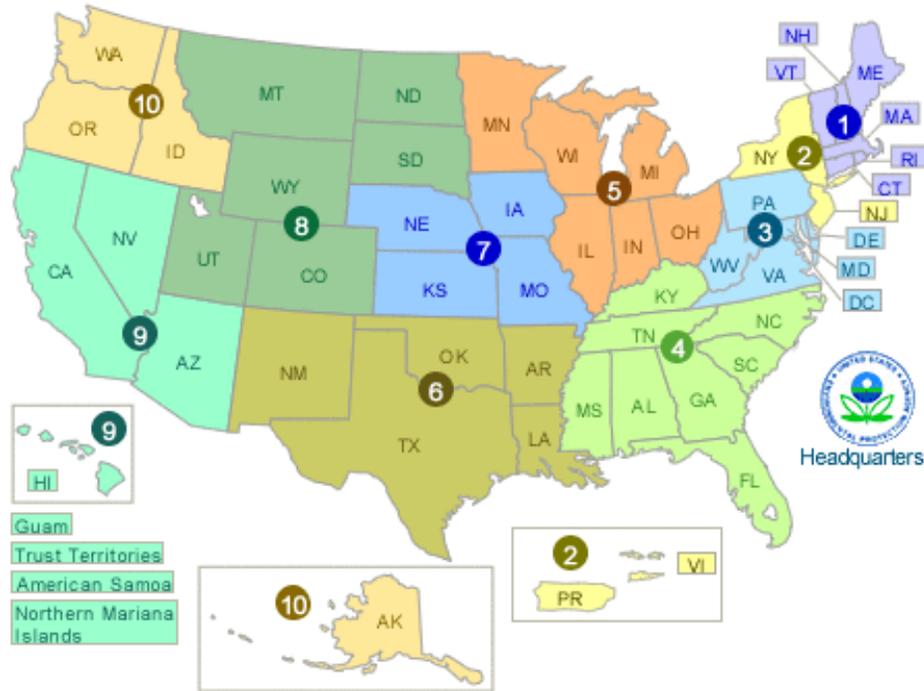


Figure 3: A map of the 10 Regional EPA offices. Massachusetts is located in Region 1, also known as EPA New England

Further, Authorized States and Regional Offices are considered “Approval Authorities” further delegate the permitting program to approve municipal entities. These municipal entities, such as towns, cities, sewage authorities, etc., as “control authorities.” Under the NPDES, Control authorities are responsible for monitoring the day-to-day functions of permitted point sources. . Acquiring these permits can be costly and time-consuming for municipalities and business. To mitigate this, Publicly Owned Treatment Works (“POTW”), or municipal wastewater treatment, are generally subsidized through the Clean Water Act.[1] The Control Authority in Springfield, Massachusetts is the Springfield Water and Sewer commission. The commission operates the areas publically owned pretreatment plant (POTW) and all sources of wastewater, such as domestic and industrial.

### **C. Publically Owned Treatment Works**

One type of point source regulated under the NPDES of the CWA is the Publically Owned Treatment Works (POTW). A POTW cleans wastewater so that it may be discharged into U.S. waters without risk to human health or the environment. The vast majority of the 16,000 POTW in operation today, such as that in Springfield, are designed to clean only domestic wastewater. Typically, influent, or wastewater as it enters the plant, undergoes Primary Treatment, Secondary Treatment, disinfection and a removal of suspended solids. *Figure 4* outlines the complex process in greater detail. While designed to treat domestic wastewater, POTW often must accept wastewater from industrial users, under NPDES, to prevent dumping of industrial wastewater and pollution into U.S. Waterways.

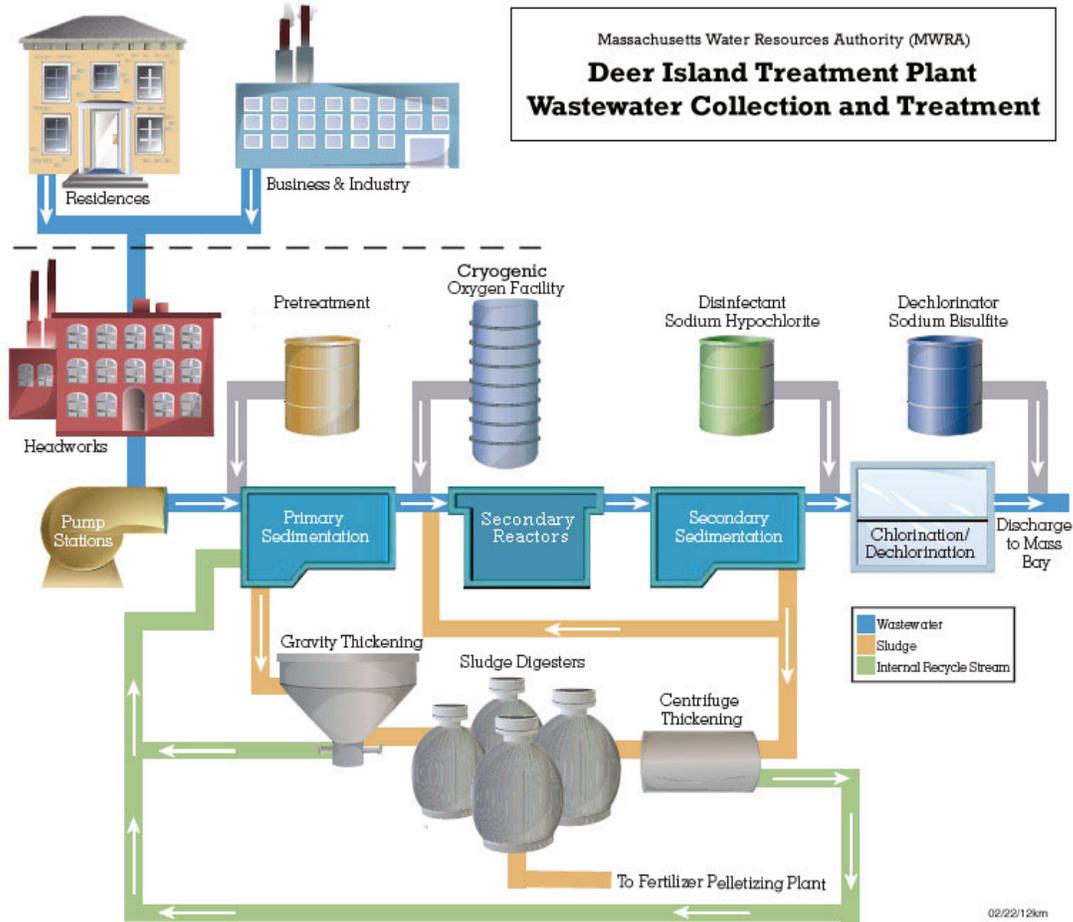


Figure 4: A flow chart of the wastewater collection and treatment process at Deer Island Treatment Plant in Boston, Massachusetts.

#### D. Need for a Pretreatment Program

Each day, approximately 255,000 mgd of industrial wastewater is discharged into U.S. waterways. (Water Environment Federation 2016) This is enough water to fill about 38,611 Olympic sized swimming pools. Each sector of industry produces a wastewater with a distinct composition of contaminants. *Table 1* lists several types of industry and the pollution typically found in their wastewater. (Hangshin Shi, EOLSS)

As previously mentioned, the POTW process is equipped to handle only domestic wastewater. Because of this, the POTW’s wastewater treatment is less stringent than necessary, as the treatment processes often cannot handle the wide range of industrial waste. This means that the majority of these industrial contaminants cannot be removed at POTW.

Contaminants that are unable to be removed from industrial wastewater at the POTW are referred to as “interference” and “pass-through” pollutants. Interference pollution interferes with the chemical and biological processes of the POTW and can prevent the proper treatment of even domestic wastewater. Pass-through pollutants do not interfere with POTW processes, but instead stay in the wastewater throughout the treatment process and are released into U.S. Waterways. (40 CFR 403.3) This water then discharged into the water source, or river, is not held to the same best-technology-available standards.

Sector	Pollutant
Iron and steel	BOD, COD, oil, metals, acids, phenols, and cyanide
Textiles and leather	BOD, solids, sulfates and chromium
Pulp and paper	BOD, COD, solids, Chlorinated organic compounds
Petrochemicals and refineries	BOD, COD, mineral oils, phenols, and chromium
Chemicals	COD, organic chemicals, heavy metals, SS, and cyanide
Non-ferrous metals	Fluorine and SS
Microelectronics	COD and organic chemicals
Mining	SS, metals, acids and salts

*Table 1: Water Pollutants by the Industrial Sector (Hangshin Shi, EOLSS)*

In order to prevent these industrial pollutants from entering the environment or interfering with POTW function, industrial users must pretreat their wastewater prior to sending it to the POTW. The National Pretreatment Program mandates all non-domestic

users to treat toxic discharge before sending it to a POTW in order to eliminate “pass through” or “interference” waste, which would evade or damage POTW treatment systems respectively. However, noncompliance is prevalent. (Fobi)

Under NPDES, NPP operates with Regional Office once again operating as the Approval Authority and the municipality and the POTW operating in conjunction as the control authority. Often, municipalities struggle to enforce compliance in fear of losing industry from the area. To fix the inefficiencies in this pretreatment program, we propose the creation of a publically owned pretreatment plant.

#### **IV. Proposed Plan for Publically Owned Pretreatment Plant**

A Publicly Owned Pretreatment Plant (“POPP”) integrated into the wastewater system directly before the POTW would have multiple benefits. First, it eases the stress on the POTW. POTWs typically take on industrial waste in order to keep businesses and manufacturing in the area, although they are designed to handle strictly municipal waste. (Fobi) In sending industrial waste into the POTW for processing, businesses do not have to seek their own NPDES permit, cutting costs and resources. They also often do not pretreat their waste before they send it to the POTW, as is required by the EPA’s National Pretreatment Program (“NPP”). (Fobi)

A POPP would be designed to handle strictly industrial waste, particularly targeting toxins and pollutants discharged by specific industrial facilities. “Pass through” and “interference” waste would be eliminated, resulting in cleaner treated water. It also removes the necessity for facilities to apply for and receive their own permit or pretreat their waste themselves, as discharging into a POPP is not a point source pollutant

discharge. This makes the existence of a POPP incredibly beneficial for industries that discharge toxic waste, and the area in which it is located more attractive for new facilities.

## **V. Recommendations for Collaborative governance**

Collaborative governance is a form of collective action in which public and private actors come together to find a solution to a specific dilemma. (*Figure 5*) In collaborative governance, there is a clear and mutual final goal that all parties wish to reach. (Ansel and Gosh) An important facet of collaborative governance is the motivation of the participants; firms, non-profit organizations, and other external agents work alongside government to advance a collective goal not because they are forced to do so or paid to do so, but because participation advances their own interests as well. (Donahue 2004) The process is consensus orientated, and deliberative in nature. In recent years, there has been a trend in using collaborative governance for watershed management that has been relatively successful. (Lupell 2002)

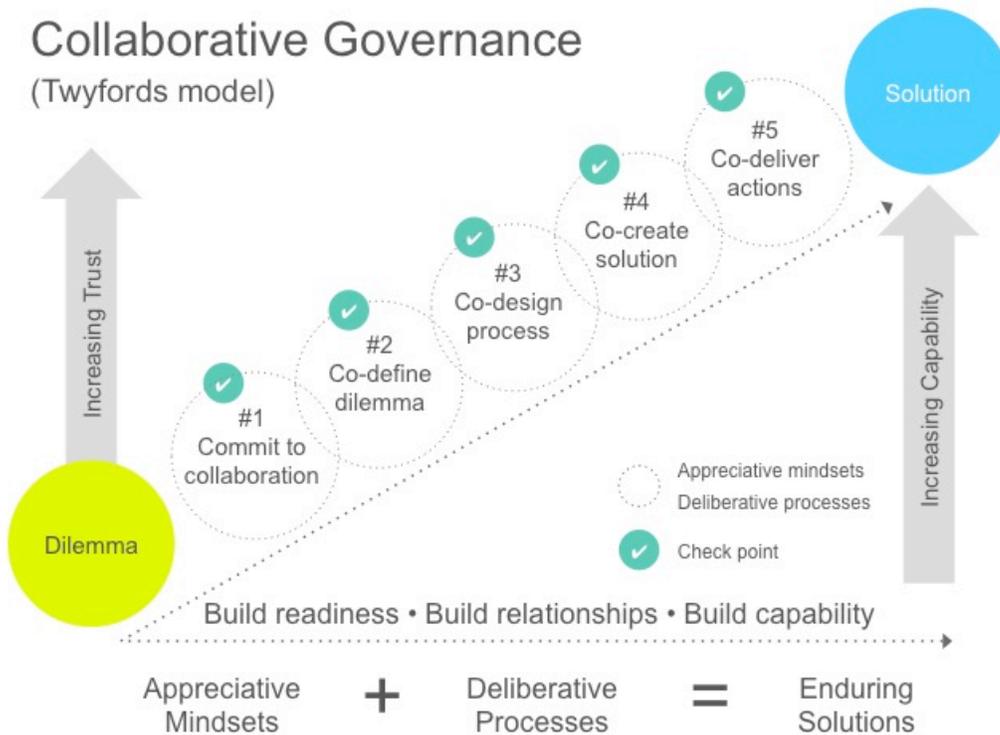


Figure 5: A common model for collaborative Governance.

### A. Government

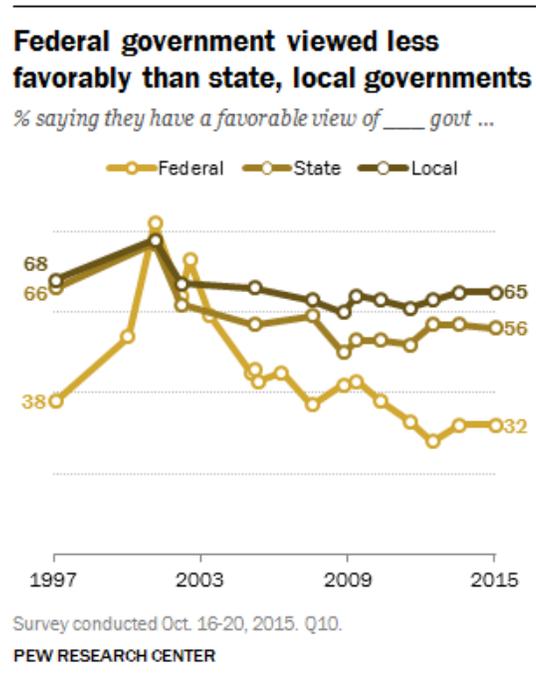
The United States exists under a form of decentralized government known as federalism. Federalism is a cooperative government system in which there is some overlap of specific powers. In a federalist country, a written constitution delineates powers to a central government and regional, state and local governments. Here the term “local” will refer to governmental authority at the sub-state level. While there may be an overlap of power, there is a distinct substance, prevalence and identify intrinsically linked to politics at a local level that make it most apt to implement a POPP program.

An example of this cooperative government is the NPDES permit program as discussed above. As the control authority, local government is the primary provider of wastewater treatment. Moreover, they are the primary monitor of the pretreatment permit program with the most knowledge of local industry type, the type of industrial pollutants emitted from the industry, which industrial users are frequently in a state of significant non-compliance. Because local government has the most intimate knowledge of the operations and inferences of a POTW, and knowledge of their site specific industrial users, it is the local government that will play the most involved roll in the implantation of the POPP program.

There is a greater prevalence of politics at local level. In fact, most elections in the United States are sub-state elections. According to U.S. Census Data, 342,812 members of local governing boards, which represented 84,955 different local government units. At the Federal level, there were only 535 legislators serving in one governmental unit, and 7,382 state legislators in all 50 States. Moreover, given that local elections occur more frequently than those of state and federal, most elections are held at the local level and most campaigns are local campaigns ((Justine Tr dskg)) Therefore, there are more potential government officials, and officials with the most narrow focus on site specific wastewater treatment, to attempt to engage and facilitate a POPP. Given the prevalence of opportunities to engage, there is greater participatory citizenship at a local level. Moreover, because of the proximity of local government to the people, citizens are more confident in their local governments. .

According to a 2015 study on How Americans View Their Government, only 32% of citizens held favorable views towards the federal government. Conversely, results

showed that 65% of citizens held favorable view towards their local government. (Graph 1) When addressing areas of concern such as pollution in wastewater and consequently the implementation of a POPP, it is important that citizens trust the governing body that is engaged. The favorable opinion of local governments makes it the ideal level to engage in collaborative governance.

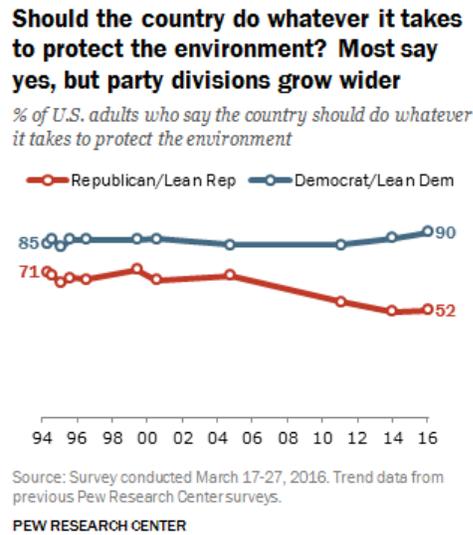


Graph 1: Shows the % of Americans that have favorable view of each level of government, federal, state and local.

## B. Citizens

While participatory citizenship opportunities are most frequent at the local level, not all issues are prioritized in the same fashion. Still, as shown in *Graph 2*, despite partisan divides, 71% of Americans believe that the country should do whatever it takes to protect the environment. Moreover, 39% of Americans identify themselves as “environmentalists. (Pew) According to voter ballots, the 2016 primary election saw Springfield heavily leaning toward the Democratic Party. 24,151 registered democrats

voted, while only 4,806 republicans went to the ballots (City of Springfield, 2016). This strong lean toward democratic values likely reinforces the areas sentiment towards protecting the environment.



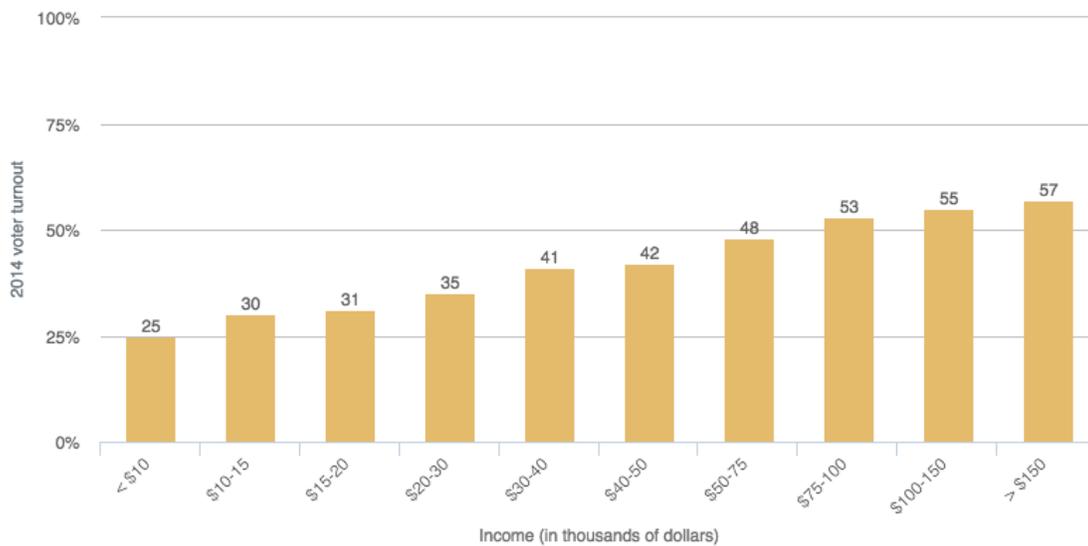
Graph 2: Shows the % of US adults who say the country should do whatever it takes to protect the environment

While collectively there are more opportunities, actual civil participation varies amongst different socioeconomic areas. Of 97,203 total registered voters in Springfield, only 24.85% participated in the primaries. This is in sharp comparison to the national average of voter participation, last recorded to be about 42% in 2014 (U.S. Census, 2014). It is also in the lower range of income-adjusted voter turnout. The Census Bureau exemplified in 2015 (Graph 3) that individuals or families making a higher income tend to have higher voter turnout. The lower one's income, the less of the

segment

voted.

### Families with higher incomes had higher voter turnout in 2014



Source: Census Bureau, 2015

Graph 3 :shows the relationship between income and 2014 voter turnout

As Springfield and other mill towns battle increasing poverty and unemployment, the community not only loses their socioeconomic power, but also with it, their political power. For the implementation of a POPP, which would require community mobilization in order to fundraise and seek grants, this presents a challenge. However, a heavily democratic population also presents an opportunity, as the concept of a POPP fits in with party standards.

### C. POTW and the Media

Unfortunately, due to the complex nature of the wastewater treatment at a POTW, there is going to be inevitable issues that arise. It is these issues that most frequently are discussed in news media. To combat the negative attention that a POTW usually receives and to facilitate education and dialogue on wastewater treatment, it is recommended that

Springfield's POTW establish a Press Release program in preparation for implantation of POPP.

In the past, a POTW in Wansua, WI established a Press Release Program for their POTW and found that the trend in type of story published in newspapers shifted from highly negative, to overall neutral if not positive. To do this, they established connection with local news, at the time the town newspaper, and wrote their own articles about the status of the plant and educate town members on the functions of a POTW. Moreover, they educated the reporters that would be covering other stories on the subject in order to assure accuracy. By establishing a connection with a local news source, educating the public on human health and safety, water conservation practices, and status of the facility, a press release programs removes most of the mysteries and concerns associated with wastewater treatment. Particularly, the press program may use the video created as a means to explain the POPP to citizens.

### **C. The Private Sector**

Under the model of collaborative governance, the private sector plays a crucial roll in the planning and development of a POPP. While the POPP will be owned and operated by a municipality, the initial costs of the project, including the construction of the facility, will be too costly for a local government to fund alone, even after governmental grants. In turn, municipalities with the goal of planning, developing constructing and operating a POPP will need outside investors to fund the project. In our research, we looked for a company that is geographically close to the proposed located of Springfield, that has a strong sense of corporate responsibility geared towards

sustainability and environmental protection and looking for potential investment opportunities in research and development. This is because for collaborative governance to operate successfully, there must be a strong consensus of a goal and effective communication is how to achieve that goal. Our findings indicated that General Electric would be the ideal firm for Springfield.

### **i. General Electric**

Recently, General Electric announced that it would be relocating its headquarters from Fairfield, Connecticut to Boston, Massachusetts. Given that Springfield is located roughly 2 hours outside of Boston, GE will be situated in the close enough geographically to effectively coordinate with the municipality. Next, GE has recently developed a strong sense of corporate responsibility. Despite GE's previous reputation as a polluter, the Fortune 500 Company shows promise in potential innovation and development in the green sector. In 2001, the EPA settled with GE in a suit charging them with dumping an estimated 1.3 million pounds of polychlorinated biphenyls (PCBs) into the Hudson River between 1947 and 1977. (Boston Globe 2016) Today, however, after years of reprioritization, GE is focused on playing a key role in sustainable technology as part of its Ecomagination. GE describes Ecomagination their growth strategy to enhance resource productivity and reduce environmental impact at a global scale through commercial solutions for our customers and through their own operations. (GE)

For example, currently, GE operates a wastewater treatment program to assist industrial facilities with regulatory compliance. One type of this program is MetClear, a wastewater treatment program that targets heavy metals such as lead, copper, chromium,

iron, manganese, mercury, nickel and zinc (Figure 6). In addition to compliance, the purpose of this program is to ensure community health, reduce treatment costs and provides potential for future recycling of wastewater.

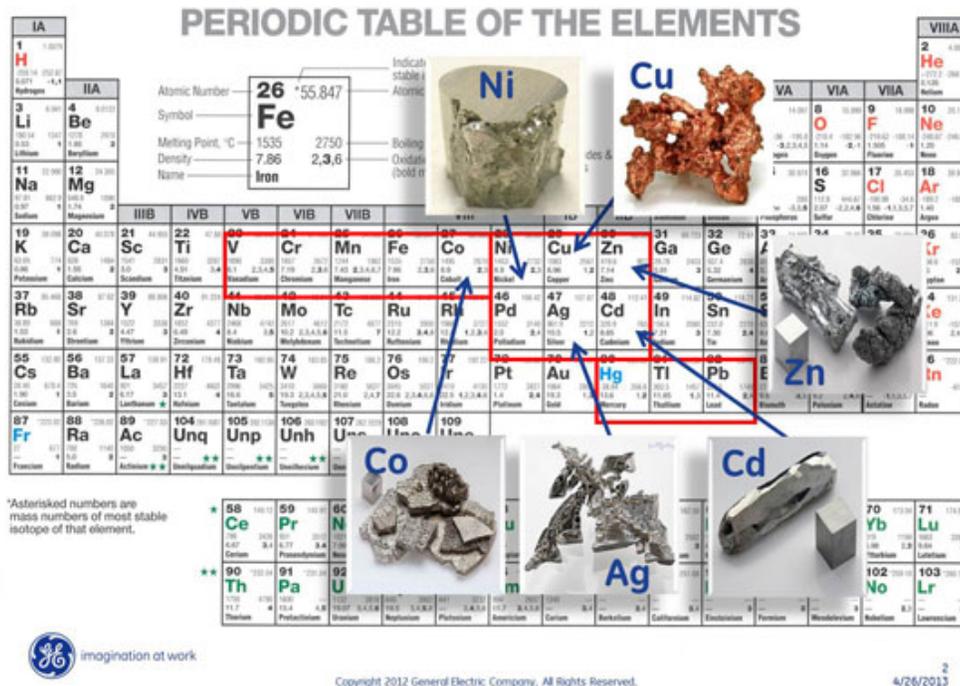


Figure 6: An info graphic form GE that highlights the heavy metals that are removed from wastewater through their MetClear program. Highlights the

In 2015, GE created several new corporate partnerships to accelerate water security and energy efficiency. GE, Goldman Sachs and MWH Global will attempt to overcome the challenge of water scarcity. The main focus will be on financing and expanding industrial and municipal wastewater reuse with the hopes of facilitating global adoption of water reuse. GE predicts that with its partners' help, industrial desalination and water reuse will triple by 2020.

Currently, GE operates a wastewater treatment program to assist industrial facilities with ensuring compliance with regulatory compliance. For example, their MetClear wastewater treatment program targets heavy metals such as lead, copper, chromium, iron, manganese, mercury, nickel and zinc (Figure XX). In addition to compliance, the purpose of this program is to ensure community health, reduce treatment costs and provides potential for future recycling of wastewater. With their expertise in tech innovation and motivation to spearhead the campaign for water reuse, GE would be an integral partner in collaborative governance to implement the POPP plan.

**ii. NGO**

As discussed earlier, it is necessary for they're to be a mobilization effort in a community such as Springfield to educate citizens and encourage civil participation. An environmental advocacy group with local knowledge would be ideal. Environmental league of Massachusetts is a Non-Profit, environmental advocacy group for the state of Massachusetts. To facilitate change they focus their efforts on the state level, however they network and collaborate with a variety leaders in business and government as well as with other environmental non-profits. Massachusetts environmental league could use its strong ties to government and industry to influence other potential partners in the collaborative effort to implement the POPP plan. Moreover, they could identify candidates to lead a more concentrated effort in grassroots campaigning for the POPP in Springfield. They are well versed in training environmental advocacy. For example, recently they held an environmental fellowship program in which students from local universities learned key techniques in advocacy, which they presented to their universities as part of an Earth Day initiative. (ELM)

Other potential NGO collaborators include WateResuse association, where a GE executive is an elected member of the Legislative Committee and Water Environment Research Foundation, where a GE executive serves on the Board of Trustees. (GE) Established relationships such as these are important when networking for collaborative governance as they serve as a foot in the door to partnerships.

### **iii. Universities**

One of the main reasons motivating GE's move to Boston was their desire to be within close proximity to elite universities and tech firms. "We want to be at the center of an ecosystem that shares our aspirations," chief executive Jeffrey R. Immelt said in a statement. (Boston Globe 2016). GE recognizes the vast opportunities for research and development at undergraduate and graduate programs. It is entirely possible that colleges or technical/trade schools in or around mill towns, such as Springfield, could adopt the POPP program implementation process for their own community revitalization. Involvement would be a boon for the school as well as the student, who would gain valuable experience, local networks, and even advantageous trade skills in an attractive and green new market.

## **VI. Conclusion**

Despite the existing problems that plague the industrial wastewater process, there is a tangible solution for fixing the dilemma. Coming together, Local government in Springfield, General Electric, Environmental League of Massachusetts, WateReuse Association, Water Environment Resource Foundation, local universities such as Boston college, the POTW itself and citizens, could successfully research, advocate for, fund and

implement a POPP. A POPP would incentive local industries to come by reducing treatment costs and ensuring regulatory compliance. Futher, municipalities would more directly have control over wastewater compliance and no longer need to worry that punishments for non-compliance will drive industry away

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