

Overflowing Wastewater Facilities and Water Pollution: Chlorine as an Example of America's Increasing Need to Upgrade Wastewater Infrastructure

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Introduction

Everyday, the lives of many citizens in the United States are protected due the process of wastewater treatment. However, currently wastewater infrastructure within the United States is at a critical state that poses a risk not only to U.S. citizens but also the diverse environments that they live in. As stated by Duhigg, "More than 9,400 of the nation's 25,000 sewage systems have reported violating the law by dumping untreated or partly treated human waste, chemicals, and other hazardous materials into rivers and lakes and elsewhere." These communities are often forced to violate the law because their wastewater treatment plants are operating at maximum capacity. By weighing the considerations of alternative disinfection methods against the commonly used chlorine process, one can see that a transition must be made into a environmentally friendly method such as Ultraviolet, ozone, or peracetic acid disinfection. Though safer alternatives are available, political and financial barriers are preventing needed upgrades to the degrading wastewater infrastructure in the United States. In over coming those barriers, public education on wastewater, government grants and loans, rate increases, and a additional sewer fees are solutions in ensuring that the health of the people and environment remain at a positive state.



Picture 1. This photo from Xylem Water Solutions shows the disinfection of wastewater by the method of ultraviolet disinfection.

Methods

In putting the state of the United State's infrastructure into context, I looked at recent engineering reports and news articles. In describing the history and processes of wastewater treatment I used multiple books and flow schematic charts in journal articles. In comparing wastewater disinfection methods, I used factsheets by journal studies and the Environmental Protection Agency. In addressing the barriers facing communities in upgrading or constructing new wastewater infrastructure, I looked for strategies that specific communities have implemented. I supplemented my analysis by doing an interview with a public works director in a community of 7,000 residents. I used a culmination of literature and environmental fact sheets to build a table that compares chlorine disinfection to the available alternatives.

Wastewater Disinfection Method Comparison Table						
	Disinfection By-products	Percentage of Use	Safety of Use	Costs for New System (5MGD)	Grade of Maintenance	Grade of Electricity Consumption
Chlorine	Trihalomethanes Haloacetics	67.3%	Potential for Hazardous Leaks	\$1,689,920	C	A
Ultraviolet Disinfection	None	33.7%	Little to no Hazard Risk	\$2,815,000	A	C
Ozone	Bromates		Minimal Hazard Risk	\$3-6,000,000	D	D
Peracetic Acid	Very Minimal to None		Potential for Hazardous Leaks and Explosions	NA	B	B

Table 1. In this table I compare alternative disinfection methods with chlorine. I ranked the "grade of maintenance and "grade of electricity" based on multiple criteria obtained from literature, factsheets, and journal studies. A being the best grade and D being the worst grade.

A Financial Barrier

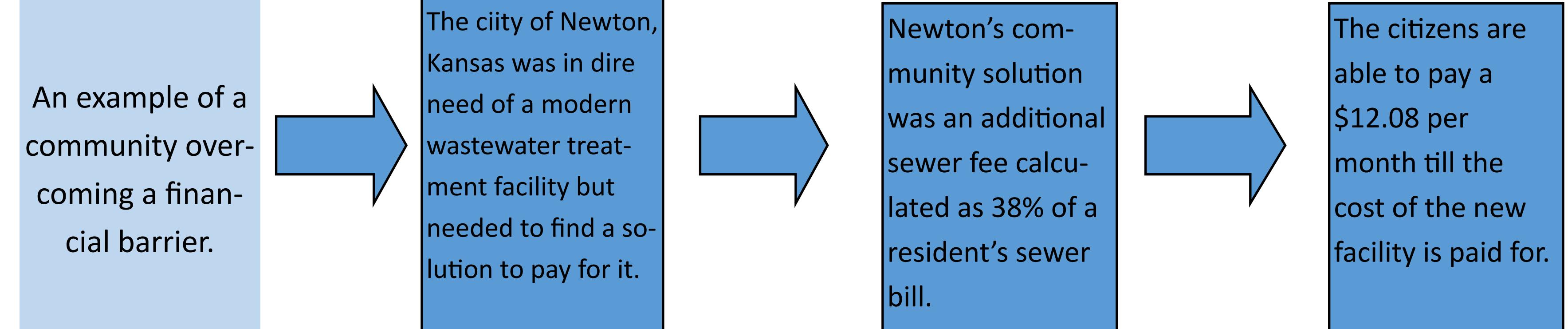
- ◆ Financial barriers are preventing communities from updating wastewater facilities
- ◆ The funding of wastewater treatment is politicized
- ◆ A lack of public knowledge on the current state of wastewater treatment facilities is critical in legitimizing funding a new project

Federal spending on water and wastewater utility infrastructure decreased in the 1980s and after 2000

Reported in billions of 2014 dollars



Figure 1. This figure shows the gradual decline of federal spending after the 1980's.



Conclusion

The health impacts of chlorine on the human population and the environment represent a larger picture of the degrading wastewater infrastructure in the United States. As wastewater facilities reach their maximum capacity in treating wastewater, now is the time to address the needs before it gets worse. Ultraviolet, ozone, and peracetic acid offer the same level of disinfection and cut down on disinfection byproducts. The drawbacks of increase use of electricity and capital can be fought with increase public funding and support in maintaining the clean waters that people bathe, drink, and use every day.

Solutions

- ◆ Government Grants and Loans
 - EPA CWA Nonpoint Source Grant
 - CWSRF Loan
 - Rural Development Insurance Fund
 - Wastewater Infrastructure Fund
- ◆ Rate Increases
- ◆ Additional Sewer/Water Fees
- ◆ Wastewater Educational Programs:
 - Tours, Newsletters, and outreach committees.

References: Bangorwater.org "Ozone System Upgrades: Planning For a Reliable, Cost Effective System For the Next 20 Years."

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