



**Cornell AAP**  
City and Regional Planning

**WATER AND SEWER  
INFRASTRUCTURE:  
CORRECTING  
UNDERINVESTMENT  
WITH SMART SPENDING**

CRP 5074 | Prof. Mildred Warner

Yeon Joo Kang (yk539)

Lohita Turlapati (dt525)

Jack Schwab (jcs546)

Junbo Huang (jh987)

---

# CHALLENGES IN WATER AND SEWER INFRASTRUCTURE

---

## Poor Investment



- Underinvestment in water and sewer from the federal government since the 1980s.
- The responsibility of investment and maintenance has shifted to state and local government.

## Weak System : Design and Operations



- Weak water and sewer distribution system planning.
- Weak community engagement processes.
- Short-term design.

## Disproportionate Impact



- Community of color has been disproportionately affected by violations of minimum standards, particularly when it comes to their health.
- Water demand has changed as a result of the pandemic.

---

# AMERICAN RESCUE PLAN ACT (ARPA): AN OPPORTUNITY

---

ARPA has provided US municipalities with a unique opportunity to address critical water and sewer concerns by directing \$350 billion to state, local, territorial, and tribal governments for funding local projects.

The ARPA funds, in particular, have given state, local, and tribal governments extensive authority invest in community improvements that will increase access to clean drinking water through wastewater and stormwater infrastructure systems, maintain service levels that meet acceptable health standards, and consider climate change resilience.



# STUDY METHODOLOGY

## LITERATURE REVIEW

### Secondary Literature

- Define key challenges in the US
- Local governments' approach
- Identify scholars
- Develop analytical framework\*

### Plan-Content Analysis

- Identify jurisdictions investing in water and sewer infrastructure.\*\*
- Code ARPA plans based on analytical framework
- Find key trends and good practices

\* Analytical framework developed from works of O'Neil, 2011; Liao et al, 2019; Loh & Kim, 2020).

\*\* Referred to <https://results4america.org/tools/arpa-dashboard/> to identify jurisdictions

## INTERVIEWS

### SCHOLARS

### CASE STUDIES

Buffalo, NY  
Geneva, NY  
St. Augustine, FL  
Polk County, FL

In-Depth  
Analysis

## RESULTS

### KEY RECOMMENDATIONS

# KEY ACTIONS IN CREATING AN EFFECTIVE PLAN

of 93 plans

**65%**



Identify underserved communities/ demographics

**52%**



Identify underserved geographies

**46%**



Engagement of historically underinvested groups

**37%**



Describe future needs for communities/ neighborhoods

**34%**



Address the citizen's ability to pay

**25%**



Protect from hazards and extreme events

Sample size  
93 local governments  
ARP Data and Evidence Dashboard  
By Results for America

# CONFRONTING THE CHALLENGES

1

## Buffalo, NY

\$ 63 Million

### Lead Pipe Replacement



Designing for Long-term  
Public-health Security



<https://spectrumlocalnews.com/nys/buffalo/community/2020/09/21/bills-team-up-with-city-of-buffalo-to-bring-internet-access-to-4-500-students->

- Water and Sewer system with pipes from the city's golden age
- Elevated blood lead levels in the city's children
- Holistic cross-agency plan making with proactive community engagement to prepare for all water and sewer challenges

---

# CONFRONTING THE CHALLENGES

---

2

## Polk Co, FL

---

\$ 80 Million

**Improve stormwater  
infrastructure**



Reducing Climate  
Vulnerability



Copyright: Truth Falcon

- One of America's fastest growing counties
- Increased climate risks and a tight city budget
- Leveraging ARPA to proactively complete projects from the unfunded list and help reduce future damage

---

# CONFRONTING THE CHALLENGES

---

3

## Geneva, NY

---

\$ 0.92 Million

### Plugging Revenue Shortfalls



Addressing Service  
Affordability



Copyright: Kevincoltonphoto.com

- A small city of 13,000 in New York's Finger Lakes
- Usage changes driven by the pandemic created a budget shortfall
- Allocating ARPA funds to replenish the lost revenue and avoid passing costs on to rate-payers



---

# CONFRONTING THE CHALLENGES

---

4

## St. Augustine, FL

---

\$ 52 Million

**Septic to  
Sewer conversion**



Ensuring Services under  
All Circumstances



Copyright: Art Wager

- Investing in West Augustine, a majority-black unincorporated community on the outskirts of St. Augustine
- Funding connection lines for homeowners to sewer system
- Improving health outcomes and economic development possibilities

---

# RECOMMENDATIONS

---

## Build Ambitious Long-term Plans

Create long-term spending and project roadmaps to leverage grants and new funding sources

## Invest for Multiple Benefits

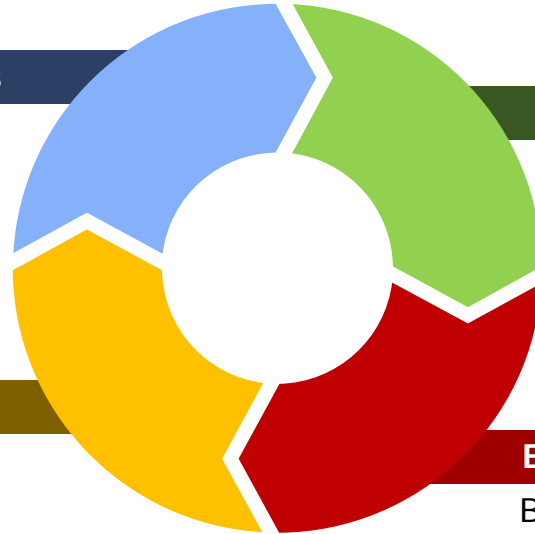
Identify the benefits of infrastructure investments across all categories, including economics and public health

## Inter-Agency Effort

Build lateral and vertical partnerships across agencies to create advocates for your goals

## Engage with Community

Build your plans using constant community input, verified with expert analysis



# ISSUE BRIEF

Full issue brief and more information: <https://labs.aap.cornell.edu/local-government-restructuring-lab/student-work>

**WATER AND SEWER INFRASTRUCTURE:**

**CORRECTING UNDERINVESTMENT WITH SMART SPENDING**

Yeon Joo Kang, Lohita Turlapati, Jack Schwab, Junbo Huang, May 2022

**Executive Summary:** Municipalities are financing water and sewer infrastructure with ARPA funding to improve public service quality and accessibility. We analysed over 100 interim plans submitted to the Treasury. Four case studies are also profiled. The most successful plans focus on the long term, build inter-agency partnerships, engage the community and invest for multiple benefits.

---

**LONG-TERM CHALLENGES**

**1. Decreased Investment**  
In the absence of federal funding, localities lack the ability to raise revenue for capital renewal and regular maintenance, resulting in expensive failing systems.

**2. Disproportionate Impact**  
Poor and minority communities face the highest costs for the lowest quality of service, deepening existing inequalities within communities.

**3. System Design**  
Short-sighted system design decisions can lead to higher long-term costs, damage public health, and limit economic development.

*Access to safe, affordable water and sewer services, is critical for economic development, environmental sustainability and quality of life.*

**THE WATER PLAN-MAKING CYCLE**

**Build Ambitious Long-term Plans**

Create spending and project roadmaps that allow for quick access to new funding sources.

**Form Inter-Agency Relationships**

Build relationships across government agencies and with community organizations and external experts to create allies for the long-term vision.

**Invest for Multiple Benefits**

Identify necessary public health, social and environmental protection outcomes that can be achieved from a single investment.

**Proactively Engage with Communities**

Develop plans with constant community input, verified with expert analysis, to develop clear investment priorities.

**KEY ACTIONS IN CREATING AN EFFECTIVE WATER AND SEWER PLAN**

KEY ACTION	% OF SUBMITTED ARPA PLANS
Identify underserved demographics	65%
Identify underserved geographies	54%
Engage with underserved groups	46%
Identify future system needs	37%
Address citizen's abilities to pay	34%
Prepare for disasters and extreme events	25%

For more details on ARPA Plan analysis: <https://bit.ly/arpaappendix> Sample Size: 93 local governments

*CORRECTING UNDERINVESTMENT WITH SMART SPENDING*

**STUDY METHODOLOGY**

---

**LEVERAGING ARPA TO MAKE A LASTING DIFFERENCE**

Buffalo, NY	Polk Co, FL	Geneva, NY	St. Augustine, FL
Lead Pipe Replacement	Improved Stormwater Infrastructure	Plugging Revenue Shortfalls	Septic to Sewer Conversion
\$63 Million	\$ 80 Million	\$0.92 Million	\$52 Million
Design for public health outcomes	Reduce climate disaster vulnerability	Address service affordability	Expand service to all
Responding to elevated blood lead levels in their city's children, Buffalo engaged all its water agencies to develop comprehensive plans with expansive community input across a variety of water issues. ARPA enabled Buffalo to expand lead pipe replacement programs and stormwater management projects.	Polk County's Roads and Drainage Division maintains an unfunded list with decades worth of stormwater management projects. The county's budget limits its ability to fund these projects, and funding usually only comes after major storms. ARPA is enabling Polk County to make investments that will reduce future flood damage.	A decline in usage during the COVID-19 Pandemic created a shortfall in the City of Geneva's maintenance budget. ARPA allowed the City of Geneva to replace its lost revenue without passing higher costs onto citizens. The City was also able to plug gaps in capital projects to reduce the system's long-term expenses.	In West Augustine, homeowners couldn't connect to the sewer system built to service their area, because it was too expensive, leading to the system lying dormant. The city is using ARPA to expand its efforts to build connections directly to homes and parcels. This opens up opportunities for new commercial and multi-family development.

For more details on case studies: <https://bit.ly/arpaappendix>

This project was conducted under the direction of Professor Mireia Warner, as a part of CRP 5074 Economic Development Workshop in the Department of City and Regional Planning at Cornell University. Funding support from the Mal He Center for Cities, the Cornell Ag. Exp. Station and USDA NIFA. More information: <https://labs.aap.cornell.edu/local-government-restructuring-lab/student-work>



**Cornell AAP**  
City and Regional Planning

# Thank You!

---

*This project was conducted under the direction of Professor Mildred Warner, as a part of CRP 5074 Economic Development Workshop in the Department of City and Regional Planning at Cornell University. Funding support from the Mui Ho Center for Cities, the Cornell Ag. Expt. Station and USDA NIFA.*

# References

---

- ARP Data and Evidence Dashboard. (n.d.). Results for America. Retrieved February 22, 2022, from <https://results4america.org/tools/arp-dashboard/>
- Coronavirus State & Local Fiscal Recovery Funds: Overview of the Final Rule. (n.d.). 44.
- Durrant D. (2017) Infrastructure, Equity and Urban Planning: A Just Process for the Allocation of Benefits and Burdens. In: Bishop J. (eds) Building
- Goff, M., & Crow, B. (2014). What is water equity? The unfortunate consequences of a global focus on “drinking water.” *Water International*, 39(2), 159–171. <https://doi.org/10.1080/02508060.2014.886355>
- Loh, C. G., & Kim, R. (2021). Are We Planning for Equity?: Equity Goals and Recommendations in Local Comprehensive Plans. *Journal of the American Planning Association*, 87(2), 181–196. <https://doi.org/10.1080/01944363.2020.1829498>
- Liao, L., Warner, M. E., & Homsy, G. C. (2019). Sustainability’s forgotten third E: what influences local government actions on social equity? *Local Environment*, 24(12), 1197–1208. <https://doi.org/10.1080/13549839.2019.1683725>
- O’Neill, P. M. (2010). Infrastructure financing and operation in the contemporary city. *Geographical Research*, 48(1), 3–12. <https://doi.org/10.1111/j.1745-5871.2009.00606.x>
- Reece, J. W. (2018). In Pursuit of a Twenty-first Century Just City: The Evolution of Equity Planning Theory and Practice. *Journal of Planning Literature*, 33(3), 299–309. <https://doi.org/10.1177/0885412218754519>

Porse, E. (2018). Open data and stormwater systems in Los Angeles: applications for equitable green infrastructure. *Local Environment*, 23(5), 505–517. <https://doi.org/10.1080/13549839.2018.1434492>

Vanderslice, J. (2011). Drinking water infrastructure and environmental disparities: Evidence and methodological considerations. *American Journal of Public Health*, 101(SUPPL. 1). <https://doi.org/10.2105/AJPH.2011.300189>

Warner, M. E., Zhang, X., & Rivas, M. G. (2020). Which states and cities protect residents from water shutoffs in the COVID-19 pandemic? *Utilities Policy*, 67. <https://doi.org/10.1016/j.jup.2020.101118>

Williams, R. A. (2020). From Racial to Reparative Planning: Confronting the White Side of Planning. *Journal of Planning Education and Research*. <https://doi.org/10.1177/0739456X20946416>

Zolan Kanno-Youngs, & Madeleine Ngo. (2021). US Goal of Racial Equity in Infrastructure Is Left to States. *New York Times*.

Gleick, Peter H. (2020). Water and the Pandemic: Reopening Buildings After Shutdowns: Reducing Water-Related Health Risks. *Pacific Institute*. <https://pacinst.org/publication/reopening-buildings-after-shutdown>