CLGFP Report 2025-03

ASSESSING THE RELATIONSHIP BETWEEN DRINKING WATER INFRASTRUCTURE AND SOCIOECONOMIC CHARACTERISTICS IN MICHIGAN MUNICIPALITIES

POLICY AND FINANCING RAMIFICATIONS

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The **MSUE Center for Local Government Finance and Policy (CLGFP)** at Michigan State University, located within the MSU Department of Agricultural, Food, and Resource Economics and in partnership with MSU Extension, was founded in 2015 to support communities in their efforts to efficiently deliver critical public services that promote health, safety, and well-being. The Center works to enhance decision-making for public officials in communities of all sizes through a diverse offering of training, engagement, and applied research opportunities.

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Executive Summary

Michigan's 731 municipally-owned and operated water systems provide water to 7.5 million Michigan's residents (Michigan Department of Environment, Great Lakes, and Energy 2021). These systems, which serve three-quarters of Michigan's population, are a core public service, foundational to the health and economic well-being of Michiganders.

Like all municipalities and public authorities, water systems have public reporting requirements, and their budgets and financial statements are readily available, but due to how information is reported and the nature of their funding structures, the fiscal health of water systems is not always apparent. Further, water system finances are not reported or monitored separately from municipal budgets, so emerging fiscal challenges specific to water systems may be less visible. As enterprise funds, water systems can be insulated from pressures on general fund budgets, but they are also subject to risks due to loss of ratepayers, higher costs of defrayed maintenance, unaffordability, and other distinct challenges.

Our analysis of the fiscal health of 250 Michigan public water systems from 2008-2022 shows low interest loans and technical assistance from State programs offer an important opportunity for fiscal stability. This insight is increasingly important as state and local government decision makers are faced with fewer options to finance necessary maintenance and long-term system improvements.

In addition to the quantitative analysis of the sample of 250 water systems, we provide a more detailed comparison of Flint's water system to other systems across the country to underscore how fiscal and management challenges manifest in different municipal contexts. This evaluation offers insight into how to better ensure the health and long-term viability of this critical infrastructure.

Recommendations:

- Establish State reporting and monitoring requirements for the fiscal health of water systems, not just water quality.
- Seek opportunities to continue and expand the Drinking Water State Revolving Fund (DWSRF) as federal funding declines, as the fund is an important component in maintaining water affordability and quality of life for Michigan residents.
- Consider state-level incentives for water systems to collaborate for more stable finances and management and accompany those incentives with governance protections to ensure transparency and accountability.

Water Systems in Michigan: Aging Infrastructure, Worsening Fiscal Health

While the Flint Water Crisis and the harms it inflicted on Flint residents brought international attention to public water systems and their oversight, it is not the only Michigan city struggling with maintaining its water system. Municipalities must deal with the day-to-day challenges of procuring, treating, and distributing water in a context shaped by local, state, and federal choices. Each community's distinct market of residents and ratepayers are also critical components to water system sustainability, as water systems are typically structured as enterprise funds. As enterprise funds, water systems rely largely on user fees, rather than tax dollars, and debt incurred to invest in capital improvements is secured by the revenues paid by ratepayers. Enterprise funds are also subject to different accounting and reporting standards than municipal budgets (Uniform Budgeting and Accounting Act 1996; Michigan Department of Treasury 2023).[1] While enterprise funds are often insulated by their revenue structure from the factors that affect municipal budgets, water systems that rely on user fees are sensitive to population loss and changes in the types of ratepayers who pay for the system (Bash et al. 2020; Doyle et al. 2020).

Financing Capital Projects: Local Priorities, State Programs, and Federal Funds

At the heart of the Great Lakes basin, water is part of Michigan's identity. Ready sources of fresh water allow residents to access drinking water in a variety of ways, and communities of all sizes operate public water systems to supply Michigan households and businesses. While these systems are funded, financed, and operated by individual local governments, the State of Michigan offers assistance with financing capital projects that helps keep systems operational.[2]

The State's involvement in ongoing drinking water infrastructure finance over the last three decades has been supported largely by participation in the federal Drinking Water State Revolving Fund and the Clean Michigan Initiative (CMI).[3] The Clean Michigan Initiative was established in 1998 with a voter-approved $675 million general obligation bond, $90 million of which was authorized, appropriated, and spent for water quality, including an infrastructure grant program (Scott 2018). The Department of Environmental Quality and its successor department, the Department of Environment, Great Lakes, and Energy (EGLE) administer a range of programs to support water-related projects, including the Drinking Water State

[1] While not the subject of this report, the implications of fee-for-service structures on affordability and equity are discussed in depth by Beecher (2021).
[2] For more on the distinction between funding and financing of public infrastructure, see Beecher (2021).
[3] The federal government increased its investment in water infrastructure through the American Rescue Plan Act (ARPA) and the Infrastructure Investment and Jobs Act (IIJA) offered substantial investment in water infrastructure. These programs are not considered separately in this report because the funds relevant to this analysis were funneled through the Michigan Drinking Water State Revolving Fund. Michigan's uses of IIJA funds are detailed in its annual Intended Use Plans.

Revolving Fund (DWSRF), the low-interest loan program which is most relevant to the scope of this research.

The federal Drinking Water Revolving Fund was established as part of the 1996 reauthorization of the Safe Water Drinking Act, and Michigan established its Drinking Water State Revolving Fund in 1997 via Part 54 of the Natural Resources and Environmental Protection Act (NREPA) (Michigan Department of Environmental Quality 2014). The Environmental Protection Agency has provided capitalization grants to states via formula, with states required to provide a 20% match, which has allowed Michigan to award over $2 billion to eligible projects since 1998 (Michigan Department of Environment, Great Lakes, and Energy 2024a).[4]

Local governments eligible to apply for DWSRF funds proceed through a multi-step application process that offers technical assistance to identify requirements and develop a project plan (Michigan Department of Environmental Quality 2014; Michigan Department of Environment, Great Lakes, and Energy 2024a). Project plans submitted by the annual deadline are ranked according to criteria established by statute and included on the DWSRF Project Priority List (PPL), which allows the project to be funded as dollars are available. A loan or grant can be issued after projects proceed through a series of reviews and approvals, including financial documentation of ability to repay the loan. Communities with low median household income, low taxable value, and/or high water system user costs may meet program criteria to be designated as "overburdened" or "significantly overburdened," a designation that affords additional points in project ranking and allows extended loan terms or subsidization of projects (Michigan Department of Environment, Great Lakes, and Energy 2024b).

Even with the DWSRF's investments, Michigan still faces significant gaps between needs and available funds. In 2016, Governor Snyder's 21st Century Infrastructure Commission identified an $800 million annual gap in water and sewer infrastructure needs and recommended substantial additional State funding, including $50 million each year for 10 years to be administered through the DWSRF (21st Century Infrastructure Commission 2016). Many communities struggle to access the DWSRF, even with technical assistance, and in recent years interest rates through the fund have been less competitive with private options (Hansen et al. 2021; Great Lakes Now et al. 2022). Further, federal priorities also threaten the fund's ability to continue meeting Michigan's water infrastructure needs. While the EPA restated its commitment to the program in May 2025 (Browne 2025), the President's recommended budget includes $2.46 billion in proposed cuts to the Clean Water and Drinking Water State Revolving Funds for FY 2026, with the rationale:

> *"EPA's State Revolving Fund (SRF) was designed decades ago to give money to States via formula allocation for seed money to set up their own water infrastructure loan programs without continued annual appropriations. When it comes to water infrastructure, the States should be*

[4] The majority of the $2 billion was awarded as low-interest loans, though $159 million has been forgiven and did not revolve back into the program (Michigan Department of Environment, Great Lakes, and Energy 2024a)

responsible for funding their own water infrastructure projects. Contrary to that design, in practice, the program has been heavily earmarked by the Congress for projects that are ultimately not repaid into the program and bypass States' interest and planning. In addition, the SRFs are largely duplicative of the EPA's Water Infrastructure Finance and Innovation Act (WIFIA) program and the Department of Agriculture's (USDA) Water and Wastewater Loan and Grant program, and they received a massive investment in the Infrastructure Investment and Jobs Act (IIJA). The Budget proposes to return the SRFs to their intended structure of funds revolving at the State level, and therefore provides the decreased funding level of $305 million total to allow States to adjust to alternative funding sources for their water infrastructure." (Vought 2025)

Thus, despite the commitment of state and local governments to improving Michigan's drinking water infrastructure over the last 30 years, communities are facing increasing needs for investment and fewer resources to support it.

What Helps a Water System Stay Afloat?

Fiscal regulatory data is a valuable starting point for assessing the conditions and needs of local government infrastructure (McDonough and Yan 2023). In a 2024 report, the Center for Local Government Finance and Policy, supported by the C.S. Mott Foundation, compiled fiscal data on water infrastructure operations, assets, and liabilities for 250 Michigan cities for the years 2008, 2015, and 2022 from Annual Comprehensive Financial Reports. This first-of-its-kind compilation of data over time highlighted issues of water affordability, lack of publicly accessible information on water system fiscal health, and aging infrastructure across Michigan communities, particularly as local governments face declining populations and fewer resources. Building on that work, this analysis examines the community and system-level factors associated with water system fiscal health to inform policymakers as they consider options to maintain and invest in this critical infrastructure (Sane et al. 2024).[5]

Community-Level Data: Finances and Community Composition

The addition of key socioeconomic and policy variables to financial data on the infrastructure and capital assets of each municipal system in the sample allows a systematic evaluation of the factors associated with better (or worse) fiscal health. Importantly, the new data enables us to observe changes in financial position relative to infrastructure investments via DWSRF

[5] The sample compiled in 2024 and used as the basis for this report included asset and liability information from a large sample of Michigan local governments who own and maintain a community or public drinking water system for the years 2008, 2015, and 2022. From the 1,383 community water supplies (Michigan Department of Environment, Great Lakes, and Energy 2021) in the state, a sample of around 400 units operated by public entities was selected. Data collection was then limited to communities with drinking water systems serving at least 1,000 residents. With this requirement and given certain data limitations (combined sewer and water data in many cases), data were collected for approximately 350 community drinking water systems in the sample. Lack of complete data available between all years (2008, 2015, and 2022) and removal of outliers narrowed the 350 units in the sample down to the 250 present in the sample. The sample included 132 cities, 56 villages, and 62 townships.

over time. Factors such as population, population change, property values, property value change, household income, change in household income, age structure, and other variables were collected. Both cross-sectional and fixed effects regression models are used to evaluate which factors are associated with better (or worse) net financial position.

Financial data were scraped from the annual comprehensive financial reports (ACFR) that are compiled by the Michigan Department of Treasury for every local government in Michigan going back to 2001. The resulting database included the following information for years 2008, 2015, and 2022: 1) book value of drinking water assets, 2) depreciation value, 3) net asset value, 4) operating income, 5) net position, 6) depreciation policy, 6) estimated useful life, 7) capitalization threshold, 8) debt level, 9) user charge revenue, 10) total revenue, 11) total expenses, and 12) cash on hand.

To understand the mix of available ratepayers in a community, demographic and socioeconomic data were also compiled from the American Community Survey (ACS) for each of the local government units in our sample, including median household income, median age, total population and percent of residents under 18 and over 65 years of age.[6] In addition, data on property value by class were pulled from equalization reports provided by Michigan Department of Treasury for a measure of the blend of potential ratepayers in a governmental unit.

Finally, revolving fund information for each local government in our sample was pulled from the Michigan Water Infrastructure Funding and Financing Dashboard (Michigan Department of Environment, Great Lakes, and Energy 2025). Projects were sorted to include only those loans related to drinking water systems, removing any focused on wastewater or other non-related projects. Detailed information on all variables used in the analysis is outlined in Appendix 1.

Comparing Systems Quantitatively: Methods and Results

The analysis draws on financial and operational data spanning three time periods: 2008, 2015, and 2022, allowing for both cross-sectional and longitudinal examination of the relationship between state revolving fund participation and the financial health of municipal water systems.

The analysis incorporates several key financial and operational measures:

- **Financial Position Indicators**: Total water-related assets, total water-related liabilities, net position, and water-related user charges
- **Revenue Base Measures**: State Equalized Value (SEV) across various property types, providing a comprehensive view of the local tax base
- **Demographic Controls**: Population size, age, and whether cities are shrinking or growing to account for scale effects

[6] Community-level data

- **Policy Variable**: State Revolving Fund (SRF) participation indicator, capturing whether municipalities accessed state-supported low-interest financing for water infrastructure, where participation occurred in the current year or any time prior

We use a two-stage analytical framework to examine the relationship between revolving fund participation and municipal financial outcomes. Initial analysis consisted of comprehensive summary statistics for all variables across the sample units to provide a baseline characterization of the financial conditions, demographic profiles, and revolving fund participation patterns among Michigan water system operators. Further information on the analytical framework can be found in Appendix 2.

The first stage of the econometric analysis used cross-sectional regression focusing on 2022 data for all 250 municipal units. This approach examined whether revolving fund participation was associated with differences in financial position indicators across local governments, controlling for population size, asset base, and local property wealth measures. The cross-sectional specification allows for identification of contemporaneous relationships between revolving fund access and financial outcomes.

The second analytical stage utilized a fixed effects panel data model incorporating observations for each local unit from 2008, 2015, and 2022. This longitudinal approach used the within-unit variation over time to identify the impact of revolving fund participation on financial positions, while controlling for differences that persist over time across municipalities as well as factors that affect the whole state over time. The two-way fixed effects specification helps address potential endogeneity concerns by controlling for municipality-specific characteristics that are fixed over time that might influence both the likelihood of revolving fund participation and financial outcomes.

Both analyses consist of two parts: the first examines at all units together; the second considered whether the communities were shrinking in population or not. Two different definitions of "shrinking" were used:

a. "any shrink" in population at all or
b. "shrink >10%" (a population decline of more than ten percent).

Analysis

While we are mindful of the reality that Michigan local governments are often quite unique and thus difficult to compare, our analysis of 250 Michigan local governments reveals stark disparities in water infrastructure and fiscal capacity across communities of different sizes and types (cite last mott). Table 1 provides summary statistics for all variables included in the evaluation. In our data set of 62 villages, 132 cities, and 56 townships, a quarter of local units had populations over 9,146, and most (58%) actually grew in population between 2008 and 2022, as shown in Table 1. The remaining communities lost residents during this time, though only 10% saw their population drop by more than 10% over the period.

All dollar-value variables are in inflation-adjusted 2022 dollars. Median household income for the sample was around 59,000 throughout the periods sampled, with about a 10k difference between low population areas ($56,590) and high population (see Table 2).[7] The lower population units in the sample tended to have higher water assets, higher net position, and higher charges for services (all in per capita terms) than those with higher populations. Thirty-four percent of units in the sample had a water purchase agreement, and these units tended to be higher income areas, with users paying the least for services on a per capita basis (Tables 2 & 3). These patterns suggest that Michigan's water infrastructure financing creates a system where smaller, lower-income communities bear disproportionate per capita costs, while larger communities benefit from economies of scale and shared agreements.

The cross-sectional analysis of 2022 data further highlights the difference between larger and smaller communities and revealed several interesting results around participation in the DWSRF.

Table 4 shows the analysis for the year 2022. Larger communities demonstrate substantially higher fiscal capacity across all measures: 78% higher assets, 98% higher liabilities, 82% higher net position, and 119% higher service charges. Higher median household income is associated with lower assets, liabilities, and net position. By contrast, higher property values were correlated with higher assets and net position. Water purchase agreements are strongly correlated with positive net position and service charges. Villages and townships also reflected lower fiscal capacity compared to the other municipalities represented in the sample.

In the initial analysis, state program participation shows no significant association with any fiscal measure, however this is not unexpected given the many unobserved factors not captured in the data for this snapshot in time. Differences do emerge when we consider separately communities that have declined in population by more than 10% (Table 5). In this subset, participation in the DWSRF is associated with higher assets, liabilities, net position, and charges for services.[8]

When considering changes in community fiscal conditions over time, the results took on a different complexion. The panel data two-way fixed effects analysis revealed that communities who received funds from the DWSRF experienced positive, statistically significant changes in their total net financial position over time. Program participation is associated with a ~32% increase in total assets and a ~34% increase in total net position. For communities with stable or growing populations, receiving DWSRF funds is associated with a 47% increase total net position. There was no significant effect for local units that experienced population loss.

When the growing/stable and shrinking communities were treated separately in the two-way fixed effects regression, participation was associated with a better net financial position for

[7] "Low population" is defined as population less than 1,903 or the lower 25th percentile, and "high population" is defined as population greater than 9,146 or upper 25th percentile.
[8] Note that these two regression models still do not control for community level invariant unobservables.

communities with stable or growing populations, but not for those units that were experiencing population loss by either definition. For communities that experienced no population loss over the periods, participation in the program is associated with a 47% increase in total net position.

Interestingly, when we consider a more stringent definition of shrinking (greater than 10% population reduction), we see a drop in the increase in net position associated with revolving fund participation for localities with more stable populations from 47% to 39%. This result is in line with the insignificant coefficients returned for program participation for the shrinking communities in the sample.

Findings

Our findings suggest that revolving fund effectiveness depends critically on local economic conditions.

- Shrinking cities may face structural challenges such as a declining tax base, higher per-capita infrastructure costs, and political constraints that limit their ability to benefit from additional infrastructure investment. Additionally, participation in the program could trigger debt burden effects that offset any operational savings and/or stranded asset risk as demand decreases even as they invest in the infrastructure.

- Stable/growing cities have the complementary conditions (growing revenue base, economies of scale, political support) needed to translate infrastructure investment into improved financial outcomes. They can theoretically better leverage infrastructure improvements into economic development, population retention, or operational efficiencies.

The results suggest that communities that have more stable populations and participate in the DWSRF are more likely to see improved fiscal positions over time. The data did not show this same general improvement for shrinking cities, though that does not mean those communities did not benefit from the program. In many cases, shrinking communities face severe fiscal distress that infrastructure investment, while sorely needed, may not be enough to have a transformative effect on the balance sheet. These findings raise important questions about whether current program design adequately serves Michigan's most fiscally distressed communities, who may need different types of support beyond infrastructure investment resources.

Lessons on Water System Fiscal Health from National Comparisons

The City of Flint and its residents have seen the most catastrophic effects of water system financial and public health failure. The depth of the water crisis and the limited number of comparable cities in Michigan means Flint has few peers of similar size to compare to within the state, so while the analysis above highlights issues shared across Michigan public water systems, national peers can offer additional lessons for Flint. Here, we provide detail on crises experienced by cities across the country, to offer insight into shared issues and strategies that may be effective as Flint continues its recovery and works to stabilize the fiscal health of its water system.

Newark, New Jersey[9]

In 2016, lead contamination was detected in the water of Newark public schools. This discovery prompted broader monitoring of the city's water supply, and by 2018 the city reported lead levels well above federal standards throughout the system that serves its 321,986 residents (Elmer 2024). After the initial reports, Newark residents organized to provide clean water to residents and press for action. A 2021 settlement from a citizen-led lawsuit secured access to water testing and filters, public reporting on water quality, and the replacement of aging lead service lines (Sencer CDC Museum 2025). The city government replaced over 20,000 lead service lines between 2019 and 2021, completing what it called a 100% replacement over three years. However, audits continue to find some existing lines not replaced by contractors (Biryukov 2024).

Prior to the crisis, the city's water system had been plagued by governance and financial issues, including bribery and corruption charges for system officials and a failed shift to municipal water authority governance after its prior nonprofit governing agency left a $42 million budget gap and a list of over $500 million in needed investments (Giambusso 2012). This parallels some of the governance and financial issues faced in Flint prior to the water crisis. Both cities have a user base unable to absorb large fee increases, so the ability to recover from failures of governance and fiscal management is extremely limited, particularly for historically disenfranchised majority Black cities.

Newark, however, was able to rapidly replace lead service lines, an investment that, along with a population increase of 10%, led to an improvement in fiscal health. The speed of response was hastened by two state actions: 1) water quality regulations that had compelled Newark to digitize records dating back to 1900; and 2) legislation that permitted municipalities to adopt ordinances that allow entrance to a property to perform a lead service line replacement without a property owner's permission (Office of the Governor 2020; CDM Smith 2025). The legislation enabled the city to adopt an ordinance mandating participation and establishing notification requirements for when the lines would be replaced. Funding for the replacement occurred in two stages. First, in 2018, the City issued $75 million in bonds and secured a $12 million loan from the state revolving fund (of which $9 million in principal was forgiven) to replace its lead service lines over eight years at a cost of $1,000 per property owner. With slow uptake due to the cost, a year later the city worked with the Essex County Improvement Authority and the Port Authority of New York and New Jersey

[9] For a more detailed exploration of the Newark and Flint cases and the citizen activism that led to action, see the David J. Sencer CDC Museum's Digital Exhibit Health is a Human Right: Achieving Health Equity.

to refinance the operation and support replacement at no cost to owners (Rebovich 2020). The total cost of the program was $170 million (CDM Smith 2025).

Baltimore, Maryland

The impacts of aging infrastructure manifested differently in Baltimore, where E. Coli levels were the first signal of larger issues (Portnoy 2022). In 2022, a boil-water advisory was issued after water main collapses, repairs, and sinkholes contributed to a pressure loss that dropped chlorine levels below appropriate treatment levels and allowed E. Coli bacteria to flourish (Rappleye et al. 2023). The lack of investment in infrastructure over time that led to repeated system failures occurred despite rising rates. Typical annual residential water and wastewater bills increased 127% from 2010 to 2018, and the system's overall fiscal health during that same time period illustrates the challenges for communities faced with an increased need for investment and a declining ability of residents to pay for those investments. The gap between water service charges billed and paid grew, and the City was unable to accurately track payments and information on unpaid bills to accurately project future revenue collection (Colton 2018). Further, in a system where 25% of water leaks before reaching the tap, fixes require expensive responses that diminish the capacity to fund planned investments (Hopkins 2020; Rappleye et al. 2023). The vulnerability of the system was acknowledged by the EPA's 2022 award of over $390 million to the City to finance capital improvements. Even with this investment and the City's efforts to streamline billing and improve revenue collection, the system's credit outlook was downgraded to negative by Moody's in 2024 due to concerns about the ability to generate sufficient revenue to cover debt service (City of Baltimore 2024; Collins 2024). Earlier this year the Maryland Board of Public Works approved $75 million in low-interest loans and principal forgiveness from its state revolving fund to address the City's ongoing water and sewer infrastructure issues, so the problems persist (State of Maryland Department of the Environment 2025).

Compton, California

A public water agency that supplied water for decades to 1,600 homes in Compton and Willowbrook, California, was officially dissolved in 2019, after decades of complaints about brown, smelly water. After the state finally took over the Sativa Los Angeles County Water District on its third attempt, the Los Angeles County Department of Public Works stepped in to manage its operations, and it immediately floated a $1.4 million line of credit to the district to address its financial issues. In addition to years of mismanagement and a lack of financial controls, the water system had a limited revenue base over which to distribute capital improvements. With a largely low-income customer base, the system charged a $65 flat rate for water service, generating $1.3 million in annual revenue, leaving little available to invest in needed improvements to pipes and water meters (Jennings and Vives 2018; Jennings 2019). Comparatively, residents of Compton served by the City's water department during the same period paid an average of $100 monthly.

Operated by a private, regulated utility since 2023, the system is now in better financial position. The new operator, Suburban Water Systems, invested $8.5 million in capital improvements and secured grant funds to improve water quality while also cutting water bills by 8% (Avila 2024). These investments were accessible in part due to Suburban Water Systems' organizational structure and management of other water systems in the region.

Shared Struggles and Limited Options: Lessons from National Comparisons

Each of these systems, serving dense urban areas with lower-income households bearing a large share of the rate-paying burden, required a large capital investment from outside to address failing infrastructure and bring it to an adequate standard. Each system also had failures of governance that exacerbated the challenges of maintaining infrastructure and managing water service.

What the cases particularly highlight is that the financial structure of water systems — enterprise funds where fees are expected to cover costs, with expensive fixed infrastructure and maintenance costs that increase rapidly once decline starts — offers limited options to remain solvent. In cities with declining populations or where governance and public health crises occur, there are even fewer options to address the downward spiral (U.S. Government Accountability Office 2016). There is no easy or quick solution to these complex problems, but places that have successfully navigated crises and improved physical infrastructure and fiscal health have needed:

- State-level intervention with regard to capital investment, policy support, or both,
- Improvements in the quality of data and information on system assets that enabled proactive asset management and proper accounting of costs and billing,
- Methods of financing that do not hamstring the system's future (e.g. principal forgiveness, state or federal direct appropriations, shared costs, etc.),
- Clarity and transparency in reporting, to begin to rebuild trust with residents.

Moving Forward: Strengthening Water System Fiscal Health

Our analysis covers the range of community and financial conditions across Michigan municipalities that impact water system fiscal health, and, consistent with earlier work (21st Century Infrastructure Commission 2016; Bash et al. 2020, 2121; Hansen et al. 2021), we offer additional evidence that the Drinking Water State Revolving Fund is a critical tool to ensure sustainable water systems. We further find that, for systems that face particularly difficult challenges related to crises and/or declining population, external intervention that supports strong asset management, cost identification, and billing practices, along with low-cost capital, helps water systems regain fiscal health and get back on the right track. While we do not focus specifically on water affordability in this report, systems with better fiscal health have more options to address community-specific affordability needs. There is no single solution to support water systems that have difficulty supplying clean water and maintaining critical infrastructure, but, based on our detailed analysis of 250 community water systems in Michigan and additional lessons from cities across the country that have faced challenges similar to those in Flint, we offer the following recommendations.

Recommendations

Establish Separate Reporting and Transparency Requirements for Water Systems The State should consider new reporting and monitoring requirements for water systems, outside of existing requirements for municipal finances and water quality standards.

While local government records in Michigan are largely open and available, that does not mean accessible. Residents may not know where to look to find information on water systems and if they do find it, it may be presented in technical terms that require more information to put into context. This is additionally complicated by the loss of local media institutions that historically covered and reported on local government annual budgets, bond issues, and public meetings. Michigan has lost 40% of its newspapers in the last 20 years, and 40 of its 83 counties have only one news source (Franklin and Vos 2025; Metzger 2024). This may seem tangential to this report, however the loss of a newspaper in a community increases the costs of borrowing by five to eleven basis points and increases municipal deficits, so public monitoring plays a critical role in municipal fiscal health (Gao et al. 2020).

There are multiple ways to support accountability, transparency, and more accessible information on water systems. California publishes an Electronic Annual Report, which compiles data from mandatory technical reports into an online dashboard that offers data on the cost of water for different ratepayers; lead service line inventories and replacement timelines; water shutoffs; water supply information; and technical, managerial, and financial capacity (State Water Resources Control Board 2024). Michigan could consider a similar system, or, at minimum, require reporting of key financial data similar to the requirements for broader municipal governments. That may involve new budgeting and auditing standards to ensure that the signs of a decline in water system fiscal health are more likely to be identified before issues are critical. Michigan could also consider public transparency requirements for posting water rates and fiscal health indicators on system websites. Additional technical assistance and support for robust data, billing and asset management programs would require more substantial investment, but they offer other paths to support long-term fiscal health and sustainability for this critical infrastructure.

Seek Opportunities to Expand DWSRF Availability As federal support declines, the State should explore creative opportunities to continue and expand the DWSRF or other funding sources. This is an important strategy to maintain water affordability and quality of life for Michigan residents, especially as the national economic outlook trends negative (Daco 2025). Municipalities are issuing a record amount of debt in the municipal bond market, and while this debt often funds needed infrastructure maintenance and improvement, repaying those obligations as budgets tighten and revenues decline is a concern (Glasgall et al. 2025).

Expanding the DWSRF under current conditions will be difficult, but as opportunities become available, Michigan should capitalize on resources that will help keep this important resource available to community water systems.

Evaluate Incentives for Partnerships and Consolidation A key challenge for municipal water systems is how limited the options are to recover once trouble begins. Collaboration and, in some cases, consolidation, may offer economies of scale or other opportunities to provide fiscal and management stability. Consolidation is often a politically fraught topic, so it may not be considered until a crisis, but the State could offer incentives for systems to consider it proactively, in order to ensure that water systems continue to meet the requirements of the Safe Drinking Water Act. North Carolina, for example, has a merger and regionalization fund that supports feasibility studies for systems considering consolidation or physical interconnection of systems (National Conference of State Legislatures 2022; North Carolina Department of Environmental Quality 2025). California's State Water Resources Control Board offers funding to support consolidation and regionalization through its DWSRF, though evaluation of these consolidations suggests that they do not necessarily lower rates and they are more likely to be used by high-resource communities (California State Water Quality Control Board 2023; Dobbin et al. 2025). California and West Virginia also have specific statutory authority to compel systems to merge under certain conditions (National Conference of State Legislatures 2022), so there are a range of potential policies for Michigan to consider.

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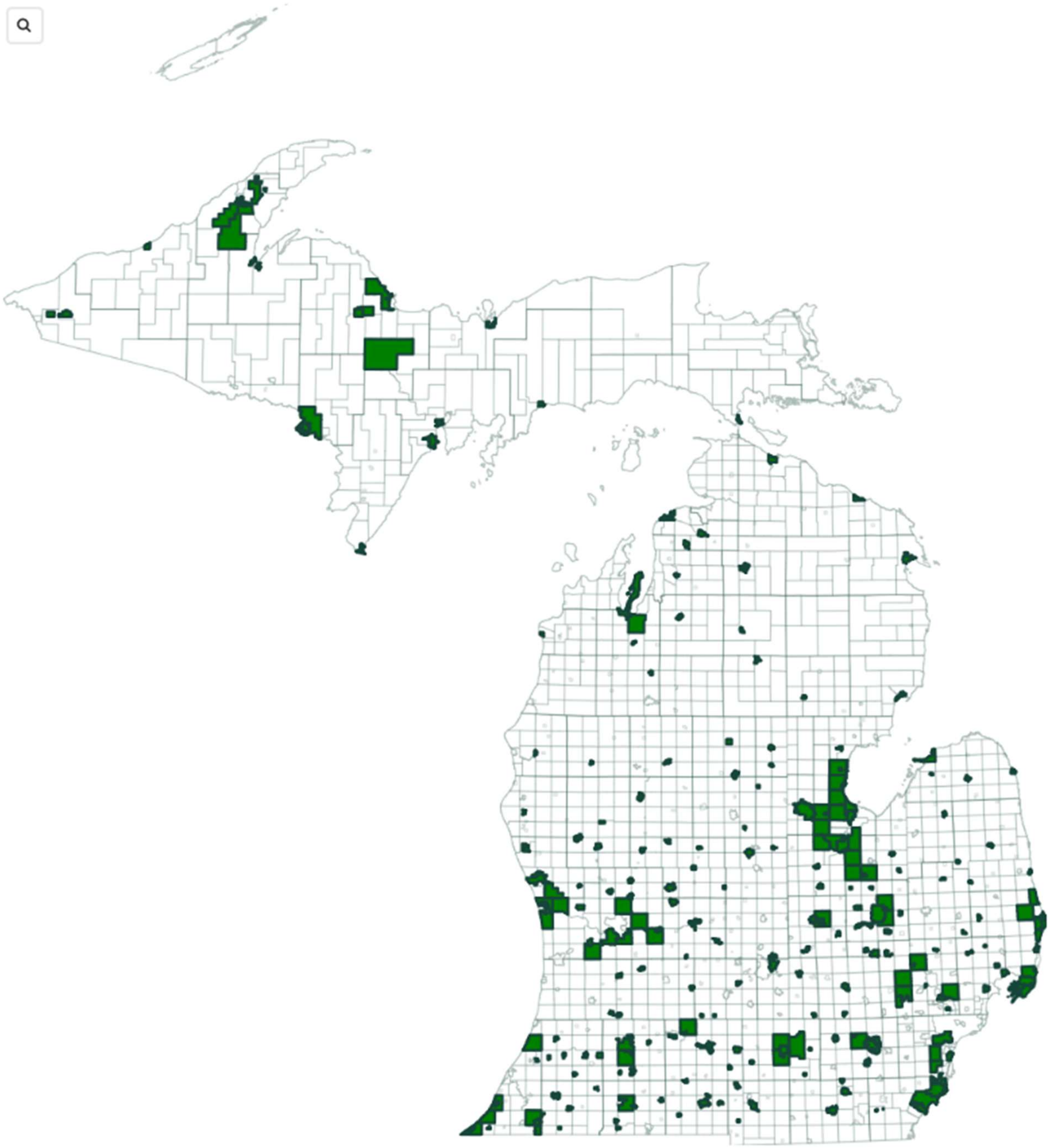
Figure 1: Map of Sample Communities



Appendix 1: Data and Variables

Variable Name	Description
Year	Year of observation: 2008, 2015, or 2022
Unit Type	Indicator for type of unit of government: city, village, or township
Unit County	County in which unit of government is located. Unit of government may span multiple counties.
Source of Water	
Population	Population (estimated) in a unit of government as reported by US Census in ACS. Pulled from Census API via FIPS code (variable B01001_001E) for appropriate year. Increase and decrease are calculated from this variable.
Median Household Income	Median household income (estimated) in a unit of government as reported by US Census in ACS. Pulled from Census API via FIPS code (variable B19019_001E) as follows: • **2008**: 2010 data as reported in the 5-year ACS (API acs/acs5). Unit-level data were not available for 2008 or 2009 for the large majority of the sample, and the data were pulled from the ACS for consistency. The same variables were used in the same way for all observation years and all variables pulled from the Census API. • **2015 and 2022**: pulled from 5-year ACS (API acs/acs5)
Median Age	Median Age (estimated) in a unit of government as reported by US Census in ACS. Pulled from Census API via FIPS code (variable B05004_001E).
Percent of Population Under 18	Percent of unit's population under 18. The Census does not report this directly for each unit, so it was calculated using the same procedures in each observation year from individual tables using the following variables from the ACS API: (B01001_003E + B01001_004E + B01001_005E + B01001_006E + B01001_027E + B01001_028E + B01001_029E + B01001_030E)/B01001_001E
Percent of Population 65 and Over	Percent of unit's population 65 and over. The Census does not report this directly for each unit, so it was calculated using the same procedures in each observation year from individual tables using the following variables from the ACS API:

Variable Name	Description
	(B01001_020E + B01001_021E + B01001_022E + B01001_023E + B01001_024E + B01001_025E + B01001_044E + B01001_045E + B01001_046E + B01001_047E + B01001_048E + B01001_049E)/B01001_001E
Total Assets	Total assets reported on the system's Annual Comprehensive Financial Report (ACFR) for the appropriate year, in inflation-adjusted 2022 dollars. Collected as part of previous work on this project (Sane et al. 2024)
Total Liabilities	Total liabilities reported on the system's Annual Comprehensive Financial Report (ACFR) for the appropriate year, in inflation-adjusted 2022 dollars. Collected as part of previous work on this project (Sane et al. 2024)
Net Position	Net position reported on the system's Annual Comprehensive Financial Report (ACFR) for the appropriate year, in inflation-adjusted 2022 dollars. Collected as part of previous work on this project (Sane et al. 2024)
Charges for Service	Charges for Service reported on the system's Annual Comprehensive Financial Report (ACFR) for the appropriate year, in inflation-adjusted 2022 dollars. Collected as part of previous work on this project (Sane et al. 2024)
State Program Participation	An indicator variable noting whether the unit has received any funds from the Drinking Water State Revolving Fund
Percent of Unit SEV – Residential	Total dollar amount of state equalized value of all property in residential class in a unit. Data sourced from Michigan Department of Treasury's online collection of annual county equalization reports. Data are not reported separately for villages in those reports, so data for villages includes 0 in the agricultural class and township totals for other categories.
Total SEV	Total dollar amount of state equalized value of all residential and personal property in classes in a unit. Data sourced from Michigan Department of Treasury's online collection of annual county equalization reports. For townships and cities, this is the total reported on county equalization reports. Totals are not the sum of other variables in the dataset because other classes (e.g. timber, development, etc.) are not included in these data. For villages, the total is the sum of agricultural, commercial, industrial, residential, and personal property SEV.

Appendix 2: Regression Modeling Framework

This study employs a standard cross-sectional regression using only 2022 data as well as a two-way fixed effects panel data model using data for years 2008, 2015, and 2022. The general specification of the two-way fixed effects model follows the standard panel data framework where unobserved heterogeneity is controlled through entity-specific intercepts as well as time-specific effects. The regression models are characterized by the following equations:

$$\text{Fiscal Measure}_{ij} = \alpha_1(\text{Program}_j) + \alpha_m(\text{Controls}_j) + e_j \quad (1)$$

$$\text{Fiscal Measure}_{ijt} = \alpha_2(\text{Program}_{jt}) + \alpha_n(\text{Controls}_{jt}) + t_t + C_j + e_j \quad (2)$$

where Fiscal Measure i (assets, liabilities, net position, and charges) are the four dependent variables, Program is an indicator variable equal to 1 if community j in period t participates in the DWSRF program, and the vector Controls includes population, median age, median household income, property value variables, and water purchase agreement status for community j in period t. Also, t represents a vector of time indicator variables (2008 is omitted base year), C is a vector of community indicator variables, a and e is the error term. The continuous variables (population, income, property values) are transformed into natural logarithms to help account for skewed distributions and the influence of extreme outliers in the framework.

Equation (1) represents the regression using cross-sectional data for 2022. Equation (1) identifies relationships using variation across municipalities in 2022, comparing municipalities that participate in the DWSRF program to those that do not. α_1 is then the difference in average financial outcomes between municipalities that participate in the program vs those that do not in 2022.

Equation (2) represents the panel data regression using data for years 2008, 2015, and 2022. Equation (2) contains the terms t and c, which are vectors of time indicator variables and community indicator variables, respectively. For the purposes of this report, we focus most heavily on the fixed effects model as described in detail by Wooldridge (2010, chap. 10, eq. 2) represents a standard fixed effects regression model that controls for statewide trends and community characteristics that are fixed over time. The fixed effects estimator identifies the parameter α_2 through within-municipality variation over time. The coefficient is estimated by comparing changes in financial outcomes to changes in revolving fund participation status within the same municipality, holding constant all time-invariant municipality characteristics. This specification is more likely to capture a causal relationship between DWSRF participation and fiscal outcomes. The regressions are estimated with a procedure that generates robust standard errors, which are heteroskedasticity-consistent and clustered by municipalities. This identification strategy addresses potential endogeneity arising from:

- Unobserved municipality characteristics that influence both DWSRF participation likelihood and financial performance.
- Time-invariant institutional, geographic, or administrative factors: year dummy variable (t_t) control for aggregate time trends affecting all municipalities, including macroeconomic conditions, state and local policy changes, or other regulatory changes.
- Historical patterns of fiscal management or infrastructure investment.

Appendix 3: Regression Results

Table 1: Summary Statistics by Year

	2008		2015		2022		All Years	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
City Indicator Variable	0.53	0.50	0.53	0.50	0.53	0.50	0.53	0.50
Township Indicator Variable	0.22	0.42	0.22	0.42	0.22	0.42	0.22	0.42
Village Indicator Variable	0.25	0.43	0.25	0.43	0.25	0.43	0.25	0.43
Water Purchase Indicator Variable	0.34	0.48	0.34	0.48	0.34	0.48	0.34	0.48
High Population Indicator Variable	0.24	0.43	0.24	0.43	0.24	0.43	0.24	0.43
Population	9,431	15,490	9,481	15,866	9,567	16,012	9,493	15,770
Pop. Decline (2008 to 2022)	0.42	0.50	0.42	0.50	0.42	0.50	0.42	0.49
Pop. Increase (2008 to 2022)	0.58	0.50	0.58	0.50	0.58	0.50	0.58	0.49
Pop. Decline > 10% (2008 to 2022)	0.10	0.31	0.10	0.31	0.10	0.31	0.10	0.31
Pop. Not Decline > 10% (2008 to 2022)	0.90	0.31	0.90	0.31	0.90	0.31	0.90	0.31
Median Household Income	60,240	20,183	56,885	18,340	61,054	21,587	59,393	20,135
Median Age	38.23	5.87	39.60	6.09	40.80	7.21	39.55	6.50
% of Population Under 18	0.25	0.05	0.23	0.05	0.21	0.05	0.23	0.05
% of Population Over 65	0.15	0.06	0.16	0.05	0.19	0.07	0.17	0.06
Total Water Assets Per Capita	1,629.83	3,958.05	1,524.36	1,221.00	1,813.62	1,394.88	1,655.90	2,525.32
Total Water Liabilities Per Capita	537.42	704.59	544.88	652.99	602.95	756.46	561.64	705.45
Net Position Per Capita	875.25	884.24	994.27	809.91	1,227.46	982.47	1,033.70	906.02
Charges for Services Per Capita	151.28	108.58	183.07	118.83	246.19	145.52	196.87	132.55
State Program Participation Indicator Variable	0.18	0.39	0.20	0.40	0.26	0.44	0.22	0.41
State Equalized Value Per Capita	61,476	65,125	55,415	60,520	74,469	81,418	63,787	69,961
% of SEV from Residential Property	0.68	0.15	0.65	0.17	0.70	0.15	0.68	0.16
Number of Observations	250		250		250		750	

Table 2: Summary Statistics by Population and Water Purchase Agreement

	Low Population		High Population		Purchase Water		No Purchase Water	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
City Indicator Variable	0.51	0.50	0.58	0.50	0.43	0.50	0.58	0.49
Township Indicator Variable	0.16	0.37	0.42	0.50	0.47	0.50	0.10	0.30
Village Indicator Variable	0.33	0.47	0.00	0.00	0.10	0.31	0.32	0.47
Water Purchase Indicator Variable	0.30	0.46	0.49	0.50	1.00	0.00	0.00	0.00
High Population Indicator Variable	0.00	0.00	1.00	0.00	0.34	0.48	0.19	0.39
Population	3393.28	2192.09	28529.49	23085.40	14054.31	19459.62	7101.09	12825.90
Pop. Decline (2008 to 2022)	0.44	0.50	0.38	0.49	0.44	0.50	0.41	0.49
Pop. Increase (2008 to 2022)	0.56	0.50	0.62	0.49	0.56	0.50	0.59	0.49
Pop. Decline > 10% (2008 to 2022)	0.11	0.31	0.08	0.28	0.16	0.37	0.07	0.26
Pop. Not Decline > 10% (2008 to 2022)	0.89	0.31	0.92	0.28	0.84	0.37	0.93	0.26
Median Household Income	56589.99	17021.74	68142.20	25852.77	68994.34	24614.13	54358.65	15082.44
Median Age	39.92	6.74	38.38	5.51	40.90	6.60	38.83	6.33
% of Population Under 18	0.23	0.05	0.22	0.04	0.22	0.05	0.23	0.05
% of Population Over 65	0.17	0.06	0.15	0.04	0.17	0.06	0.17	0.06
Total Water Assets Per Capita	1813.37	2857.66	1162.60	681.58	1338.71	1086.30	1821.92	3004.19
Total Water Liabilities Per Capita	636.99	770.82	327.17	354.92	390.84	576.54	650.57	749.28
Net Position Per Capita	1086.86	981.73	867.73	583.92	962.17	763.18	1070.49	970.02
Charges for Services Per Capita	205.81	139.95	166.87	98.55	181.09	126.40	204.94	135.02
State Program Participation Indicator Variable	0.22	0.42	0.20	0.40	0.18	0.38	0.24	0.43
State Equalized Value Per Capita	70055.09	77600.77	44223.11	29701.16	65177.58	73406.86	63057.08	68150.27
% of SEV from Residential Property	0.69	0.16	0.64	0.13	0.69	0.16	0.67	0.15
Number of Observations	568		182		258		492	

Table 3: Summary Statistics by Community Type

	City		Township		Village	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
City Indicator Variable	1	0	0	0	0	0
Township Indicator Variable	0	0	1	0	0	0
Village Indicator Variable	0	0	0	0	1	0
Water Purchase Indicator Variable	0.28	0.45	0.71	0.45	0.15	0.35
High Population Indicator Variable	0.27	0.44	0.46	0.50	0.00	0.00
Population	11972.98	19736.08	11863.68	10517.63	2071.77	1313.38
Pop. Decline (2008 to 2022)	0.39	0.49	0.45	0.50	0.48	0.50
Pop. Increase (2008 to 2022)	0.61	0.49	0.55	0.50	0.52	0.50
Pop. Decline > 10% (2008 to 2022)	0.06	0.24	0.20	0.40	0.11	0.32
Pop. Not Decline > 10% (2008 to 2022)	0.94	0.24	0.80	0.40	0.89	0.32
Median Household Income	55008.14	19360.72	74586.35	20787.87	55006.80	13446.70
Median Age	38.51	6.35	43.04	5.65	38.59	6.45
% of Population Under 18	0.23	0.05	0.22	0.04	0.24	0.06
% of Population Over 65	0.17	0.06	0.18	0.07	0.16	0.06
Total Water Assets Per Capita	1672.06	3185.92	1332.88	1226.99	1913.43	1633.15
Total Water Liabilities Per Capita	550.87	674.72	365.35	580.85	760.59	814.39
Net Position Per Capita	992.76	784.92	968.64	767.17	1178.08	1201.35
Charges for Services Per Capita	212.82	125.55	134.94	130.75	216.97	133.49
State Program Participation Indicator Variable	0.21	0.41	0.21	0.41	0.23	0.42
State Equalized Value Per Capita	35732.66	24687.98	73334.91	82396.92	114889.80	89405.62
% of SEV from Residential Property	0.62	0.14	0.71	0.17	0.76	0.12
Number of Observations	396		168		186	

Table 4: Cross-Section Regressions - Determinants of Fiscal Measures (2022)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	**lntotalassets**		**lntotalliabilities**		**lntotalnetposition**		**lnchargesforservice**	
Median Household Income		-0.497***		-0.770*		-0.489**		-0.197
		(-2.752)		(-1.670)		(-2.488)		(-0.811)
Ln(Population)		0.575***		0.683***		0.482***		0.782***
		(6.006)		(3.019)		(5.344)		(4.623)
Median Age		0.012		0.026		0.009		0.020**
		(1.520)		(1.602)		(1.076)		(2.412)
Ln(State Equalized Value)		0.347***		0.265		0.479***		0.173
		(4.165)		(1.294)		(5.889)		(1.197)
% of SEV from Residential Property		-0.316		-0.099		-0.312		-0.213
		(-1.016)		(-0.124)		(-0.710)		(-0.666)
State Program Participation Indicator Variable	**-0.029**	**-0.064**	**-0.068**	**-0.070**	**-0.057**	**-0.082**	**0.011**	**-0.019**
	(-0.183)	**(-0.644)**	**(-0.267)**	**(-0.321)**	**(-0.333)**	**(-0.730)**	**-0.076**	**(-0.250)**
Township Indicator Variable	-0.064	-0.393***	-0.902***	-1.194***	0.107	-0.280**	-0.447**	-0.824***
	(-0.330)	(-3.490)	(-2.635)	(-3.643)	(0.527)	(-2.276)	(-2.211)	(-5.678)
Village Indicator Variable	-0.902***	-0.294*	-1.039***	-0.318	-0.987***	-0.488***	-1.071***	-0.246
	(-6.428)	(-1.788)	(-3.813)	(-0.797)	(-6.271)	(-2.632)	(-8.891)	(-1.255)
Water Purchase Indicator Variable	0.300*	-0.014	0.026	-0.264	0.372**	0.027	0.474***	0.144
	(1.702)	(-0.138)	(0.090)	(-1.003)	(2.008)	(0.272)	-2.791	(1.443)
Constant	15.806***	9.491***	14.346***	10.897***	15.368***	7.358***	13.949***	5.482***
	(134.881)	(6.196)	(77.372)	(2.908)	(123.348)	(4.262)	-125.259	(2.936)
Number of Observations	249	248	244	243	250	249	248	247
R-squared	0.148	0.681	0.072	0.275	0.176	0.687	0.201	0.769

Robust t-statistics in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

Table 5: Cross-Section Regressions - Determinants of Fiscal Measures, Shrinking-Growing (2022)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	**lntotalassets**		**lntotalliabilities**		**lntotalnetposition**		**lnchargesforservice**	
	Any Shrink	***Shrink >10%***	***Any Shrink***	***Shrink >10%***	***Any Shrink***	***Shrink >10%***	***Any Shrink***	***Shrink >10%***
*Ln(Median Household Income)*Shrink*	-0.362	-0.646***	-0.694	-0.927	-0.372	-0.572**	-0.106	-0.272
	(-1.641)	(-2.659)	(-1.372)	(-1.354)	(-1.533)	(-2.482)	(-0.384)	(-0.975)
*Ln(Population)*Shrink*	0.566***	0.511***	0.735***	0.406	0.466***	0.377***	0.859***	1.192***
	(5.532)	(3.706)	(3.220)	(1.264)	(4.405)	(3.707)	(4.342)	(4.352)
*Median Age*Shrink*	0.022**	0.031***	0.048**	0.047**	0.015	0.022*	0.028**	0.037**
	(2.103)	(2.910)	(2.096)	(2.092)	(1.393)	(1.851)	(2.362)	(2.337)
*Ln(State Equalized Value)*Shrink*	0.317***	0.494***	0.299	0.577	0.444***	0.606***	0.144	-0.047
	(2.911)	(3.313)	(1.249)	(1.487)	(4.169)	(4.886)	(0.733)	(-0.164)
*% of SEV from Residential Property*Shrink*	-0.729*	-0.540	-1.304	-1.456	-0.152	-0.556	-0.065	2.240
	(-1.954)	(-0.730)	(-1.436)	(-1.000)	(-0.211)	(-1.010)	(-0.110)	(1.487)
State Program Participation *Shrink	**0.146**	**0.694*****	**0.017**	**1.498****	**0.176**	**0.528****	**0.113**	**0.427***
	(0.805)	**(2.642)**	**(0.044)**	**(2.231)**	**(1.102)**	**(2.012)**	**(0.911)**	**(1.671)**
*Median Household Income*Not Shrink*	-0.377*	-0.287	-0.414	-0.469	-0.374*	-0.320	0.004	-0.093
	(-1.949)	(-1.408)	(-0.722)	(-0.867)	(-1.666)	(-1.324)	(0.017)	(-0.556)
*Ln(Population)*Not Shrink*	0.624***	0.597***	0.784**	0.720**	0.495***	0.515***	0.696***	0.690***
	(5.265)	(5.582)	(2.408)	(2.594)	(3.623)	(4.936)	(5.539)	(7.416)
*Median Age*Not Shrink*	-0.004	0.005	-0.004	0.018	-0.003	0.005	0.005	0.012**
	(-0.468)	(0.658)	(-0.184)	(0.962)	(-0.259)	(0.503)	(0.709)	(2.075)
*Ln(State Equalized Value)*Not Shrink*	0.318***	0.299***	0.140	0.191	0.474***	0.431***	0.203**	0.219***
	(3.113)	(3.132)	(0.485)	(0.754)	(3.994)	(4.468)	(2.082)	(2.830)
*% of SEV Residential *Not Shrink*	0.008	-0.390	0.636	0.010	-0.476	-0.377	-0.399	-0.611**
	(0.018)	(-1.102)	(0.546)	(0.011)	(-0.978)	(-0.742)	(-1.085)	(-2.093)
State Program Participation *Not Shrink	**-0.065**	**-0.132**	**0.002**	**-0.217**	**-0.115**	**-0.132**	**-0.023**	**-0.070**
	(-0.592)	**(-1.323)**	**(0.008)**	**(-0.936)**	**(-0.826)**	**(-1.108)**	**(-0.257)**	**(-0.919)**
Township Indicator Variable	-0.411***	-0.415***	-1.249***	-1.233***	-0.263**	-0.298**	-0.809***	-0.793***
	(-3.753)	(-3.617)	(-3.845)	(-3.644)	(-2.059)	(-2.274)	(-6.258)	(-6.501)
Village Indicator Variable	-0.288*	-0.302*	-0.237	-0.364	-0.509***	-0.481**	-0.282	-0.307**

	(-1.741)	(-1.698)	(-0.567)	(-0.804)	(-2.638)	(-2.484)	(-1.586)	(-2.120)
Water Purchase Indicator Variable	-0.040	-0.086	-0.316	-0.403	0.006	-0.025	0.108	0.107
	(-0.415)	(-0.873)	(-1.254)	(-1.506)	(0.057)	(-0.240)	(1.142)	(1.159)
Constant	8.643***	8.264***	9.063**	9.020**	6.612***	6.376***	4.104**	4.863***
	(5.727)	(5.155)	(2.348)	(2.241)	(3.597)	(3.216)	(2.231)	(3.442)
Number of Observations	248	248	243	243	249	249	247	247
R-squared	0.701	0.703	0.298	0.300	0.699	0.699	0.784	0.802
Robust t-statistics in parentheses								*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 6: Fixed Effects Regressions - Determinants of Fiscal Measures

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	**lntotalassets**		**lntotalliabilities**		**lntotalnetposition**		**lnchargesforservice**	
Median Household Income		-0.022		-0.055		-0.042		-0.053
		(-0.129)		(-0.106)		(-0.169)		(-0.228)
Ln(Population)		0.134		0.469		0.384		0.546*
		(0.550)		(0.554)		(1.372)		(1.795)
Median Age		0.001		-0.011		0.013		0.002
		(0.205)		(-0.659)		(1.506)		(0.328)
Ln(State Equalized Value)		0.103		-0.221		0.154		-0.234
		(1.220)		(-0.907)		(1.280)		(-0.906)
% of SEV from Residential Property		0.044		-0.209		-0.472		-0.489
		(0.117)		(-0.218)		(-0.472)		(-0.894)
State Program Participation Indicator Variable	**0.278****	**0.279*****	**0.012**	**0.009**	**0.281****	**0.292****	**-0.009**	**-0.005**
	(2.590)	**(2.629)**	**(0.039)**	**(0.028)**	**(2.173)**	**(2.330)**	**(-0.117)**	**(-0.070)**
Year Indicator Variable for 2015	0.008	0.033	0.090	0.044	0.060	0.065	0.062	-0.010
	(0.272)	(0.956)	(1.044)	(0.389)	(1.520)	(1.483)	(1.380)	(-0.142)
Year Indicator Variable for 2022	-0.060	-0.046	-0.157	-0.173	0.005	0.005	0.236***	0.195***
	(-1.574)	(-1.134)	(-1.308)	(-1.336)	(0.115)	(0.091)	(5.763)	(3.949)
Constant	15.655***	12.683***	14.044***	15.552*	15.181***	9.236***	13.508***	14.296***
	(529.960)	(4.401)	(161.828)	(1.673)	(424.465)	(2.677)	(472.700)	(3.767)
Community FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	748	747	736	735	742	741	671	670
Number of Communities	250	250	250	250	250	250	250	250
R-squared (within)	0.024	0.028	0.014	0.017	0.019	0.043	0.072	0.081
R-squared (between)	0.0001	0.55	0.002	0.146	0.004	0.662	0.008	0.512
R-squared (overall)	0	0.509	0.004	0.114	0.002	0.613	0.009	0.456
Robust t-statistics in parentheses							**** p<0.01, ** p<0.05, * p<0.1*	

Table 7: Fixed Effects Regressions - Determinants of Fiscal Measures, Shrinking-Growing

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Variables	**lntotalassets**		**lntotalliabilities**		**lntotalnetposition**		**lnchargesforservice**	
	Any Shrink	***Shrink >10%***	***Any Shrink***	***Shrink >10%***	***Any Shrink***	***Shrink >10%***	***Any Shrink***	***Shrink >10%***
*Ln(Median Household Income)*Shrink*	0.134	0.175	-0.262	-1.785	0.092	0.417	0.246	-0.088
	(0.737)	(0.507)	(-0.396)	(-1.316)	(0.592)	(1.134)	(0.551)	(-0.277)
*Ln(Population)*Shrink*	0.117	1.528***	1.254	5.863***	0.032	-0.365	1.038*	1.579
	(0.310)	(3.158)	(1.107)	(3.532)	(0.085)	(-0.499)	(1.698)	(1.088)
*Median Age*Shrink*	0.008	0.005	0.012	0.030	0.000	-0.019	0.001	-0.015
	(0.981)	(0.312)	(0.575)	(0.583)	(0.056)	(-1.265)	(0.129)	(-1.513)
*Ln(State Equalized Value)*Shrink*	0.012	-0.660**	-0.072	-2.140**	0.055	0.127	-0.324	-0.366
	(0.216)	(-2.467)	(-0.370)	(-2.416)	(0.868)	(0.296)	(-0.915)	(-0.573)
*% of SEV Residential *Shrink*	-0.488	1.687	0.449	8.919**	0.787**	0.771	-1.007	1.845
	(-0.624)	(1.646)	(0.247)	(2.042)	(2.296)	(0.705)	(-0.867)	(0.702)
State Program Participation *Shrink	**0.191**	**0.505****	**0.280**	**1.223**	**0.050**	**0.006**	**-0.074**	**0.204**
	(1.192)	**(2.150)**	**(0.526)**	**(1.562)**	**(0.364)**	**(0.024)**	**(-0.383)**	**(1.292)**
*Median Household Income*Not Shrink*	-0.190	-0.051	0.074	0.184	-0.133	-0.056	-0.287	-0.027
	(-0.703)	(-0.266)	(0.099)	(0.344)	(-0.343)	(-0.207)	(-1.198)	(-0.097)
*Ln(Population)*Not Shrink*	0.390	0.012	0.203	-0.071	0.541	0.476	0.141	0.195
	(1.109)	(0.043)	(0.167)	(-0.072)	(1.465)	(1.555)	(0.383)	(0.795)
*Median Age*Not Shrink*	-0.007	0.000	-0.036	-0.013	0.026	0.016*	0.002	0.004
	(-1.171)	(0.001)	(-1.500)	(-0.762)	(1.533)	(1.774)	(0.212)	(0.627)
*Ln(State Equalized Value)*Not Shrink*	0.354	0.140	-0.646	-0.228	0.608**	0.157	-0.145	-0.285
	(1.569)	(1.403)	(-1.209)	(-0.922)	(2.515)	(1.225)	(-0.544)	(-0.981)
*% of SEV Residential *Not Shrink*	0.511	0.042	-0.799	-0.658	-0.620	-0.525	-0.213	-0.682
	(1.364)	(0.107)	(-0.757)	(-0.686)	(-0.519)	(-0.504)	(-0.582)	(-1.146)
State Program Participation *Not Shrink	**0.328*****	**0.250****	**-0.098**	**-0.211**	**0.385****	**0.328****	**0.028**	**-0.026**
	(2.613)	**(2.132)**	**(-0.250)**	**(-0.659)**	**(2.413)**	**(2.377)**	**(0.356)**	**(-0.335)**
Year Indicator Variable for 2015	0.047	0.039	0.038	0.049	0.110***	0.064	0.012	-0.010
	(1.220)	(1.092)	(0.284)	(0.425)	(2.611)	(1.438)	(0.176)	(-0.131)
Year Indicator Variable for 2022	-0.052	-0.027	-0.151	-0.118	0.004	-0.007	0.235***	0.218***

	(-1.118)	(-0.639)	(-1.010)	(-0.874)	(0.074)	(-0.129)	(4.653)	(4.522)
Constant	9.823***	13.264***	17.972*	18.074*	5.015	8.773**	14.465***	16.917***
	(3.375)	(4.393)	(1.720)	(1.864)	(1.447)	(2.449)	(3.498)	(4.075)
Community FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	748	747	736	735	742	741	671	670
Number of Communities	250	250	250	250	250	250	250	250
R-squared (within)	0.048	0.041	0.026	0.047	0.08	0.053	0.088	0.095
R-squared (between)	0.014	0.147	0.009	0.002	0.005	0.131	0.007	0.006
R-squared (overall)	0.012	0.14	0.01	0.003	0.004	0.125	0.006	0.003
Robust t-statistics in parentheses								*** $p<0.01$, ** $p<0.05$, * $p<0.1$