Funding and Financing to Sustain Public Infrastructure: Why Choices Matter

A primer and framework for policy analysts, public officials, and stakeholders

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ABSTRACT

Investment in public infrastructure, including the provision of essential services through capital-intensive networks, is critical to supporting economic development and, more so, the quality of places and lives. The sustainability of public utilities and other infrastructure systems depends on spending to an optimal compliant service level and raising revenues that fully cover the cost of service. Sustaining infrastructure relies on both funding and financing mechanisms, which should not be confused. This primer provides a framework for understanding the difference between funding and financing and why policy choices for these functions matter. Funding choices affect the distribution of burdens on service consumers; financing choices affect the cost of capital for service providers. These implications tend to receive less attention than behavioral incentives for economic efficiency. The portfolio of alternative funding and financing methods and instruments is described along with how they relate to structural and governance models for service delivery. The report provides key statistics and trends across U.S. infrastructure sectors, with highlights for Michigan. To varying degrees by infrastructure sector, the analysis detects discernable shifts in fiscal federalism and policy emphasis from governmental funding to financing, from federal to state and local funding, from tax-based to fee-based funding, and from public to private capital financing, with implications for impacts and outcomes. Investment gaps and methods for closing them are considered. By improving understanding, this primer aims to promote inclusive and constructive stakeholder engagement around equity in the realization of sustainable public infrastructure.

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1. INTRODUCTION

Public infrastructure, or the "built environment," is ubiquitous and provided for public purpose and use, that is, the delivery of services that are deemed essential, if not critical, to modern life. From water to energy to transportation systems, and public structures and spaces of all kinds, infrastructure connects people to one another and their environment and enables livability and fulfillment. Society supports public (or "social") infrastructure through both *funding* and *financing*, a distinction with a difference.

Despite fundamental differences, these two mechanisms for generating fiscal resources are often conflated, even by experts. Whereas funding refers to who pays for infrastructure, financing refers to how infrastructure is paid for over time. Fiscal resources raised through funding are not repayable, where fiscal resources raised through *financing* must be repaid from the *funding* that ultimately comes from taxpayers or ratepayers (Deloitte, 2017; CBO, 2018a). Funding and financing are deployed by distinct methods and instruments that relate directly to structural and governance models for service delivery and differ in their implications for consumers and providers (Figure 1.1). By delineating these concepts, this primer aims to inform state and local public officials and economic development professionals with respect to planning and investment for long-term infrastructure sustainability.

Essential service infrastructure has its origins in the construct of "common carriers," which morphed into the constructs of public utilities and then network industries (Figure 1.2). Physical infrastructure exhibits significant capital intensity, scale economies, and network effects. Adequate and reliable infrastructure, along with *universal, affordable access,* conveys everyday personal comfort, convenience, and security as well as a myriad of societal benefits. Though not easily quantifiable, relevant metrics relate to public health, safety, and welfare; environmental quality and protection; and economic development and prosperity. Investments in and modernization of infrastructure can improve productivity, which in turn contributes to long-term economic growth (Bivens, 2017; Stupak, 2018) or, perhaps more appropriately, *sustainability*.

Sustainability calls for stewardship of public infrastructure within established ecological, economic, and *equity* tolerances. This analysis focuses mainly on economic sustainability while also drawing attention to how funding and financing mechanisms and policy choices matter to social equity. Sustainable infrastructure systems must be *sustained by* the communities and consumers they serve.

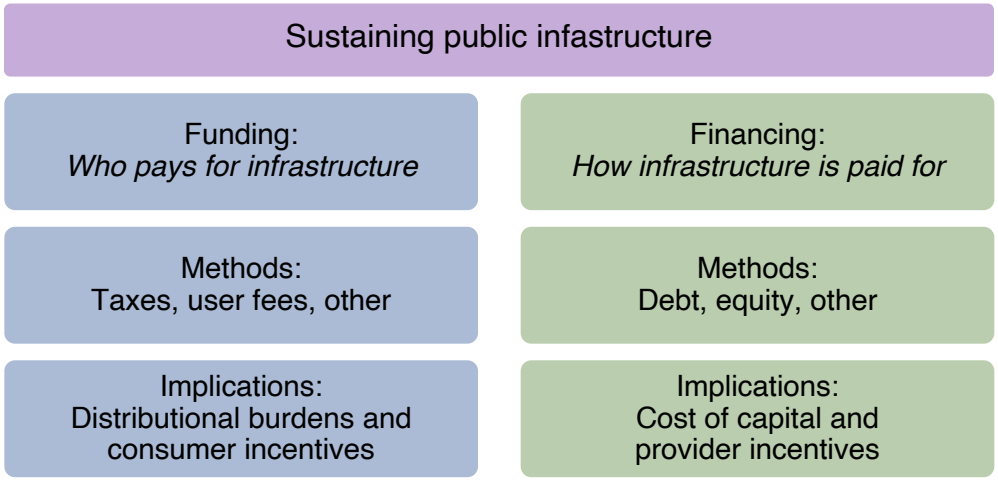

Figure 1.1. Framework for funding and financing to sustain public infrastructure.

Infrastructure is often measured in terms of capital intensity and substantial investment in long-life fixed assets (Figure 1.3). Globally, the public sector accounts for 83% of infrastructure investment, of which 66% is managed by state-owned enterprises and 34% is managed by public entities; the private-sector role in infrastructure remains limited (World Bank, 2017). In the United States, the public sector dominates asset investment and ownership in the transportation and water sectors (comprised of drinking water, wastewater, and stormwater systems). In contrast, the private sector dominates the energy (electricity and natural gas) and communications (telecommunications and broadband) sectors. The structural features of the sectors shape governance and regulation, as well as funding and financing methods.

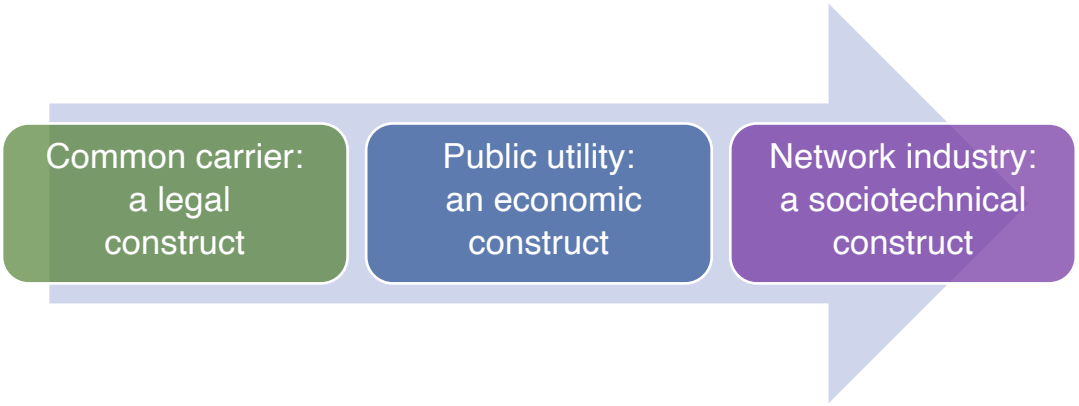

Figure 1.2. Infrastructure evolution from carriers to utilities to networks.

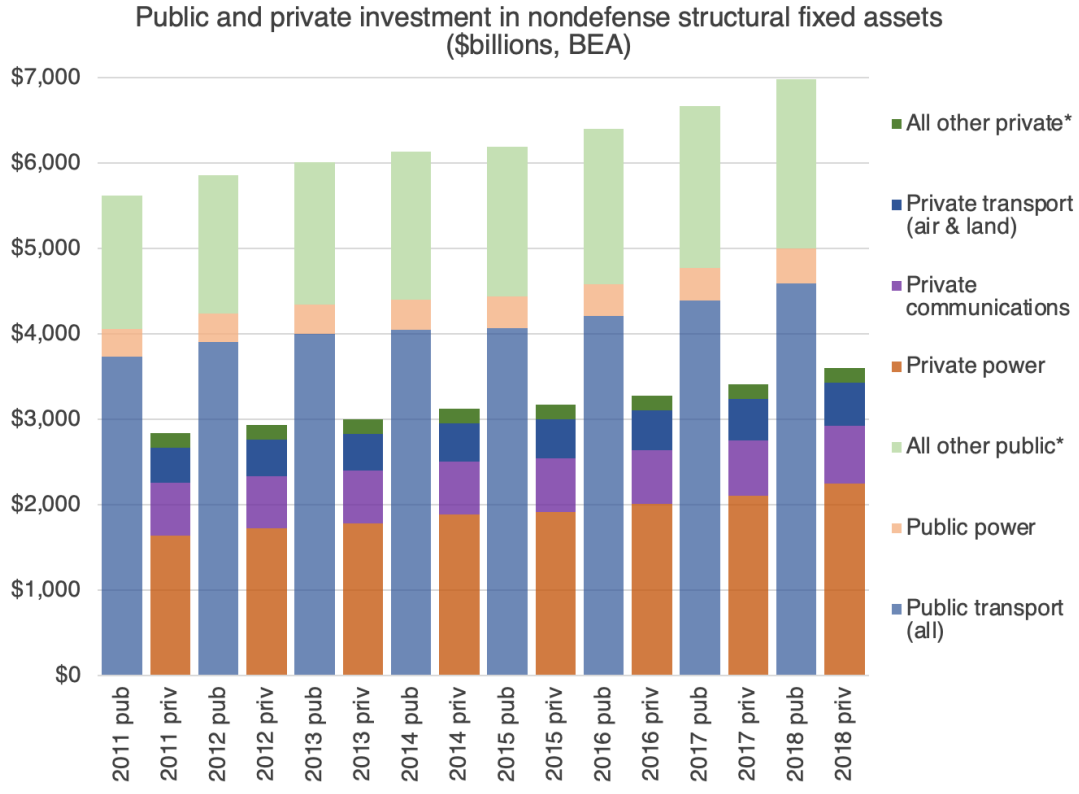

Figure 1.3. Public and private investment in U.S. public infrastructure as measured by fixed assets.
Source: Data available from the Bureau of Economic Analysis (bea.gov).
*Other includes water and sewer but also other mismatched data categories.

The quality of infrastructure bears a direct connection to the quality of place and life. Disparities among and within communities are manifested in disparities of infrastructure conditions, accessibility, and affordability. Needs are especially acute in distressed legacy cities and rural communities with limited local resources as well as aging and sometimes oversized facilities.

Physical failures of infrastructure reflect institutional and policy failures, with the Flint water crisis as an enduring example of environmental and health injustice. Investment in and modernization of public infrastructure to address gaps within and across communities, improve performance, and ensure resilience, is a critical social priority. In the federalism of infrastructure policy, the role of the federal government is formidable. However, state and local governments are the "primary stewards" of infrastructure (McNichol, 2019), and much of the responsibility for infrastructure (both investment and operation) falls to them. Perpetual needs translate to a perpetual quest for infrastructure funding and financing.

Against this backdrop, this primer was guided by the following research questions:

- What is the difference between funding and financing public infrastructure, and why does it matter to fiscal health and system sustainability?

- How do infrastructure funding and financing vary by the structure and governance of infrastructure providers?

- What funding and financing methods and instruments are used to support public infrastructure, and what are their differential impacts on consumers and providers?

- Where are the investment trends and gaps across the public infrastructure sectors, and how might a portfolio of solutions help close them?

2. FUNDING VS. FINANCING

Funding and financing are sometimes used interchangeably by policymakers and experts as means to address infrastructure needs. Both funding and financing "transfer" fiscal resources, but in very different ways. While interrelated and synergistic, these mechanisms function in distinct in ways that matter. In both conceptual and practical terms, funding refers to who pays for infrastructure; financing refers to how infrastructure is paid for over time (Table 2.1). Choices among funding and financing methods and instruments have consequences and present potential tradeoffs with regard to impacts on consumers and providers of infrastructure services.

Methods of funding confer dedicated and recurring revenues from taxes and user fees to cover ongoing capital and operating costs of infrastructure, including financing costs. Funding constitutes the budget for public infrastructure that serves society and its citizens, and *ultimately* comes essentially from one of two pockets (or both): a taxpayer pocket and a ratepayer pocket (for similar framing, see EurEau, 2011; Deloitte, 2017; Schanzenbach et al., 2017). Taxes may be collected at different levels (federal, state, and local). User fees (pricing instruments, such as rates, charges, and tolls) are distinctly local to the service territory and specific to the infrastructure user. Capital contributions (from customers and developers) and other income may also play a funding role. Who pays for infrastructure matters in terms of political processes (legislative or regulatory) as well as distributional burdens and potential behavioral incentives that guide consumption, namely price signals about the cost of service.

Methods of financing confer discrete injections of financial capital to support infrastructure investment and spread substantial fixed costs over time, which enhances intergenerational equity. Infrastructure is capital-intensive and long-lasting, often across generations of users, so financial methods in the form of debt or equity are deployed to cover the costs of multi-year assets (or "plant-in-service") over long periods. Both debt and equity establish a financial stake in an enterprise. Fiscal resources raised in credit and equity markets (respectively) must be repaid from recurring revenues, including reasonable returns relative to risk. Funded reserves can provide a limited source of internal financing. A wide range of financing instruments can be utilized simultaneously. How infrastructure is paid for matters to the cost of capital and potential behavioral incentives that guide production, namely profit motives. Additional details about funding and financing methods, and their implications, are provided in subsequent sections.

Still, the practice literature on infrastructure (including authoritative sources) is replete with references to "sources of funding" that are actually methods of financing. Infrastructure investors (including return-seeking bondholders and shareholders) do not supply funding. Issuing debt or equity creates a financial obligation and *adds* to funding requirements (in terms of the "cost of money") but lessens immediate funding pressures. Supporting infrastructure investment from recurring revenues alone is impractical; financing spreads these costs over its useful life (CBO, 2018a).

Government-backed funding and financing can be especially confusing. A government *grant* can be understood as a tax-supported funding instrument; a government *loan* can be understood as a tax-supported financing instrument. To the extent that a loan from a government program embeds a below-market interest rate, it can be understood as a *financing* instrument that incorporates an indirect *funding* component because repayment is less than it would be without the taxpayer subsidy.

Appendix A adapts an analysis of the advantages and disadvantages of alternatives for supporting community stormwater management that highlights funding and financing distinctions.

Table 2.1. Summary overview of funding vs. financing for public utilities.

	Funding: who pays for infrastructure	Financing: how infrastructure is paid for
Focus	*Who* pays for infrastructure	*How* infrastructure is paid for
Definition	A unidirectional transfer of nonrepayable fiscal resources from revenue sources to cover ongoing operating and capital costs of infrastructure, including financing	A bidirectional transfer of repayable fiscal resources from investors to support infrastructure investment with remuneration for the cost of capital over time
Methods	Property and other taxes, fund transfers, and government grants (not requiring repayment)	Debt issues requiring repayment of principal and interest (government and bank loans, and bonds)
	User (ratepayer) fees and (sur)charges, including connection fees and system development charges	Shareholder equity issues (stocks and reinvested earnings) requiring compensation (returns) to investors.
	Capital contributions (nonrepayable) and other income	Customer advances (repayable) and funded reserves
Financial reporting	Income statement and cash-flow statement	Balance sheet and cash-flow statement
Effect on financial position	Dedicated and recurring revenues for use without obligation for compensation or repayment	Discrete injections of financial capital with an obligation for repayment and compensation
Effect on cash flow	Inflow from operating and financing activities	Inflow and outflow from financing activities
Impacts	Distributional burdens and consumer incentives (price signals)	Cost of capital and provider incentives (profit motives)

Funding, Financing, and Sustainability

The true cost of public infrastructure services includes direct costs and indirect social and environmental externalities and opportunity costs (Rogers, 1998; Canadian Water Network, 2018). For practical purposes, providers and policymakers focus on accounting costs, meaning the booked capital and operating costs of service, including realized externalities (such as decommissioning costs and pollution taxes). For many providers, the cost of service incorporates expenses for asset depreciation, contingency reserves, and taxes or tax equivalents (such as franchise fees or payments in lieu of taxes). Stable recovery of costs over time ensures financial viability and sustainability.

The sustainability of infrastructure systems can be considered in terms of two key dimensions. The system should be spending to achieve an optimized compliant service level, meaning that it prudently meets the service population's needs and complies with all applicable environmental and other standards. Expenditures include those for both annual operations and long-term capital investment (including costs associated with financing). In theory, it follows that revenues from all sources (taxes, user fees, and any other) must be sufficient to cover expenditures.

In reality, as illustrated in Table 2.2, system types can be found for every combination of spending and revenues. In other words, enterprises may under or over-spend, as well as under or over-collect revenues. All suboptimal conditions are undesirable, but deficient systems that defer necessary spending and fail to secure sufficient revenues pose particular concerns from a sustainability perspective.

Funding, Financing, and Cash Flow

The blurring of funding and financing might stem from the functional reality that both transfer fiscal resources that infrastructure providers can use to support ongoing operating expenses and long-term capital investment. Data from the National Association of State Budget Officers (Figure 2.1) make the point. In 2019, the fiscal resources for infrastructure were mainly supplied from state (37.8%), federal (25.8%), and general (8.2%) funds; an additional 27.1% of resources were attributed to resources supplied from bond issuances (that is, financing). Data on fiscal resources for highways indicate a much smaller share for bond receipts (Figure 2.2). In terms of expenditures, the federal government plays an important role, particularly in supporting capital expenditures. Still, much responsibility for both capital and operating expenditures falls to the states and, even more so, to local governments (Figures 2.3 and 2.4).

A useful financial accounting concept for disentangling funding and financing is *cash flow,* that is, the inflow and outflow of cash or cash equivalents. From individuals to households to businesses to governments, cash flow helps maintain financial viability and resilience under stressful circumstances. Lenders and investors and their rating agencies consider cash flow when considering worthiness. Net cash inflows from funding and financing provide the fiscal capital available for cash outflows that support capital investment and day-to-day system operations and maintenance (Figure 2.5). While funding transfers are recurring and *unidirectional* (+), financing transfers are discrete and *bidirectional* (+/).

Public and private enterprises use cash-flow statements to record inflow and outflow effects on their financial position for a period of time, such as a fiscal year. Cash-flow statements have three components, each of which may have inflows and outflows: cash related to operating activities (including net income from operations based on revenues from sales and expenditures), cash related to investing activities (such as investment in utility plant), and cash related to financing activities (such as debt proceeds or dividends paid). Based on these categories, a cash-flow statement might be another source of confusion because funding and financing activities appear across operating, investing, and financing activities.

Table 2.2. Financially sustainable infrastructure systems.

System revenues relative to expenditures*	System capital and operating expenditures relative to an optimized compliant service level		
	< 1: expenditures are below optimum ("cost avoidance")	= 1: expenditures are optimal	> 1: expenditures are above optimum ("gold plating")
< 1: revenues are below expenditures ("revenue avoidance")	Deficient system	Deficit system	Wasteful system
= 1: revenues are equal to expenditures	Underinvesting system	**SUSTAINABLE SYSTEM**	Overinvesting system
> 1: revenues are above expenditures ("profit-seeking")	Revenue-diverting system	Surplus system	Excessive system

*System revenues may flow from taxpayer or ratepayer funding.

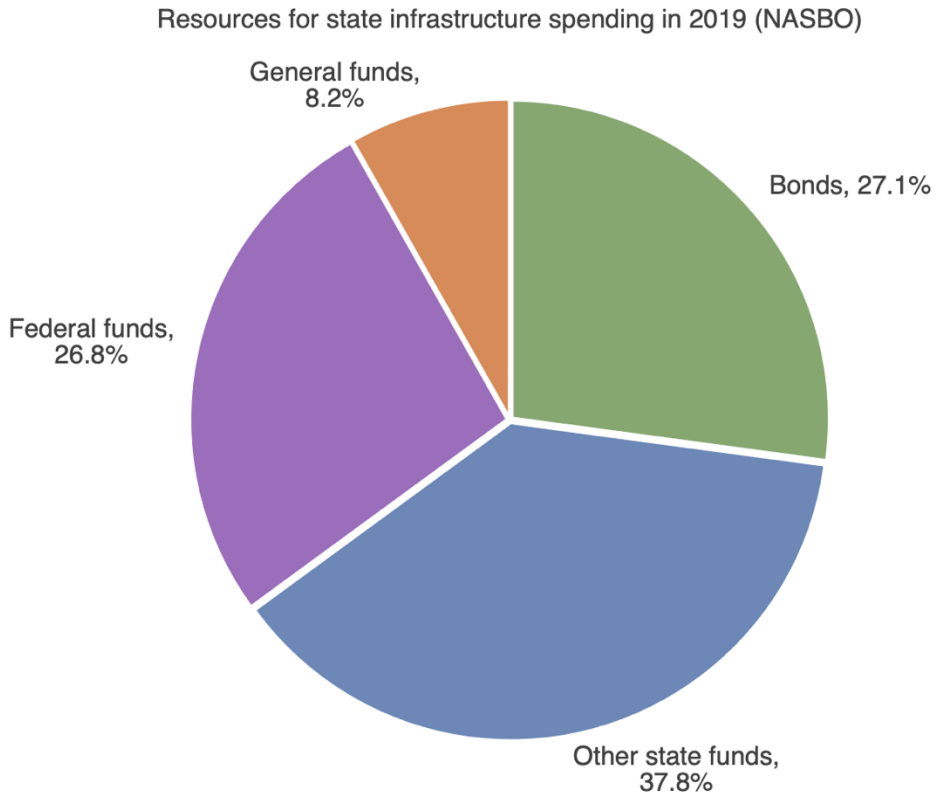

Figure 2.1. Fiscal resources for state infrastructure spending in 2019.
Source: National Association of State Budget Officers (2019).

Proceeds from sales of bonds and stocks might appear to be sources of funding because they convey expendable fiscal resources that can be used by the enterprise for capital projects. Unlike the mostly recurring revenue streams from taxes or sales, the discrete injection of financial capital from financing (cash inflows) establishes a stake (or claim) on balance-sheet assets, and thus a financial obligation; these transfers of capital must be repaid in full, including interest on debt and returns on equity (cash outflows) to compensate investors for the use of their capital over long terms. Ultimately and invariably, however, funding is supplied by taxpayers and ratepayers, and financing is supplied by debtholders and equity shareholders.

Cash inflows from funding and financing and outflows for spending and financing costs are illustrated for a hypothetical privately owned ("investor-owned") utility (Table 2.3). In this case, funding comes from sales of services to customers and should be a positive amount. Financing is the net amount of inflows and outflows related to various financial activities. The difference between the two is available to spend during the period. The capital-related expenditures include the cost of financing (repayments of principal and interest and returns of and on investment in net utility plant or the "rate base" by equity shareholders).

Optimized cash flow from funding and financing complements and facilitates the achievement of an optimized service level. Fiscal resources from funding provide stability, boost creditworthiness, and facilitates and lowers the cost of financing. Fiscal resources from financing enhance cash-flow management by infrastructure providers and may lower opportunity costs and improve resilience.

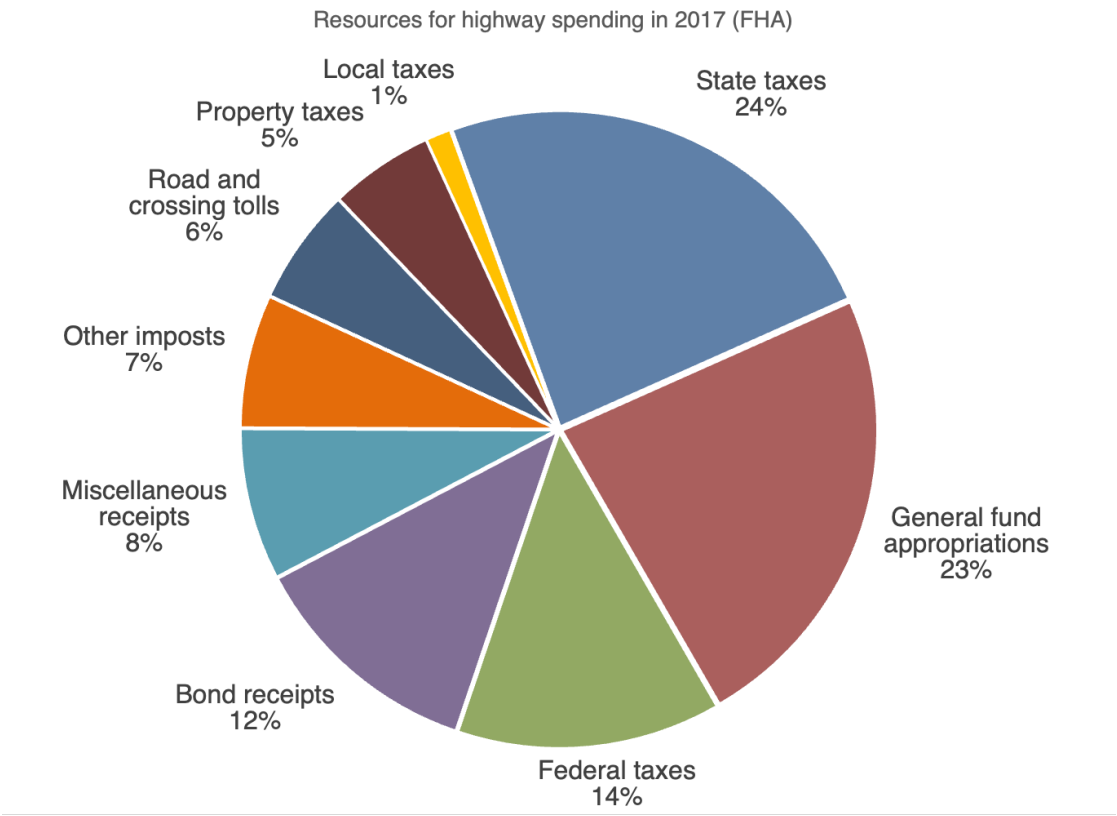

Figure 2.2. Fiscal resources for highway spending in 2017.
Source: U.S Department of Transportation (2018).

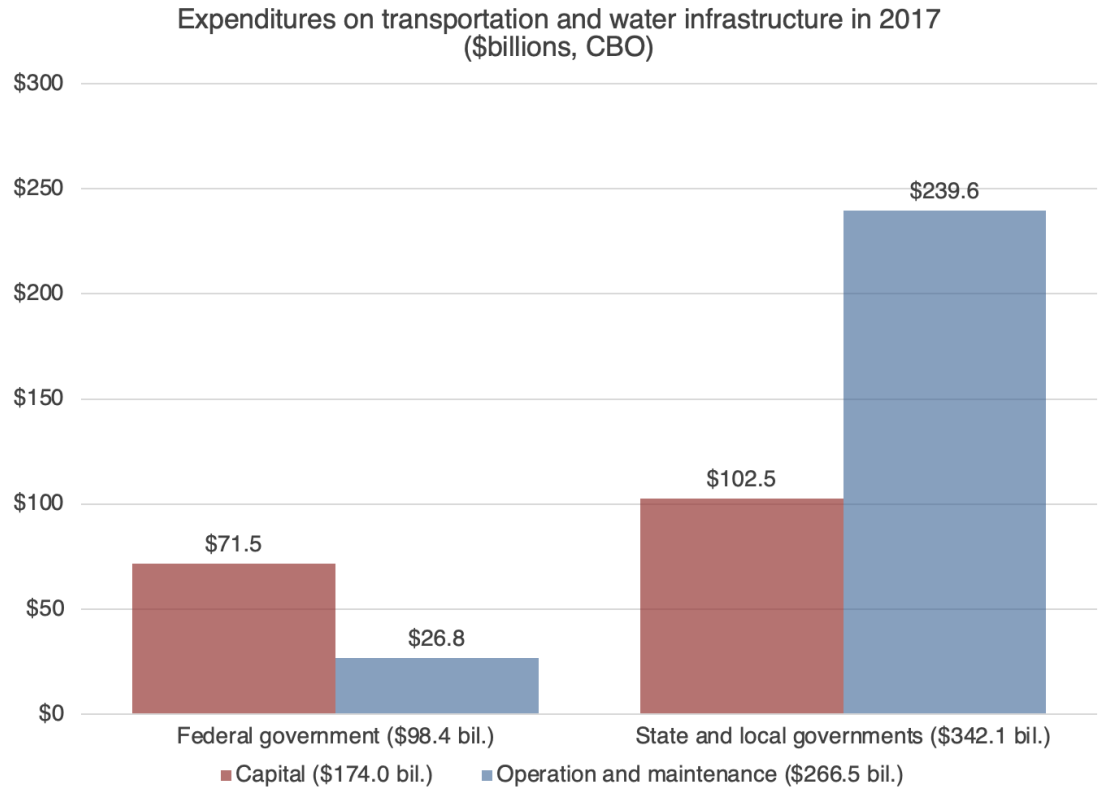

Figure 2.3. Capital and operating expenditures on infrastructure in 2017.
Source: Congressional Budget Office (2018b).

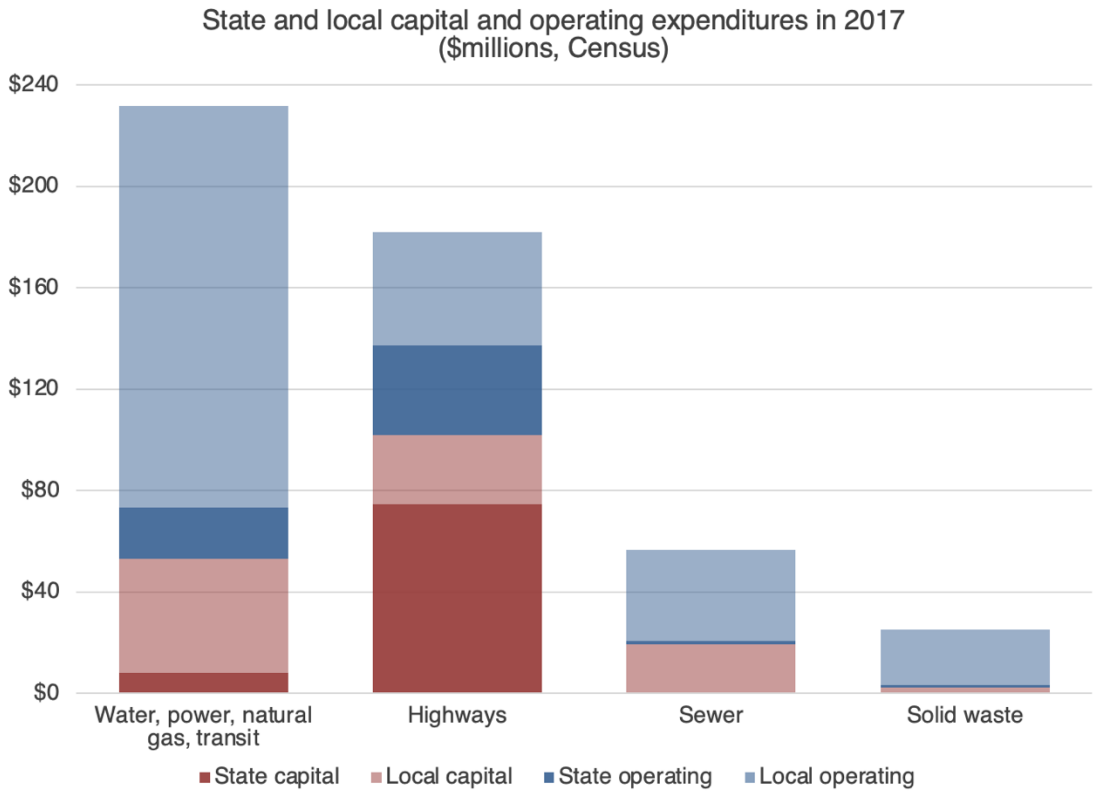

Figure 2.4. State and local capital and operating expenditures by sectors in 2017.
Source: U.S. Census Bureau, *Annual Survey of State and Local Government Finances* (census.gov).

Figure 2.5. Fiscal resources available for infrastructure investment and operations.

Table 2.3. Illustration of cash flow for a hypothetical privately owned water utility (simplified).

	Cash flow ($USD in thousands)	$ inflow (+) or outflow (-)	Category	Activity
1	>Cash balance at beginning of period	$ 0		
2	**Cash flows from operating activities**			
3	Operating revenues	$ 40,000	Funding	Customer payments
4	Operating expenses	(24,000)	Spending	Operations
5	Depreciation and amortization	6,000	Funding	Noncash expense
6	Interest expense	(5,000)	Financing	Debt compensation
7	Other income	1,000	Funding	Non-operating revenues
8	>Net cash from operating activities	$ 18,000		
9				
10	**Cash flows from investing activities**			
11	Purchase of utility plant assets	(17,000)	Spending	Asset purchase
12	Sale of utility plant assets	1,000	(Spending)	Asset sale
13	>Net cash from investing activities	$ (16,000)		
14				
15	**Cash flows from financing activities**			
16	Proceeds of short-term debt	1,000	Financing	Bank credit line
17	Proceeds of debt securities	20,000	Financing	Bond issues
18	Proceeds of equity securities	8,000	Financing	Stock issues
19	Repayment of long-term debt	(21,000)	Financing	Repayment of bonds
20	Dividends paid to shareholders	(14,000)	Financing	Equity compensation
22	Contributed capital from grants	2,000	Funding	Government subsidies
23	Contributions for construction	1,000	Funding	Customer contributions
24	Advances for construction	1,000	Financing	Customer advances
25	>Net cash from financing activities	$ (2,000)		
26	>Cash balance at end of period	$ 0		

Note: In this illustration, funding = $50,000, financing = $-10,000, and spending = $-40,000.

Infrastructure Delivery Models

Funding and financing methods and instruments, and how they are used, vary with the structure and governance of infrastructure providers and service provision. Combining approaches reveals alternative service delivery models, as summarized in Table 2.4. The funding dimension focuses attention on consumer impacts and incentives, and the financing dimension focuses attention on provider impacts and incentives. Pricing and performance incentives are generally understood in terms of prevailing normative economic theory centering on potential efficiency as driven by cost control and profit motives. These implications and tradeoffs are highly generalized, and actual effects depend on endogenous and exogenous factors, including organizational culture and governance, as well as broader policy and regulatory frameworks.

Table 2.4. Generalized delivery models and potential impacts based on funding and financing.

			Financing	
			Public sector (not-for-profit)	Private sector (for-profit)
			Lower cost of capital and weaker provider incentives	*Higher cost of capital and stronger provider incentives*
Funding	Taxes	*Less regressive effects and weaker consumer incentives*	Public provider (e.g., municipal department)	Private partner (e.g., contract operator)
	User fees	*More regressive effects and stronger consumer incentives*	Public enterprise (e.g., publicly owned utility)	Private enterprise (e.g., investor-owned utility)

Of course, the public-private ownership dichotomy oversimplifies the structural options for infrastructure providers and monopolistic utilities in terms of ownership and operation. For some services, including energy and water, member-owned cooperatives (Lund, 2013) are a distinct third option (Table 2.5). Cooperatives do not have taxing authority, so they must rely on user fees. As they also operate on a not-for-profit basis, their economic incentives are more closely aligned with those of public than private enterprises.

Public providers face public accountability and associated political processes. Private providers are driven by profit motives that must be placed in check by either performance-based contracting or economic regulation. Privately owned (and some publicly owned) utilities with monopoly power are subject to regulation "in the public interest," by which state public service commissions apply long-held standards of review to ensure that investments and expenditures are prudent, operations are efficient, and rates and returns are "just and reasonable."

In the U.S. transportation sector, infrastructure providers are usually units of state or local government, including transportation authorities, although contracting with private companies for project work is common. Privately owned toll roads are uncommon; in the Midwest, the Chicago Skyway and the Indiana Toll Road are notable examples. In the electricity sector, about 2,006 publicly owned utilities (59.1% of the total) serve about 14.4% of the population served; about 873 (25.7% of the total) cooperative utilities serve about 13.0% of the population served; 182 (5.4%) privately owned electricity utilities serve 67.6% of customers served (APPA, 2019; excludes nonutility providers).

In the water sector, local governments (namely municipalities and special-purpose districts and authorities) dominate system ownership and operation. Compared to the energy and telecommunications sectors, very few water companies are publicly listed and traded; the biggest are multi-state holding companies. The presence of for-profit water utilities varies by state. Georgia, Michigan, Minnesota, North Dakota, South Dakota, and the District of Columbia have little to no presence and do not implement economic regulation of water utilities (Beecher et al., 2020).

Table 2.5. Characteristics of three primary types of public utilities.

	Publicly owned	Cooperatively owned	Privately owned
Classification	Governmental	Nongovernmental not-for-profit	Nongovernmental for-profit
Ownership	Government-owned department, division, or enterprise	Member-owned cooperatives, associations, other NFPs	Investor-owned corporation or private proprietor
Governance structure	Elected officials (councils), local boards, and commissions	Member boards of directors	Corporate boards of directors and governmental regulators
Orientation	Constituent service	Member benefits	Shareholder returns
Responsible owner of assets	Unit of (local) government	Member-owners or shareholders	Investors in publicly traded or private equity
Tax status of operations	Tax-exempt but may make payments in lieu of local taxes	Tax-exempt but may make payments in lieu of local taxes	Pay income, property, and other taxes on private corporations
Distribution of profits	May retain reserves or make transfers to parent governments	Proportionate to member shares and subject to federal tax policy	Regulated returns based on capital invested in utility plant (rate base)
Sources of funding	Citizen ratepayers and taxpayers (including grants and other contributed capital)	Member ratepayers and taxpayers (including grants and other contributed capital)	Customer ratepayers with limited funding from contributed capital (including grants)
Means of financing	Debt, government equity, advances, and reserves	Debt, member equity, and advances, and reserves	Debt, investor equity, advances, and reserves
Financial rules	Governmental Accounting Standards Board (GASB)	Financial Accounting Standards Board (FASB)	Financial Accounting Standards Board (FASB)
Financial regulation	State-level as applicable	State-level as applicable	Federal Securities and Exchange Commission (SEC) if publicly traded
Economic regulation	Sometimes and conditional	Sometimes	Always for monopolies

3. FUNDING: WHO PAYS FOR INFRASTRUCTURE

Funds are needed to cover the "full accounting cost" of operating and maintaining infrastructure plus the capital costs of multi-year investments that typically are financed. The total cost of service incurred is also understood as the provider's revenue requirement (Figure 3.1). Sadly, *there is no "revenue fairy,"* no magical funding source for public infrastructure, including public or private sector capital. Philanthropic or charitable foundations (private, corporate, or community) may provide some support for proposal development, planning, and coordination but not for major infrastructure investments. The public ultimately pays for infrastructure by dipping into one of two pockets (sometimes both): a taxpayer pocket and a ratepayer pocket. Taxpayers and ratepayers are not identical, and neither are their pockets; who pays for infrastructure raises issues of social and economic equity.

A sizeable share of the nation's infrastructure was built out with taxpayer funding, that is, "contributed capital" in the form of tax-supported grants. Now at the end of its useful life and in need of repair or replacement, and following decades of waning tax support, lagging spending, and cost inflation, much of the exhausted physical plant must be rebuilt with funding by ratepayers as a matter of fiscal necessity. Politically, both taxes and user fees are mostly regarded as "necessary evils," and user fees may even be perceived as a form of taxation. Ratepayer funding relieves tax systems from infrastructure obligations and may be politically expedient in the face of tax resistance. Utility rates can also be a convenient target to expand revenues and, in some cases, transfer wealth.

Although both consign value and recovery costs, taxes and user fees are fundamentally different methods (Table 3.1). The taxpayer's connection to infrastructure is indirect and diffuse, both spatially and temporally. Infrastructure can be funded from local, state, or federal taxes or combinations thereof. With exceptions, taxes make it possible to *socialize* cost recovery, meaning that costs are spread widely across all taxpayers. The ratepayer's connection to infrastructure is direct and immediate, taking the form of entrance fees, tolls on roads, or utility bills, that *individualize* cost recovery at the point of service. Some fee structures borrow from both models. The concept of "postage-stamp pricing" refers to cost "socialization" through a uniform charge to users. Hybrid funding combines methods. Revenue requirements from rates are net of tax funding; revenue requirements from taxes are net of user funding.

Funding appears on an entity's income statement and cash-flow statement as an operating activity. Any form of infrastructure funding will reflect some degree of cost-averaging, cost-sharing, or (cross) subsidization. Not everyone who is taxed or charged will directly or proportionately benefit from infrastructure investment and vice versa. Some tax instruments are modeled as user fees to target cost causers or beneficiaries. Federal and state excise and sales taxes on fuel (gasoline) that generate funds for roads are leading examples. Utility rates can also cover costs that serve broader social purposes, such as the clean energy transition or removal of lead service lines, that could be tax-funded.

Figure 3.1. Funding to cover the total cost-of-service revenue requirement.

Table 3.1. Comparing taxes and user fees.

Criteria	Taxes	User fees
Personal connection	Indirect and diffuse	Direct and immediate
Social orientation	Public services	Private services
Role of subsidies	More accepted	Less accepted
Capacity for support	Geopolitical-level	Household-level
Cost treatment	Cost-sharing	Cost allocation
Equity conception	Social equity	Economic equity
Consumer incentives	Weaker price signals	Stronger price signals
Institutional oversight	Legislation	Regulation
Political scrutiny	More political	Less political
Distributional burdens	Less regressive	More regressive

Funding from Taxes

Tax-supported funding can come from the federal, state, or local levels, and the geopolitical configurations vary by infrastructure sector. Proportionately, voters place responsibility for infrastructure on the federal government (36%), state government (39%), or both (20%) (Quinnipiac University, 2018). Decisions about tax-supported infrastructure are typically delegated to elected officials, and some tax proposals may be put directly before voters through referendums. Relative to income, the distributional effect of various tax structures may be regressive, unitary, or progressive. A regressive tax takes a greater share of the budget of the lower-income household than the higher-income household. Tax burdens can thus be highly variable depending on the taxing entity and instrument.

Although federal taxpayers pay for some infrastructure directly, such as U.S. Corps of Engineers projects, they usually fund grant or loan programs. Tracing the path of intergovernmental transfers can be arduous (Figure 3.2). Federal dollars may directly flow to states, local governments, and to a lesser extent, the private sector for partial funding of infrastructure projects. Federal support can also indirectly offset funding and financing by other means, freeing state or local resources for other purposes in a substitution

effect (Campbell, 2019). Federal funding may be used to support financing programs (such as revolving loan funds). Government-backed loans, below-market interest rates, and tax-favored financing instruments embed federal support in the form of foregone tax revenues, often with the rationale that offsetting returns will come from economic activity and growth.

Under cooperative federalism, the federal government shares revenues with the states. The 1960s saw a shift to a more coercive federalism associated with federal mandates (funded and unfunded), as well as a shift from federal *funding* to federal *financing* (Kincaid, 1990; CRS, 2019a; CRS, 2020), discussed in the following section. Federal funding today, including funding for infrastructure, takes the form of project-specific or formulaic categorical grants (CRS, 2019a), for which grantees have less discretion about the use of funds (Figures 3.3). Federal funding is increasingly likely to provide incentives for more desirable (and disincentives for less desirable) structures and behaviors.

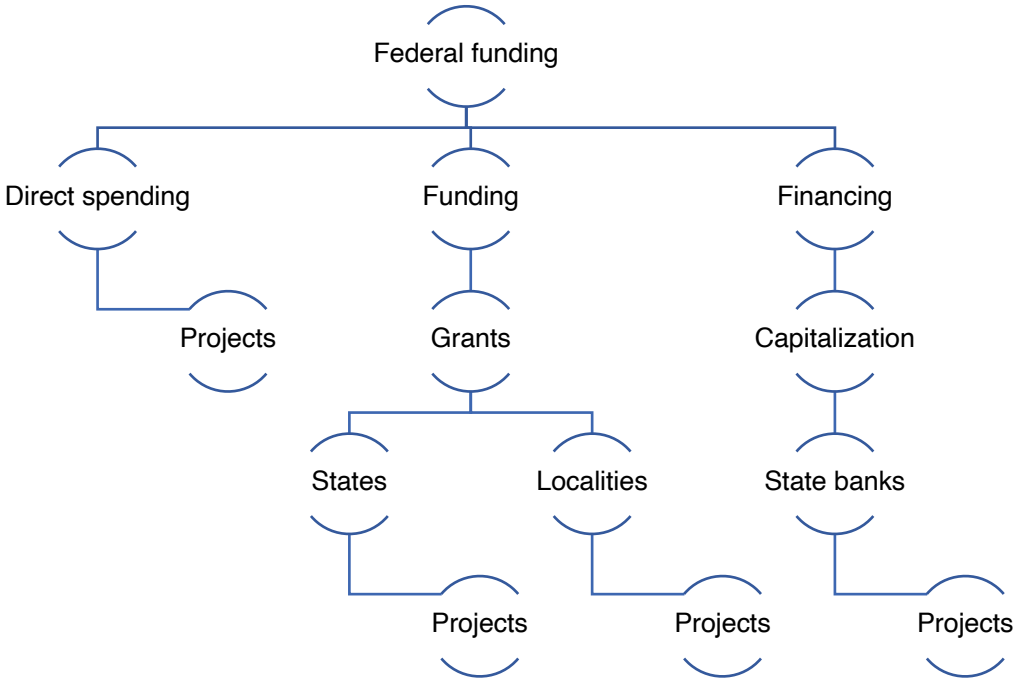

Figure 3.2. Federal funding paths to infrastructure projects.

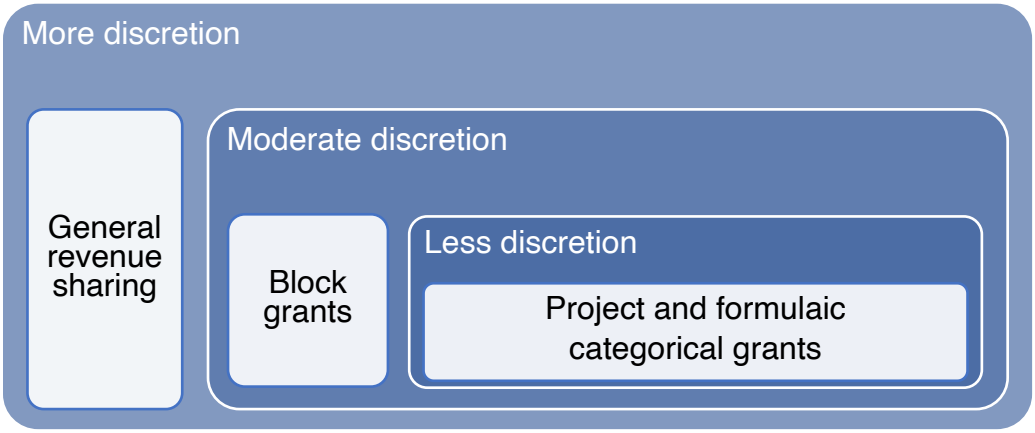

Figure 3.3. Federal funding and grantee discretion.
Source: Adapted from U.S. Congressional Research Service (2019a).

In fiscal year 2019, the federal government was expected to provide about 1,200 grants to state and local governments totaling about $750 billion in support of "health care, transportation, income security, education, job training, social services, community development, and environmental protection" (CRS, 2019a). About one-third of total state government budgets are federally funded, more so for health care and public assistance (CRS, 2019a). In 2017, funding of nondefense (social) infrastructure related to transportation, natural resources and the environment, veteran's benefits and services, community and regional development, commerce and housing credit, and other areas totaled $302 billion, with $124 billion for education and training, $114 billion for physical capital, and $64 billion for research and development (Campbell, 2019).

Several federal agencies implement programs to advance universal service and expand broadband (NTIA, 2017). The Federal Communications Commission oversees, and the Universal Service Administrative Agency (USAC) administers the Connect America Fund (CAF) to subsidize network build-outs in rural or hard-to-serve locations (Shapiro, 2019). The E-Rate Program provides discounts to schools and libraries, and the Rural Health Care Program supports rural healthcare (telemedicine). The U.S. Department of Agriculture administers ReConnect and other programs that support rural broadband through grants and loans. States programs include the Connecting Michigan Communities Grant program (CMIC) and "moonshot" strategies to align interests and leverage resources (Shapiro, 2020).

Federal funding for the interstate transportation sector is supported by the Federal Highway Trust Fund, which was established by the 1956 Federal-Aid Highway Act to support states in building a safe and efficient highway network across the country. Revenue growth in the fund outpaced spending until 2001; Congress authorized general fund transfers to cover shortfalls beginning in 2008 and pursuant to the Fixing America's Surface Transportation Act (FAST Act) since 2015 (CRS, 2020). The fund's solvency is an ongoing concern, particularly amidst the added fiscal strain of the COVID-19 pandemic (Garrison and Simmons, 2020). As of September 2020, the highway trust fund held balances of $12.5 billion for highways (down 56.5% for the fiscal year) and $5.1 billion for mass transit (down 55.2% for the fiscal year; fhwa.dot.gov).

The Congressional Research Service (CRS) has concluded that "funding and financing surface transportation is expected to continue to be a major issue for Congress" (CRS, 2020). Funding options going forward include making general fund transfers permanent (with ultimate funding from federal taxpayers), raising taxes on motor fuel (the "gas tax," which is vulnerable to changing fuel usage), replacing motor fuel taxes with a vehicle-miles traveled (mileage), a sales tax, a carbon tax, "value capture" from land developers, and expanded use of user fees in the form tolling (CRS, 2020). The CRS also identifies numerous *financing* solutions to preserve the trust fund and reduce the federal funding burden in the sector (CRS, 2020).

The Congressional Budget Office (2018b) tracks inflation-adjusted infrastructure funding for transportation (Figure 3.4) and water (Figure 3.5). For the transportation sector, federal funding remains significant, but state and local governments have taken on a bigger role over time. For the water sector, the federal share of funding has been shrinking since its peak in the 1970s (CBO, 2018b; U.S. Water Alliance, 2020). Local governments must find funding for water, wastewater, and other services from mostly local sources. The federal role in the sector has also shifted from funding to financing, as discussed in the next section. Privately owned infrastructure providers rely primarily on funding, which covers the cost of investor-provided capital.

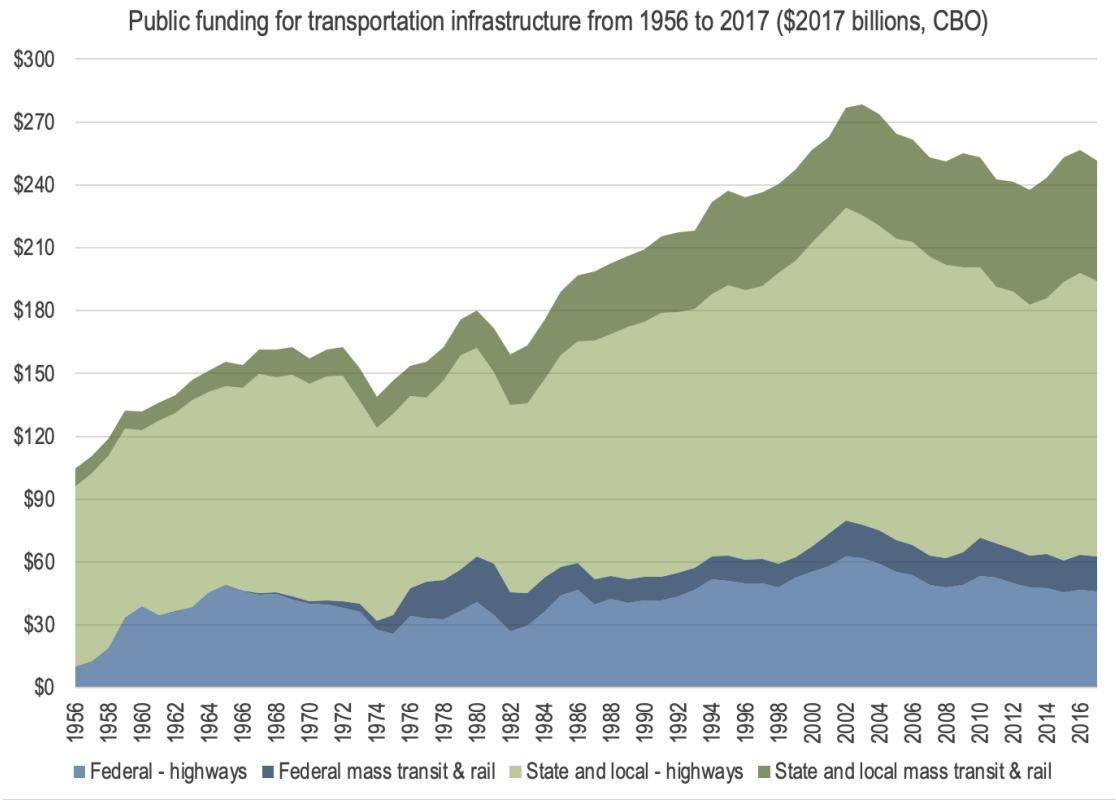

Figure 3.4. Public funding for transportation infrastructure.
Source: U.S. Congressional Budget Office (2018b). Data are adjusted for inflation.

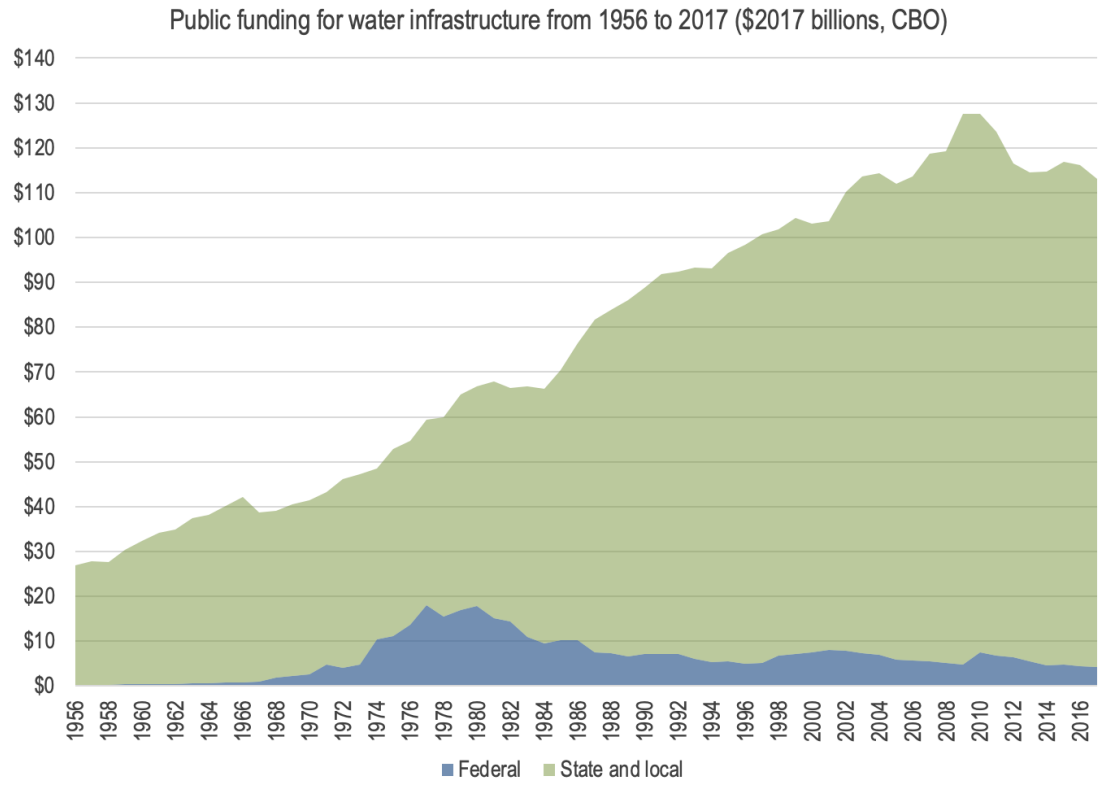

Figure 3.5. Public funding for water infrastructure.
Source: U.S. Congressional Budget Office (2018b). Data are adjusted for inflation.

Funding from User Fees

Infrastructure services have characteristics of both public and private goods and can thus be understood as "social" goods. They are sometimes referred to as "toll" goods not because they *must be* paid for by user fees but because they *can be.* In other words, access can be restricted, and usage can be separately metered and priced. The concepts of "full-cost recovery" and "full-cost pricing" also align with the public finance goals of fiscal stability and sustainability. Full-cost pricing is viewed as a way to address historic underpricing associated with the "willingness to pay" and the "willingness to charge."

Funding from user fees (pricing instruments) finds formidable normative support from economic theory favoring "public choice" and market-oriented approaches. Accordingly, in theory, all parking spaces can be metered and all roads can be toll roads (Marshall, 2020). Prices that are "undistorted" by subsidies and allocate costs based on causality, even if imperfectly and imprecisely, help guide efficient production and consumption. Prices that are too low relative to cost may lead to excessive (or "wasteful") consumption, with adverse economic and environmental impacts, although prices that are too high may lead to human deprivation and distress. The economic rationale for user fees has merit for discretionary usage, but the ability to respond to prices (inelasticity) for essential and nondiscretionary usage, and thus potential efficiency gains, are limited. Pricing the essential level of infrastructure services bears a resemblance to taxation, arguing for a circumspect approach.

The concepts of full-cost pricing and tolling are widely and normatively accepted by policymakers and analysts, as in the "right way" to price. According to the U.S. Environmental Protection Agency, "Pricing of water services should accurately reflect the true costs of providing high-quality water and wastewater services to consumers to maintain infrastructure and plan for upcoming repairs, rehabilitation, and replacement of that infrastructure" (USEPA website). The Congressional Research Service considers tolling a potentially "effective" way to raise funds for roads, bridges, and tunnels because it cannot easily be "evaded" (CRS, 2020). Many, if not most, policy analysts believe that user fees should take priority over taxes for funding (Schanzenbach, 2017).

Once funded by property taxes, many local services are now supported by user fees (Miller, 2020b). The establishment of stormwater utilities and fees are the most recent example. Recent Census data reveal that local expenditures for core utilities are mostly covered by service-related revenues (Figure 3.6). Slight deficits are apparent for solid waste and water, with a notable difference for transportation, meaning that costs are partly covered from other funding sources (namely, tax revenues). A bus or metro fee does not pay for the "true cost" of service because subsidies for transportation are considered purposeful due to positive economic and social spillover effects associated with local mobility. Globally and in the United States, some cities have considered eliminating fares altogether (Day and Wakefield, 2020).

Census data also demonstrate climbing local expenditures in the utility sectors (Figure 3.7), in most cases exceeding inflation rates (about 74% for 1993-2018 and 33% for 2004-2018). Whether these expenditure levels are insufficient, resulting in "gaps," is discussed later. Wastewater revenues generally track expenditures; water revenues are slightly below expenditures (Figure 3.8). Data for Michigan indicate flattening of revenues for both subsectors, with better coverage for water than for wastewater (Figure 3.9)

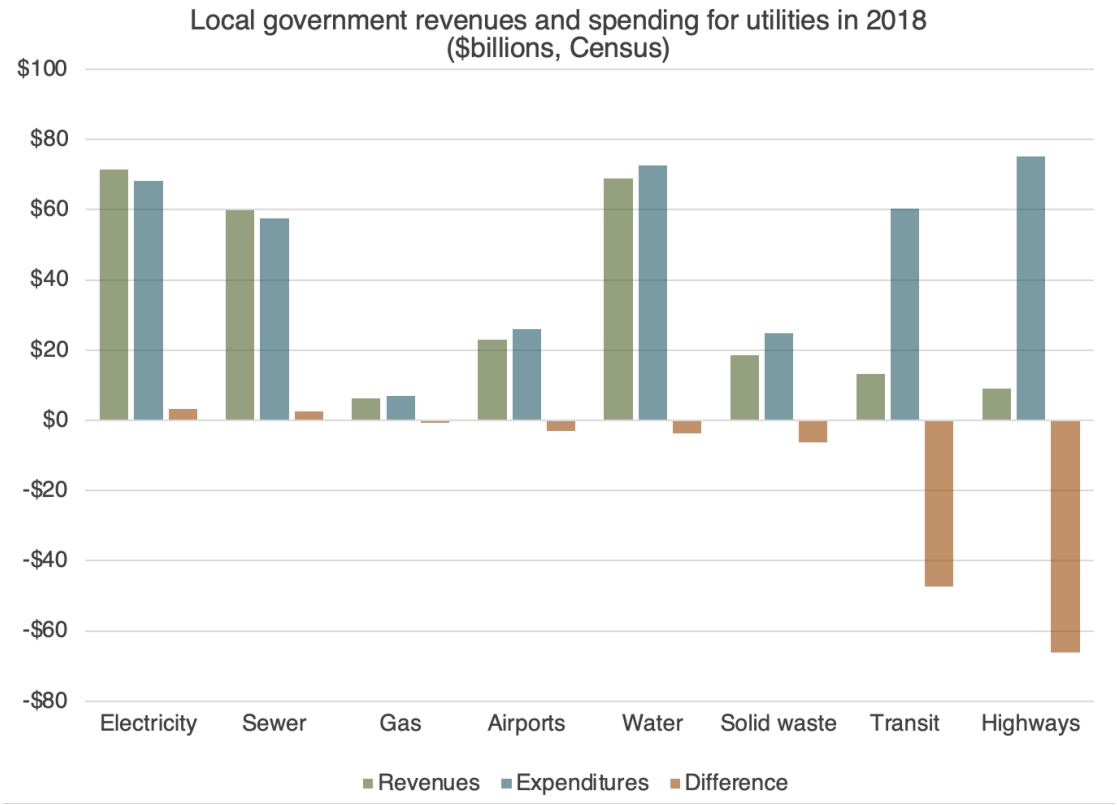

Figure 3.6. Local revenues and expenditures for utilities (2018).
Source. U.S. Census Bureau, *Annual Survey of State and Local Government Finances* (census.gov).

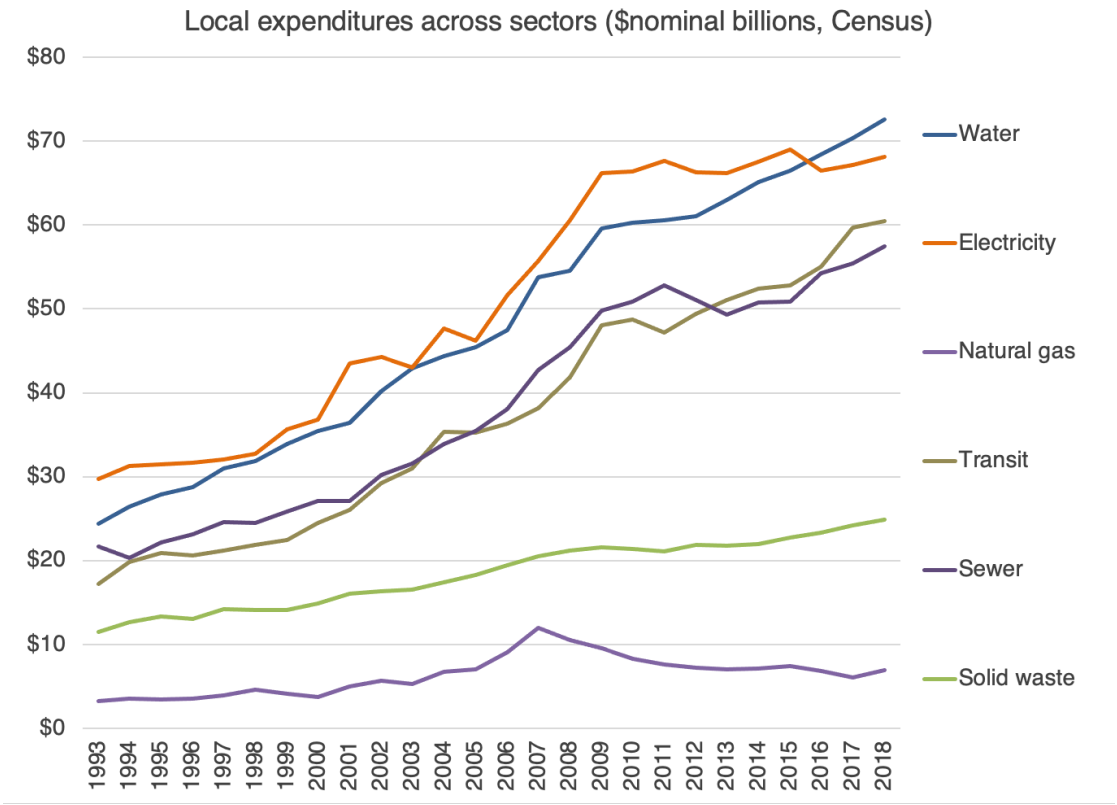

Figure 3.7. Local expenditures on utilities over time.
Source. U.S. Census Bureau, *Annual Survey of State and Local Government Finances* (census.gov).
Data are not adjusted for inflation.

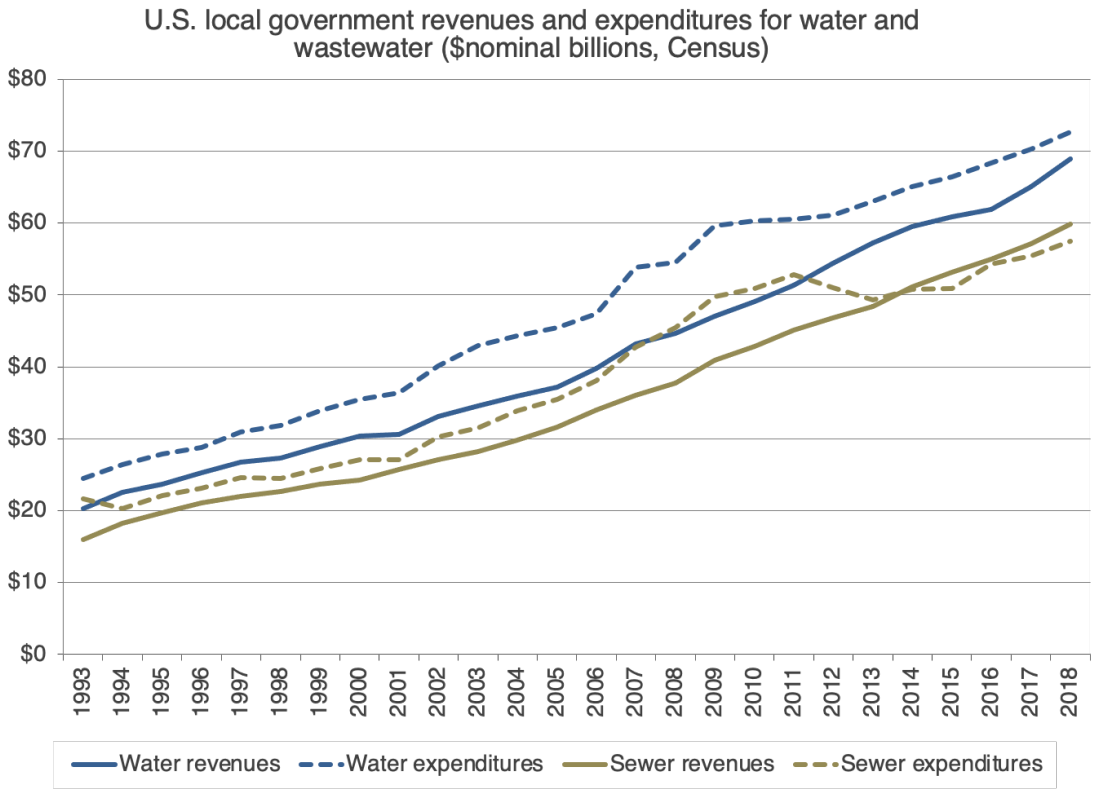

Figure 3.8. Trend in U.S. local expenditures for water and wastewater services.
Source. U.S. Census Bureau, *Annual Survey of State and Local Government Finances* (census.gov).

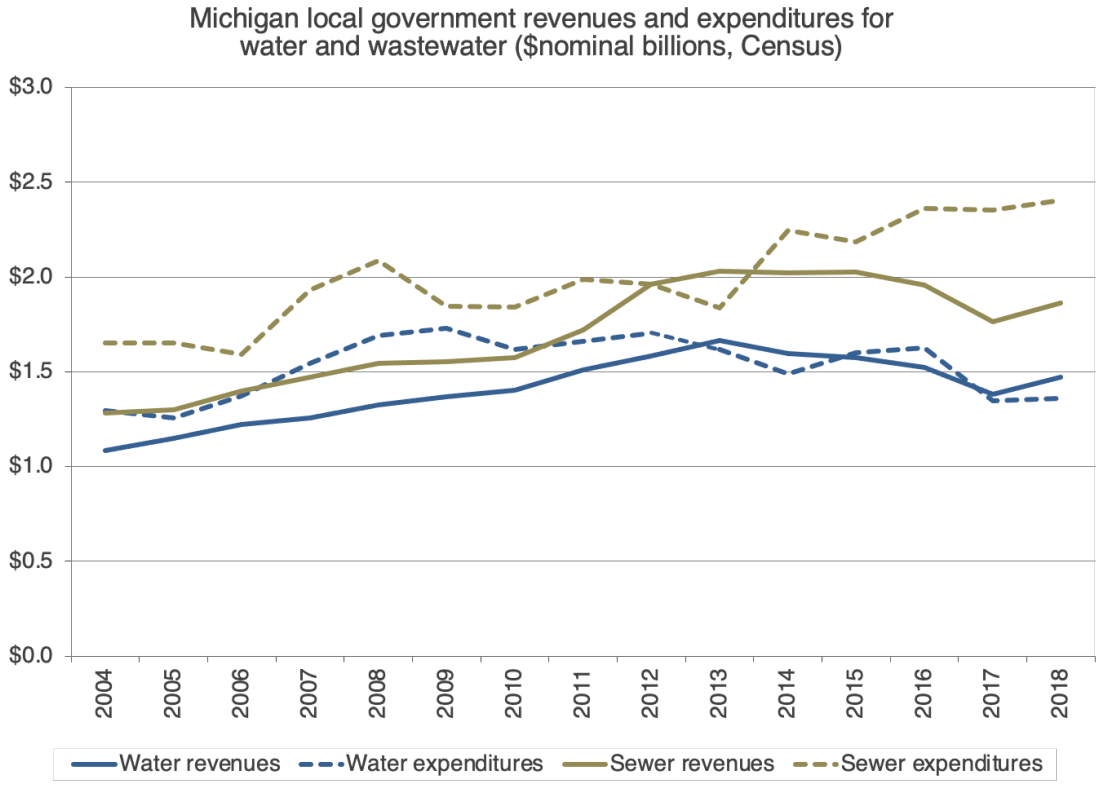

Figure 3.9. Trend in Michigan local expenditures for water and wastewater services.
Source. U.S. Census Bureau, *Annual Survey of State and Local Government Finances* (census.gov).

Many nonprivate systems operate as enterprises and charge the full cost of service; for some, prices may be "distorted" by embedded subsidies, transfers, practices, or artifacts that may not be transparent, meaning that prices may be higher or lower than the cost of service and "noisy." Privately owned infrastructure providers invariably price at full cost, including the cost of financing, because there is no other funding source. Both prices and the profits they embed will be subject to state economic regulation.

Privately owned utility systems are expected to realize profit-driven efficiencies, but the prices they charged will be higher than those of publicly owned or not-for-profit providers. Private companies pay corporate income and other taxes, incur a higher cost of capital (including returns to shareholders), and charge a depreciation expense; these costs are constitutionally recoverable from regulated rates. Publicly traded and holding companies incur overhead, including corporate compliance costs. Larger investor-owned utilities also have a propensity to invest in capital projects based on incentives associated with the economic regulatory model. The numerous conditions and practices affecting costs and rates, one way or another, are summarized for the water sector in Figure 3.10. For these reasons, comparing rates across utilities is tenuous.

Figure 3.10. Factors affecting cost and rate disparities based on water utility ownership type.

Nonprivate entities may or may not charge users for asset depreciation. Depreciation is a non-cash expense (no outflow) item that can be included as a component of revenue requirements and rates according to the "utility basis" for ratemaking. Depreciation thus increases ratepayer funding and positively impacts cash flow, with an expectation of reinvestment to meet service obligations. For a privately owned (for-profit) utility, the depreciation expense charged to ratepayers is a repayment or *return of* investor-supplied capital apart from an authorized *return on* capital. Accumulated depreciation reduces the value of the rate base on which returns are earned. For investor-owned utilities, funds raised through depreciation may be reinvested by shareholders for future returns. Some suggest that depreciation pricing and reserves should be mandatory for publicly owned utilities (Miller, 2020a).

Trends in Consumer Prices

The consumer price index (CPI) provides a metric for assessing price trends and inflation for goods and services (Figures 3.11 and 3.12). Apparent from the data is that prices in the telecommunications, energy, and transportation sectors have generally trended below the overall rate of inflation, likely explained by technological advances across these sectors and trends in fuel costs needed for energy services (particularly natural gas). Some slight pressure on parking and tolls may indicate more use of these user-fee instruments. By stark contrast, prices for water, solid waste (garbage), and cable and satellite television services have soared relative to the CPI generally and to the CPI for all other utility services.

Water system cost and price profiles vary considerably by system type, age, and location. Nonetheless, substantial capital costs are a common cost driver across the water, wastewater, and stormwater subsectors. Most of this investment is for remediation and improvement, but some may be associated with population growth and new investment in supply, treatment, transmission, distribution, and storage facilities. Operating cost pressures subject to inflationary effects include labor, energy, chemicals, and purchased water; compliance with federal and state water quality standards, including costs associated with new contamination threats (such as pharmaceuticals, coal ash, and hydraulic fracturing); and periodic water supply constraints, some of which are due to climate change.

For many systems, declining demand is relevant to rates in terms of addressing revenue erosion or attrition (Beecher and Chesnutt, 2012; DeOreo et al., 2016). Legacy cities affected by population losses and economic recession have seen dramatic declines in water sales and are now left with excess capacity. More generally, end-use efficiency standards and practices have reduced per capita water consumption. Efficiency gains can help systems avoid operating costs in the short run and capital costs in the long run. However, a mathematical reality in ratemaking is that less usage must be met by a higher rate to achieve revenue requirements. Fortunately, for many, higher rates apply to lower household usage, so the trajectory for bills may not be as steep as that for rates. Unfortunately, efficiency gains can make rates "less high" but cannot offset all of the costs related to infrastructure replacement and regulatory compliance.

Across the United States and elsewhere, a significant price driver in the water sector is the transition to full-cost pricing by nonprivate systems. The combination of rising costs and falling demand, along with greater reliance on revenues from customers, means higher rates and higher bills for water services. Following the impulse to price, many households now pay fees for stormwater and solid waste management in addition to water and wastewater services. The combined burden is bringing growing attention to the equity and affordability of ratepayer-funded water services.

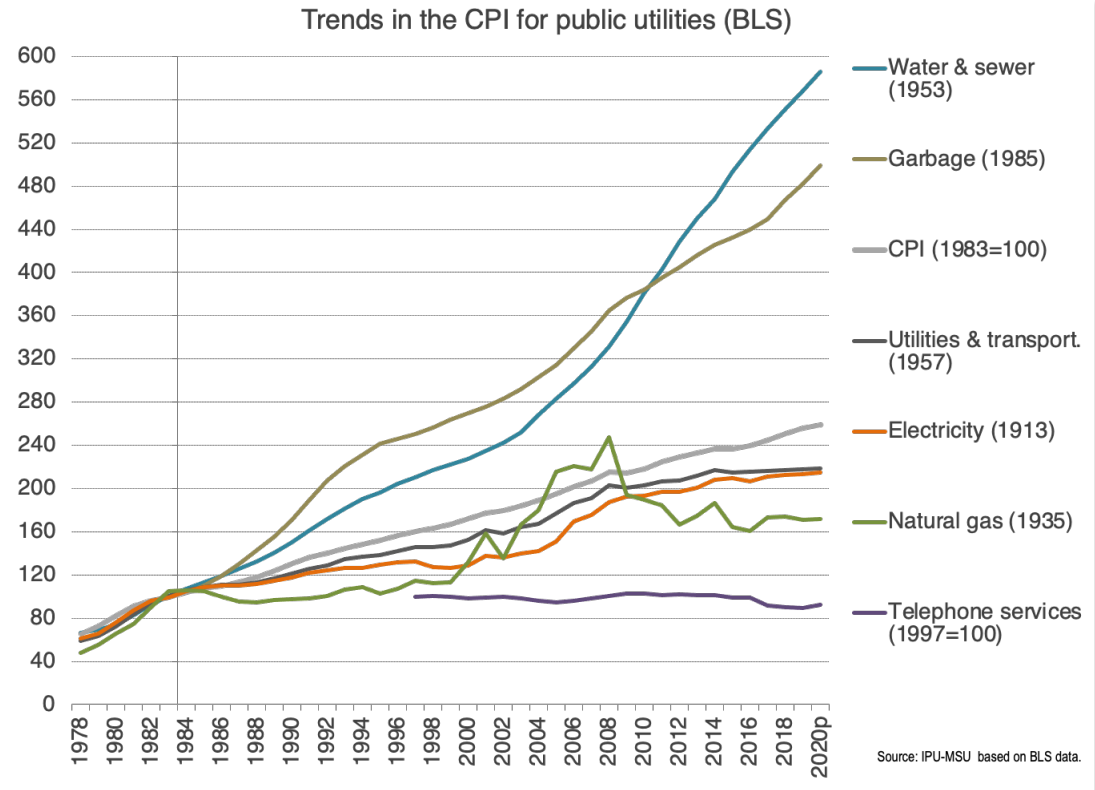

Figure 3.11. Trends in the Consumer Price Index (CPI) for utility services.
Source: Annual data from the U.S. Bureau of Labor Statistics (bls.gov).

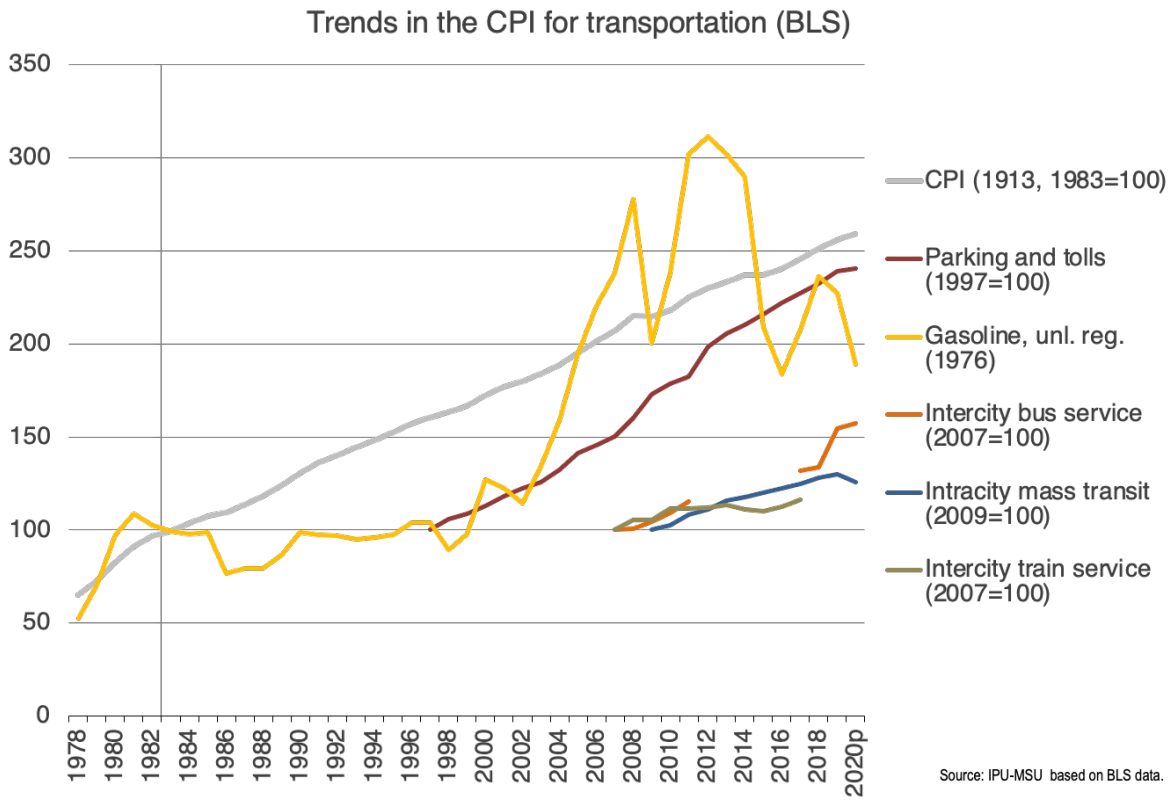

Figure 3.12. Trends in the Consumer Price Index for transportation services.
Source: Annual data from the U.S. Bureau of Labor Statistics (bls.gov).

Household Impacts

Based on cost-of-service studies, residential customers' utility rates are invariably higher than for commercial and industrial customers. All ratemaking involves some degree of averaging with customer classes but across functional usage. For utilities, effective prices can be calculated by dividing revenues by sales for each customer class. This relationship holds across the utility sectors and ownership types. For the electricity sector, private ownership is associated with higher effective prices and a wider spread between residential and industrial customers (Figure 3.13). For the water sector, data for a multi-state holding company confirms these effective price relationships, including a wider spread between residential and industrial customers over time (Figure 3.14).

Consistent with the price index data, household expenditures have climbed steadily (Figure 3.15) and have distributional effects similar to those for other basic needs (Figure 3.16). Although usage of and bills for energy and water services rises with income, lower-income families will devote a much greater share of their budget for these essential services. The degree of regressivity is affected by several factors. The fixed portion of the bill must be paid regardless of usage. The effect of alternative rate structures (such as usage and time differentiated rates) depends on the details of design and the household's circumstances. Various policy measures, including lifeline rates, comprehensive customer assistance, and tailored efficiency programs, can help mitigate the effects of rising infrastructure costs and prices for energy and water.

Fortunately, more attention is being paid to the human and social dimensions of utility infrastructure, including universal, affordable access (Beecher, 2020; Miller 2020b). Like utility bills, the aggregate burden of various taxes on households is regressive (Figure 3.17); that is, the kind of tax also matters to outcomes (Institute on Taxation and Economic Policy, 2018). However, comparing utility and tax expenditures by income quintiles illustrates why funding choices matter (Figure 3.18). Whereas household utility expenditures are always regressive, taxes based on property or income can be less regressive or progressive. The essential nature of utility services and their impact on household budgets urge caution against inflating costs unnecessarily or incorporating into rates certain costs (including *taxes*) that might be covered more equitably through more transparent tax instruments, particularly given pervasive income inequality.

The choice between taxes and user fees is often dichotomized, as are the "winners and losers" associated with different models (Strong Towns, 2017). When taxpayer funding is constrained or withheld, much of the burden will fall to ratepayers, raising concerns about equity and affordability. While user fees will continue to play a central role in infrastructure funding, they do not necessarily have to play an exclusive role. Understanding the distributional effects associated with funding argues for a more critical exploration of feasible options (McNichol, 2019; Miller 2020a and 2020b), including combinations of tax and user-fee instruments to cover revenue requirements.

The pricing paradigm can also evolve to include methods that borrow features from both models to balance efficiency and equity objectives and spread burdens fairly. One proposed water rate structure ties the rate recovery of some of the capacity costs of water systems to property values based on public functionality (such as fire protection and sanitation) while incorporating an allowance for essential usage and maintaining price signals for discretionary usage (Beecher, 2020). Based on public-health and other rationales, the model also recommends the use of service limiters over disconnection.

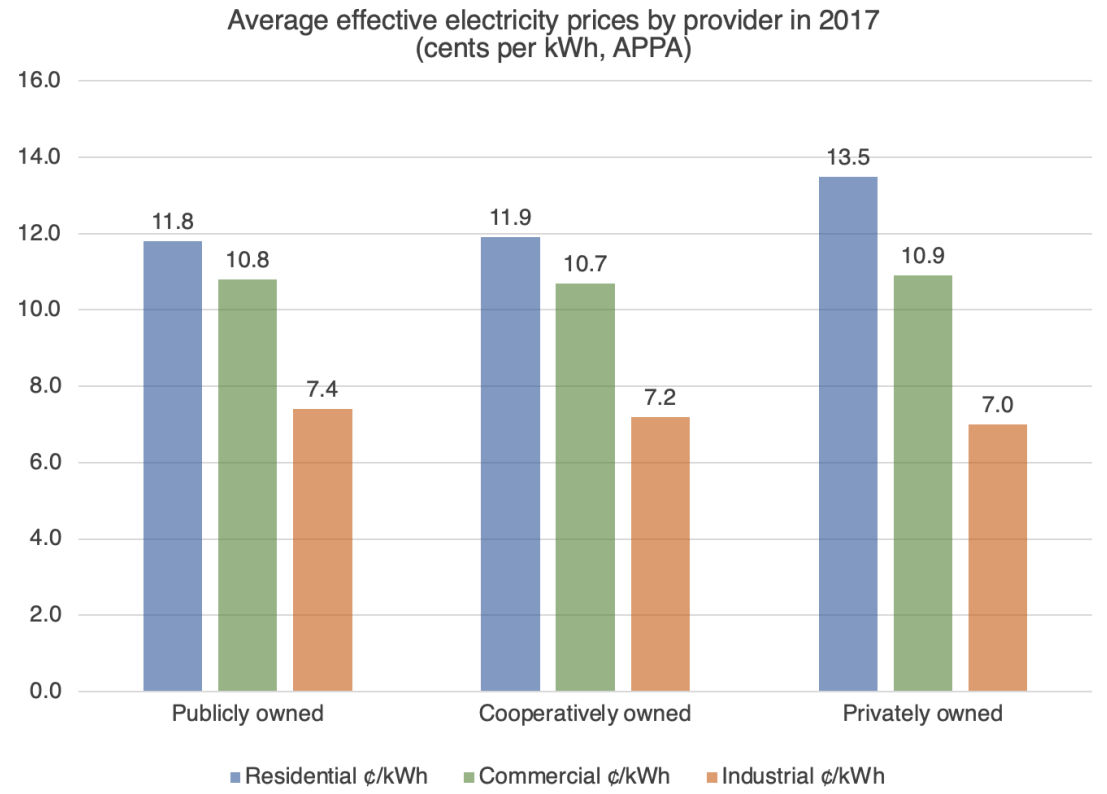

Figure 3.13. Average effective electricity prices by utility type and customer class.
Source: American Public Power Association (2019). Calculated by revenues per sales; excludes nonutility providers.

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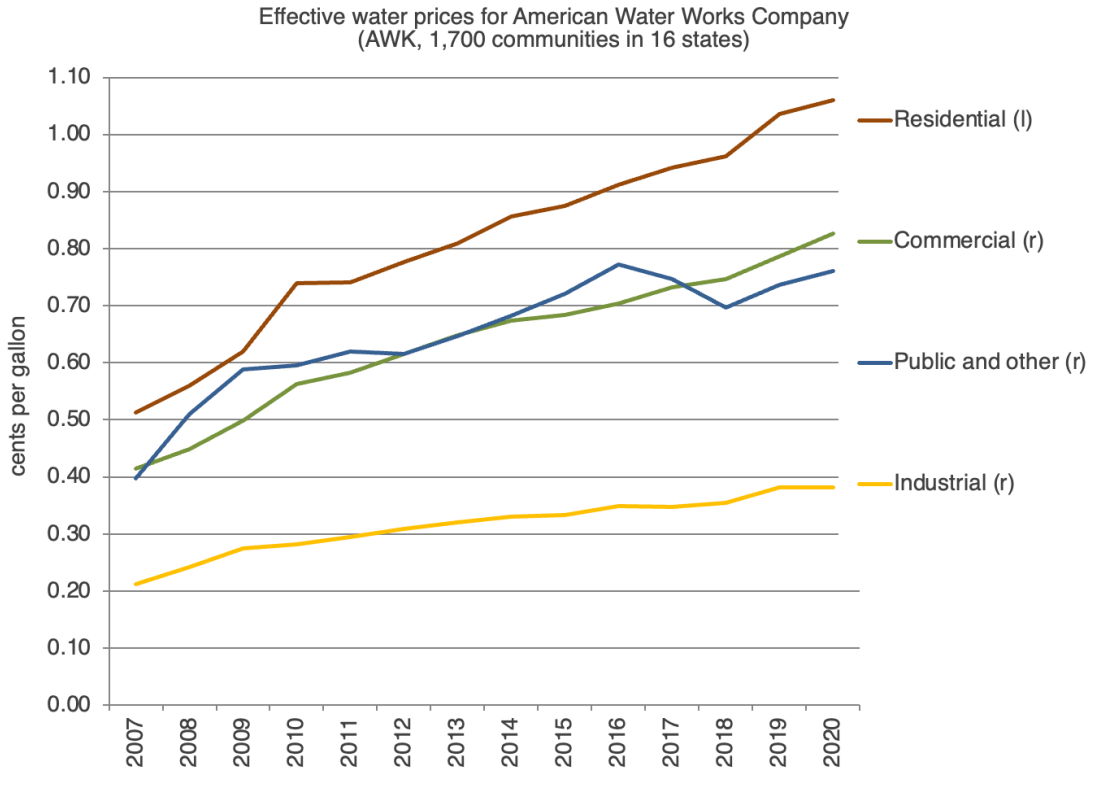

Figure 3.14. Effective water prices by customer class over time for American Water.
Source: American Water Works Company, *Annual Reports* to the Securities and Exchange Commission (sec.gov). Calculated by revenues per sales.

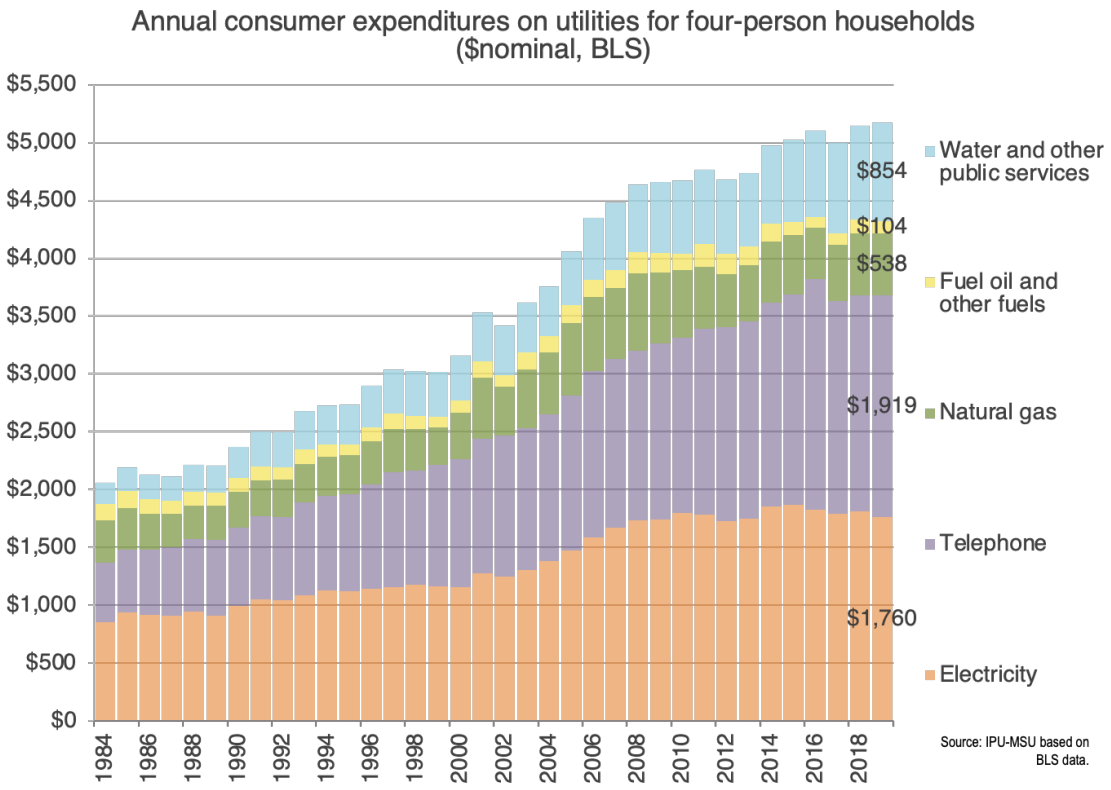

Figure 3.15. Trends in household expenditures on utility services ($).
Source: Annual data from the U.S. Bureau of Labor Statistics (bls.gov).

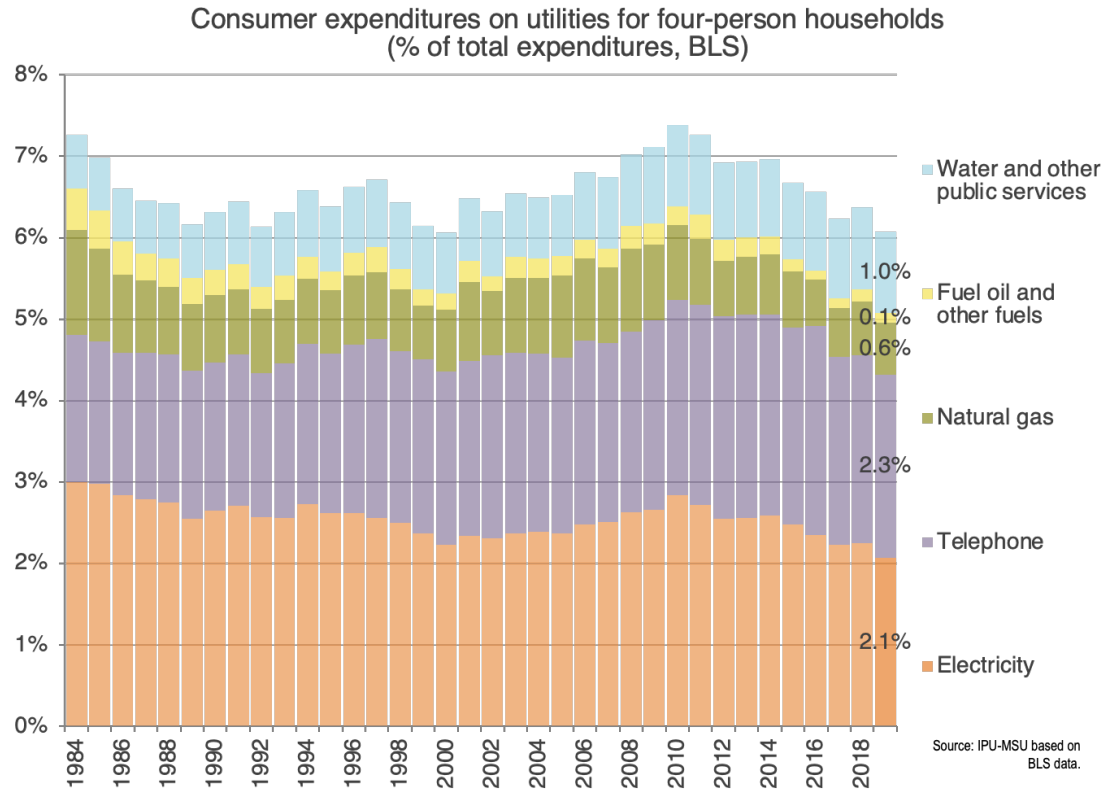

Figure 3.16. Trends in household expenditures on utility services (%).
Source: Annual data from the U.S. Bureau of Labor Statistics (bls.gov).

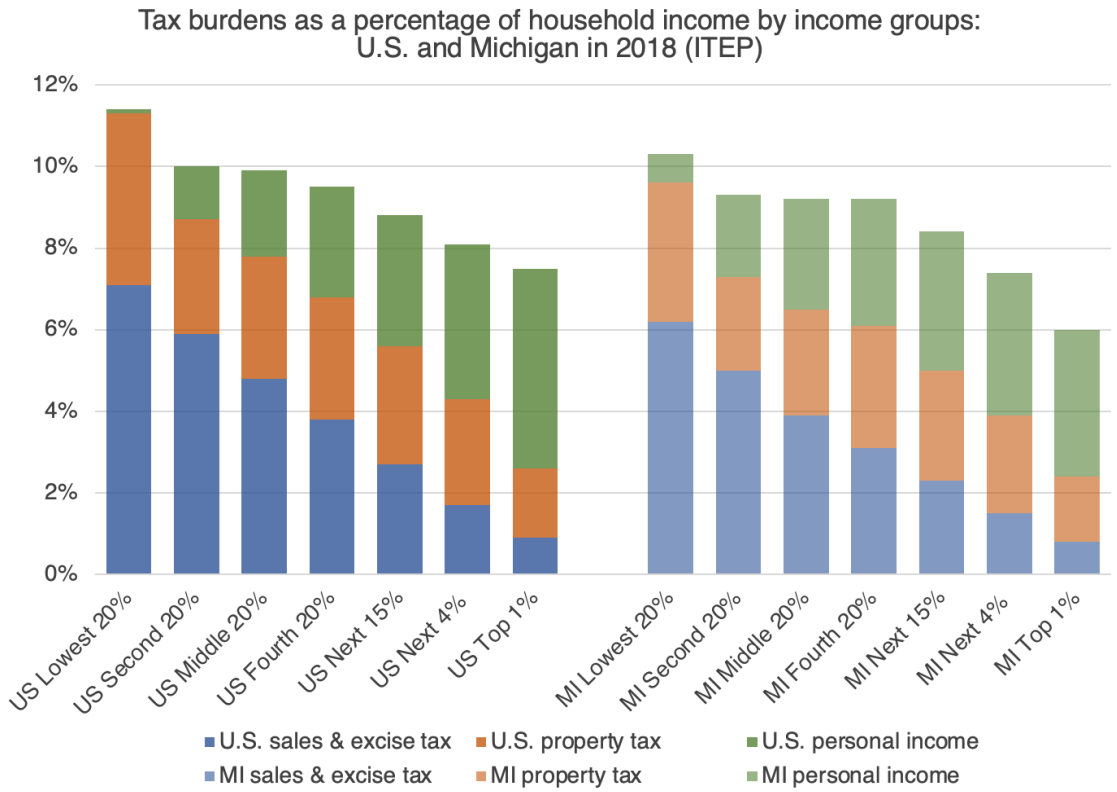

Figure 3.17. Tax burdens as a percentage of household income by income groups: U.S. and Michigan.
Source: Institute on Taxation and Economic Policy (2018).

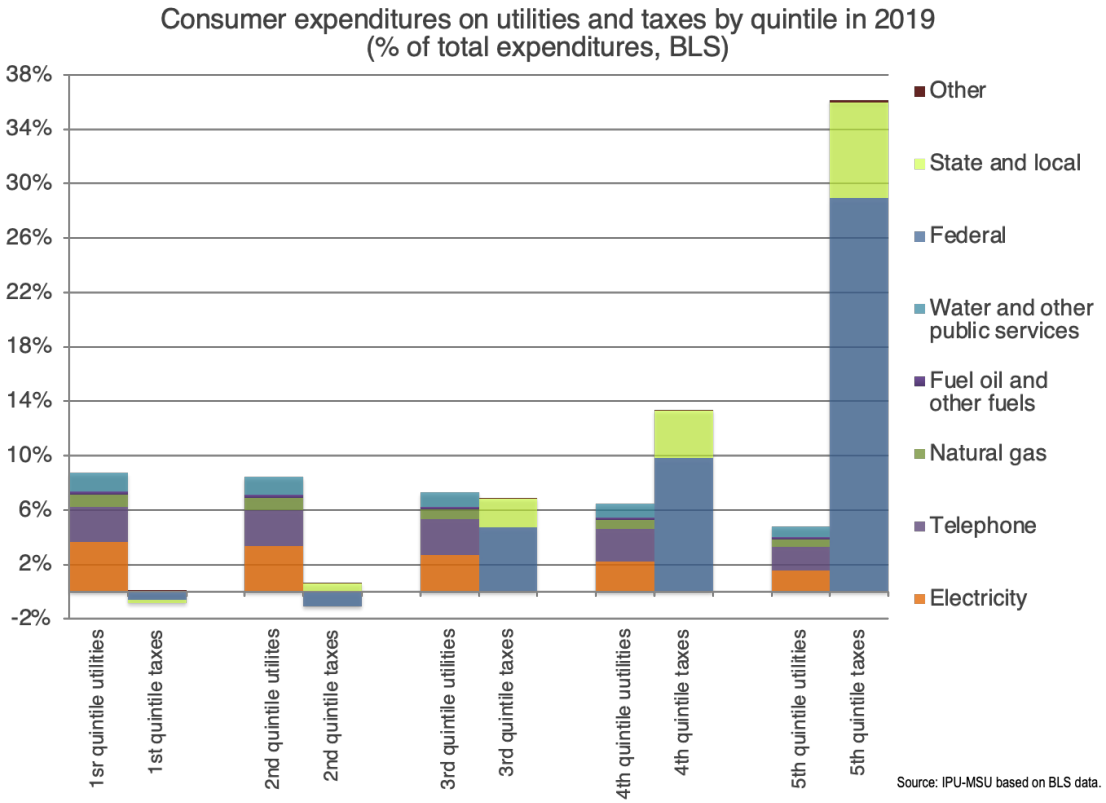

Figure 3.18. Household expenditures on utility services and taxes.
Source: Annual data from the U.S. Bureau of Labor Statistics (bls.gov).

Michigan's Barriers to Funding

For some states, public policies make it harder to close the gap by raising funds from either taxes or user fees, at least not without voter acquiescence. In Michigan, constitutional law and legal precedents (namely, the *Headlee Amendment* and *Bolt v. City of Lansing* decision, respectively) impose two apparent constraints on the funding challenge (Appendix C).

The *Headlee Amendment* to the state constitution, passed by voters in 1978 (Article IX, Sections 24 to 34) to place limits on raising local tax revenues without voter approval (Wolcott, 2016).

The second constraint materialized with the decision by the state supreme court in *Bolt* (1998), which invalidated Lansing's stormwater management service charge on the basis that it failed to meet the first two of three criteria for the imposition of a user fee:

1. It must serve a regulatory purpose rather than a (general) revenue-raising purpose;
2. It must be proportionate to the necessary cost of the service; and
3. It must be voluntary in that users can refuse or limit their use of the commodity or service.

While the court opined that "There is no bright-line test for distinguishing between a valid user fee and a tax that violates the Headlee Amendment," it warned against "the danger to the taxpayer" inherent in the "burgeoning phenomenon" of mandatory user fees. A majority found that in this case, the fee was essentially a "disguised tax." First, enterprise fund revenues from fees replaced general fund revenues from taxes. Second, a majority of unaffected customers would have to pay for the minority of affected customers. Third, the ability to place a lien for nonpayment is also suggestive of a tax (for counterarguments, see the dissenting opinion by Justice Boyle). Codifying the long-held conception of water as a priceable commodity, the court concluded that the stormwater charge was not a valid user fee but a tax.

The reasoning behind *Bolt* may be generally sound. Still, the precedent brings Michigan cities back to face the dilemma of raising taxes for certain forms of public infrastructure, less they also "abrogate" the responsibility of governments to provide essential services to the public and enable economic development. The degree to which *Headlee* and *Bolt* constitute "settled law" via challenges and clear precedents is not entirely clear and debated among experts. Together, however, they seem to place local funding for infrastructure between the "rock" of raising taxes (*Headlee*) and the "hard place" of raising user fees (*Bolt*).

Together, *Bolt* and *Headlee* seem to have had a chilling effect on raising funds for infrastructure. A recent legal analysis makes the case against presuming that Michigan law precludes adopting alternative water rate structures to address affordability, including income-case rates (Leonard et al., 2020). A judicial order along these lines would provide needed clarity on this issue. Regardless, policymakers are obligated to find ways to overcome political and legislative barriers to funding critical infrastructure by reasonable and equitable combinations of taxes and user fees.

4. FINANCING: HOW INFRASTRUCTURE IS PAID FOR

How infrastructure is paid for matters in terms of the cost of capital and economic incentives. Infrastructure, by definition, is capital intensive and long-lasting and financing over relatively long time periods is appropriate and strategic. Financing methods have a smoothing effect that makes it possible to spread costs and their recovery over the useful life of assets from the beneficiaries of the investment, which satisfies intergenerational equity while also enhancing cash-flow management for the provider. Some financing instruments can provide entities with essential "working capital" for operations.

Issuing debt and equity are the fundamental methods for converting financial capital into physical capital, and their usage varies by sector and ownership. The cost of financial capital also varies with specific financing instruments. Financing costs tie directly back to funding (Figure 4.1) because funding must cover the cost of financing. Moreover, funding from dedicated and recurring revenue streams can be leveraged (or "securitized") by financing instruments that inject financial capital for investment (Deloitte, 2017). In other words, *funding* allows for *financing* and lowers the cost of the risk-adjusted compensation of investors.

Interest or dividends paid to debt-holders and returns to shareholders are based on an assessment of risk. Risk drives the cost of capital, and revenue certainty and stability are key risk factors. Investments in infrastructure and utilities, regardless of ownership, are considered relatively less risky (or relatively "safe") than other sectors of the economy, which lowers the cost of financing. The debt and equity instruments that support infrastructure provide income in an investment portfolio.

The perception of lower risk by financial markets is associated with the essential nature of infrastructure services, along with the stabilizing (and "credit positive") effect of government ownership or economic regulation on revenues from taxes or user fees. Speculative-grade debt issues in transportation and utilities are very uncommon; public-sector debt issues with dedicated revenue streams, as well as taxing and bonding authority and capacity, are less risky than private-sector providers (S&P Global, 2020a and 2020b). For investor-owned utilities, however, economic regulation tends to mitigate revenue and other risks. For these reasons, the state regulatory climate is taken into account in credit and equity ratings.

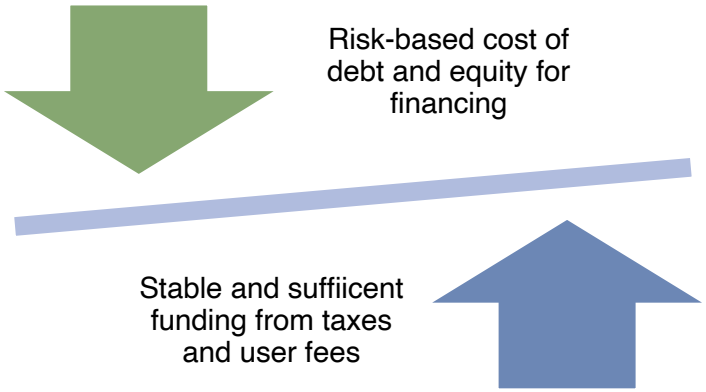

Figure 4.1. Relationship of funding support to the cost of financing.

Debt and Equity

Infrastructure financing methods draw a distinct contrast between the public, not-for-profit, and private sectors. Public-sector and not-for-profit providers may hold equity interests (as "shareholders"), but they rely mainly on debt instruments for financing; private sector providers rely on a combination of debt and equity instruments, often in roughly equal proportions, on an ongoing ("rolling") basis. Investors in debt and equity securities expect and are legally entitled to fair compensation for their investment.

Debt consists of lines of credit and loans of various terms from banks or other lenders, including government agencies (see the discussion of revolving loans below). General obligation and revenue bonds are forms of long-term debt. Debt limitations and coverage (revenue sufficiency) may be specified in bond covenants. Debt-service coverage ratios are also used in setting rates for publicly and cooperatively owned (nonprivate) utilities. The interest from municipal bonds issued to support capital spending for public purposes is exempt from federal and sometimes state and local income taxes.

Municipalities have moved away from general obligation debt supported by general revenues and taxes to instruments with other assurances, including revenue bonds, special assessment bonds, and tax-increment financing (Miranda and Picur, 2000). Private activity bonds allow private-sector access to tax-exempt public financing for some infrastructure projects. Revenue bonds associated with enterprise funds have distinct revenue streams (such as revenues from utility sales) pledged to repayment and are generally excluded from the parent public entity's debt burden (Miranda and Picur, 2000). As utility enterprises provide essential services (power and water), their business risks are relatively low; bonds related to transportation are somewhat riskier (Howard, 2019; S&P Global, 2020b).

For publicly owned providers, traditional financing methods include local government revenue bonds, federal loans, and state loans from infrastructure banks; innovative financing instruments, many of which deploy private capital, include project finance loans, taxable bonds, private-activity bonds, mezzanine hybrid debt, and investor equity supplied under partnerships (Deloitte, 2017). Water and wastewater providers have been found to carry debt amounting to about half the value of their net assets; debt payments account for about 20% of cash revenues, excluding cash spent on capital projects (Thompson and Gorman, 2014). Bond terms of 30 years are typical (though not necessarily optimal). Given the ongoing interest-rate environment, some utility debt can be refinanced at lower rates and possibly extended maturities (40 to 55 years). However, "advance refunding" of tax-exempt bonds more than 90 days prior to their call date was restricted by U.S. tax law in 2017; tax-exempt bonds can only be advance refunded with taxable bonds, the economics of which (like all refinancing) depends on interest rates (Barcena and Wessel, 2020; GFOA, 2020).

A public letter-grade credit rating from one of the major private credit-rating agencies (Fitch, Moody's, and Standard & Poor's) facilitates bond issuances. Favorable ratings in the investment-grade category can lower the cost of debt to the benefit of the taxpayers or ratepayers who fund debt service (principal and interest payments) over time. In addition to traditional financial metrics, ratings increasingly account for broader environmental and social responsibilities that are important to stakeholders, including resource management, climate action, and affordability.

Infrastructure providers tend to enjoy very positive credit ratings, with water utilities being among the highest (Thompson and Gorman, 2014). As the interest payment (or coupon) on a debt instrument is almost invariably fixed at issue, debtholders bear only downside risks (default). Bond defaults are comparatively

rare in the transportation and utility sectors, particularly for public debt issues (Figure 4.2). Although debt markets saw record activity in 2020 (Barcena and Wessel, 2020; Brennan, 2020; Mutua, 2021; Reuters, 2021), driven by a surge in refinancing, the COVID-19 crisis is imposing an ongoing stress test on corporate and government finances, and the challenges for new investment loom large.

The federal role in infrastructure financing remains significant, as summarized in Table 4.1 and Figures 4.3 and 4.4. Publicly owned infrastructure providers are generally eligible for a federal tax-exemption on the debt they issue (Thompson and Gorman, 2014). Conditionally, providers from the public and private sectors may qualify for subsidized loans from various federal programs. Tax-exempt bonds are the most common form of financing for transportation and water infrastructure and are less restrictive than other forms of financing (CBO, 2018a). Federal financing vehicles also include state revolving loan funds and infrastructure banks, direct federal credit programs providing loans or loan guarantees to state and localities, and tax-credit bonds issued by states and localities (such as Build America Bonds, authorized by the American Recovery and Reinvestment Act of 2009), which have not been issued for the transportation or water sectors since their use 2009 and 2010 (CBO, 2018a).

In addition to debt, infrastructure can also be funded by equity investors or shareholders, including large institutions (such as pension funds and insurance companies). Shareholders are compensated with returns on their invested capital, and they bear both upside and downside risks. For jurisdictional utilities, the cost of equity is modeled based on "comparable risk." Utilities must have a reasonable opportunity to earn "fair" returns that are authorized *but not guaranteed* by economic regulators. However, risks are generally lower for regulated (monopolistic) than non-regulated (competitive) companies, and investors have traditionally valued utilities for stable dividends (especially during volatile markets).

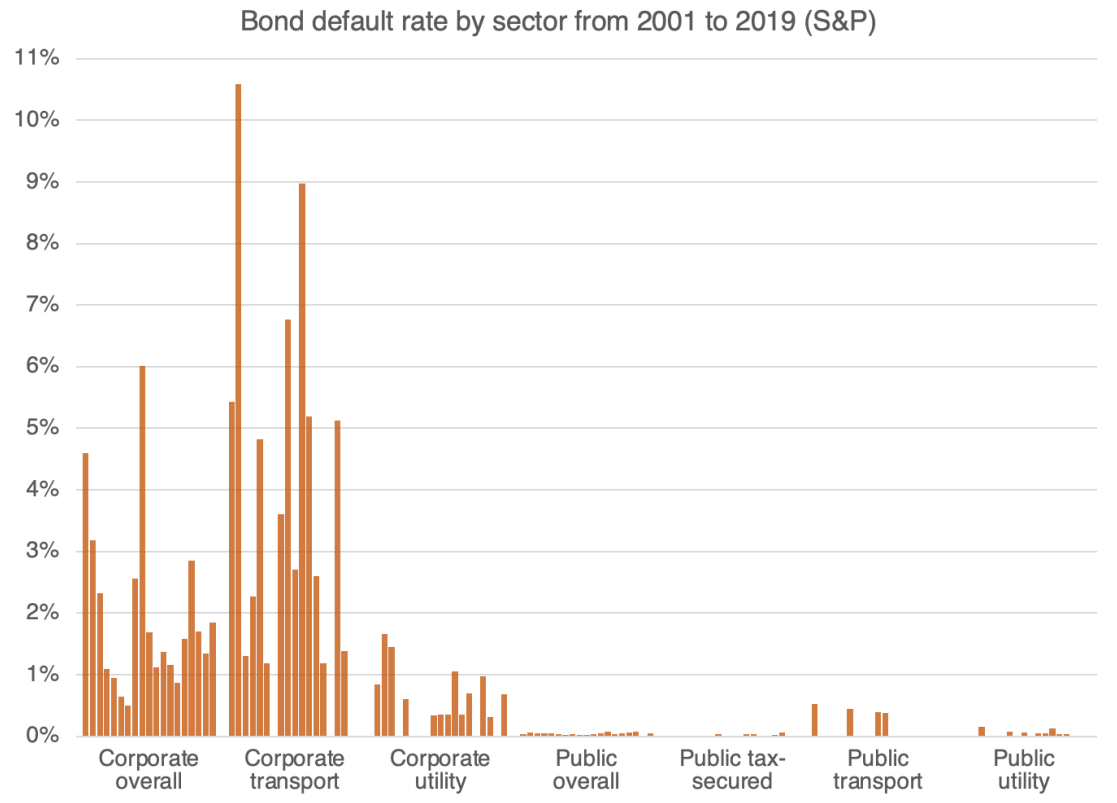

Figure 4.2. Bond default rates by sector from 2001 to 2019.
Source: S&P Global (2020a, 2020b). Includes investment and speculative grades.

Table 4.1. Types of federal financing support for infrastructure.

Type	Type of federal support	Applicability to the private sector	Potentially influential parties	Examples
Tax-exempt bonds issued by states and localities	Forgone tax revenues estimated at $0.26-0.36 per $1.00 of financing provided depending on the term, with most of the subsidy flowing to the issuer and some to the bondholder	Through qualified private activity bonds	For bonds backed by project revenues, credit-rating agencies, and bond-market advisers	Traditional tax-exempt governmental bonds; grant anticipation bonds for highways and mass transit; qualified private activity bonds
State revolving loan funds and infrastructure banks	For federal capitalization grants to banks, discretionary appropriations; for tax-exempt bonds issued by banks, forgone tax revenues; federal support estimated at $0.26-0.43 per $1.00 of financing	Unless precluded by state law or program requirements	Typically, none	State revolving funds for clean water and drinking water; state infrastructure banks for highways and mass transit
Direct federal credit programs providing loans or loan guarantees to state and localities	Discretionary appropriation for infrastructure projects; federal support estimated at $0.07-0.33 per $1.00 of financing*	Unless precluded by program requirements	In some cases, federal lenders, credit-rating agencies, or both	Transportation Infrastructure Finance and Innovation Act program; Water and Waste Disposal program; Railroad Rehabilitation and Improvement Financing program; Water Infrastructure Finance and Innovation Act program
Tax-credit bonds issued by states and localities (not currently implemented)	For traditional tax credit bonds, forgone tax revenues; for direct-pay bonds, mandatory spending; federal support estimated at $0.19-0.30 per $1.00 of financing	As specified in authorizing legislation	Same as for tax-exempt bonds	Build America Bonds (direct-pay)

Source: Adapted from Congressional Budget Office (2018a). *Costs associated with high-quality (low-risk) borrowers may be substantially less.

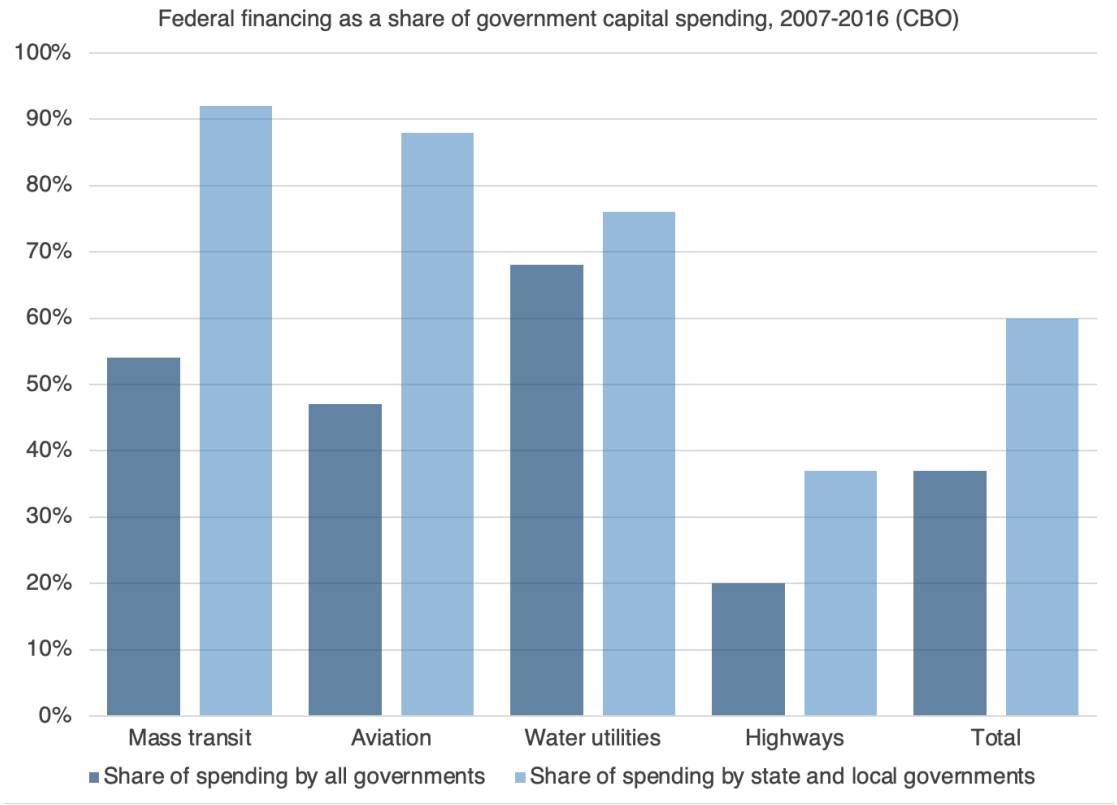

Figure 4.3. Federal financing for infrastructure by sector.
Source: Congressional Budget Office (2018a).

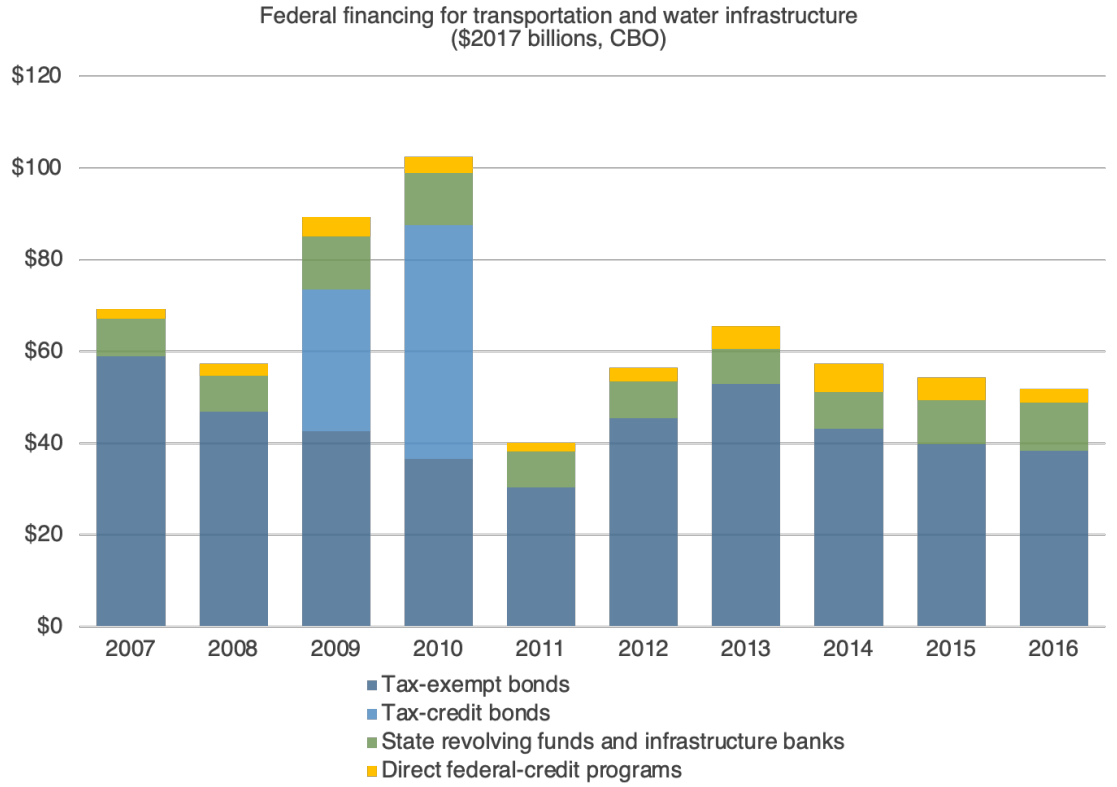

Figure 4.4. Federal financing for transportation and water infrastructure over time.
Source: Congressional Budget Office (2018a).

Cost of Capital

Across the economy, provider and project financing can almost always be found; the relevant issue is its total cost based on perceptions of risk. Alternative financing methods present different costs to infrastructure providers. As previously discussed, a government *grant* is a tax-supported funding instrument. A government *loan* typically offers a rate below those provided by markets. Customer advances and funded reserves may provide some no-cost financing. Figure 4.5 depicts the generalized hierarchy of the cost of capital for different methods of debt and equity.

Figure 4.6 compares the cost of capital for public and private financing instruments in the U.S markets compared to risk-free Treasury bond rates (used as the basis for interest rates offered in the major federal loan programs, discussed later) to show why financing choices matter. These data are not specific to the infrastructure sectors, for which risks and capital costs may be relatively lower. The cost of privately supplied equity ("privatized capital") implies an equity premium that diverges from Treasuries over time; market returns for U.S. stocks have hovered in the area of 8% for more than a decade (Damodaran, 2019). However, regulators continue to authorize returns on equity for regulated electric (and other) utilities in the 9-10% range (Edison Electric Institute), reflecting risk and return premiums; for illustration only, these are shown in Figure 4.6 with a 1.5% markup on U.S. corporate equity returns.

Private ownership of public infrastructure is rationalized by access to private-sector financial capital; private operation of public infrastructure is rationalized by access to technical and managerial expertise in service provision and the potential to realize economies of scale in operations and projects. The comparative advantages of alternative ownership models in economic and other terms are heavily analyzed and debated, not entirely conclusive, and beyond the scope of this analysis. However, the potential for returns is understood as a strong motivator for capital investment. Equity instruments to compensate owners (shareholders) require higher rates of compensation or a risk premium. Moreover, economic regulators typically authorize returns that exceed the cost of capital for policy purposes, including the aim to motivate beneficial investment (Beecher and Kihm, 2016). In other words, equity investors earn both a risk and a return premium, which must be funded. Both the investment and the cost of capital are covered by the rates charged for services, with differences apparent between for-profit and not-for-profit entities (APPA, 2019).

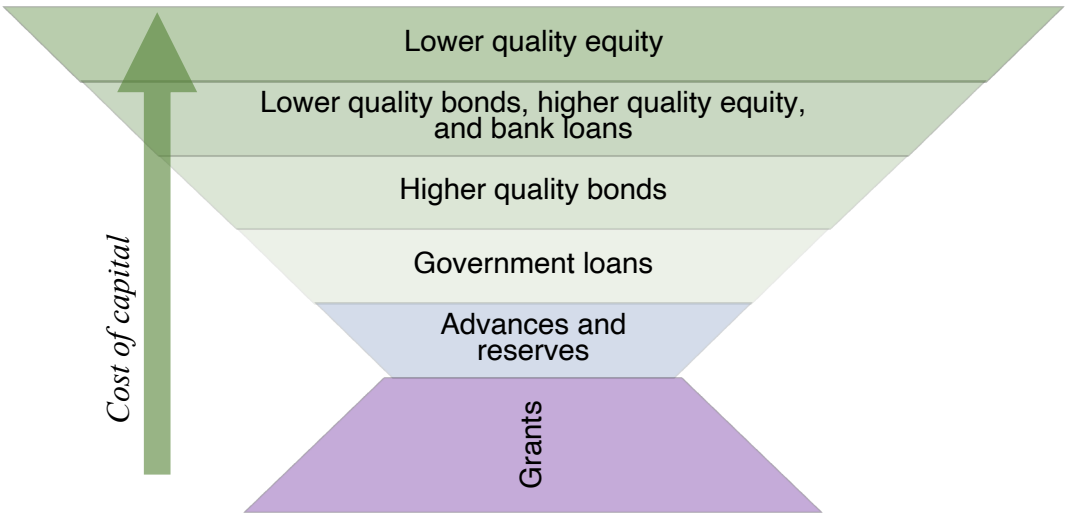

Figure 4.5. Generalized hierarchy of financing methods for public infrastructure reflecting the risk-based cost of capital.

A utility's capital structure combines investor-supplied debt and equity to support capital investment needs while balancing cost and risk. A snapshot can be found on an entity's balance sheet, where the value of capital assets is reported for the end of the calendar or fiscal year.

Privately owned utilities tend to have a capital structure in the range of 60/40 to 40/60 debt and equity to provide an optimal balance of cost and risk, which minimizes total costs and allows for flexible access to financing at a reasonable cost (Deloitte, 2012). Rate revenues cover the cost of interest, and some debt service may be interest-only. Although debt has considerable advantages in terms of capital costs and taxation (interest-payment deductibility), taking on too much debt exposes equity shareholders to greater financial risk (in the case of default), raising the total cost of capital. Credit rating agencies consider the capital structure when assessing credit quality. The capital structure of privately owned utilities is reviewed by state economic regulators, and approval may be needed for major issuances of equity or debt.

The "cost of capital" is measured by the rate of interest on debt (loans and bonds) and the rate of return on equity (stock). The overall cost of capital is weighted by the proportion of debt and equity in the enterprise's capital structure. An illustration for prospective financing by a utility is provided in Table 4.2. Markets "price" financial capital based primarily on the risk of insolvency and failure to compensate investors for the use of their resources (default). The rates associated with Treasury bonds for different maturities represent risk-free rates. The cost of debt depends on market conditions and the entity's credit rating at the time of issuance. Stock markets price-in current investor expectations about returns on equity.

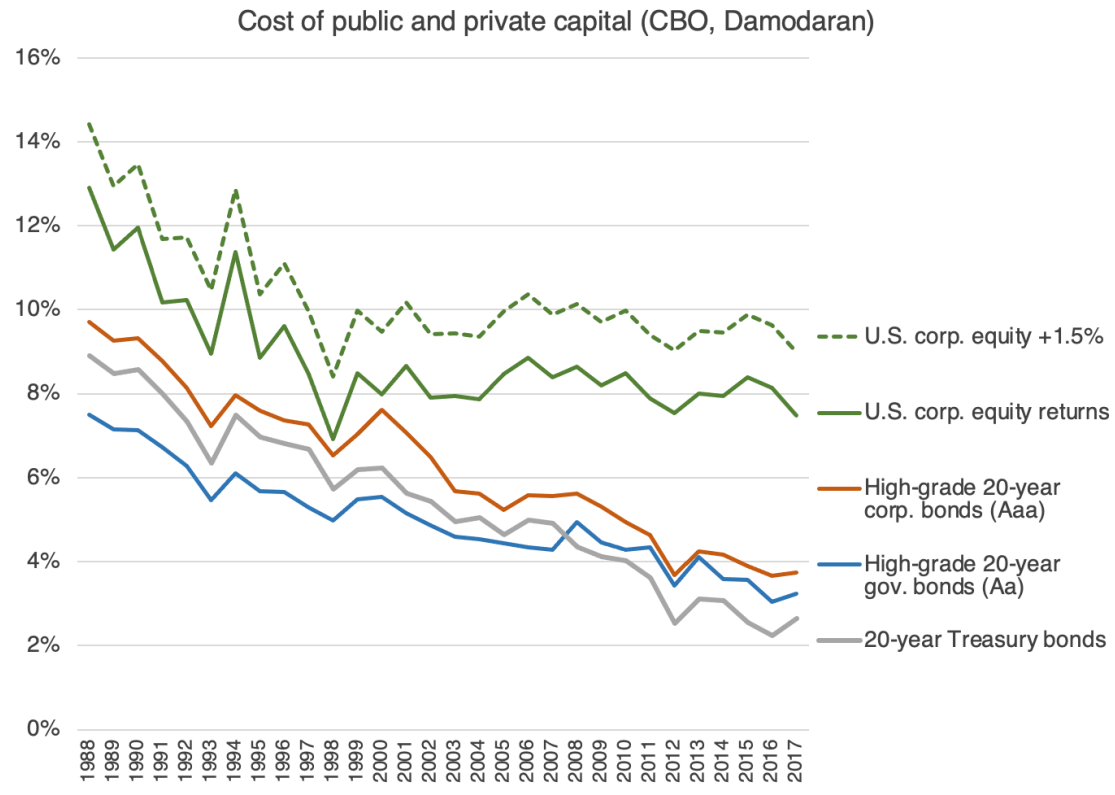

Figure 4.6. Cost of public and private capital over time.
Source: Congressional Budget Office (2018a) and A. Damodaran (stern.nyu.edu/~adamodar).

Table 4.2. Illustration of the weighted cost of capital for prospective utility investment.

Method	Instrument	Amount	Capital structure	Cost of capital*	Weighted cost of capital**
Public sector					
Debt	Government loan	$1,500,000	3.00%	1.50%	0.05%
	Bonds	$48,500,000	97.00%	2.50%	2.43%
	Total	$50,000,000	100.00%		2.47%
Private sector					
Debt	Government loan	$1,500,000	3.00%	1.50%	0.05%
	Bonds	$25,000,000	50.00%	3.50%	1.75%
Equity	Stocks	$23,500,000	47.00%	8.50%	4.00%
	Total	$50,000,000	100.00%		5.79%

*Interest rates on debt incurred and authorized returns to equity shareholders.

Nonprivate utilities rely mainly on debt for capital projects, the cost of which is affected by their funding capacity. As allowed by policy, reserves accumulated from ratepayer funding may provide a limited form of internal financing. Reserves have a stabilizing effect that mitigates short-term fiscal uncertainty related to revenues and spending. Statement 34 of the Government Accounting Standards Board (gasb.org) allows for the use of either asset management plans or depreciation expense to ensure that asset value is maintained.

Incorporating a depreciation expense in revenue requirements and rates (return of capital) can be used to build a prudent level of reserves that can be deployed subsequently to offset some of the need for capital financing. Depreciation practices are limited by public and regulatory policies and concerns about disproportionate funding burdens on customers, namely opportunity costs and intergenerational inequity. In other words, benefits and burdens should be reasonably balanced so that one generation of customers does not unfairly subsidize another.

The cost of spending available cash is the opportunity cost of alternative uses, including investment in an interest-bearing account. In effect, many local communities maintain an equity interest in their utilities through direct or indirect ownership of balance sheet assets and support for related liabilities. Under a formal "government shareholder" model, which is uncommon in the United States, they receive returns (dividends) on those investments. Privatization involves permanent divestitures of publicly owned assets.

Revolving Loan Funds

Governmental support for infrastructure increasingly takes the form of financing rather than funding. State revolving loan funds (SRFs) have become a prominent financing vehicle, administered by the U.S. Department of Transportation and the U.S. Environmental Protection Agency for the transportation and water sectors, respectively. Government loan programs for financing embed a funding component, as federal capitalization grants enable indirect support (or subsidies) in the form of lower-cost financing and, in some cases, direct support in the form of principal forgiveness (Figure 4.7). Federal support increases with the length of loan terms (CBO, 2018a). The Clean Water SRF was established by the 1987 amendments to the Clean Water Act (CWA), and the Drinking Water SRF was established by the 1996 amendments to the Safe Drinking Water Act (SDWA). Their key aspects are summarized in Table 4.3.

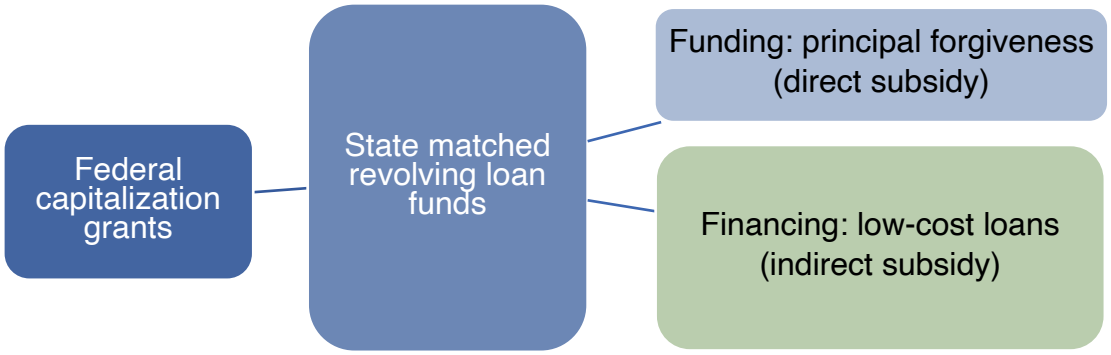

Figure 4.7. Role of revolving loan fund programs in funding and financing.

Table 4.3. Federal Drinking Water and Clean Water Revolving Loan Fund Programs.

Program	Clean Water State Revolving Fund (CWSRF)	Drinking Water State Revolving Fund (DWSRF)
Statutory basis	Established by the 1987 amendments to the Clean Water Act (CWA)	Established by the 1996 amendments to the Safe Drinking Water Act (SDWA)
Purpose	▪ To construct municipal wastewater facilities ▪ To control nonpoint sources of pollution ▪ To build decentralized wastewater treatment systems ▪ To create green infrastructure projects ▪ To protect estuaries ▪ To fund other water quality projects	▪ To improve drinking water treatment ▪ To fix leaky or old pipes (water distribution) ▪ To improve the source of water supply ▪ To replace or construct finished water storage tanks ▪ To support other infrastructure projects needed to protect public health
Types of assistance	▪ Loans ▪ Purchase of debt or refinance ▪ Guarantees and Insurance to improve credit market access ▪ Guarantee SRF revenue debt ▪ Loan guarantees ▪ Additional subsidization may be provided as grants, principal forgiveness, and negative interest rate loans	▪ Loans ▪ Refinancing ▪ Purchasing ▪ Guaranteeing local debt ▪ Purchasing bond insurance ▪ Additional subsidization may be provided as grants, principal forgiveness, and negative interest rate loans
Eligible projects	▪ Publicly owned treatment works ▪ Watershed projects ▪ Nonpoint source projects ▪ Energy and water conservation ▪ National estuary program projects ▪ Water reuse ▪ Decentralized wastewater treatment systems ▪ Security measures at publicly owned treatment works ▪ Stormwater ▪ Technical assistance	▪ Water treatment projects ▪ Transmission and distribution ▪ Source water ▪ Water storage ▪ System consolidation ▪ Creation of new systems

Source: U.S. Environmental Protection Agency (www.epa.gov/cwsrf and www.epa.gov/dwsrf).

All fifty states and Puerto Rico receive the water-related SRF capitalization grants, which require a 20% state match. The federal appropriations have been leveraged at the state level by 3:1 for the CWSRF and by 2:1 for the DWSRF (Figure 4.8). Both programs specify loan terms as the lesser of 30 years the useful (design) life of projects, with exceptions for disadvantaged communities under the DWSRF. Loan rates (recently about 1.5%) are less than half of the market rate. Repayments of loan amounts (beginning 12 to 18 months following project completion) allow funds to replenish or "revolve," becoming available for other eligible projects.

In 2014, Congress expanded USEPA's role in financing with the Water Infrastructure Finance and Innovation Act (WIFIA), echoing the Transportation Infrastructure Finance and Innovation Act (TIFIA) of 1998 (CRS, 2020). WIFIA added an innovative increment to federal appropriations (Figure 4.9) and has the potential to become a more significant funding vehicle. Eligible WIFIA borrowers are local, state, tribal, and federal government entities, partnerships, joint ventures, corporations, and trusts, as well as the CWSRF and DWSRF programs, with consideration of a project's creditworthiness and dedicated revenue source, and weighted selection criteria. Under WIFIA, USEPA can provide loan guarantees or fund up to 49 percent of an eligible project's cost; total federal funding may not exceed 80 percent of eligible costs.

The minimum WIFIA project size is $20 million for larger communities and $5 million for smaller communities (with populations of less than 25,000), with loan terms of 35 years and a maximum five-year deferral of repayment following project completion. Application fees apply, and loan interest rates are fixed at U.S. Treasury rates for similar maturities at the time of closing. WIFIA loans offer terms and interest rates that cannot be readily accessed in the private debt markets and can thus be an attractive source of capital even for highly rated entities that typically issue tax-exempt bonds. As the WIFIA program allows for loan subordination, customized amortization ("sculpting"), and flexible repayment (to match anticipated revenues with expenditures), combining a WIFIA loan with a tax-exempt issue for a long-lived asset may result in a lower financing cost than otherwise possible (Ryan, 2020). For some systems, debt restructuring may be in order to capture these synergies.

A significant financing resource for rural communities, including cooperatives, is also offered through the Rural Utilities Service (RUS) of the U.S. Department of Agriculture (Alger, 2017). RUS supports the Water and Environmental, Electric, and Telecommunications Programs. For example, the RUS Revolving Fund program provides grants of up to $100,000 to state and local governments, nonprofit organizations in communities with populations less than 10,000, and those located on Tribal lands and Colonias. Eligible projects include the predevelopment costs of water and wastewater treatment projects and short-term small capital improvement projects. In 2018, the agency invested in projects that brought broadband service to 45,00 rural homes and businesses, benefited seven million rural electricity customers, and provided new or improved water and wastewater services to nearly three million rural Americans (rd.usda.gov/resources).

A persistent concern about the low-cost government loan programs is that fiscal resources from financing may be "left on the table" because communities may lack the information and capacity to pursue them. A potential policy priority is to consolidate application and review processes ("one-stop shopping") and provide practical assistance as necessary to communities in need. A holistic and strategic approach can also help leverage infrastructure funding and financing opportunities into broad and lasting benefits to communities and citizens.

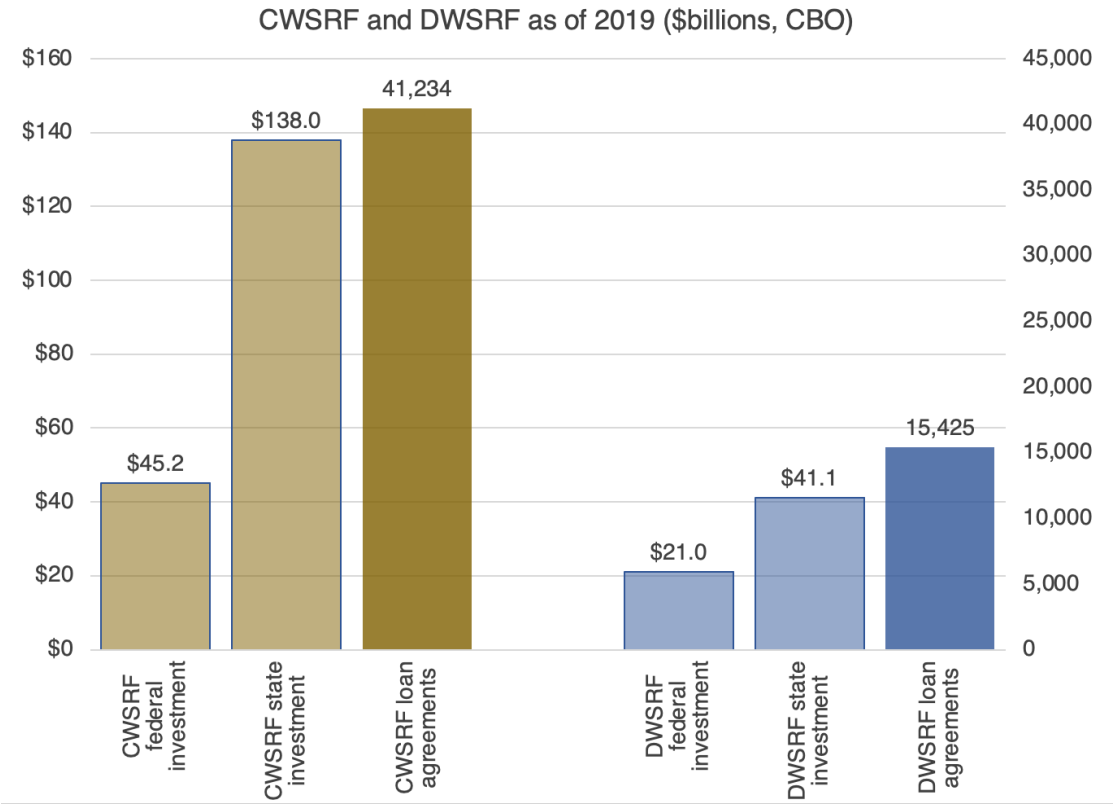

Figure 4.8. Clean Water and Safe Drinking Water State Revolving Funds as of 2019.
Source: U.S. Environmental Protection Agency (www.epa.gov/cwsrf and www.epa.gov/dwsrf).

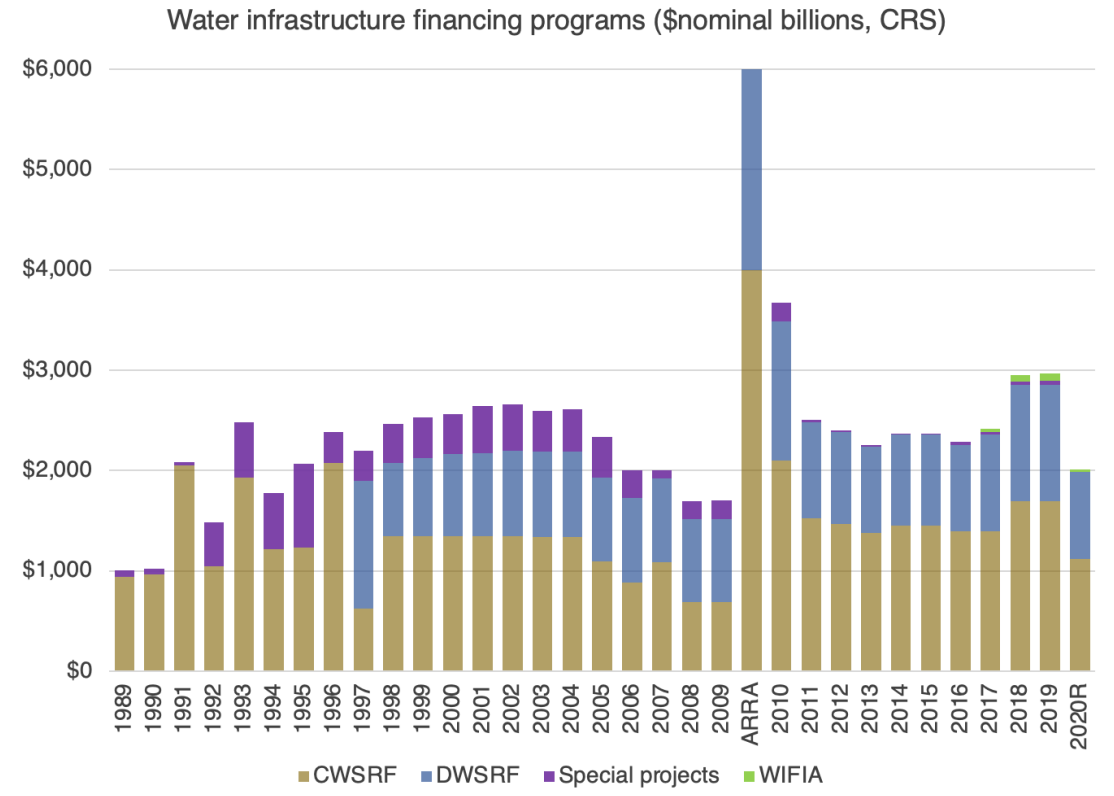

Figure 4.9. Federal appropriations for financing water sector projects over time.
ARRA indicates supplemental appropriation under the American Recovery and Reinvestment Act; 2020R is requested.
Source: U.S. Congressional Research Service (2019b).

Financial capital is available for infrastructure investment, but new approaches may be needed. Some states now offer a variety of debt instruments for infrastructure, including "green," environmental, or social impact bonds, to provide funding through grants or leverage other forms of financing. Green bonds support environmental and climate-action objectives and projects, consistent with environmental, social, and governance (ESG) investment screening. In 2019, green bond issuances globally exceeded $250 billion for investments in energy (31.5%), buildings (29.3%), transportation (20.2%), water (9.3%), and more; about 20% of the issuances were in the United States (Climate Bonds Initiative, 2020). In 2020, amidst the pandemic, the "global sustainable debt market" was propelled to $732 billion by sales of green, social, and sustainability (or sustainability-linked) bonds, and green and sustainability-linked loans (Mutua, 2021).

Innovative financing opportunities may also be on the horizon in the form of expanded federal and state infrastructure banks and lower cost and longer-term financing vehicles (such as 55-year debt instruments, as recently proposed by Congress for the WIFIA program). The federal government could also offer inflation-indexed bonds earmarked for infrastructure and sold on a non-tradeable basis to individual or institutional investors; adding an interest premium as a bonus for long-term holding would make them attractive for inclusion in portfolios and encourage retirement savings (Miller, 2020a). Private capital and partnerships are regularly conjectured in the practice literature as an alternative means of infrastructure financing and often tied to user-based funding. These solutions relieve government funding but raise total costs that must find funding elsewhere.

Provider Incentives

As noted, asset ownership is a defining and delineating feature of public infrastructure (Table 4.4). Transportation assets are mainly found in the public domain. In the utility and communications sectors, both the public and private ownership models are found. The public sector dominates the water sector, and the private sector dominates the energy and communications sectors in ownership and operation.

Expanding the private role in its various forms rest on a theory that the private sector offers potential for risk transfer and efficiency gains due to economic incentives for performance, namely profit motives; if realized, these gains come at the price of higher financing and transaction costs (CBO, 2020a). Overall, the experience with public-private partnerships (PPPs) has been mixed and includes project cancellations, loss of public control, and adverse financial impacts on the partners (CBO, 2020a). Moreover, despite "market-orientation," privatization in any form should not be equated with competition and market discipline. Regardless of how the private sector is involved in infrastructure, monopoly power is persistent. Thus, policies and capacities for effective contract management or regulatory oversight are critical for imposing standards, accountability, and incentives to manage moral hazards and guard against abuses.

Even when assets are publicly owned, however, the private sector is invariably involved to some degree in delivering infrastructure services based on functional specialization (Table 4.5). Nonetheless, the private "partner" is a subordinate agent to the government "partner" who remains the principal. Along a continuum of potential roles, public-sector participation can also take the form of more formalized hybrid arrangements for infrastructure service delivery by which the private for-profit partner brings technical expertise, managerial capacities, and, in some cases, financial resources to bear on project construction or system operations. Examples include contract operations, long-term leases, and concession agreements. Despite global attention, the role of formal participation agreements in the United States remains relatively limited, and with limited private financing (Figure 4.10).

In the water sector, operation and maintenance agreements are far more common than design and build agreements (Figure 4.11) but still account for only a small share of sector expenditures. One reason may be an apparent preference of the private sector for the ownership over the operations models. For investor-owned utilities, asset ownership is also the basis for investor returns under the economic regulatory model. For highway projects, arrangements involving toll revenues (that is, user fees compared to government payments) are associated with marginally higher levels of private financing over time (Figure 4.12), consistent with an enterprise orientation, although other financing modes still prevail.

Table 4.4. Ownership of assets and private-sector participation in infrastructure system operations.

		Operation of the infrastructure system	
		Public	Private
Ownership of infrastructure assets	Public	Publicly owned utility with public capital and local governance	Contract services or operations with local governance
	Private	Design, finance, and build of infrastructure facilities	Investor-owned utility with private capital and economic regulation

Table 4.5. Primary infrastructure functionalities with potential private participation.

Function	Activities
Design	Complete plans for the project, which includes producing architectural drawings and selecting construction materials.
Build	Construct the facility, which includes reviewing the condition of the site, providing construction crew, materials, and equipment, and amending the design as needed to address problems discovered during the construction phase.
Finance	Provide capital for the project, which may include issuing debt or equity and verifying the feasibility of plans for repaying debt or providing a return on equity.
Operate	Ensure the performance and availability of the facility, which includes, for example, removing snow from roadways and debris from storm drains and collecting fees from users.
Maintain	Keep the project in a state of good repair, which includes filling potholes, repairing pipes, or fixing tracks.

Source: Congressional Budget Office (2020a).

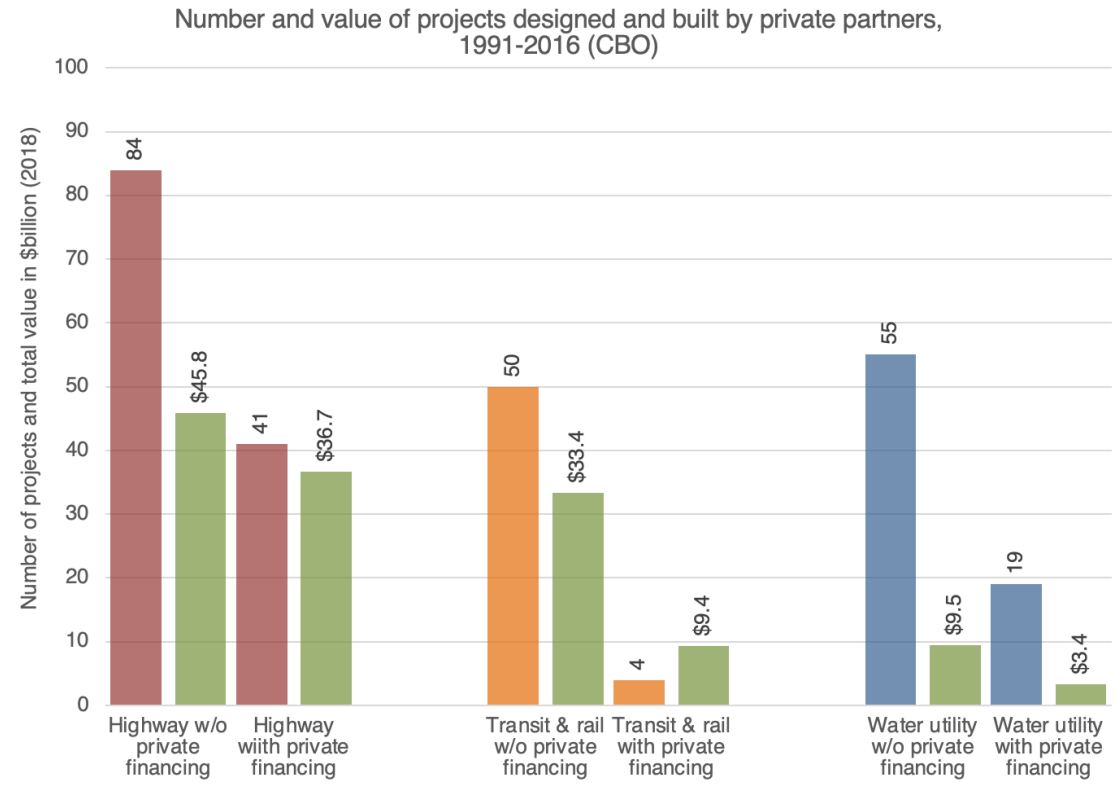

Figure 4.10. Number and value of projects built and design by private partners (1991-2016).
Source: Congressional Budget Office (2020a).

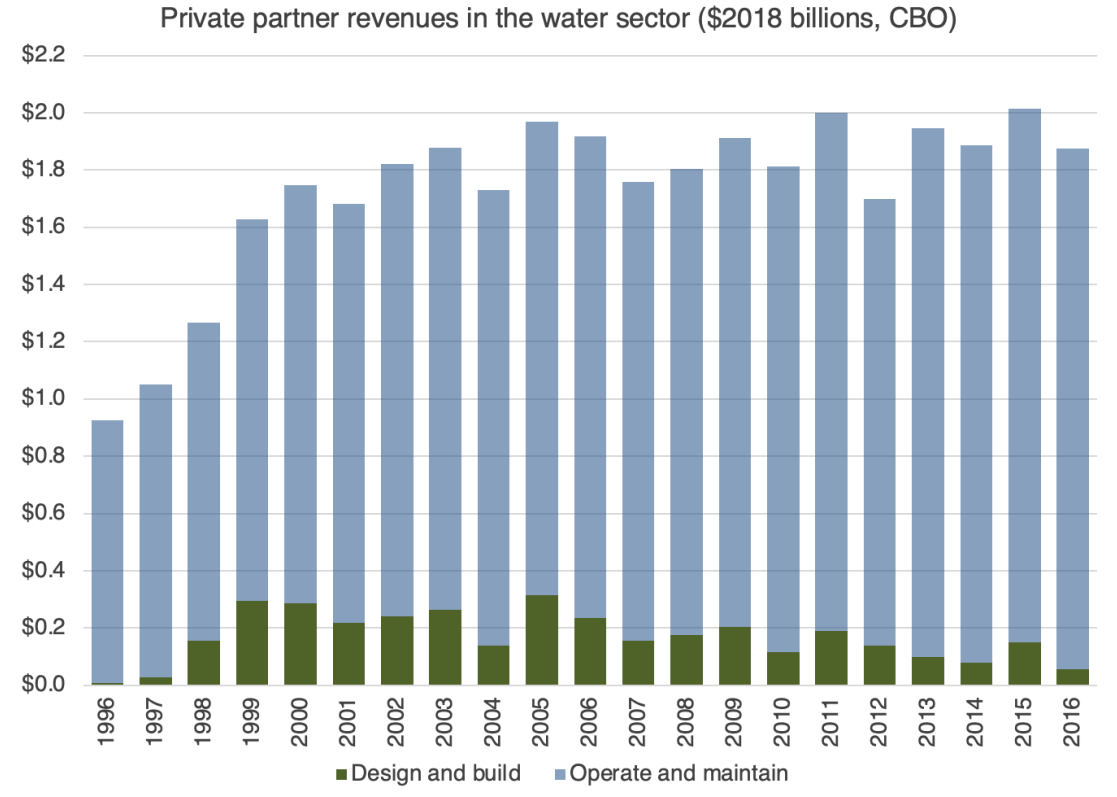

Figure 4.11. Private partner revenues in the water sector over time.
Source: Congressional Budget Office (2020a).

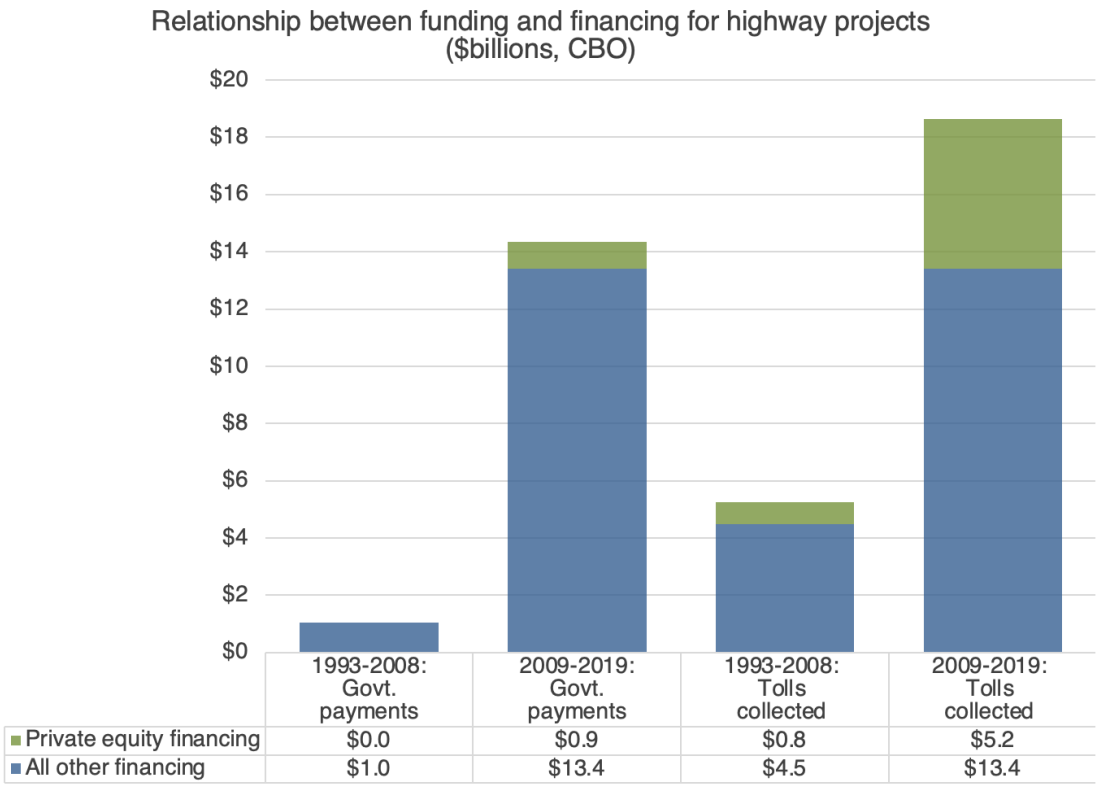

Figure 4.12. Relationship between funding and financing for highway projects (1993-2019).
Source: Congressional Budget Office (2020a).

5. CLOSING INFRASTRUCTURE INVESTMENT GAPS

Infrastructure enjoys favorable public opinion and bipartisan appeal (Newport, 2019). A clear majority of voters supports rebuilding America's infrastructure as a federal policy priority (Figure 5.1), comparable to the priority given to strengthening the economy. Voters also express support for expanding federal investment to rebuild the nation's water infrastructure (84%) and make it more resilient to climate change (73%), even at a high price tag paid over decades by governments at various levels.

The intractable challenge lies in the garnering of fiscal resources. When it comes to infrastructure, "Everybody wants to rebuild it. Nobody wants to pay for it" (Miller, 2020a). Public infrastructure may be everywhere, but much of it is also invisible to the public eye (Figure 5.2), buried underground or out of sight and thus out of mind (Deloitte, 2016). As a consequence, too much public infrastructure is underappreciated and suffering from "neglect" (McNichol, 2019). Infrastructure failures cause more than inconvenience. Deteriorating roads and bridges, collapsing dams, contaminated drinking water, sewerage overflows, and the like can exact devastating damages on communities and citizens. Less resilient systems also jeopardize national security (Ruokonen, 2021).

Accountability for infrastructure and its development globally, and thus blame for failure, falls squarely on governments (World Bank, 2017). Recent years have seen more deliberate attention on apparent gaps between infrastructure investment and needs, and how to ensure sustainability while expanding access and improving service quality. The construct of a funding gap is the difference between what is spent and what should be spent on infrastructure to sustain desired service levels. Gaps are observed for spending on capital projects and also operation and maintenance (U.S. Water Alliance, 2020). The gap construct tends to focus on funding to the exclusion of cost reduction and ratepayer funding to the exclusion of taxpayer funding. The imperative for infrastructure providers and policymakers is to explore alternative delivery structures and practices to close the gaps from both the top (lowering costs) and the bottom (raising funds).\

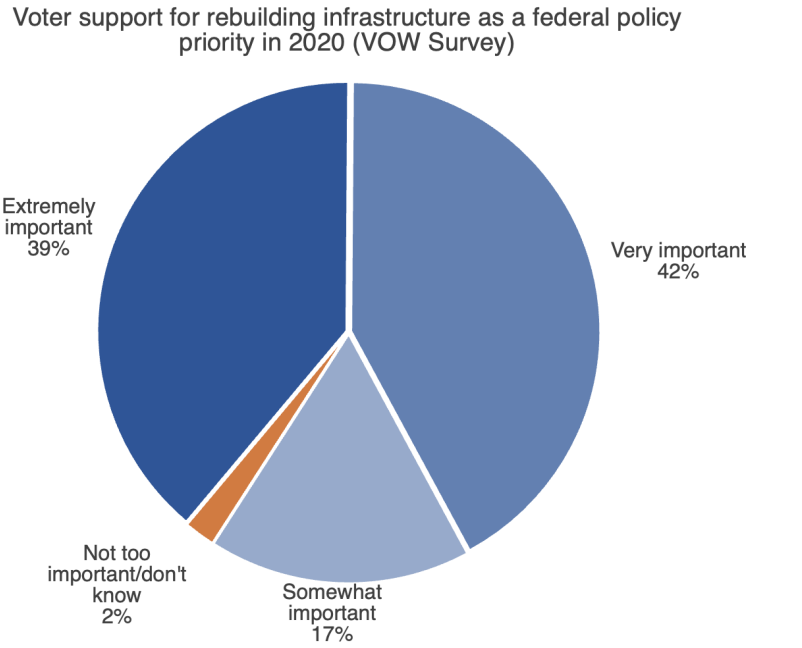

Figure 5.1. Voter support for rebuilding infrastructure as a federal policy priority in 2020.
Source: "Value of Water" Survey, Metz and Weigel (2020),

Investment incentives and behavior can diverge between the public and private sectors. Privatization is sometimes advanced to close infrastructure investment gaps by filling them with shareholder capital (at its cost). Underinvestment is generally not an issue for investor-owned utilities because they earn returns on equity. Indeed, they may be prone to overinvestment, which is why independent and effective economic regulation is needed to ensure that planning is sufficient, and spending is "used and useful" and prudent.

Infrastructure Conditions

The nation's infrastructure is frequently described as "crumbling" (Deloitte, 2017; DeGood et al., 2019). The challenges are widespread but uneven, reflecting a "checkered history" marked by segregation and discrimination in service access and quality (Institute for Public Integrity, 2020), or what might be termed "(infra)structural inequity." Infrastructure stress from lack of adequate maintenance and investment translates to economic, social, and personal stress.

The leading voice promoting infrastructure investment in the United States is the American Society of Civil Engineers (ASCE), whose reports are frequently cited as the rationale for increasing infrastructure funding and spending. Industry groups, such as the American Road and Transportation Builders Association (ARTBA) and the American Water Works Association (AWWA), also weigh in heavily on this issue. ASCE's most recent "report card" (2017b) findings are reported in Table 5.1

In the most recent report, both the United States and Michigan receive a grade of D+, including D- for stormwater, D for drinking water, C- for energy, and C for wastewater. A "D" grade from ASCE indicates infrastructure at risk of failure and characterized by poor, fair, substandard, or deteriorating conditions and escalating operation and maintenance costs as various components approach the end of their original, useful service lives (Table 5.2). Across all types of infrastructure, failing grades suggest potentially dangerous conditions.

Estimating the Gaps

While not all infrastructure is visibly crumbling, and some progress is apparent (ASCE, 2020a), it is undeniably aging. Although different drivers apply, each of today's infrastructure sectors finds itself in need of repair and replacement (AWWA, 2016; Kane and Tomer, 2019). The predominant concern in the infrastructure space is that the pace of replacement (and thus spending and funding) is unrealistically slow given impending expiration and potentially unsafe operation, resulting in gaps of growing proportions. Reasons for the investment gap vary, but both political and economic forces likely play a role.

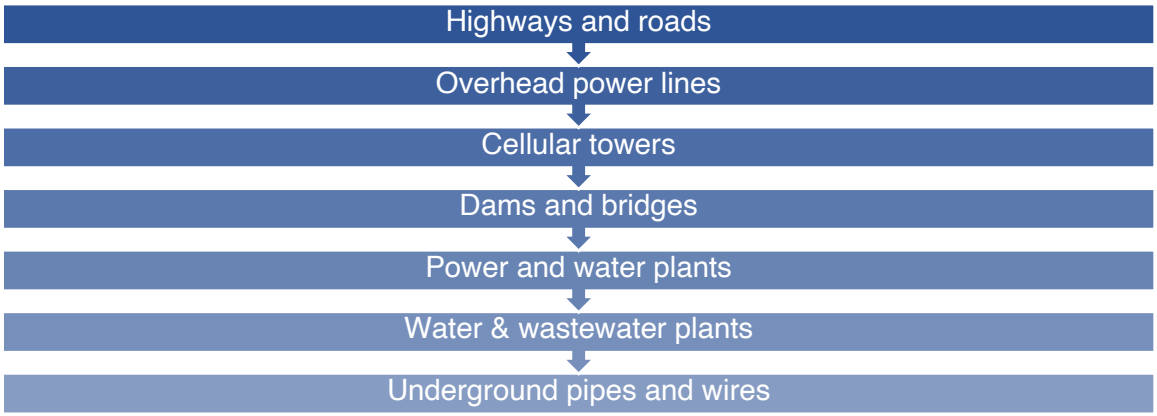

Figure 5.2. Public infrastructure (in)visibility.

Table 5.1. Infrastructure report card for the U.S. (2017) and Michigan (2018).

United States	Infrastructure	Michigan
D	Aviation	C
C+	Bridges	C-
D	Dams	C-
D	Drinking water	D
D+	Energy	C-
B	Rail	C-
D	Roads	D-
C+	Solid waste	C+
D-	Transit	C-
D+	Wastewater	C

Source: American Society of Civil Engineers (2017b).

Table 5.2. Approximate useful lives of infrastructure.

Transportation	Paved roads	10–20 years
	Rail tracks	50 years
	Bridges	50–100 years
Energy	Transmission lines	50 years
	High-voltage transformers	40 years
	Generating plants	35–80 years
	Substations	35-45 years
Water	Reservoirs and dams	50–80 years
	Treatment plants and pumping stations	60–70 years
	Drinking water distribution and storm and sewage collection systems	60–100 years

Source: Gibson (2017).

While need estimates vary, a clear consensus has formed around the persistent underinvestment in infrastructure and its deleterious effects, and the urgency of response (Institute for Policy Integrity, 2020). The global infrastructure funding gap for the "Group of 20" (G20) countries has been estimated at $15 trillion based on current spending of $79 trillion and a need of $94 trillion for the 2015-2040 period; the United States has the widest forecast funding gap, estimated at $3.8 trillion (32% of a $12 trillion need) (outlook.gihub.org). The need includes funding for transportation, energy, water, and meeting sustainable development goals (SDG). Relative to GDP, the United States today spends less on infrastructure than many other developed countries or compared to past levels (Stupak, 2018).

Table 5.3 provides an overview of the gaps by sector. Federal funding for transportation has tracked the GDP, but other sectors have not fared as well (Figure 5.3). Investment in infrastructure by the federal, state, and local governments declined from about 4.2% of the GDP in the late 1930s to about 1.5% in 2016; about 1.4% of this was attributed to state and local spending (McNichol, 2016; Stupak, 2018).

A modest investment surge nationally followed the American Recovery and Reinvestment Act (ARRA) in 2009, followed by a steady decline (Figure 5.4). Michigan compares poorly in terms of infrastructure as a percentage of state funding nationally (McNichol, 2019) and in the Great Lakes Region. Data from the U.S. Census Survey of State and Local Finances (census.gov) indicate that in 2018, local governments in Michigan spent $3.6 billion on water supply, electric power, gas supply, and transit infrastructure, including $677 million in capital outlays, $3.0 billion on highways ($649 million in capital outlays), $574 million on airports, $48 on parking facilities, and $3 million on port facilities.

Table 5.3. Cumulative infrastructure needs by sector through 2025 ($billions in 2010)

Infrastructure systems	Total needs	Estimated funding	Funding gap
Roads, bridges, and transit	$2,042	$941	$1,101
Electricity	$934	$757	$177
Dams, levees, waterways, and ports	$162	$38	$124
Water and wastewater	$150	$45	$105
Airports	$157	$115	$42
Rail	$154	$125	$29
Hazardous and solid waste	$7	$4	$3

Source: American Society of Civil Engineers Report Card, as reported in McNichol (2019).

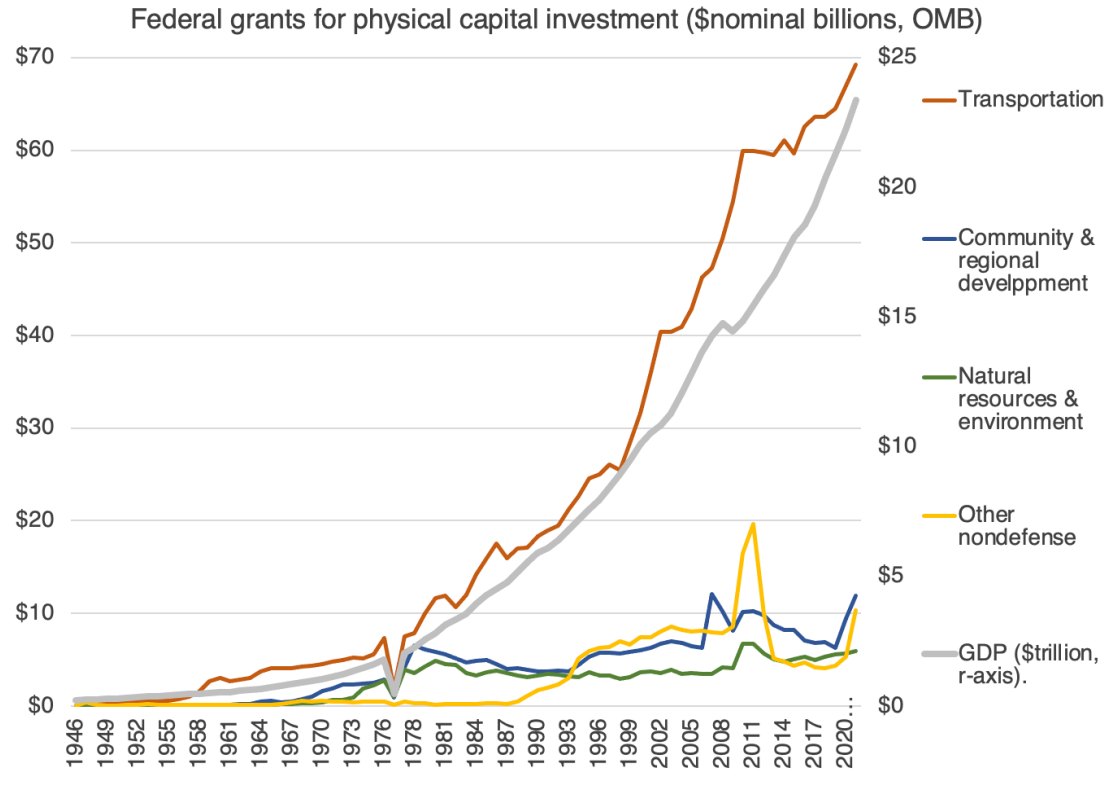

Figure 5.3. Federal grant outlays for public physical capital investment.
Source: Office of Management and Budget (whitehouse.gov/omb/historical-tables).

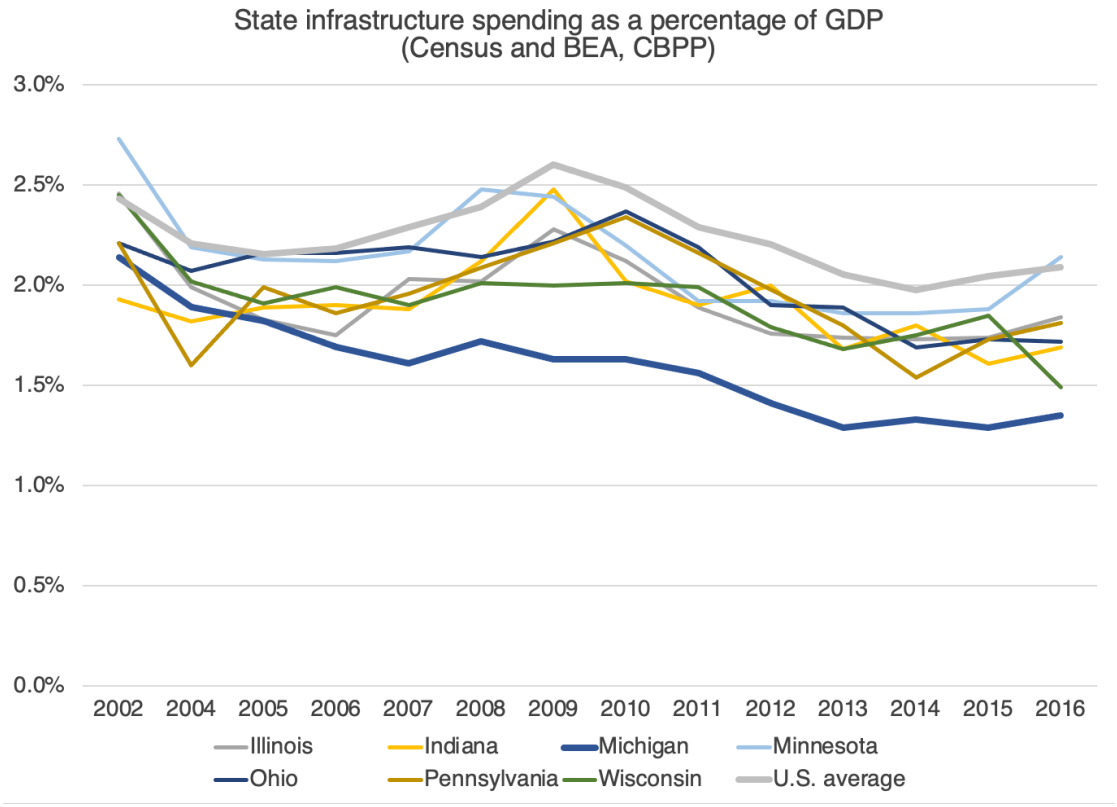

Figure 5.4. State infrastructure spending as a percentage of GDP.
Source: U.S. Census and Bureau of Economic Analysis, as reported in McNichol (2019).

ASCE report-card estimates of cumulative infrastructure funding gaps by sector through 2025 are provided in Figure 5.5. In a recent forecast for the 2020 to 2039 period, ASCE (2020b) estimates an investment gap in the surface transportation sector at $2.1 trillion, with a current spending backlog of $176 billion expected to grow to $500 billion. Despite some modest progress, ARTBA (2020) recently estimated that 37% of all bridges are in need of repair or replacement (including 7.5% deemed "structurally deficient") at a cost of $164 billion. For the electricity sector, ASCE (2020b) estimates an investment gap of $208 billion by 2029 and $338 by 2039 across the core functions of generation (60%), transmission (10%), and distribution (29%), driven by the transition to clean energy.

The water sector suffers from underfunding globally relative to the transportation and energy sectors (World Bank, 2017). In the United States, the needs are critical, and the solutions are not easy (Deloitte, 2016). "Chronic" underinvestment reflects a languid governmental response to needs (U.S. Water Alliance, 2020). In 2002, based on needs surveys and considering a range of possibilities, U.S. Environmental Protection Agency estimated 20-year capital needs at $274 billion for drinking water and $388 billion for wastewater; operation and maintenance needs for the period were estimated at $161 and $148 billion, respectively (USEPA, 2002). It appears that little progress has been made. ASCE (2020b) recently estimated that 2019 spending of $47 billion falls short of the $129 billion need, for an annual gap of $81 billion and a cumulative gap of $2.2 trillion by 2039. For drinking water systems, AWWA (2012) had previously estimated the 25-year need for at $1 trillion, rising to $1.7 trillion through 2050, with 54% attributed to replacement and $46% for growth and migration (Figure 5.6). The imperative to replace lead service lines has added to the need (Deloitte, 2016). Fortunately, despite aging conditions and substantial needs, the U.S. drinking water supply remains relatively safe (Rose, 2019).

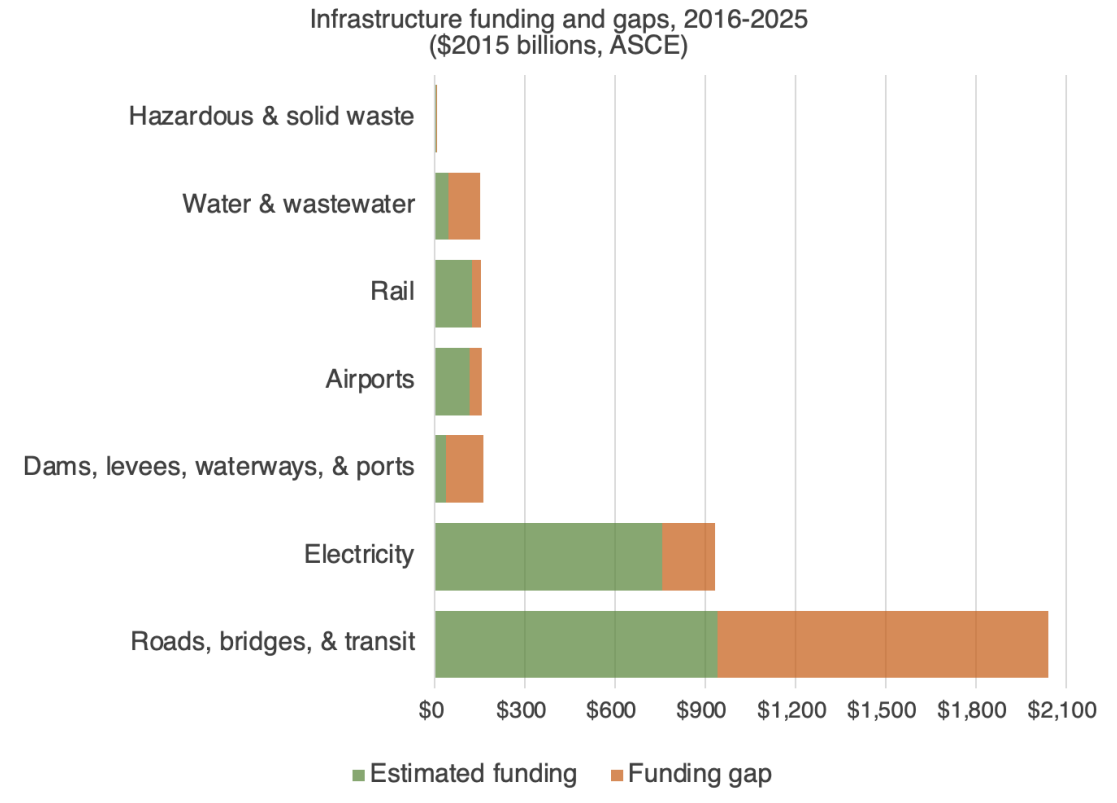

Figure 5.5. Cumulative infrastructure funding and gaps based on needs estimates (2016 to 2025).
Source: American Society of Civil Engineers (2017).

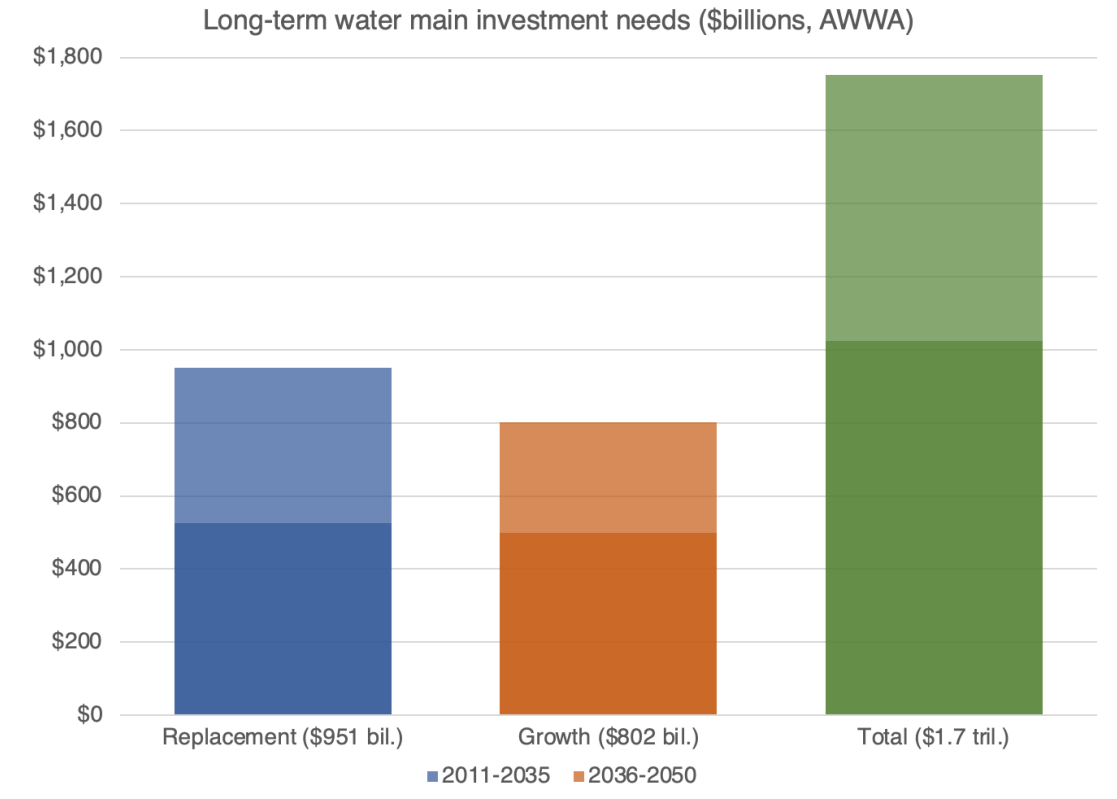

Figure 5.6. Long-term investment needs for water distribution mains.
Source: American Water Works Association (2012).

Although immense needs and gaps are widely stipulated, some caveats are in order. The first is that the estimates are broad and inexact, forecast for long periods, and potentially prone to inflation. Perceptions about desirable service levels, and metrics for their measurement, are also influenced by the interests of stakeholders, including those who directly benefit from investment.

Second, some estimates may be unrealistic in terms of ongoing planning assumptions about growth and the need for excess capacity to ensure its accommodation, especially given increasing efficiency in energy and water end uses and technological opportunities for managing demand and supply. Socioeconomic conditions and consumer preferences have changed since the build-out of the existing infrastructure. Some urban systems designed for growth may have to contend with a shrinking base. Oversized infrastructure has implications for system integrity as much as undersized infrastructure. Moreover, counting on future growth is not a sound basis for asset planning; more thoughtful and flexible approaches are needed along with a reorientation toward sustainability.

Third, it is unclear whether the assessments assume rebuilding (if not expanding) infrastructure "in-kind" (foot-by-foot, diameter-by-diameter, and volume-by-volume) rather than the holistic re-optimization of infrastructure networks that recognizes dynamics in supply, demand, and consumer preferences as well as opportunities for technology-enabled monitoring and management. Following their long incremental development, many systems are likely suboptimal in the first place. Not all infrastructure can or should be replaced instantly. It can be replaced as part of a long-term strategic capital plan, subject to appropriate review, to reoptimize systems and achieve more efficient infrastructure design and delivery, including co-beneficial "green" and decentralized solutions across the sectors.

As the infrastructure has aged, patterns of usage have changed. Usage of energy and water is far more efficient, driven by technical standards along with economic forces (markets and prices). Hard-fought efficiency gains are only realized in terms of avoided capital and operating costs by incorporating these effects in infrastructure design going forward. Communities that postponed spending need to start making critical investments, but modernization calls for revisiting assumptions and rethinking how to maintain and enhance service levels and access. In sum, infrastructure is at an inflection, and prudence calls for not building tomorrow's infrastructure to meet yesterday's demand (Beecher, 2019).

As highlighted by Michigan's 21st Century Infrastructure Commission (2016), following decades of deferral, too much of the state's infrastructure is in disrepair or in need of additional investment, particularly in the transportation sector (including roads and bridges) and water sector (including wastewater and stormwater management), but also in the energy sector (including natural gas pipelines and power generation). Looming challenges include the extension of advanced broadband services and ensuring the reliability of energy services. The commission forecast 20-year investment needs at $40 billion in the transportation sector, $19 billion in the water sector, and $600 million in the communications sector to expand broadband access (Figure 5.7). Noticeably, no gaps were identified for the energy sector, which is dominated by private utilities that rely on ratepayer funding.

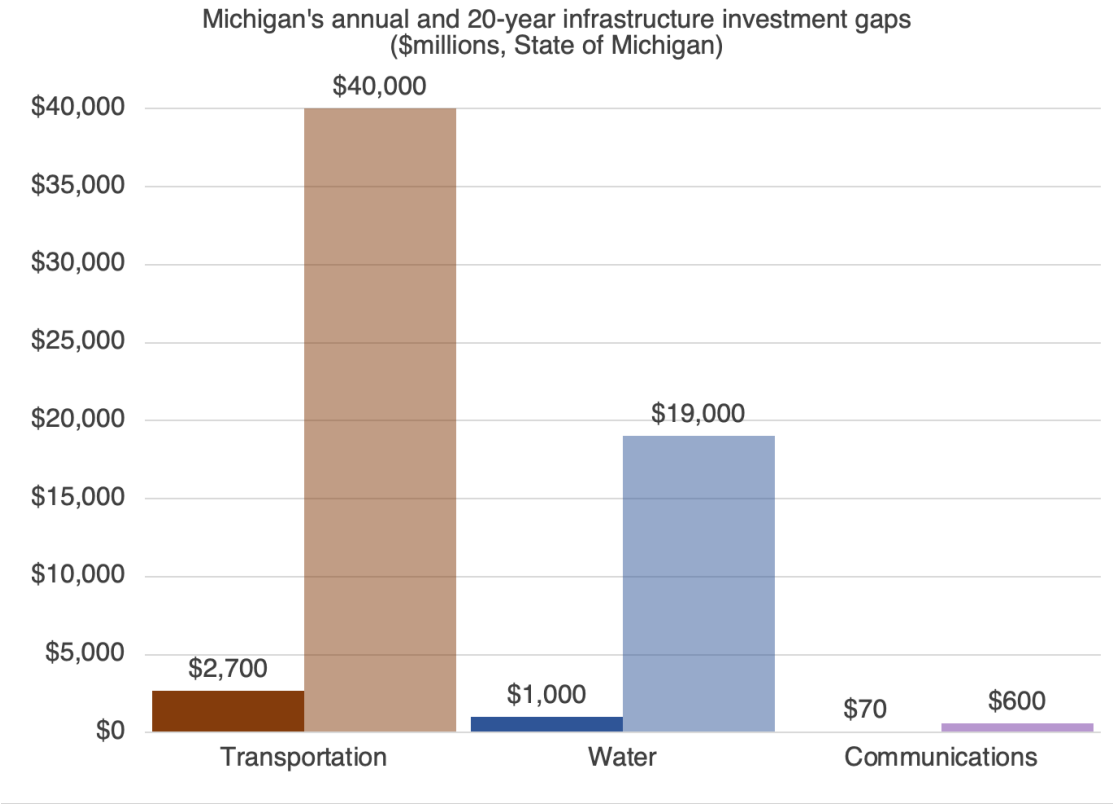

Figure 5.7. Michigan's annual and 20-year infrastructure investment gaps.
Source: Michigan 21st Century Infrastructure Commission (2016).

Return on Infrastructure Investment

The gap left by deferring or avoiding infrastructure investment exacts a price on the global and U.S. economies. ASCE (2017a, 2020b, 2021) chronicles the "chronic failure to act" and attributes substantial economic "drag" to the *status quo* levels of investment. For the period 2020 to 2039, ASCE (2021) estimates the value of increasing annual investment by $281 billion at $10 trillion in GDP, $23 trillion in total output (primarily from business sales), more than 3 million jobs, and more than $3,300 in annual household disposable income.

Estimated returns on infrastructure investment are inexact and not easily isolated from the interrelated workings of financial markets and the economy. Conventional transactional economic metrics may not fully capture all relevant welfare effects (CEA, 2018). Nonetheless, findings in this area almost always confirm that infrastructure investment confers economic benefits generally and economic stimulus in the context of recession. The Congressional Budget Office (CBO, 2016) estimates that federal investment yields a positive return to productivity of 5% compared to 10% for the private sector.

The Council of Economic Advisors (2018) estimated that a 10-year infrastructure investment of $1.5 trillion could add 0.1 to 0.2 percentage points to average annual real GDP growth and 290,000 to 414,000 workers (but with possible offsetting job losses). One study estimated the multiplier effect of increased public spending on infrastructure at 1.57, including a boost to private sector output over the long term (Bivens, 2017). Infrastructure investment may be more beneficial than other policy strategies (such as tax breaks) to spur private-sector activity and economic growth and improve the quality of life (McNichol, 2019). Private-sector expansion, in turn, raises federal and state tax revenues.

The stimulus effects of infrastructure investment can be measured for the short, medium, and long time horizons in terms of stabilizations, efficiency, and growth criteria (Figure 5.8). The implications of stalled infrastructure spending during the COVID-19 crisis have brought calls for "countercyclical" federal funding (Pine et al., 2020). However, some question the use of federal funding support as a form of stimulus to recover from economic recession (Krol, 2020).

Short-term gains in the GDP can be captured by investment in core infrastructure (such as transportation-related) even with deficit financing, which is only an option for the federal government; longer-term gains may be greater with deficit-neutral financing to avoid the potential "crowding out" of private investment due to the effects of higher interest rates on the economy (Stupak, 2018). Infrastructure projects do not necessarily require deficit financing if other funding and financing strategies are deployed (Miller, 2020a). Low interest rates for financing present infrastructure investment opportunities (Schanzenbach et al., 2017; Katseff, 2020).

In sum, the future of infrastructure will be shaped by economic conditions as well as federal funding and stimulus policy (Katseff, 2020). Although challenging to quantify, strategic long-term infrastructure investment is also associated with positive spillover or multiplier effects that accrue to society and consumers (locally, regionally, nationally, and over time), more so if it actively redresses inequity and injustice (DeGood et al., 2019; McNichol, 2019; Institute for Policy Integrity, 2020). The social return on infrastructure investment is easily understated. Studies that demonstrate the economic returns on infrastructure investment also contradict the perception that infrastructure is unaffordable to society (Institute for Policy Integrity, 2020).

Closing the Gaps

The infrastructure investment gap is often described as a *funding gap* as compared to a *spending gap.* In other words, the considerable and rather redundant gap literature emphasizes the need to close the gap *from the bottom* by raising revenues, in the form of public funding through taxes but, more often, cost-based user fees. More funding can provide the cash flow needed to secure financing and accelerate capital spending while also covering necessary operation and maintenance costs. Funding can be enhanced by implementing intentional and transparent hybrid approaches that combine revenue sources and ratemaking reform to include a depreciation expense and reserves, and progressive rate design to ensure affordability. Recent assessments have paid some attention to the potential for closing the gap from the top by *lowering costs* (Figure 5.9).

Figure 5.8. Potential economic stimulus from infrastructure investment.
Source: Informed by Schanzenbach et al. (2017), Bivens (2017), and Stupak (2018).

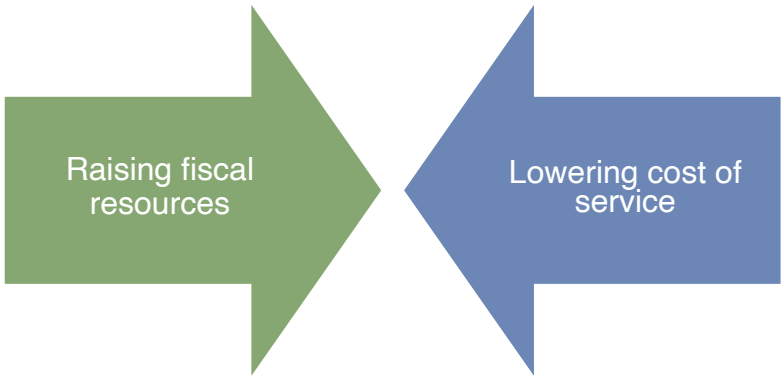

Figure 5.9. Closing infrastructure investment gaps.

In the short run, as mentioned, end-use efficiency can help energy and water systems avoid operating costs. Over the long run, end-use efficiency can help avoid capital costs as well. Related demand-management tools and incentives can be used to lower and shift demand to improve system efficiency. Efficiency trends are meaningful only if captured in system planning, design, and operation on the supply side. Even still, however, many infrastructure costs remain fixed and cannot be avoided entirely.

Beyond "asset management" (ASCE, 2020a) and "right-sizing," modern infrastructure should be reoptimized based on emerging demand and supply realities. A broad range of strategies and actions to reoptimize infrastructure have been identified (Deloitte, 2017), and many relate to funding or financing (Figure 5.10). Reimagining infrastructure also includes transforming operations to enhance the user experience and improve service delivery (Katseff, 2020).

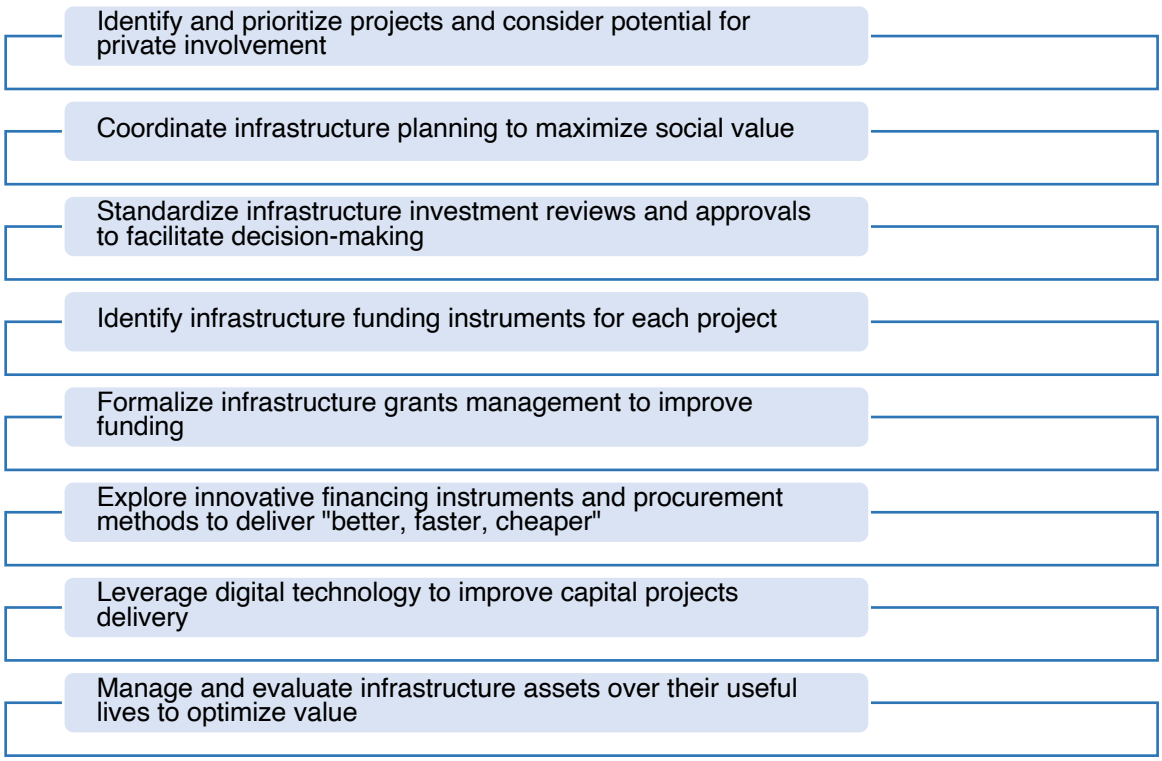

Figure 5.10. Strategies to optimize infrastructure investment.
Source: Adapted from Deloitte (2017).

All providers should also be held to standards of prudence, operational efficiency, and cost control. Prudence today recognizes that demand and supply for infrastructure are diverse and dynamic, in large part due to market forces and technology-enabled innovation. Infrastructure providers need to engage in integrated resource and capital planning, systemic optimization modeling, and risk-aware decision-making. To the extent feasible, infrastructure providers should incorporate flexible design principles and modularity, life-cycle asset and materials management, and grid intelligence in their systems.

At the system level, infrastructure renovation and innovation also lower costs of ongoing operation and maintenance. These savings may be reflected in reductions in power or water losses in distribution systems, conserving resources and other inputs. Other savings may be realized by incorporating technologies, including geographic information systems, remote sensors, and grid intelligence for real-time monitoring and management of increasingly complex and interconnected infrastructure systems.

Under some circumstances, market-based and structural solutions may help achieve additional efficiencies in infrastructure operations. These include performance-based contracting, competitive bidding, collaboration and coordination, public-public and public-private partnerships, and alternative ownership and governance models. These include public, private, and cooperative equity in infrastructure. In some cases, beneficial regionalization or consolidation can capture scale economies and broaden the funding base. Structures for providing services are not confined to traditional public and private ownership models. However, market constraints and limits to scale are relevant to the evaluation of structural options. Models that involve profit-seeking firms call for economic regulation to protect consumers against monopoly abuse in pricing and terms of service. Regulation may be useful regardless of ownership or operational structure to balance interests, ensure accountability, and support sustainability,

Funding and financing mechanisms both play a role in closing the spending gap and supporting infrastructure sustainability. A portfolio approach recognizes dynamic opportunities to leverage synergies and deploy an optimized set of conventional and innovative funding and financing methods and instruments. Choices among options and their permutations should be informed by impact analysis as well as community engagement to identify priorities and values.

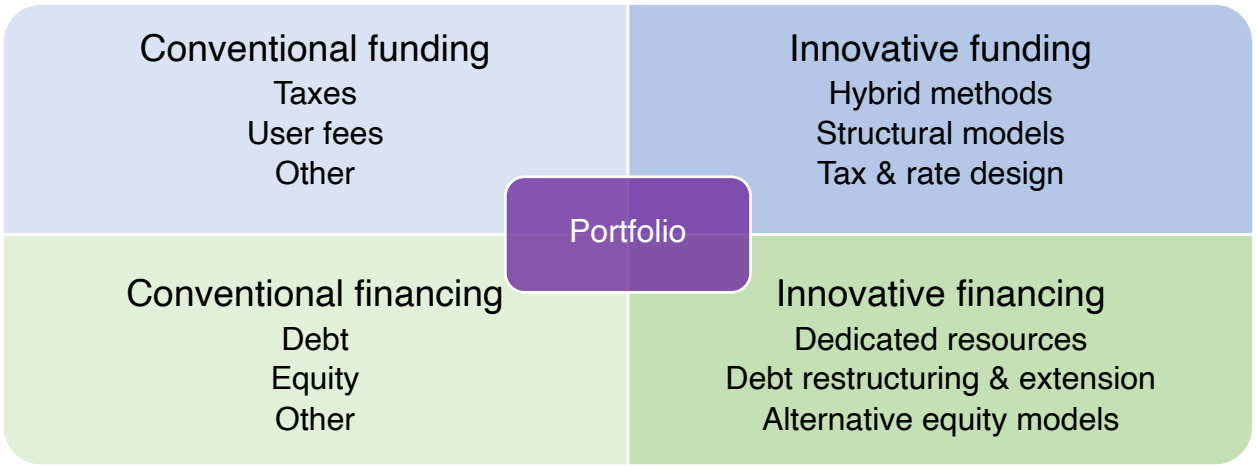

Figure 5.11. A dynamic portfolio approach to closing infrastructure investment gaps.

At the various governmental levels, new policy frameworks and reforms may be needed to break down institutional and legal barriers, allow programmatic flexibility, and support alternative funding, financing, and structural models for service delivery. Process improvements across agencies that oversee planning, permitting, procurement, and environmental impact assessment may be useful (Institute for Policy Integrity, 2020). Some argue for accelerated permitting, with an eye toward the 5.1-year average period for completion of environmental impact analyses as of 2016 and 472 days for federal regulatory approval of pipelines as of 2015 (CEA, 2018).

Closing infrastructure gaps also presents broader opportunities to close structural social gaps manifested in inequities in public health, safety, and welfare, educational access, and personal security. Infrastructure investment should incorporate carbon output and climate action in planning, construction, and funding, with sustainability as a guiding principle (Institute for Policy Integrity, 2020). Robust and comprehensive federal funding should be climate-smart, worker-oriented, and equitable (DeGood et al., 2019). In addition to loan guarantees and grants across sectors, a national infrastructure bank or "sustainability accelerator" could support state green banks and leverage other sources of public and private capital and stimulate economic activity, and thus employment (Coalition for Green Capital, 2020; Institute for Policy Integrity, 2020; Whitney et al., 2020). Critically, investing in modern infrastructure can also reckon with and redress disparate conditions and discriminatory practices and advance progressive ideals (DeGood et al., 2019; Coalition for Green Capital, 2020), including environmental stewardship and universal, affordable access to essential services.

6. CONCLUSIONS

The needs of ubiquitous and essential public infrastructure are perpetual. To meet them, infrastructure providers are on a never-ending quest for sustainable fiscal resources necessary for the sustainable provision of optimized essential services. Consensus about needs, however, has not translated to an effective response. Investing in and maintaining infrastructure takes vision and ambition, and often requires hard choices and tradeoffs. The aim here is to improve understanding of infrastructure funding and financing, and thereby facilitate inclusive and constructive stakeholder engagement.

Funding and financing can be easily confused, partly because both contribute to an infrastructure provider's cash flow. Cash from funding is recurring and flows from tax or user-fee instruments. Cash from financing is discrete and flows from debt and equity instruments. Choices about who pays for infrastructure (funding) are consequential in terms of the regressivity of impact and price signals. Choices about how infrastructure is paid for (financing) are consequential in terms of the cost of capital and provider incentives.

To varying degrees across infrastructure sectors, the analysis detects discernable shifts in fiscal federalism and policy emphasis from governmental funding to financing, from federal to state and local funding, from tax-based to fee-based funding, and from public to private capital financing, with implications for impacts and outcomes (Figure 6.1). Alone and in combination, these shifts imply higher total costs due to lesser reliance on public resources, thus widening investment gaps. They also imply regressive distributional effects due to greater reliance on user fees, thus widening social gaps.

The gaps imply a relinquishment of public responsibility for public infrastructure. Raising taxes for any public function is not easy, particularly given political and institutional barriers. The rationale for shared responsibility and tax-based support (or subsidization) for infrastructure is apparent. In the first place, all infrastructure can be considered *public* infrastructure, regardless of private roles in its provision. Second, the reliance of user-fee design on cost causality to align burdens and benefits offers a sense of precision while suffering from a host of theoretical, practical, and normative limitations (Beecher, 2020). Third, infrastructure investment yields positive, enduring, and often immeasurable returns to people, communities, and society and is thus affordable to society at sufficient levels of fiscal support.

In many respects, this primer's pragmatic framing perpetuates overly simplistic and largely false dichotomies of funding and financing, taxes and user fees, and debt and equity. These dichotomies tend to box-in policymakers and contract rather than expand the feasible solution set. A portfolio perspective emphasizes optimizing solutions across evolving options, including combined and hybrid methods. Responsive policies and innovative approaches to funding and financing have the potential to close both investment and social gaps in the realization of sustainable public infrastructure.

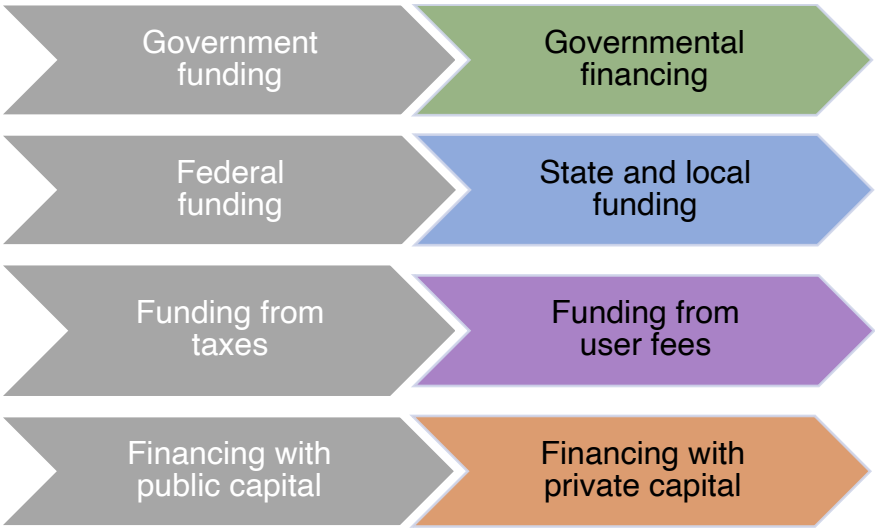

Figure 6.1. Discernable shifts in fiscal federalism and infrastructure policy emphasis.

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8. GLOSSARY

Glossary of Finance Terms (Investopedia)

Asset. An asset is a resource with economic value that an individual, corporation, or country owns or controls with the expectation that it will provide a future benefit. Assets are reported on a company's balance sheet and are bought or created to increase a firm's value or benefit the firm's operations. An asset can be thought of as something that, in the future, can generate cash flow, reduce expenses, or improve sales, regardless of whether it's manufacturing equipment or a patent.

Audit. The term audit usually refers to a financial statement audit. A financial audit is an objective examination and evaluation of the financial statements of an organization to make sure that the financial records are a fair and accurate representation of the transactions they claim to represent. The audit can be conducted internally by employees of the organization or externally by an outside Certified Public Accountant (CPA) firm.

Balance sheet. A balance sheet is a financial statement that reports a company's assets, liabilities and shareholders' equity at a specific point in time, and provides a basis for computing rates of return and evaluating its capital structure. It is a financial statement that provides a snapshot of what a company owns and owes, as well as the amount invested by shareholders.

Bankruptcy. Bankruptcy is a legal proceeding involving a person or business that is unable to repay their outstanding debts. The bankruptcy process begins with a petition filed by the debtor, which is most common, or on behalf of creditors, which is less common. All of the debtor's assets are measured and evaluated, and the assets may be used to repay a portion of outstanding debt.

Bond. A bond is a fixed income instrument that represents a loan made by an investor to a borrower (typically corporate or governmental). A bond could be thought of as an I.O.U. between the lender and borrower that includes the details of the loan and its payments. Bonds are used by companies, municipalities, states, and sovereign governments to finance projects and operations. Owners of bonds are debtholders, or creditors, of the issuer. Bond details include the end date when the principal of the loan is due to be paid to the bond owner and usually includes the terms for variable or fixed interest payments made by the borrower.

Bondholder. A bondholder is an investor or the owner of debt securities that are typically issued by corporations and governments. Bondholders are essentially lending money to the bond issuers. In return, bond investors receive their principal—initial investment—back when the bonds mature. For most bonds, the bondholder also receives periodic interest payments.

Bond rating. A bond rating is a way to measure the creditworthiness of a bond, which corresponds to the cost of borrowing for an issuer. These ratings typically assign a letter grade to bonds that indicates their credit quality. Private independent rating services such as Standard & Poor's, Moody's Investors Service, and Fitch Ratings Inc. evaluate a bond issuer's financial strength, or its ability to pay a bond's principal and interest, in a timely fashion.

Budget. A budget is an estimation of revenue and expenses over a specified future period of time and is usually compiled and re-evaluated on a periodic basis. Budgets can be made for a person, a group of people, a business, a government, or just about anything else that makes and spends money.

Capital. Capital is a term for financial assets, such as funds held in deposit accounts and/or funds obtained from special financing sources. Capital can also be associated with capital assets of a company that requires significant amounts of capital to finance or expand.

Capital asset. Capital assets are significant pieces of property such as homes, cars, investment properties, stocks, bonds, and even collectibles or art. For businesses, a capital asset is an asset with a useful life longer than a year

that is not intended for sale in the regular course of the business's operation. This also makes it a type of production cost. For example, if one company buys a computer to use in its office, the computer is a capital asset. If another company buys the same computer to sell, it is considered inventory.

Capital expenditures. Capital expenditures, commonly known as CapEx, are funds used by a company to acquire, upgrade, and maintain physical assets such as property, buildings, an industrial plant, technology, or equipment.

Capital structure. The capital structure is the particular combination of debt and equity used by a company to finance its overall operations and growth. Debt comes in the form of bond issues or loans, while equity may come in the form of common stock, preferred stock, or retained earnings. Short-term debt such as working capital requirements is also considered to be part of the capital structure.

Cash flow. Cash flow is the net amount of cash and cash-equivalents being transferred into and out of a business. At the most fundamental level, a company's ability to create value for shareholders is determined by its ability to generate positive cash flows, or more specifically, maximize long-term free cash flow (FCF).

Cost of capital. Cost of capital is the required return necessary to make a capital budgeting project, such as building a new factory, worthwhile… Many companies use a combination of debt and equity to finance their businesses and, for such companies, the overall cost of capital is derived from the weighted average cost of all capital sources, widely known as the weighted average cost of capital (WACC).

Coverage ratio. A coverage ratio, broadly, is a group of measures of a company's ability to service its debt and meet its financial obligations such as interest payments or dividends. The higher the coverage ratio, the easier it should be to make interest payments on its debt or pay dividends. The trend of coverage ratios over time is also studied by analysts and investors to ascertain the change in a company's financial position.

Credit rating. A credit rating is a quantified assessment of the creditworthiness of a borrower in general terms or with respect to a particular debt or financial obligation. A credit rating can be assigned to any entity that seeks to borrow money—an individual, corporation, state or provincial authority, or sovereign government.

Debt. Debt is an amount of money borrowed by one party from another. Debt is used by many corporations and individuals as a method of making large purchases that they could not afford under normal circumstances. A debt arrangement gives the borrowing party permission to borrow money under the condition that it is to be paid back at a later date, usually with interest.

Debt-to-equity ratio. The debt-to-equity (D/E) ratio is calculated by dividing a company's total liabilities by its shareholder equity. These numbers are available on the balance sheet of a company's financial statements. The ratio is used to evaluate a company's financial leverage. The D/E ratio is an important metric used in corporate finance. It is a measure of the degree to which a company is financing its operations through debt versus wholly-owned funds. More specifically, it reflects the ability of shareholder equity to cover all outstanding debts in the event of a business downturn. The debt-to-equity ratio is a particular type of gearing ratio.

Debt-service coverage ratio. In corporate finance, the debt-service coverage ratio (DSCR) is a measurement of the cash flow available to pay current debt obligations. The ratio states net operating income as a multiple of debt obligations due within one year, including interest, principal, sinking-fund and lease payments. In government finance, it is the number of export earnings needed to meet annual interest and principal payments on a country's external debts. In personal finance, it is a ratio used by bank loan officers to determine income property loans. In each case, the ratio reflects the ability to service debt given a particular level of income.

Depreciation. Depreciation is an accounting method of allocating the cost of a tangible or physical asset over its useful life or life expectancy. Depreciation represents how much of an asset's value has been used up. Depreciating assets helps companies earn revenue from an asset while expensing a portion of its cost each year the asset is in use.

If not taken into account, it can greatly affect profits. Businesses can depreciate long-term assets for both tax and accounting purposes.

Dividend. A dividend is the distribution of a portion of the company's earnings, decided and managed by the company's board of directors, and paid to a class of its shareholders. Common shareholders of dividend-paying companies are typically eligible as long as they own the stock by the ex-dividend date. Dividends may be paid out as cash or in the form of additional stock.

Equity. Equity is typically referred to as shareholder equity (also known as shareholders' equity), or owners' equity (for privately held companies), which represents the amount of money that would be returned to a company's shareholders if all of the assets were liquidated and all of the company's debt was paid off.

Expense. An expense is the cost of operations that a company incurs to generate revenue. As the popular saying goes, "it costs money to make money." Common expenses include payments to suppliers, employee wages, factory leases, and equipment depreciation. Businesses are allowed to write off tax-deductible expenses on their income tax returns to lower their taxable income and thus their tax liability. However, the Internal Revenue Service (IRS) has strict rules on which expenses business are allowed to claim as a deduction.

Energy Regulatory Commission (FERC). The Federal Energy Regulatory Commission (FERC) is an independent agency that regulates the interstate transmission of electricity, natural gas, and oil. FERC also reviews proposals to build liquefied natural gas (LNG) terminals and interstate natural gas pipelines as well as licensing hydropower projects.

Financial Accounting Standards Board (FASB). The Financial Accounting Standards Board (FASB) is an independent nonprofit organization that is responsible for establishing accounting and financial reporting standards for companies and nonprofit organizations in the United States, following generally accepted accounting principles (GAAP). The FASB was formed in 1973 to succeed the Accounting Principles Board and carry on its mission. It is based in Norwalk, Conn.

Finance. Finance is a term for matters regarding the management, creation, and study of money and investments. Finance can be broadly divided into three categories, public finance, corporate finance, and personal finance. There are many other specific categories, such as behavioral finance, which seeks to identify the cognitive (e.g., emotional, social, and psychological) reasons behind financial decisions.

Fixed asset. A fixed asset is a long-term tangible piece of property or equipment that a firm owns and uses in its operations to generate income. Fixed assets are not expected to be consumed or converted into cash within a year. Fixed assets most commonly appear on the balance sheet as property, plant, and equipment (PP&E). They are also referred to as capital assets.

Government Accounting Standards Board (GASB). The Government Accounting Standards Board (GASB) is a private non-governmental organization that creates accounting reporting standards, or generally accepted accounting principles (GAAP), for state and local governments in the United States.

Generally accepted accounting principles (GAAP). Generally accepted accounting principles (GAAP) refer to a common set of accounting principles, standards, and procedures issued by the Financial Accounting Standards Board (FASB). Public companies in the United States must follow GAAP when their accountants compile their financial statements. GAAP is a combination of authoritative standards (set by policy boards) and the commonly accepted ways of recording and reporting accounting information. GAAP aims to improve the clarity, consistency, and comparability of the communication of financial information.

Grant. A grant is an award, usually financial, given by one entity (typically a company, foundation, or government) to an individual or a company to facilitate a goal or incentivize performance. Grants are essentially gifts that do not have to be paid back, under most conditions.

Green bond. A green bond is a type of fixed-income instrument that is specifically earmarked to raise money for climate and environmental projects. These bonds are typically asset-linked and backed by the issuing entity's balance sheet, so they usually carry the same credit rating as their issuers' other debt obligations.

Income. Income is money (or some equivalent value) that an individual or business receives, usually in exchange for providing a good or service or through investing capital. Income is used to fund day-to-day expenditures… Business income can refer to a company's remaining revenues after paying all expenses and taxes. In this case, income is referred to as "earnings." Most forms of income are subject to taxation.

Income statement. An income statement is one of the three important financial statements used for reporting a company's financial performance over a specific accounting period, with the other two key statements being the balance sheet and the statement of cash flows.

Issue. An issue is one process of offering securities in order to raise funds from investors. Companies may issue bonds or stocks to investors as a method of financing the business. The term "issue" also refers to a series of stocks or bonds that have been offered to the public and typically relates to the set of instruments that were released under one offering.

Leverage. Leverage results from using borrowed capital as a funding source when investing to expand the firm's asset base and generate returns on risk capital. Leverage is an investment strategy of using borrowed money—specifically, the use of various financial instruments or borrowed capital—to increase the potential return of an investment. Leverage can also refer to the amount of debt a firm uses to finance assets. When one refers to a company, property or investment as "highly leveraged," it means that item has more debt than equity.

Liability. A liability is something a person or company owes, usually a sum of money. Liabilities are settled over time through the transfer of economic benefits including money, goods, or services. Recorded on the right side of the balance sheet, liabilities include loans, accounts payable, mortgages, deferred revenues, earned premiums, unearned premiums, and accrued expenses. Even marriages can change your liability.

Market failure. Market failure is the economic situation defined by an inefficient distribution of goods and services in the free market. In market failure, the individual incentives for rational behavior do not lead to rational outcomes for the group.

Mezzanine financing. Mezzanine financing is a hybrid of debt and equity financing that gives the lender the right to convert to an equity interest in the company in case of default, generally, after venture capital companies and other senior lenders are paid.

Monopoly. A monopoly refers to when a company and its product offerings dominate a sector or industry. Monopolies can be considered an extreme result of free-market capitalism in that absent any restriction or restraints, a single company or group becomes large enough to own all or nearly all of the market (goods, supplies, commodities, infrastructure, and assets) for a particular type of product or service. The term monopoly is often used to describe an entity that has total or near-total control of a market.

Municipal bond. A municipal bond is a debt security issued by a state, municipality or county to finance its capital expenditures, including the construction of highways, bridges or schools. They can be thought of as loans that investors make to local governments. Municipal bonds are exempt from federal taxes and most state and local taxes, making them especially attractive to people in high income tax brackets.

Net income (NI). Net income (NI), also called net earnings, is calculated as sales minus cost of goods sold, selling, general and administrative expenses, operating expenses, depreciation, interest, taxes, and other expenses. It is a useful number for investors to assess how much revenue exceeds the expenses of an organization. This number appears on a company's income statement and is also an indicator of a company's profitability.

Net operating income (NOI). Net operating income (NOI) is a calculation used to analyze the profitability of income-generating real estate investments. NOI equals all revenue from the property, minus all reasonably necessary operating expenses. NOI is a before-tax figure, appearing on a property's income and cash flow statement, that excludes principal and interest payments on loans, capital expenditures, depreciation, and amortization. When this metric is used in other industries, it is referred to as "EBIT", which stands for "earnings before interest and taxes".

Network effect. The network effect is a phenomenon whereby increased numbers of people or participants improve the value of a good or service. The Internet is an example of the network effect. Initially, there were few users on the Internet since it was of little value to anyone outside of the military and some research scientists.

Not for profit. Not-for-profit organizations are types of organizations that do not earn profits for its owners. All of the money earned by or donated to a not-for-profit organization is used in pursuing the organization's objectives and keeping it running. Typically, organizations in the nonprofit sector are tax-exempt charities or other types of public service organizations, and as such, they are not required to pay most taxes. In a nonprofit organization, income is not distributed to the group's members, directors, or officers. There are also nonprofit corporations known as non-stock corporations.

Operating income. Operating income is an accounting figure that measures the amount of profit realized from a business's operations, after deducting operating expenses such as wages, depreciation, and cost of goods sold (COGS).

Overhead. Overhead refers to the ongoing business expenses not directly attributed to creating a product or service. It is important for budgeting purposes but also for determining how much a company must charge for its products or services to make a profit. In short, overhead is any expense incurred to support the business while not being directly related to a specific product or service.

Profit. Profit describes the financial benefit realized when revenue generated from a business activity exceeds the expenses, costs, and taxes involved in sustaining the activity in question. Any profits earned funnel back to business owners, who choose to either pocket the cash or reinvest it back into the business. Profit is calculated as total revenue less total expenses.

Private activity bond. Private activity bonds (PAB) are tax-exempt bonds issued by or on behalf of a local or state government for the purpose of providing special financing benefits for qualified projects. The financing is most often for projects of a private user, and the government generally does not pledge its credit. Private activity bonds are sometimes referred to as conduit bonds.

Privatization. Privatization occurs when a government-owned business, operation, or property becomes owned by a private, non-government party. Note that privatization also describes the transition of a company from being publicly traded to becoming privately held. This is referred to as corporate privatization.

Rate of return (RoR). A rate of return (RoR) is the net gain or loss of an investment over a specified time period, expressed as a percentage of the investment's initial cost. When calculating the rate of return, you are determining the percentage change from the beginning of the period until the end.

Return on assets (ROA). Return on assets (ROA) is an indicator of how profitable a company is relative to its total assets. ROA gives a manager, investor, or analyst an idea as to how efficient a company's management is at using its assets to generate earnings. Return on assets is displayed as a percentage.

Return on equity (ROE). Return on equity (ROE) is a measure of financial performance calculated by dividing net income by shareholders' equity. Because shareholders' equity is equal to a company's assets minus its debt, ROE is considered the return on net assets. ROE is considered a measure of how effectively management is using a company's assets to create profits.

Revenue. Revenue is the income generated from normal business operations and includes discounts and deductions for returned merchandise. It is the top line or gross income figure from which costs are subtracted to determine net income.

Revenue bond. A revenue bond is a category of municipal bond supported by the revenue from a specific project, such as a toll bridge, highway or local stadium. Revenue bonds that finance income-producing projects are thus secured by a specified revenue source. Typically, revenue bonds can be issued by any government agency or fund that is managed in the manner of a business, such as entities having both operating revenues and expenses.

Risk. Risk is defined in financial terms as the chance that an outcome or investment's actual gains will differ from an expected outcome or return. Risk includes the possibility of losing some or all of an original investment.

Security. The term "security" is a fungible, negotiable financial instrument that holds some type of monetary value. It represents an ownership position in a publicly-traded corporation—via stock—a creditor relationship with a governmental body or a corporation—represented by owning that entity's bond—or rights to ownership as represented by an option.

Securities and Exchange Commission (SEC). The U.S. Securities and Exchange Commission (SEC) is an independent federal government regulatory agency responsible for protecting investors, maintaining fair and orderly functioning of the securities markets, and facilitating capital formation. It was created by Congress in 1934 as the first federal regulator of the securities markets. The SEC promotes full public disclosure, protects investors against fraudulent and manipulative practices in the market, and monitors corporate takeover actions in the United States. It also approves registration statements for bookrunners among underwriting firms.

Securitization. Securitization is the procedure where an issuer designs a marketable financial instrument by merging or pooling various financial assets into one group. The issuer then sells this group of repackaged assets to investors. Securitization offers opportunities for investors and frees up capital for originators, both of which promote liquidity in the marketplace.

Shareholder. A shareholder, also referred to as a stockholder, is a person, company, or institution that owns at least one share of a company's stock, which is known as equity. Because shareholders are essentially owners in a company, they reap the benefits of a business' success. These rewards come in the form of increased stock valuations, or as financial profits distributed as dividends. Conversely, when a company loses money, the share price invariably drops, which can cause shareholders to lose money, or suffer declines in their portfolios' values.

Shareholder equity. Shareholder equity (SE), also referred to as shareholders' equity and stockholders' equity, is the corporation's owners' residual claim after debts have been paid. Equity is equal to a firm's total assets minus its total liabilities. Equity is found on a company's balance sheet; it is one of the most common financial metrics employed by analysts to assess the financial health of a company. Shareholder equity can also represent the net or book value of a company. Shareholder's equity represents the amount of money that would be returned to shareholders if all of the assets were liquidated, and all of the company's debt was paid off.

Social responsibility. Social responsibility means that businesses, in addition to maximizing shareholder value, must act in a manner that benefits society. Social responsibility has become increasingly important to investors and consumers who seek investments that are not just profitable but also contribute to the welfare of society and the environment. However, critics argue that the basic nature of business does not consider society as a stakeholder.

Stock. A stock (also known as equity) is a security that represents the ownership of a fraction of a corporation. This entitles the owner of the stock to a proportion of the corporation's assets and profits equal to how much stock they own. Units of stock are called "shares."

Taxable municipal bond. A taxable municipal bond is a fixed-income security issued by a local government, such as a city, county, or related agency, to finance projects that the federal government will not subsidize, and it is not tax exempt. Taxable municipal bonds are typically used to fund projects that don't directly benefit the general public, which is why they are not granted tax-exempt status.

Utilities sector. The utilities sector refers to a category of companies that provide basic amenities, such as water, sewage services, electricity, dams, and natural gas. Although utilities earn profits, they are part of the public service landscape and are therefore heavily regulated. Investors typically treat utilities as long-term holdings and use them to inject steady income in their portfolios.

Utility. Utility is a term in economics that refers to the total satisfaction received from consuming a good or service. Economic theories based on rational choice usually assume that consumers will strive to maximize their utility. The economic utility of a good or service is important to understand, because it directly influences the demand, and therefore price, of that good or service. In practice, a consumer's utility is impossible to measure and quantify. However, some economists believe that they can indirectly estimate what is the utility for an economic good or service by employing various models.

Working capital. Working capital, also known as net working capital (NWC), is the difference between a company's current assets, such as cash, accounts receivable (customers' unpaid bills) and inventories of raw materials and finished goods, and its current liabilities, such as accounts payable. Net operating working capital is a measure of a company's liquidity and refers to the difference between operating current assets and operating current liabilities. In many cases these calculations are the same and are derived from company cash plus accounts receivable plus inventories, less accounts payable and less accrued expenses.

Yield. Yield refers to the earnings generated and realized on an investment over a particular period of time. It's expressed as a percentage based on the invested amount, current market value, or face value of the security. It includes the interest earned or dividends received from holding a particular security. Depending on the valuation (fixed vs. fluctuating) of the security, yields may be classified as known or anticipated.

Source: Investopedia glossary available at investopedia.com.

9. APPENDIX A

Funding and Financing Methods for Stormwater Management

Description	Advantages	Disadvantages
FUNDING		
Grants. State and federal grants provide additional funding for water quality improvements.	• Existing sources available for stormwater-related funding • Does not require repayment	• Competitive • Typically one-time, project specific, or time-constrained funds • Often requires a funding match
Taxes: general funds. Funds raised through taxes such as, property, income, and sales that are paid into a general fund.	• Consistent from year-to-year • Utilizes an existing funding system	• Competition for funds • Tax-exempt properties do not contribute • System is not equitable (does not fully reflect contribution of stormwater runoff)
User fees: service model. Funds raised through charges for services such as inspections and permits; funds raised through developer impact fees are one-time charges linked with new development.	• Specific permit and inspection fees allow for more direct allocation of costs for services provided • Addresses potential stormwater impacts related to new construction	• Funding not available for larger projects or system-wide improvements • Developer impact fees may be an unreliable source when development slows (due to market downturns/contractions) • Requires administrative framework to assess and manage
User fees: utility model. A stormwater utility generates its revenue through user fees and the revenues from the stormwater charges will go into a separate fund that might be used only for stormwater services.	• Dedicated funding source • Directly related to stormwater impacts • Sustainable, stable revenue • Shared cost • Improved watershed stewardship • Addresses existing stormwater issues	• Feasibility study required for implementation, fee structure, and administration of utility • Approval by vote of the local legislative body • Perception by the public of a “tax on rain”
FINANCING		
Bonds. Bonds are not a true revenue source, but are a means of borrowing money. “Green” bonds are a new source of funding dedicated to environmentally friendly projects, including clean water projects.	• Existing sources available for stormwater-related funding • Can support construction-ready projects • Can provide steady funding stream over the period of the bond	• One-time source of funds • Requires individual approval for each issuance • Requires full repayment • Possible interest charges • Requires dedicated repayment revenue stream • May require design-level documents to be prepared in advance • Likely requires voter approval • Can have high transaction costs relative to requested amount • May require significant administrative preparation to issue
Loans. Low-interest loans may be secured, but are generally used for planning and capital projects.	• Existing sources available for stormwater-related funding • Offers low- or no-interest financing	• One-time source of funds • Requires full repayment
PARTNERSHIPS		
Public-private partnerships. Contractual agreement between a public agency and a private sector entity that allows for the private sector participation in the financing, planning, design, construction, and maintenance of stormwater facilities.	• Can reduce costs to government • Significantly leverages public funding and government resources • Ensures adequate, dedicated funding • Improved O&M • Shared risk	• Perceived loss of public control • Assumption that private financing is more expensive and belief that contract negotiations are difficult

Source: Adapted from U.S. Environmental Protection Agency (2014).

10. APPENDIX B

Environmental Funding and Financing Resources for Michigan

Michigan Clean Water Act Section 319 Grants

- Michigan Department of Environmental Quality (DEQ)
- Clean Water Act Section (CWA) 319 Grants provide funding to implement nonpoint source activities identified in DEQ-approved watershed management plans. Implementation activities must address specific sources of nonpoint source pollution identified by Michigan's Nonpoint Source Program Plan.
- Request for proposals (RFP) is announced with a deadline for application. Eligible applicants can contact DEQ Nonpoint Source staff for grant application assistance. Prior to application, locally developed watershed management plans should be submitted to the DEQ for review and approval.
- No Maximum project amount. Minimum project amount is $25,000. Approximately $2,000,000 available each round. Most watershed implementation projects require a minimum 25% match. Conservation easement projects require a 50% match.
- Contact: Robert Sweet, sweetr@michigan.gov, (517) 284-5520; Michigan Department of Environmental Quality (DEQ), EGLE-Assist@Michigan.gov.

Michigan Clean Water State Revolving Fund (CWSRF)

- Michigan Department of Environmental Quality (DEQ)
- Michigan's Water Pollution Control Revolving Fund, better known as the Clean Water State Revolving Fund (CWSRF) is a low interest loan financing program that assists qualified local municipalities with the construction of needed water pollution control facilities. The Green Project Reserve is for projects with components that address green infrastructure, water or energy efficiency improvements, or other environmentally innovative activities.
- Projects must apply to be on the annual priority list by submitting an Intended Use Plan (IUP). Applications can be found online. Contact your state office for more information.
- FY20 has $304,000,000.
- Contact: Sonya Butler, butlers2@michigan.gov, (517) 284-5409; Michigan Department of Environmental Quality (DEQ), EGLE-WIFS@Michigan.gov.

Michigan Community Development Block Grant (CDBG) Program

- Michigan Economic Development Corporation (MEDC)
- CDBG funds may be utilized to address a wide variety of community needs, including construction or renovation of various infrastructure projects such as water, wastewater and solid waste facilities, streets, and flood control projects. The funds must be used for activities that either benefit low- and moderate-income persons or address community development needs that have a particular urgency.
- For more information on these uses, please call our Customer Contact Center and they will direct you to the appropriate regional staff. https://www.miplace.org/globalassets/media-documents/cdbg/cdbg_map.pdf
- Contact: Greg West, westg2@michigain.org, (517) 643-6682; Michigan Economic Development Corporation (MEDC).

Michigan Community Facilities Direct Loan and Grant Program

- U.S. Department of Agriculture (USDA) Rural Utility Service (RUS)
- This program provides affordable funding to develop essential community facilities in rural areas. An essential community facility is defined as a facility that provides an essential service to the local community for the orderly development of the community in a primarily rural area, and does not include private, commercial or business undertakings.
- Contact your local office to discuss your specific project. Applications for this program are accepted year round. Program resources are available online (includes forms needed, guidance, certifications). Request a Data Universal Number System (DUNS) number online if your organization doesn't already have one. Register your organization with the System for Award Management (SAM) online if you aren't already registered. Apply online using RD Apply: https://rdapply.usda.gov
- Low interest direct loans and grants are available. These may be combined with commercial financing to finance one project if all eligibility and feasibility requirements are met.
- Contact: Alec Lloyd, alec.lloyd@mi.usda.gov, (517) 324-5204; USDA Rural Utilities Service.

Michigan Drinking Water State Revolving Fund (DWSRF)

- Michigan Department of Environmental Quality (DEQ)
- This program assists water suppliers in satisfying the requirements of the Safe Drinking Water Act by offering low interest loans to eligible water suppliers.
- Projects must apply to be on the annual priority list by submitting an Intended Use Plan (IUP). Applications can be found online. Contact your state office for more information.
- As of October 1, 2017, the DWSRF program has provided low-interest loans for 288 projects, totaling $949 million.

- Contact: Kelly Green, GreenK1@michigan.gov, (517) 284-5433; Michigan Department of Environmental Quality (DEQ), EGLE-WIFS@michigan.gov.

Michigan Hazard Mitigation Grant Program (HMGP)
- U.S. Federal Emergency Management Agency (FEMA)
- The purpose of the HMGP program is to help communities implement hazard mitigation measures following a Presidential major disaster declaration. Hazard mitigation is any action taken to reduce or eliminate long term risk to people and property from natural hazards. Mitigation planning is a key process used to breaking the cycle of disaster damage, reconstruction, and repeated damage.
- Sub-applicants apply to Michigan for funding. Consult your State and FEMA website for application information (https://www.fema.gov/hazard-mitigation-grant-program-guide-state/local-governments). Contact your Local Mitigation Planner of State Hazard mitigation Officer (SHMO) (https://www.fema.gov/state-hazard-mitigation-officers) to learn more about the application process.
- Depends on the federally recognized disaster and current appropriations.
- Contact: Matt Schnepp, schneppm1@michigan.gov, (517) 284-3950; Emergency Management and Homeland Security Division, aburris@nfip-iservice.com.

Michigan Nonpoint Source Pollution Control Grants: Clean Michigan Initiative
- Michigan Department of Environmental Quality (MDEQ)
- Nonpoint Source Pollution Control Grants provide funding to implement the physical improvements in approved watershed management plans intended to restore impaired waters and protect high quality waters. Practices must address specific sources of nonpoint source pollution identified by Michigan's Nonpoint Source Program Plan. Physical improvements are structural and vegetative best management practices.
- A request for proposals (RFP) is announced with a deadline for application. Eligible applicants can contact DEQ Nonpoint Source staff for grant application assistance. Prior to application, locally developed watershed management plans should be submitted to the DEQ for review and approval.
- Approximately $1-$2 million has been available most funding rounds. There is no maximum for proposals submitted. The minimum project amount is $25,000.
- Find your NPS contact by area (https://www.michigan.gov/documents/deq/wrd-nps-staff_344828_7.pdf), (517) 284-5520; Michigan Department of Environmental Quality (DEQ), EGLE-Assist@Michigan.gov.

Michigan Stormwater, Asset Management, and Wastewater (SAW) Program
- Michigan Department of Environmental Quality
- The Stormwater, Asset Management and Wastewater program provides grants for the development of plans to identify and manage stormwater or wastewater assets, stormwater treatment management plans, planning and design of sewage, stormwater, or nonpoint source pollution reduction projects, and the testing and demonstration of innovative water quality improvement projects. Additionally, low interest loans are available for construction activities that protect water quality and are identified in an asset management program or and approved stormwater management plan.
- Applications information can found online.
- For fiscal year 2020, 18 awards for a total of $8 million were designated to applicants.
- Contact: Sonya Butler, butlers2@michigan.gov, (517) 284-5433; Michigan Department of Environmental Quality (MDEQ), EGLE-Assist@Michigan.gov.

Michigan Water and Waste Disposal Loan and Grant Program
- U.S. Department of Agriculture (USDA) Rural Utility Service (RUS)
- This program provides funding for clean and reliable drinking water systems, sanitary sewage disposal, sanitary solid waste disposal, and storm water drainage to households and businesses in eligible rural areas.
- This program assists qualified applicants who are not otherwise able to obtain commercial credit on reasonable terms. Eligible applicants include: most state and local governmental entities, private nonprofits, and federally-recognized tribes. Contact your local Rural Development Office. Apply online using RD Apply.
- Long-term, low-interest loans are available. If funds are available, a grant may be combined with a loan if necessary to keep user costs reasonable. Current interest rates for 1st Quarter FY 2019, effective October 1, 2018 to December 31, 2018 are Poverty: 2.375%; Intermediate: 3.250%; Market: 4.000%.
- Contact: Alec Lloyd, alec.lloyd@mi.usda.gov, (517) 324-5204; USDA Rural Utilities Service.

Source: U.S. Environmental Protection Agency, Water Finance Clearinghouse. https://www.epa.gov/waterdata/water-finance-clearinghouse.

11. APPENDIX C

Michigan's Headlee Amendment and Bolt Decisions

The Headlee Amendment to the Michigan State Constitution (1978)

§ 26 Limitation on taxes; revenue limit; refunding or transferring excess revenues; exceptions to revenue limitation; adjustment of state revenue and spending limits. Sec. 26. There is hereby established a limit on the total amount of taxes which may be imposed by the legislature in any fiscal year on the taxpayers of this state. This limit shall not be changed without approval of the majority of the qualified electors voting thereon, as provided for in Article 12 of the Constitution. Effective with fiscal year 1979-1980, and for each fiscal year thereafter, the legislature shall not impose taxes of any kind which, together with all other revenues of the state, federal aid excluded, exceed the revenue limit established in this section. The revenue limit shall be equal to the product of the ratio of Total State Revenues in fiscal year 1978-79 divided by the Personal Income of Michigan in calendar year 1977 multiplied by the Personal Income of Michigan in either the prior calendar year or the average of Personal Income of Michigan in the previous three calendar years, whichever is greater.

For any fiscal year in the event that Total State Revenues exceed the revenue limit established in this section by 1% or more, the excess revenues shall be refunded pro rata based on the liability reported on the Michigan income tax and single business tax (or its successor tax or taxes) annual returns filed following the close of such fiscal year. If the excess is less than 1%, this excess may be transferred to the State Budget Stabilization Fund.

The revenue limitation established in this section shall not apply to taxes imposed for the payment of principal and interest on bonds, approved by the voters and authorized under Section 15 of this Article, and loans to school districts authorized under Section 16 of this Article.

If responsibility for funding a program or programs is transferred from one level of government to another, as a consequence of constitutional amendment, the state revenue and spending limits may be adjusted to accommodate such change, provided that the total revenue authorized for collection by both state and local governments does not exceed that amount which would have been authorized without such change.

§ 31 Units of Local Government are hereby prohibited from levying any tax not authorized by law or charter when this section is ratified or from increasing the rate of an existing tax above that rate authorized by law or charter when this section is ratified, without the approval of a majority of the qualified electors of that unit of Local Government voting thereon. If the definition of the base of an existing tax is broadened, the maximum authorized rate of taxation on the new base in each unit of Local Government shall be reduced to yield the same estimated gross revenue as on the prior base. If the assessed valuation of property as finally equalized, excluding the value of new construction and improvements, increases by a larger percentage than the increase in the General Price Level from the previous year, the maximum authorized rate applied thereto in each unit of Local Government shall be reduced to yield the same gross revenue from existing property, adjusted for changes in the General Price Level, as could have been collected at the existing authorized rate on the prior assessed value.

The limitations of this section shall not apply to taxes imposed for the payment of principal and interest on bonds or other evidence of indebtedness or for the payment of assessments on contract obligations in anticipation of which bonds are issued which were authorized prior to the effective date of this amendment.

Select Text from Bolt v. City of Lansing: Appellate Decision (221 Mich. App. 79; 561 N.W.2d 423, 1997)

The sole issue here is whether the charge to landowners for the cost of separating the storm water and sewage systems and treating the storm water runoff, is a "tax" or a "user fee." If it is a tax, it is unquestionably a tax increase as well as a tax which was not in effect on the date the effective date of the Headlee Amendments, December 23, 1978, and thus would constitute a tax which requires voter approval pursuant to Const 1963, art 9, §31. In other words, Ordinance 925 would run afoul of the Headlee Amendment. If, however, the charge is a user fee, as the City contends, then it is simply unaffected by Article 9.

The difficulty we face here is that the Headlee Amendment, Art 9, §§25-34, fails to define or redefine a tax or a fee, and historically, there is no bright line test that distinguishes the two. In general, a fee is exchanged for a service rendered or a benefit conferred, and there must be some reasonable relationship between the amount of the fee and the value of the service or benefit. [citations]

For example, if a landowner opts to sign up for city snow removal service and is charged accordingly, this would clearly constitute a user fee.[4] Conversely, a charge against the property of a landowner based solely on the value of the land (such as an ad valorum property tax) represents the other end of the spectrum – a tax.[5] Sewage disposal and treatment, therefore, falls somewhere between these two ends of the spectrum.

Our Supreme Court has answered this question insofar as sewage treatment is concerned. Sewage disposal charges to landowners constitute a user fee, not a tax. Ripperger v City of Grand Rapids, 338 Mich 682, 686 ff; 62 NW2d 585 (1954). In Ripperger, the Court looked to established law (that charges for furnishing water to city residents were a fee and not a tax), and concluded by analogy that charges for provision of sewage disposal similarly constituted a fee rather than a tax. From this analysis in Ripperger, we conclude that here, storm water collection, detention, and treatment (which even plaintiff concedes was properly subject to a fee and not a tax) when combined with sewage disposal, does not lose its character as a fee by virtue of being separated from sewage collection and disposal. Therefore, for the reasons stated in Ripperger, we hold that the result does not change by separating the systems – the charge here is a user fee, not a tax.[6]

As to the argument that municipalities may abuse the "user fee" concept to avoid the Headlee Amendment, the answer lies in a case-by-case review of such challenged conduct or an additional constitutional amendment which address more clearly this precise issue. Unless a particular fee, however, violates the Constitution, the judiciary has no role to play in resolving such political questions. Const 1963, art 3, §2.

Select Text from Bolt v. City of Lansing: Supreme Court Decision (587 N.W.2d 264, 459 Mich. 152, 1998)

We granted leave to appeal in this case to determine whether the storm water service charge imposed by Lansing Ordinance No. 925 is a valid user fee or a tax that violates the Headlee Amendment, Const 1963, art 9, § 31.[1] We hold that the storm water service charge is a tax, for which approval is required by a vote of the people. Because Lansing did not submit Ordinance 925 to a vote of the people as required by the Headlee Amendment, the storm water service charge is unconstitutional and, therefore, null and void…

There is no bright-line test for distinguishing between a valid user fee and a tax that violates the Headlee Amendment. As noted by the Court of Appeals, the difficulty in resolving the issue is that the Headlee Amendment fails to define either the term "tax" or "fee," an omission that the Headlee Blue Ribbon Commission urged the Legislature to rectify. Headlee Blue Ribbon Commission, A Report to Governor John Engler, Executive Summary, and § 5, pp 26-31 (September 1994). A primary rule in interpreting a constitutional provision such as the Headlee Amendment is the rule of "common understanding"…

In resolving this issue, this Court has articulated three primary criteria to be considered when distinguishing between a fee and a tax. The first criterion is that a user fee must serve a regulatory purpose rather than a revenue-raising purpose. Merrelli v. St. Clair Shores, 355 Mich. 575, 583-584, 96 N.W.2d 144 (1959), quoting Vernor, supra at 167-170, 146 N.W. 338. A second, and related, criterion is that user fees must be proportionate to the necessary costs of the service. Id.; Bray, supra at 160, 341

N.W.2d 92. As was summarized in Vernor,

> To be sustained [as a regulatory fee], the act we are here considering must be held to be one for regulation only, and not as a means primarily of producing revenue. Such a measure will be upheld by the courts when plainly intended as a police regulation, and the revenue derived therefrom is not disproportionate to the cost of issuing the license, and the regulation of the business to which it applies. [Id. at 167, 146 N.W. 338.]

In Ripperger, this Court articulated a third criterion: voluntariness. Quoting from Jones v. Detroit Water Comm'rs, 34 Mich. 273, 275 (1876), the Ripperger Court stated:

> "The water rates paid by consumers are in no sense taxes, but are nothing more than the price paid for water as a commodity, just as similar rates are payable to gas companies, or to private water works, for their supply of gas or water. No one can be compelled to take water unless he chooses, and the lien, although enforced in the same way as a lien for taxes, is really a lien for an indebtedness, like that enforced on mechanics' contracts, or against ships and vessels. The price of water is left to be fixed by the board in their discretion, and the citizens may take it or not as the price does or does not suit them"…

We conclude that the storm water service charge imposed by Ordinance 925 is a tax and not a valid user fee. To conclude otherwise would permit municipalities to supplement existing revenues by redefining various government activities as "services" and enacting a myriad of "fees" for those services. To permit such a course of action would effectively abrogate the constitutional limitations on taxation and public spending imposed by the Headlee Amendment, a constitutional provision ratified by the people of this state. In fact, the imposition of mandatory "user fees" by local units of government has been characterized as one of the most frequent abridgments "of the spirit, if not the letter," of the amendment.

The danger to the taxpayer of this burgeoning phenomenon [the imposition of mandatory user fees] is as clear as are its attractions to local units of government. The "mandatory user fee" has all the compulsory attributes of a tax, in that it must be paid by law without regard to the usage of a service, and becomes a tax lien of the property. However, it escapes the constitutional protections afforded voters for taxes. It can be increased any time without limit. This is precisely the sort of abuse from which the Headlee Amendment was intended to protect taxpayers. [Headlee Blue Ribbon Commission Report, supra, § 5, pp 26-27.]