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1301 West 22nd Street
Suite 906
Oak Brook, IL 60523
Tel 630.571.9393
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A Local Perspective on the Rank and Selection of Infrastructure Projects

This paper is one of six commissioned as part of the workshop, *Economic Returns to Rural Infrastructure Investment*, organized by Farm Foundation and USDA's Economic Research Service (ERS). The workshop took place April 10–11, 2018, in Washington, D.C. A seventh paper, which had already been published, was also presented at the workshop because of its high relevance to the topic.

Led by Kent Wolfe, Ph.D., and David Tanner, a team of researchers at the University of Georgia, interviewed state and local officials to identify factors that influence their decision-making when investing in rural infrastructure projects.

To read the complete paper, or any of the other six papers, visit the Farm Foundation website, https://farmfoundation.org.

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Rank and Selection of Infrastructure Projects: A Local Perspective

Authors

University of Georgia Carl Vinson Institute of Government
David Tanner, Jeffrey Robert, Victoria Tomlin, John O'Looney

University of Georgia Center for Agribusiness and Economic Development
Kent Wolfe and Tommie Shepherd

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Introduction

Purpose

This white paper provides perspective on local government agencies' infrastructure priorities and investment decisions. It focuses on the decision-making process regarding investments in

broadband internet, water and sewer infrastructure, and transportation. This paper was produced for the U.S. Department of Agriculture's Economic Research Service (ERS) and Farm Foundation's jointly sponsored workshop on "Economic Returns to Rural Infrastructure Investment," on April 10–11, 2018, in Washington, DC.

The authors took a qualitative approach, conducting interviews with state and local officials in order to identify best practices and common practices in the decision-making process. The authors also reviewed related literature to validate the insights and practices shared in the interviews. This white paper provides a practitioner's perspective on how local government officials in rural America make decisions and some of the hurdles and challenges they face due to limited resources.

The research produced the following key findings:

- The large number of organizations with decision-making authority over infrastructure spending may limit economies of scale and efficiencies in the management of infrastructure. Rural areas in New England and the upper Midwest have as many as 58 to 109 different organizations in a county with some decision power over an aspect of infrastructure spending.
- In some states, local government legal authority to operate certain utilities like broadband infrastructure is limited by state law.
- Rural communities face obstacles not faced by more urban communities including available funds, limited staff, and available expertise. Many rural local governments engage in minimal planning and risk analysis. Therefore, a large number of rural communities are reactively addressing their infrastructure needs.
- Best practices exist on how local governments should manage their capital assets and infrastructure; however, many rural communities have limited human and financial capacity to do so thorough planning and management.
- Federal and state programs do exist to help rural communities with asset planning and some maintenance needs. However, for some rural communities, just doing the planning exceeds their available resources. Ultimately, some of these rural communities cannot apply for some state and federal grants or loan programs because the communities do not have adequate funding to satisfy pre-program guidelines.
- Many rural governments focus on maintaining their existing aging infrastructure, with roads and sewer and water systems being the top priorities for maintenance and infrastructure spending. Local officials observed that there are numerous sources of grant funds for capital projects, but few external fund sources for routine maintenance of the assets after completion.
- Many rural areas across the country have declining populations, limiting the ability for rural governments to finance infrastructure because of a potentially shrinking tax base.
- Economies of scale to build and finance infrastructure systems can be achieved through intergovernmental cooperation such as joint authorities and intergovernmental agreements for sewer and water systems. Incentives from state or federal funders could be used to encourage local collaboration and economies of scale.
- Maintaining roads is a top priority for rural counties. Heavy equipment and loads from the agriculture and mining and extraction industries often disproportionately affect rural roads. In one case, in a rural county with population of a mere 14,000 residents, researchers estimated the experienced wear and tear on its roads was roughly equivalent to that of 722 million passenger car trips a year.

- Infrastructure projects are often financed by pooling a mix of local, state, and federal funds. For smaller localities, local matching funds are often difficult to find in their smaller budgets.
- Locally elected decision makers tend to rely on their department and agency staff for decision support and less on economic or financial models.
- Decision tools used by rural governments include rating criteria, needs assessment data, funding plans, and financial forecasts.

Background

Across the nation, local governments, both large and small, are confronted with choices about maintenance, replacement, and expansion of infrastructure. The United States spends more than $400 billion on infrastructure each year; however, this is still not enough to cover needed maintenance, which is often deferred due to high costs and a lack of funding (Schwartz et al., 2017). By one estimate, transportation infrastructure requires an infusion of $160 billion to make up for deferred maintenance needed for roads and highways. Water-related infrastructure requires approximately $1 trillion for maintenance and expansion (Schwartz et al., 2017).

Local governments, which provide most of the funding for infrastructure improvements and development, largely feel the financial strain related to infrastructure. In the 2015 Menino Survey of Mayors, when asked about the greatest local challenge that also poses a state or federal concern, almost 50% of mayors cited infrastructure in their answers (U.S. Conference of Mayors, 2016). A recent International City/County Management Association (ICMA) survey showed that 42% of local governments feel that more local, state, and federal funding is needed to maintain the current infrastructure and that a lack of funding affects local residents' quality of life. Of those surveyed, 45% would prefer additional infrastructure funding, and only 13% felt that their current infrastructure meets the community's needs (ICMA, 2016).

To finance local infrastructure, local officials can typically draw on fund sources like the general fund (local tax revenues), fees, or debt financing through general obligation bonds or revenue bonds (see Appendix A for a list of fund sources). Depending on the state, other alternative financing tools are also available to local governments. DuPuis and McFarland (2016) identified five innovative financing methods for local infrastructure:

1. Local fuel option tax
2. Local-option sales tax
3. Public-private partnerships
4. Local option motor vehicle registration fee
5. State infrastructure banks

Appendix B shows the states currently taking advantage of these financing tools and how they are using them. Just three states authorize all five methods, and seven states authorize four of the five. In 18 states, legislatures have not authorized the use of public-private financing options. In 12 of the 32 states that do authorize public-private partnerships, there are limitations, or such partnerships are only allowed for road or water projects (DuPuis & McFarland, 2016).

In terms of infrastructure development, state legislatures not only authorize certain financing tools but also allow local governments to operate certain types of infrastructure such as broadband. For example, five states prohibit municipal broadband, and another 19 states restrict its formation (Sisneros & Sponsler, 2016). Tapia, Maitland, and Stone (2006) contend that incumbent providers lobbied state legislatures to prevent municipal broadband expansion. These providers claimed that municipal intervention reduced competition within the industry.

They emphasized the municipal authority's ability to draw upon tax reserves from the entire community and claimed that municipal competition would reduce innovation.

In addition to legal authority affecting how local governments make decisions about infrastructure, the number of local governments that can make decisions about infrastructure impacts overall operational efficiency and economies of scale. This paper discusses the reality of rural government decision-making processes compared to best practices in capital budgeting and asset management. The paper also explores typical revenues used to finance infrastructure and how rural governments prioritize capital expenditures. Case studies are also provided that illustrate the local decision processes with a specific focus on broadband, water and sewer, and transportation.

Methodology

This project involved a three-step qualitative approach. First, the authors reviewed publications and articles related to managing the governmental budgeting process and interviewed experts in local finance, capital budgeting, and grant-making. While this literature is important for understanding the context in which local governments operate, the paper is not intended to be a review of the extensive library of resources—decision guides, publications on best practices, templates for administrative rule-making and governmental budgeting, and so forth[1]—available to governments. Most of these resources focus on documenting costs (construction and maintenance), benefits (delivery of public services), and revenue sources, and then incorporating this information into a comprehensive prioritization and formal decision-making process. Instead, the authors were interested in the realities of actual infrastructure spending decisions by government officials in rural areas. In contrast to textbook examples of best practices, these realities often include insufficient funding for infrastructure projects, high levels of deferred maintenance, and a lack of the technical expertise and manpower necessary to adequately implement many prescribed best practices.

Second, county-level data on economic status (as defined by the Appalachian Regional Commission's County Economic Status in Appalachia[2]), population change, labor force participation, and median household income were examined for all counties in the contiguous United States to identify areas of interest in terms of infrastructure, with an emphasis on rural counties. The authors examined spending patterns by infrastructure category — roads, water/sewer, electricity, etc. — across various types of rural governments, such as counties, cities, and townships. Using data from the U.S. Census of Governments (2012), the authors also examined the number of individual decision-making entities in each county, such as general-purpose governments and infrastructure authorities specific to water/sewer, transportation, and so on.

A map depicting the economic status of U.S. counties was compared with a map of rural population change. Rural counties whose population grew between 2009 and 2016 were of

[1] The Government Finance Officers Association is a good initial resource and maintains a library of best practices at www.gfoa.org/best-practices.

[2] The authors adapted the Appalachian Regional Commission's County Economic Status in Appalachia method to calculate the economic status of all counties in the United States. See Appendix I for more information and a county map. "At-risk" counties are those at risk of becoming economically distressed. They rank between the worst 10% and 25% of the nation's counties. "Distressed" refers to counties that are the most economically depressed counties. They rank in the worst 10% of the nation's counties.

particular interest because they were more likely to have faced significant infrastructure spending decisions. Local government officials in these areas were identified through local government websites, professional associations, and conversations with state agencies. Counties that bordered other economically at-risk or distressed counties were of special interest, as their infrastructure spending decisions could be compared to those of their underperforming neighbors.

Using the data and the U.S. Department of Agriculture (USDA) regions, the authors identified one county for interviews in each of six states: Texas, California, North Dakota, Nevada, Florida, and Iowa. The authors also interviewed municipal government officials in the city of Apalachicola, Florida; Waynesboro, Georgia; Douglas, Georgia; and McMillen County, Texas. Interviews were conducted over the phone using a set of open-ended questions prepared by the authors. Officials were also asked to imagine how they would spend a windfall of new funds in their community.

These decision makers discussed the process for prioritizing spending on infrastructure, specifically broadband, water/sewer, electricity, and roads. Particular attention was paid to the choice between constructing new infrastructure and maintaining existing infrastructure, criteria for prioritizing spending across broad categories of infrastructure, projects within individual categories, assessing public needs, and various financing alternatives. Interviewees were also asked to discuss challenges related to funding, grant writing and management, regulatory compliance, seeking public input, and complying with best management practices.

Individual interviews typically lasted 30–60 minutes. Interviews were not recorded, but the interviewers took notes during the conversations. Interview notes were then compiled and analyzed by the authors as a group, in order to arrive at a consensus as to the general ranking and prioritization process used by interviewees as well as to select case studies representative of infrastructure issues facing rural America.

Third, the authors interviewed other government decision makers for the research. These interviews included officials from six counties in Georgia, four state officials in Georgia, and local officials in Ammon, Idaho; Thomasville, Georgia; and Traverse City, Michigan. Local government grant administrators at the Utah Department of Workforce Services, Housing and Community Development Division; the Texas Department of Agriculture, Office of Rural Affairs; the State of Louisiana, Division of Administration; the Office of Community Development, Texas Panhandle Regional Planning Commission; and the Arkansas Economic Development Commission were also interviewed. Subject matter experts in capital budgeting and local government finance at the Carl Vinson Institute of Government at the University of Georgia were also interviewed. All interviews were conducted by the authors between February and May 2018.

This paper provides a number of examples from Georgia due to researcher familiarity. Examples from other states are included based on interviews and case study research.

Decision-Making Process

The Organizational Context for Infrastructure Investment

Contextual factors affect local communities' ability to manage the infrastructure investment decision-making process. Chief among these factors are the number of independent organizations that have some decision-making power over local infrastructure. This section

surveys the following contextual factors that can affect infrastructure investment: whether these organizations are aligned with public or private organizations, an organization's size and level of capitalization, and the scope and scale of each organization's responsibilities and the nature of their interrelationship.

Number of organizations. As the number of organizations responsible for infrastructure investment increases, the ability to coordinate investment decisions and choose the best or most cost-effective investments becomes increasingly complex and difficult. Figure 1 shows a rural county-by-county breakdown of the number of public organizations with a role in infrastructure investment decisions across the United States. Rural counties are defined as the nonmetro counties by the USDA Economic Research Service County Typology Codes. Nonmetro counties are outside the boundaries of metro areas and have no cities with 50,000 residents or more.[3] Figure 1 shows that rural counties in the Northeast and upper Midwest have significantly more organizations involved in infrastructure investment decisions than counties in the Southeast and West.

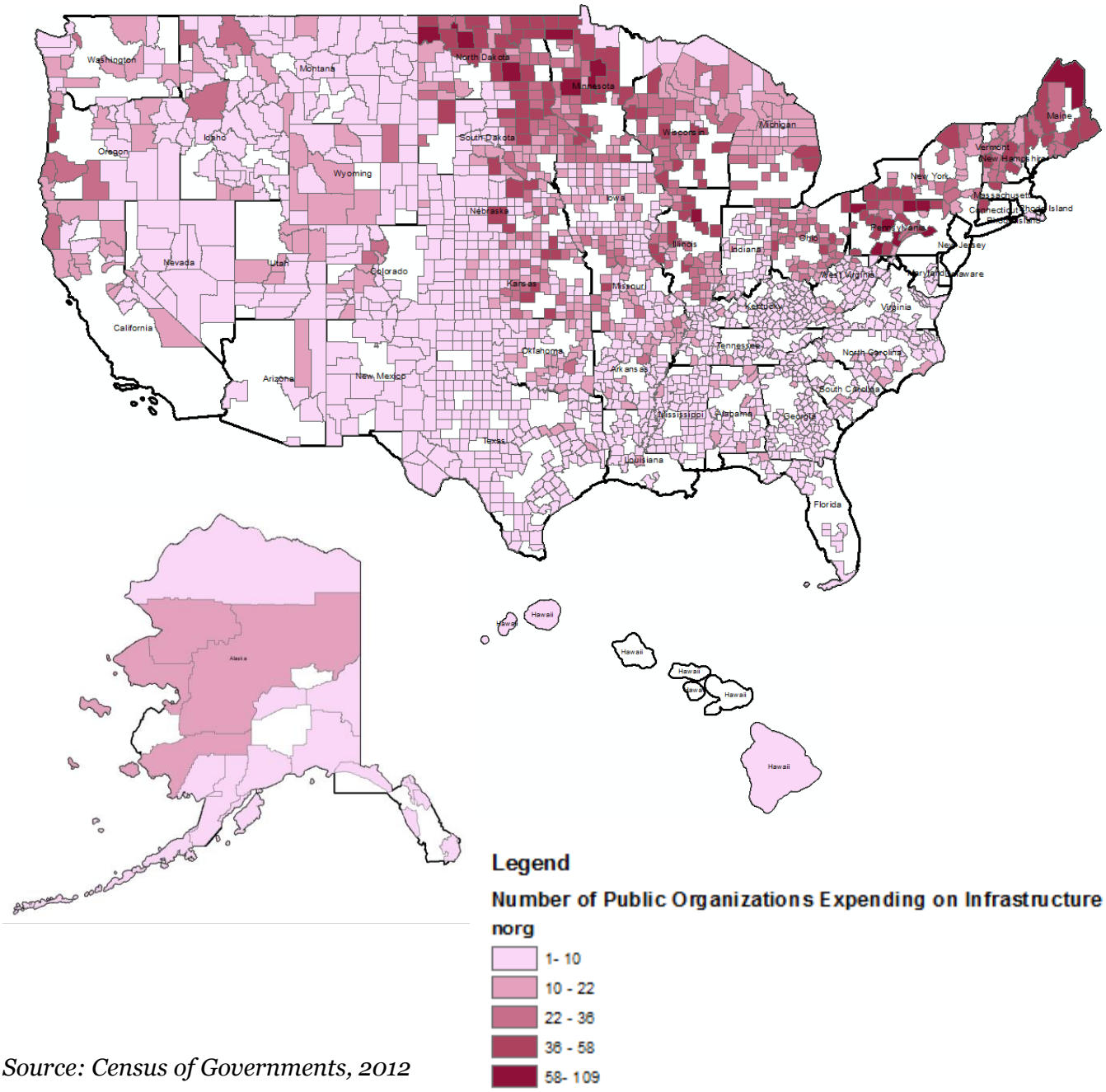
Interviews with local government officials in Georgia and Michigan provided additional context for the challenges and some efficiencies related to the number of public organizations with responsibility for infrastructure. In Michigan the number of organizations has its roots in the formation of the state. The Northwest Ordinance of 1787 created a system of land division where a maximum of six square miles consisted of a township. As a result, there are over 1,200 townships in the state of Michigan, with 477 cities, special districts, and other authorities. Thus, Michigan has many layers of local government.

Traverse City, with a population of 15,000, is a "full-service" city, meaning the municipality provides a wide range of services to residents. The city must partner with surrounding local governments to provide these public services. Using memorandums of understanding (MOUs) and contracts, the local governments reduce duplication of capitally intensive infrastructure investments. However, coordinating infrastructure between other local governments is more challenging. It requires longer planning time periods prior to the completion of projects and necessitates more administrative oversight on behalf of all parties. From a personnel time commitment standpoint, increasing the number of local entities involved in a municipal infrastructure project increases administrative cost and the duration of the project (M. Colburn, personal communication, May 8, 2018)

By contrast, Thomasville, Georgia, with a population of 18,400, offers a wide range of municipal services: water, sewer, electricity, and broadband services in addition to fire and police. Even though each utility provides services under the sole umbrella of the municipality, each utility service is an independent operation with specific priority needs, budgets, and revenues. A single government running all the utilities means better coordination across each service, human capital savings, and better efficiency. Multiple utilities can share support staff such as financial services, human resources, information technology/technical services, and fleet services. Each enterprise fund pays a portion of these support service budgets according to an internal services formula. As a result, each municipal utility has access to a greater range of support services at a fraction of the cost (S. Sykes, personal communication, April 26, 2018 & C. White, personal communication, April 26, 2018).

[3] United States Department of Agriculture, Economic Research Service County Typology Codes. Found at: www.ers.usda.gov/data-products/county-typology-codes

Figure 1. Number of Public Organizations Involved in Infrastructure in Rural Counties



Source: Census of Governments, 2012

Types of organizations. The terms "public" and "private" apply to most organizations involved in infrastructure investment. In some states and communities, water, sewer, gas, and electric utilities are primarily the responsibility of private sector entities, while in other states and communities they are operated by governmental bodies. Even within governments, there are different organizational types — cities, counties, townships, special districts, and authorities — each with different powers, scopes of responsibility, service areas, and fiscal capabilities. In rural areas, just over 50% of infrastructure spending occurs in municipalities. Counties and special districts account for another 40% (see Table 1 in Appendix F).

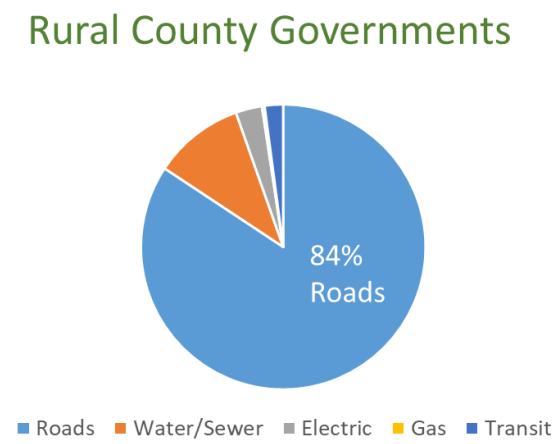
Scope of responsibility. "Scope of responsibility" refers to the number of different infrastructure types under the purview of an organization. For example, a general-purpose local government that supplies water, sewer, gas, electricity, broadband, and road infrastructure has a wide scope, whereas a single-purpose water authority has a narrow scope. One state official shared that local governments that manage multiple utilities within a single enterprise fund have more flexibility than those that only manage one utility or service. If needed, revenue from one service could help to fund needs related to a second service (Georgia Department of Community Affairs representative, personal communication, 2018). To promote community value, decisions about infrastructure investment would involve a broad assessment of needs spanning infrastructure investment possibilities of all types. Ideally, the infrastructure investment with the highest possible return on investment based on a specified set of criteria would be given highest priority. When the scope of government responsibility is fractured with likely competing priorities, however, such a broad assessment is much more difficult to execute.

In an analysis of U.S. Census of Governments data conducted for this study, the authors identified the number of functions (e.g., water, sewer, gas, electric, roads, transit) on which rural counties in each state reported expenditures. This analysis suggested several trends in which types of governments tend to take responsibility for particular types of infrastructure spending. Municipalities and special districts are more likely to provide water and electric utilities, while county and township governments are primarily responsible for roads. Figure 2 highlights the different levels of spending by rural county governments compared to rural municipal governments. According to 2012 U.S. Census of Governments data, rural city governments' spending on infrastructure typically goes to water and sewer (36.5%) or electricity (39%) (See more data in Appendix F). Rural county governments report spending 84% of their infrastructure dollars on roads.

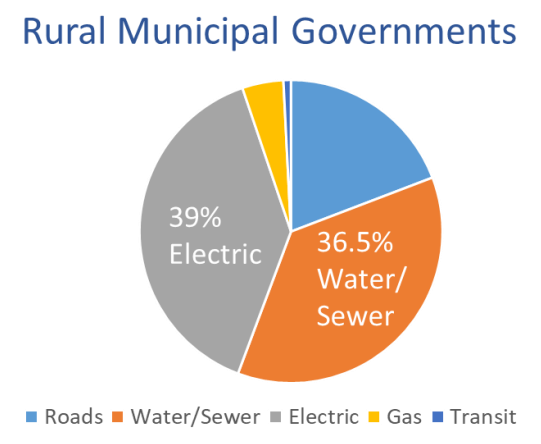
Consistent with this analysis, the 12 county representatives interviewed said they maintain less infrastructure than cities and that the infrastructure the counties do maintain is mostly roads and bridges, which includes paving, striping, and maintaining shoulders and rights-of-way. They indicated that very little of their infrastructure spending goes to other areas as they do not have water and sewer facilities or utilities. Of the 12 county representatives interviewed, only two indicated that they have water and sewer facilities that need maintenance. Water, sewer, and other utilities are both owned and operated by the municipalities in the counties or run by a private enterprise.

The municipal representatives interviewed indicated that they spend between 75% and 80% of their infrastructure spending on maintenance and upgrades. The remaining money is spent on new construction. The department heads play a big role in spending decisions as do preliminary discussions with citizens. The city representatives indicated that the majority of their spending is related to water and sewer, with some road expenses.

Figure 2. Comparison of rural county and municipality spending on infrastructure



Rural County Governments Spending		
Type	Total Spending (in thousands)	Percent of Grand Total
Roads	$624,324,580	84.3%
Water/Sewer	$76,509,640	10.3%
Electric	$22,020,620	3.0%
Gas	$1,857,600	0.3%
Transit	$15,922,720	2.1%
Grand Total	$740,635,160	100.0%



Rural City Governments Spending		
Type	Total Spending (in thousands)	Percent of Grand Total
Roads	$360,259,060	19.2%
Water/Sewer	$686,147,460	36.5%
Electric	$735,247,840	39.1%
Gas	$83,138,760	4.4%
Transit	$15,785,160	0.8%
Grand Total	$1,880,578,280	100.0%

Source: Census of Governments

To test the difference between how spending in rural counties may differ based on the authority and funding that states give to local governments to provide infrastructure intensive services, the authors analyzed spending data from the Census of Governments for rural counties in Nebraska and Kansas. A comparison of infrastructure spending by rural counties in the two states in the "All Infrastructure" category, the authors found a substantial divergence between the two states. Nebraska rural governments spend approximately 3.31 times the amount that Kansas rural county governments (of all types) do on a per capita basis. When we looked into the individual infrastructure types, the difference in per capita spending in rural counties spending in the two states for road, water and sewer were not substantial. However, the differences in per capita spending on gas and electric utility spending between the two states was quite substantial, particularly for electric utility spending which was approximately eleven times greater in Nebraska than Kansas. This difference can possibly be explained by differences in infrastructure spending at the state level. However, the authors found little difference between the states in state-level spending on all types of infrastructure per capita. A more likely explanation is Nebraska's being an "all public power state" with provision of services coming from municipal electric systems, public power districts, or cooperatives.[4] Alternatively, rural counties in Kansas may be receiving services like electricity from private cooperatives rather than public organizations.

[4] Of the 33 members of the Nebraska Rural Electric Association, 24 are organized as public power districts or rural public districts, and nine are organized as cooperatives. See nrea.org

Figure 3. Comparison of Rural Local Government Infrastructure spending in Nebraska and Kansas

Rural Counties Expenditures	
All Infrastructure Types	
NEBRASKA	$181.01
KANSAS	$54.68

Source: Census of Governments, 2012

Economies of scale and scale of investment capability. Of all government functions, infrastructure intensive functions like utilities (water, gas, electric, broadband) and transportation services tend to be the most capital-intensive. These are also the functions where the economies of scale are much greater than other typical local government services such as parks and recreation or public safety. As a consequence, small governments in places with few residents and customers are at a disadvantage when it comes to making cost-effective investments in infrastructure. The case study section of this report profiles two water infrastructure projects where governments cooperated to have the needed economies of scale for the projects to be successful.

Geographic area of responsibility. When multiple types of organizations are responsible for community infrastructure, the geographic overlap of areas of responsibility can impact the ability of stakeholders to collaborate on infrastructure investment. When there is little overlap or only partial overlap, the incentives for collaboration may be too weak to be effective.

Summary. Contextual factors create a spectrum of different decision-making environments. At one end of the spectrum is a community where all major infrastructure is the responsibility of one or two general-purpose local governments that have congruent service areas so that community investments can reach the scale needed to be cost-effective and planning can be coordinated. In such a situation, needs assessments can be made across all possible investment areas to identify the investments with the greatest potential for returns. Similarly, planning for joint or coordinated projects (e.g., replacing power lines or storm water pipes simultaneously with road improvements) can be easily done. At the other end of the spectrum, multiple relatively small public and private sector organizations have various shares of responsibility for different types of infrastructure. Geographic service areas may also be incongruent, and the provider organizations may be unable to reach economies of scale.

While a complete assessment of the organizational context for infrastructure investment is beyond the scope of this paper, the map in Figure 1, which shows the number of public organizations involved in infrastructure investment, indicates that these contexts vary greatly across rural counties in the United States. As the number of organizations involved increases, so does the likelihood of other challenges, such as the involvement of more and different types of organizations, a more diffuse scope of responsibility, more incongruent geographical service areas, and fewer organizations reaching economies of scale.

Best Practices in Local Decision-Making for Infrastructure Projects

A long line of theoretical and empirical literature has identified best practices in decision-making for local governments. Although this paper is not intended to restate information documented by professional organizations and practitioners, to have a proper perspective, a general understanding of best practices in decision-making is necessary. Established best practices for local government (both county and municipal) decision-making provide a foundational framework with which to evaluate how well a local government ranks and selects infrastructure projects for investment.

Local decision-making components

1. Needs assessment
2. Capital improvement plan and other planning documents
3. Public input and support
4. Revenue and expense considerations
5. Capital budget
6. Scheduled list of projects: maintenance, replacement, new

Needs Assessment. Governments that employ best practices inventory their assets regularly, assess their needs, and then determine options to address the needs. They then quantify the cost of each option and forecast future-year obligations connected to the asset. A needs assessment considers the condition, useful life, and age of the asset. The needs assessment process may include a formal asset management plan.

These asset management plans should include a survey of the current condition of infrastructure assets and a timeline for rehabilitating, repairing, and replacing assets as well as the associated costs (U.S. Environmental Protection Agency [EPA], 2012). The EPA suggests that local governments ask five key questions when creating an asset management plan:

1. What is the current state of the system's assets?
2. What is the required sustainable level of service?
3. Which assets are critical to sustain performance?
4. What are the minimum lifecycle costs?
5. What is the best long-term funding strategy?

Answers to these questions can help governments create a repair-and-replacement schedule for current infrastructure assets. This strategy enables local governments to get an overview of their assets and plan how best to manage them. Asset management helps with prioritizing projects and ensures that infrastructure remains operational without any system failures caused by deferred maintenance.

Asset management involves taking a preventative rather than a reactive approach to planning. In other words, the government uses a system to plan for the repair and replacement of infrastructure assets over their lifetime rather than waiting for them to break or wear out (Cromwell, Nestel, & Albani, 2001). The flowchart of decisions in Appendix E shows this proactive approach to planning. Many municipalities instead have long used the reactive approach outlined in the decision-making flowchart in Appendix D. The result is often increased infrastructure costs. As a best practice, the EPA suggests that governments look at the following five core areas when creating an asset management plan: the current state of assets, level of

service, critical assets, minimum lifecycle costs, and long-term funding plan (Figure 1, Appendix I).

One challenging decision that policymakers must make is whether to prioritize maintenance spending or building new infrastructure assets. Municipal funds allocated to maintenance cannot be used to purchase new community assets. New community infrastructure assets require maintenance appropriations after construction.

Capital improvement plan and other planning documents. The capital improvement plan (CIP) lists capital projects anticipated over the course of the next five to 10 years. It is the local list of priorities. Data from the asset management plan and staff reports on the condition of assets and their recommended maintenance schedules inform the CIP. The CIP lists all assets that need to be repaired and replaced as well as new infrastructure that is needed. After creating a CIP, local officials would then invite the public to comment and provide feedback on the priorities outlined in the CIP. As part of the CIP, officials would determine the best funding source to meet the need.

The CIP should be created from an asset management plan that allows for project prioritization (W. Clarke, personal communication, March 13, 2018). A capital improvement plan helps officials think long term about infrastructure priorities and then develop a budget accordingly.

Many rural communities rely on grants to build infrastructure assets, but they often cannot afford to save for the inevitable maintenance of the newly installed assets (G. Bioke, personal communication, March 5, 2018). If maintenance funding is not in the plan or capital budget, the infrastructure slowly degrades until it falls into disrepair; at this point, municipal managers attempt to obtain grants for its repair or replacement.

In addition to the asset management plan and the CIP, the following planning documents are considered best practices to guide local governments' rank and selection of infrastructure:

- **The comprehensive plan** usually defines a community vision out 25 to 50 years. It is revisited and revised every five to 10 years to update the community's assets, aspirations, and challenges. At least in theory, it sets the goals for all of the other plans and actions that follow. For instance, the CIP should be specifically tied to the goals of the comprehensive plan and the future land use map that it contains.
- **A debt management plan** provides written guidelines, allowances, and restrictions that guide the debt-issuance practices of state or local governments, including the issuance process, management of a debt portfolio, and adherence to various laws and regulations (Government Finance Officers Association).

In Georgia, comprehensive plans are complemented by service delivery strategies (SDS). The SDS ensures that entities are not making redundant and wasteful infrastructure investments. It requires that service providers agree to the boundaries of their respective service areas. Both the comprehensive plan and the SDS are required in Georgia to be eligible for grants and loans managed through eh Department of Community Affairs.

Public Input and Support

Public input is necessary for the continued success of infrastructure deployment and government service renewal. Governments that follow best practices encourage the public to comment and provide feedback on the priorities outlined in the CIP. The joint dialogue between the public and the government fosters mutual understanding of needs and enhances community partnerships.

Revenue and Expense Considerations

Local governments use a variety of federal, state, and local revenue sources to fund infrastructure. Common federal sources include Community Development Block Grants (CBDG), Economic Development Administration (EDA) public works funds, and Department of Agriculture (USDA) grant and loan programs. State grant and loan programs for infrastructure vary by state. A detailed view of typical categories of revenue sources is provided in Appendix A. Tax sources include sales tax, income tax, property tax, and special-purpose local-option sales tax (SPLOST). Authorization for local governments to use certain types of revenue and financing methods varies by state. Municipal officials interviewed for this project indicated that capital expenditures recently have come from SPLOST funds.

Fees collected for services have increasingly become popular sources of revenue as more and more jurisdictions implement user fees rather than new taxes. Impact fees assessed on new development to pay for the cost of new infrastructure are becoming increasingly common. Storm water fees are also used to provide specific infrastructure to identified areas. Debt financing is a long-standing option that usually comes in the form of general obligation bonds or revenue bonds.

Business improvement districts or community improvement districts are also mechanisms to fund infrastructure. These kinds of special districts are often created to enable economic development. This was the case in Ammon, Idaho, where a special district tax was used to fund broadband expansion (see case study on page 18).

Public-private partnerships between local governments and private firms are another financing strategy (Chen, 2017). There are four types of partnerships that differ based on the private firm's investment level and type. In a design-build (DB) partnership, the firm assists in designing and building the project. In a design-build-operate-maintain (DBOM) partnership, the firm assists in the operation and maintenance of the project in addition to the DB partnership design and build requirements. In a design-build-finance-operate-maintain partnership, the private firm helps with the design, build, operation, and maintenance of the project and assists in financing it. In the final public-private partnership type, a concession, the private firm simply gives an upfront payment to assist with the infrastructure project. In the case of a concession, the concessioner's return on the project is paid out typically in installments through tolls, fee revenue, or payment from a government.

Finally, donations through crowdfunding sources or from private or nonprofit partners can be used to fund infrastructure projects (Chen, 2017).

Local governments evaluate the requirements of each fund source and determine which source or combination of sources is best. As one state official noted, gathering input from citizen groups on infrastructure priorities can also be coordinated as part of a SPLOST vote process (in states that authorize SPLOST). Citizen groups can become key advocates for a new tax if they understand what the funds will be used for and they had input on what items are on the list. One enterprising local government included an item for strategic economic development projects in its SPLOST list. These funds helped the government respond quickly to opportunities and became a source of matching funds for infrastructure grants (Georgia Department of Community Affairs representative, personal communication, 2018).

Capital budget. A capital budget identifies and balances revenues or other financial resources and spending for the acquisition or construction of major capital projects or assets (Vogt, 2012). Policymakers are often challenged when it comes to deciding whether to prioritize maintenance spending or building new infrastructure assets. Municipal funds allocated to maintenance

cannot be used to purchase new community assets. New community infrastructure assets require maintenance appropriations after construction to prolong the life of these assets. A capital budget helps officials think long term about these trade-offs and then develop a budget accordingly.

Typically, governments categorize capital budget expenditures in the following ways:

- Maintenance: funds for routine upkeep of the asset and maintenance to extend the useful life of the asset. Some jurisdictions also budget funds to meet regulatory requirements, such as the Americans with Disabilities Act.
- New: funds for expenditures to add additional capacity or new assets to the community.
- Replacement: funds for replacement of existing assets. Once an asset has run its useful life, the capital budget may cover replacing the asset.
- Contingency: funds available for emergencies.

Many rural communities require grants or dedicated funds from private entities to build infrastructure assets. It is common for a developer of a subdivision or business park to put in the storm water infrastructure, sewer and water lines, and street lighting and to pave the streets. These costs are then included in the price of the new homes or office space. However, these assets are typically turned over to the local government to maintain. Often these rural local governments cannot afford to save for the inevitable maintenance of the newly installed assets (G. Bioke, personal communication, March 5, 2018). If maintenance funding is not in the plan or capital budget, the infrastructure slowly degrades until it falls into disrepair; at this point, public managers attempt to obtain grants for its repair or replacement. In rural Jones County, Georgia, municipal leaders prioritized the construction of a water tank and saved tax revenue monthly for its future repair (G. Bioke, personal communication, March 5, 2018). This budgeting process accounted for future maintenance expenditures in current ongoing operations. It reduced the impact of taxes and service costs on residents as the infrastructure aged.

When discussing the funding and financing of infrastructure, it is best practice for local governments to have a capital budget that is informed by the asset management plan and the CIP. Capital budgets allow governments to plan and budget for long-term, expensive projects. A review of state guidelines and requirements indicates that to qualify for many state and federal grant and loan programs, local governments must meet certain criteria or requirements. Typically, the government must have a comprehensive community plan, a CIP, and a debt management plan. For some rural communities, just doing the planning exceeds their available resources. Ultimately, these rural communities cannot apply for some state and federal grants or loan programs because the communities do not have adequate funding to satisfy pre-program guidelines.

To achieve higher efficiency, rural local governments can invest resources in written budgetary policies. Specific, measured targets written into policies can reduce political intervention and ensure the government funds appropriate infrastructure investment. A report or scorecard allows managers to highlight critical areas for funding. Policies must be specific and measurable and have associated actions. Well-developed budgetary policies guide efficient decision-making (J. Hulsey, personal communication, February 23, 2018).

Moreover, effective municipal budgeting includes maintenance spending within the CIP. Superior public budgeting allocates funds to maintain the condition of assets. If funds are not apportioned annually for maintenance, the preservation of those assets becomes deferred. Communities spend millions of dollars constructing assets that span generations of residents,

but years of deferred maintenance reduces infrastructure quality, its overall benefit to the community, and the useful life of the asset.

Scheduled List of Projects: Maintenance, Replacement, New

According to the local government officials interviewed, infrastructure prioritization begins with community safety. For governments that provide sewer and water service, raw sewage and its unsanitary disposal takes priority over most other infrastructure spending. A close second priority is clean drinking water and any disruption of service is an immediate priority. After these necessities, in fiscally constrained budgets, various economic development initiatives are prioritized based on local support. For example, in most communities, residents understand the need for a vibrant employment base and infrastructure investments, which increase employment opportunities (G. Bioke, personal communication, March 5, 2018).

When prioritizing infrastructure projects across categories, it is best practice to use a decision-making matrix to rank projects based on a point system (J. Hulsey, personal communication, February 23, 2018). Higher point-earning projects receive priority. For example, the City of Suwanee, Georgia, developed the matrix shown in Appendix C. Points are assigned based on categories: funding source, legal mandate, public health and safety, implementation feasibility, operating budget impact, percentage of population served, preservation of facilities, project life, conformity to city plans and goals, department plans and goals, recreational/ cultural/aesthetic value, and frequency of use. Top consideration is given to projects with an existing severe hazard, court decision, or regulatory requirement that must be funded and completed; these are denoted by an asterisk in the matrix. The next highest number of points is given to funding source, legal mandate, public health and safety, implementation feasibility, preservation of facility, and department plans and goals, ensuring that these are given higher priority in the ranking process.

Best Practices Versus Reality in Local Decision-Making

The decision-making process by rural public officials ranges from straightforward and simplistic to more time intensive activities including asset planning, public hearings and focus groups. In some rural areas with few government staff and elected officials, staff or department heads bring recommendations to the city/county manager or council/commission, depending on the local government structure. From there, a decision is made. A few smaller counties indicated that the elected officials make the decision on infrastructure spending with little input from staff or experts. For example, officials from one county in south Texas said that four commissioners and the county judge (a role similar to a county commission chair) decide where to spend infrastructure dollars. This particular county does not hold public forums or have an advisory committee because the officials feel they are in touch with their constituents and the county's needs. Other local governments rely on feedback from their constituents by fielding complaints and suggestions. They rely on the residents to bring issues to their attention and then they address those issues as their budgets allow.

Governments in counties with small populations rely less on formal hearings at council/commission meetings to gather the input of residents and stakeholders. Instead, elected officials monitor the pulse of the community. Leaders in these counties feel they know their residents and are able to learn what is needed and what the major concerns are. Other counties have decision processes that engage citizens and other stakeholders. For example, according to an official from one county government in the Midwest, in order to involve stakeholders, a

public meeting is held with the county engineer, the county manager, and any other interested parties. Those in attendance discuss what the road crews are doing and any road and bridge maintenance issues. The media are always invited, and the official said that they do a good job of getting this information out to the public. If a major issue is under discussion, the local government may hold focus groups with local citizens to determine how the public feels about the issue.

The methods that rural local governments use to rank projects vary. Public input seems to rank low in importance when deciding how to spend infrastructure resources. As one county manager put it, "It's not that we do not value the public's input, but the commissioners' decisions reflect the citizens' desires and are not directly provided to the county government." Staff or department heads provide much of the information used to drive infrastructure spending if the local government is large enough to have these departments. Of the counties represented in interviews, three have a five-year plan to inform decisions, but the plan is changed if needs arise. For the most part, in these counties, staff and elected officials are the primary decision makers of infrastructure spending. Cost-benefit analysis and other metrics are employed, but rarely.

The majority of the county officials interviewed indicated that 75-80% of their local infrastructure resources are used for maintenance, and the remaining 15-20% goes to new construction. In general, the counties rely on grant money for new construction projects. However, new construction means new maintenance liabilities that are difficult for counties to fund. Several interviewed officials wished that grant programs had resources available for routine maintenance. They lamented that there are numerous sources of grant funds for capital projects, but few to none for maintaining those assets after completion.

For example, officials in one county indicated that the process for prioritizing maintenance and new investments in infrastructure depends on the availability of new capital. If the county gets new state or federal grant dollars, it will invest in new infrastructure projects. However, without that infusion of new money, the county is in "maintenance mode."

The county officials interviewed generally indicated that if their government ever received a windfall of resources for infrastructure, the money would be spent first on roads and bridges and secondarily on a courthouse or jail expansion. A few respondents said that such a windfall would be used to help fund a large needed project that currently did not have adequate funding. Municipal officials interviewed indicated that additional revenue would be spent on water and sewer, roads, and telecommunications. It is common for a local government to pool a mix of funds from local, state, and federal sources to fund a single infrastructure project (Georgia Department of Community Affairs representative, personal communication, 2018). If a small windfall of funds were available, the county officials interviewed said they would generally look at what short-term investments appear to best serve the greatest short-term need. If the funds were recurring, they would allocate the funds for an ongoing project or need, like road maintenance or fire or emergency medical service equipment replacement. When asked about infrastructure on their wish list, most county officials stated that they would use the money for roads and bridges; two indicated that they would like to have broadband because the private providers were not able to keep up with the population growth; and several noted that new sewer lines were needed.

Case studies

This section uses case studies to provide additional perspective on how local governments make infrastructure decisions. Three areas of infrastructure are highlighted: broadband, water, and transportation.

Broadband

Access to broadband technology is becoming increasingly important in a variety of industries, including health care, education, and agriculture. Communities attempting to provide broadband infrastructure face challenges ranging from political barriers to technical requirements. For a rural community to offer broadband as a utility, it must first be in a state that allows municipalities to provide the service. Broadband efforts require years of planning, and a multitude of regulatory hurdles must be overcome. One key to success for municipalities, that implement broadband, is public support. Municipalities typically must hold numerous community forums before they are eventually able to pass ballot measures incorporating a municipal broadband authority. Strong leadership is also pivotal to the successful formation of a municipal broadband service.

The cost of broadband infrastructure is one of the main deterrents for many communities. However, a 2017 Harvard study that examined internet speeds and the relative costs of those services to the community found lower four-year average prices for municipally owned broadband services compared to incumbent providers. Municipally owned internet provider prices for the slowest FCC-defined broadband package were an average of 2.9 to 50% less than a similar service through incumbent providers (Talbot, Hessekiel, & Kehl, 2017).

Customer choice is what separates broadband infrastructure from electricity or sewer/water municipal services. All municipal customers desire clean drinking water, and electricity remains a single commodity product. However, broadband internet has different requirements. Customers demand different service levels, leading to operational challenges and new pricing strategies.

Case Study: Municipally Operated Broadband

Two case studies illustrate the process municipalities undergo when creating their own broadband networks. The first is Thomasville, Georgia, located in rural southern Georgia near the Florida-Georgia border. The second is Ammon, Idaho, in the southeastern part of the state. Interviews were conducted with rural community members to determine municipal prioritization and why the community chose to develop a municipal broadband network. To preserve confidentiality, all individuals' names have been removed from the text.

Thomasville, Georgia

Thomasville, Georgia, is the county seat of Thomas County and has a population near 19,000. The population density of the area is 1,200 people per square mile. The five-year 2012–2016 Census Bureau estimate for median household income was $31,699, with a 26% poverty rate (U.S. Census Bureau, 2016). Even though the area is rural, it has had a successful municipal broadband network since the late 1990s.

According to managers, the primary focus of local budgetary prioritization was citizen need, and this drove the effort to create a local broadband infrastructure. In Thomasville, the existing service provider was underserving residents. "[There was] a great bit of disparity in what customers would pay for internet connectivity," said one municipal manager.

The road to municipal broadband in Thomasville began in the early 1990s. The local IT committee of the city council began to question the lack of telecommunication service in the area. At that time, Thomasville was a full-service provider of utilities and governmental services to all residents, including electricity, sewer, and water. This sense of municipal provision and the skills of utility operators coalesced into the formation of a municipal broadband plan when the community asked the town to begin a telecom service. All sectors of the community were represented in a community forum. School leaders, business owners, and residents all wanted Thomasville to provide telecom services.

Prior to the municipal intervention, internet connection speeds were either too slow or too costly. One town manager claimed that the T-1 lines, which are direct fiber optic lines to a business, provided by an incumbent company cost three times as much in Thomasville as in more urban areas like Atlanta. In terms of rural development, municipal leaders were facing rising business costs as more and more industries began to rely on high-speed connectivity. Officials questioned why any company needing strong internet would locate in their city.

Galvanized by this question, Thomasville built its first fiber network in 1995 and connected 6,000 residents to internet service. The town's internet infrastructure connected local schools, municipal buildings, and the police and fire departments to the network. One of the successes of the Thomasville telecom expansion centered on the experiences of operating the electrical utility. Because the city owned the electricity poles, fiber optic cables were deployed through aerial construction, and 90–95% of all Thomasville fiber optic lines are now aerial. This construction technique has resulted in an $8 to $1 reduction in deployment costs. After the first few years of the project, Thomasville constructed most of its fiber infrastructure.

In 1997, the surrounding communities of Cairo, Camilla, and Moultrie asked to join the Thomasville broadband system. These cities formed a four-city broadband coalition called the South Georgia Governmental Services Authority, or SGGSA. Each city paid for the broadband infrastructure investment within its community borders, and they separately maintained their community systems. The four communities divided the necessary interconnection costs.

In 2017, SGGSA purchased the physical fiber infrastructure from each of the four communities. Services have not changed, but the authority can consolidate expenses and operate more efficiently with greater purchasing power. Today, SGGSA operates in seven counties with 400 miles of fiber and 850 miles of cable. The authority serves more than 16,000 residents with internet and cable services. In addition, 65 school facilities have access to broadband internet through the Authority's broadband service.

Initially, Thomasville acquired a local bank loan to invest in the necessary fiber infrastructure. Cairo, Camilla, and Moultrie issued long-term bonds. Though no public referendum was required to obtain local approval for municipal broadband services and funding, importantly the city council for each city was fully committed to the municipal broadband service.

Currently, local residents can obtain fast internet through the authority's provider, Community Network Services. Six different internet packages are offered, ranging in download speeds from 6 mbps to 150 mbps. According to local government officials in Thomasville, the current pricing is cheaper than the incumbent providers. At the end of each year, SGGSA returns unused portions of the broadband revenue back to each municipality. In effect, local residents are supporting their community, receiving quality internet, and supplementing local town revenue through the return of unused broadband funds.

SGGSA evaluates current investment and expansion of the infrastructure based on three drivers: population growth, lack of service to residents, and economic development. New residential

development drives the need for new broadband infrastructure. While much of Thomasville has access to broadband services, the community has prioritized connecting residents who are still without service. Economic development also requires additional broadband expansion. The municipal internet provider evaluates each business expansion project individually.

Ammon, Idaho

The city of Ammon, Idaho, is located east of Idaho Falls in the southeastern portion of the state. From 2000 to 2010, Ammon's population grew by more than 100% from 6,187 to 13,816 residents (U.S. Census Bureau, 2010). Spurred by residential growth and the need for more services, the city decided to pursue public broadband service. Two events converged simultaneously that led municipal officials to consider public broadband investment. First, Ammon had a newly constructed municipal building that required internet service. Incumbent providers would connect the building for an estimated $830,000. Second, the city's three schools needed improved internet access. In total, Ammon would be charged $70,000 per year by incumbent providers for internet service to these buildings. The municipal leaders compared the upfront costs of incumbent-provided internet for both projects, along with the annual fees associated with those services, and determined that it would be cheaper to install public broadband.

For many communities, the cost of broadband infrastructure investment can be an insurmountable hurdle. Broadband development can cost millions of dollars, and in regions with low population density, the cost per customer is unsustainable. In contrast to the private sector marketplace, where investment time periods are much shorter, Ammon officials and affiliated broadband partners recommended a different approach to finance the broadband investment. "[Communities] can self-finance [broadband infrastructure investment] if you take a longer-term view of it and look at it as a community investment" (Curri, 2017). Communities must consider broadband investment as a 20- to 25-year process. Under this financing strategy, monthly charges remain low for residential consumers because costs are amortized over longer periods.

Another difference in the financing structure between municipal broadband and incumbent providers is the profit motive. Ammon's municipal broadband rate structure is designed to break even for the town and its residents (Patterson, 2017). There is no profit motive for the town to increase service rates beyond the costs of maintenance and repairs. Replacing a profit-driven business with public provision reduces costs to residents without sacrificing service quality.

After collecting community input, Ammon began building its fiber optic infrastructure. Local officials worked with the local water utility provider to connect water wells and water monitoring sites to the fiber optic network. In exchange for the water utility paying for the infrastructure, Ammon was required to maintain the fiber optic lines. One key aspect of the Ammon project was the lack of debt financing. The city was not encumbered with debt and did not expose taxpayers to the risks of broadband default.

The broadband model of service is different in Ammon than in Thomasville. In Ammon, the municipality installed the fiber optic backbone only. Residents opt into the broadband connection to their homes. The homeowner chooses to connect their house with the fiber backbone. Once connected, residents access providers through the municipal broadband portal. Ammon does not provide telecommunications services, only the fiber optic infrastructure. Forward-thinking officials in Ammon sought to protect their broadband infrastructure from future legal challenges. They requested a judicial opinion to uphold continued municipal

broadband operations. Because Ammon does not provide retail telecommunication services and operates the broadband utility as a basic and essential service, the district court of Idaho affirmed the continued operation of the municipal broadband network. The court further cited the city's position as a provider of essential services and confirmed that Ammon is not in competition with third-party telecommunications service providers (City of Ammon, 2016).

The public broadband network connected residents for $3,000 to $3,500 each using a local improvement district (LID) bond. With this financing vehicle, residents who choose broadband own a small portion of the LID debt, which is attached to their residential property. The residents own the fiber cable to their house, and the cost of installation is attached to the property. Using the 20-year amortization schedule of the debt, residents paid $18 per month for the upfront cost of broadband installation. Similar to a sewer assessment, if a resident moves, the monthly costs for fiber connection are paid by the next owner of the property.

Maintenance costs of the fiber and the telecommunications equipment are $16.50 per connected household. Residents receive access to a portal to connect with a service provider. Internet services from third-party providers ranging in data speeds from 25 to 100 mbps with no caps cost $20 per month. In total, residents can expect to pay $55 per month for internet. According to municipal officials, even with the connection charge, residents save approximately $70 per month compared to incumbent providers. In addition, the fiber installed by the city is significantly faster for residents than a cable line as the bandwidth is not shared. Not only did costs decline for most residents, but those that connected using fiber experienced better service. There are no contract provider options, no data caps, and more service providers from which to choose.

City leaders reported that the town of 15,000 residents will be saving almost $1 million per year over the next 25 years due to the municipal broadband program. In addition, the business community has access to the fastest available internet at a reasonable cost. According to Michael Curri of Strategic Networks (2017), Ammon's small businesses with less than 50 employees are growing annual revenue by $3.7 million per year because of the public broadband network.

While the Thomasville and Ammon cases seem promising, not all municipal broadband initiatives have been as successful. Communities face many challenges to creating, operating, and successfully deploying broadband services. The debate continues as to which providers, incumbents or public entities, should be installing and operating broadband infrastructure. As mentioned earlier in this paper some state legislatures have authorized municipal broadband networks and other states have not. Some municipalities have been required to hold additional referenda or conduct feasibility studies (Tapia, 2006). Lafayette, Louisiana, spent three years and $4 million in legal fees to confirm their right to provide municipal broadband services. Eventually, the Louisiana Supreme Court sided with the city and the municipality created a broadband service for the community.

Municipalities that survey community residents and conduct feasibility studies are generally better equipped to defend their authority to offer services where state law allows. Community support continues to be paramount in the successful development and implementation of local broadband service as does having champions of the service in local positions of authority.

The organizational models used in Thomasville, Georgia, and Ammon, Idaho, can be replicated in other rural regions to extend the benefits of broadband to more rural Americans. These two case studies highlight some key factors that made broadband service provision successful. First, the jurisdictions had the authority to have a municipal broadband program. Second, both municipalities had public support and could demonstrate the benefits of going forward with the expense. Local champions were on board and helped rally support. In both cases, partnerships

were key. In Thomasville, working with the municipal power company enabled aboveground deployment using the city-owned power poles. In Ammon, by partnering with the water utility provider, the city was able to establish a network because the utility provided capital and installation sites to get the network started. Finally, officials in each community knew their business case and had done a cost comparison of building out the infrastructure themselves versus having an incumbent provider take on the project.

Water and Sewer

Water infrastructure is essential to communities, but according to those interviewed, it is the most expensive and challenging infrastructure to build and maintain. The utility must service both individual households and businesses and must accommodate the needs of water-dependent industries. Water infrastructure is essential for economic development, and disruptions to water services can be detrimental to local economies. However, many water systems in the United States are on the verge of failure due to deterioration and deferred maintenance.

In a 2009 survey by the Water Environmental Research Foundation, when water utility providers were asked about the largest capital problems they faced, the top two responses were affordability (71.4%) and material costs (71.4%), followed by timing (53.6%) and project selection (46.4%) (Olstein et al., 2009). An asset management plan can help communities quantify and plan for their water infrastructure funding, maintenance, and expansion. Local governments must create a project timeline and prioritize infrastructure projects.

According to the Water Environment Research Foundation, public input is considered a best practice when prioritizing water-related infrastructure. In Columbus, Georgia, the Columbus Water Works (CWW) used information gleaned from interviews and focus groups with stakeholders and customers to set its level of service (Bhagwan, 2009). CWW continues to monitor stakeholder and customer input through regular surveys, and updates the level of service based on demand.

According to a recent the Government Accountability Office (GAO) study, 11 of 25 small water utilities indicated that they set benchmarks or targets for performance based on customer demand (Gomez, 2016). Nineteen of the 25 had set benchmarks only to meet federal regulations, and 17 had set their performance benchmarks based on the performance of the system. Eighteen of the 25 small water utilities had identified critical assets, but only 11 had assessed the failure possibility of those assets. Fifteen of the 25 determined which infrastructure projects to fund based on which had already failed. Even among the small water utilities that had identified the possibility of failure, best practices in scoring were not used. While some used scoring cards or computer systems to monitor assets, others simply used “mental notes” to determine critical assets (Gomez, 2016). Of the county and municipal officials interviewed by the authors of this paper, several indicated that their systems are small so they informally keep track of critical assets and their current conditions.

Once critical assets and their modes of failure are identified, a maintenance strategy ensures that the highest level of service is provided at the lowest cost, or the minimum lifecycle cost (Boulenouar & Schweitzer, 2015). Of the 25 small water utilities surveyed by the GAO study, 19 performed regular maintenance, but of those 19, only nine actually knew the costs of regular maintenance and replacement of the utility assets. Only 15 had any sort of written plan for response to maintenance and replacement needs in the case of asset failures (Gomez, 2016).

To create an asset management plan, the costs of the full life of the asset system and the revenue streams need to be considered (Boulenouar & Schweitzer, 2015). Although 19 of the 25 surveyed

small water utilities had a reserve fund, only 11 had funds to cover long-term costs and capital needs (Gomez, 2016). Even more concerning, only five had written asset management plans.

Though grant programs do exist (See side bar "Federal Funding for Asset Management"), the GAO's findings are consistent with what was learned in the interviews with local officials conducted for this study: Local governments engage in little to no planning and risk analysis. Therefore, a large number of rural communities are reactively addressing their infrastructure needs.

Rural communities have less funding and flexibility to respond to failures than larger and more urban governments. Rural communities do not have the same ability as larger governments to issue bonds, and for this reason, they have difficulty funding large infrastructure projects and performing necessary maintenance (Gomez, 2015). They also do not have experts on staff to design and inventory assets and, to do so, must pay consultants. Additionally, this lack of human capital can make rural communities ineligible for some grants and loans because they do not have the technical, financial, and managerial capacity required (Gomez, 2015). In a 2015 report, GAO advised federal agencies to streamline their application processes and allow the same reports and analyses to be used in applications across agencies in order to lift the financial burden of applying for funding for rural communities and assist in asset management and technical assistance (Gomez, 2015).

Interviews supported this GAO observation that rural communities often lack the capacity—either money or staff expertise—to comply with grant application requirements. Any effort to offset the planning costs for rural communities could enable more rural communities to participate in grant programs.

Federal Funding for Asset Management

"EPA and USDA funding for asset management activities falls under various larger programmatic budget categories. EPA funds asset management in the following three categories: (1) grants to provide training and technical assistance to water utilities to improve financial and managerial capacity; (2) grants to selected public, private universities or colleges, and nonprofit organizations to provide technical assistance to communities on a range of EPA priorities, including improving financial capacity; and (3) drinking water SRF grants to states, a portion of which may be used for increasing water utilities' technical, managerial, and financial capacity. USDA primarily funds asset management activities through two programs: (1) the Water & Waste Disposal Technical Assistance & Training Grants program, which provides grants to nonprofit organizations in the 50 states for managerial technical assistance, and (2) the Circuit Rider program, which provides training and technical assistance through contracted staff called circuit riders, in each of the 50 states to provide technical assistance to small water utilities on day-to-day operational, managerial, and financial issues."

Source: GAO Report. Water Infrastructure: EPA and USDA are helping small water utilities with asset management; opportunities exist to better track results. (January 2016). https://www.gao.gov/assets/680/674816.pdf Note: see Appendix III for more details on these grant programs.

Officials of rural counties that were interviewed for this project tended not to be responsible for water and sewer systems or facilities. If such infrastructure existed, it was generally owned and maintained by the municipalities within the county. Given the rural nature of these counties, many likely relied on well and septic tank systems to handle their water and sewer needs. If

these utilities were needed for a large project, they were often able to work with municipalities to tie into their systems.

State of Georgia Approach

The state of Georgia, through the Georgia Environmental Finance Authority, helps manage state and federal funds and provides funding to local governments in the form of grants and loans related to water infrastructure. The authority meets quarterly to evaluate new requests. The authority considers projects in four main areas:

- Regulatory: compliance with consent orders, judgements, and other crises
- Maintenance: replacement and upgrades of infrastructure (not an immediate crisis)
- Economic development: opportunities related to site development usually involving enhanced sewer and water capacity to a site
- Future growth: new capacity required due to population change

Federal programs are often used to fund emergency projects that involve environmental or public health concerns, and a mix of federal and state programs are generally used for projects related to economic development (GEFA representative, personal communication, March 9, 2018).

According to GEFA officials, the two main criteria taken into account are project readiness and whether a municipality can afford the loan. GEFA considers how much debt communities can afford and then works with the communities to make adjustments to their revenue streams and the loan terms to try to accommodate them. When evaluating a project, GEFA considers the following (GEFA representative, personal communication, March 9, 2018):

- Median household income
- Unemployment
- Population on fixed incomes
- Population over age 65
- Percentage of personal income from transfer payments
- Population trends

Beyond affordability and readiness, loans are administered on a first-come, first-served basis.

Case Study: Collaboration to Increase Water and Sewer Capacity

Water and sewer services require significant investments in infrastructure and can be considerably challenging for small rural communities to provide. Numerous examples of collaboration efforts abound across the nation, as small neighboring cities and counties seek to achieve the economies of scale necessary for cost-effective delivery of service. The two case studies in this section were chosen due to the authors' familiarity with their home state of Georgia.

The Eatonton-Putnam Water and Sewer Authority

The first case study highlights how two governments cooperated to provide water and sewer services when neither could achieve economies of scale on its own. Eatonton, Georgia, is a city of about 7,000 and the county seat of Putnam County in central Georgia. The Eatonton-Putnam Water and Sewer Authority was formed in 2005 to serve both the citizens of Eatonton and rural residents of unincorporated Putnam County. During the late 1990s and early 2000s, wells in rural Putman County were running dry and the county lacked a water system of its own. In response, the county, along with neighboring Baldwin County, asked the legislature to form the Sinclair Water Authority, which would create a jointly owned water treatment plant to provide water to the two counties. To make the Eatonton-Putnam Water and Sewer Authority fiscally viable, however, it needed the customer base of both Putnam County and the city of Eatonton. The City of Eatonton owned a system that included water distribution lines, a water treatment plant, and two sewer treatment plants, but was close to running out of water. To incentivize Eatonton's participation in the Eatonton-Putnam Water and Sewer Authority and surrender most of its assets to the authority, the city customers were granted 20 years over which to be weaned from their lower rates to the eventual equalized countywide rate. County water delivery lines were installed and both city and county water infrastructure was transferred to the Eatonton-Putnam Authority, which purchases water from the Sinclair Water Authority treatment plant and resells it to Eatonton-Putnam customers.

The decision to create a new joint water and sewer authority was key to the success of the project. This brought the city and county governments together to combine their assets. The creation of the Eatonton-Putnam Water and Sewer Authority board and its structure illustrates the benefits of political compromise. The mayor of Eatonton and the commission chair of Putnam County both serve on the authority's board. Each government appoints a member to the board (which may not be a member of the governing authority of the city or county), and these four together select a fifth board member. The authority is empowered to set rates and make decisions about expansion and service provision without the consent of any other governmental entity. A quorum for doing business is three members, and a majority vote of the members of the board is necessary to take action.

The Hard Labor Creek Reservoir

Population growth is one of the factors GEFA considers when funding water-related infrastructure in Georgia. The Hard Labor Creek Reservoir is a project that was jointly undertaken by Walton and Oconee counties, about 60 miles east of Atlanta, to address projected increases in water demand. Recognizing the future need for an expanded water supply as the region's population grows and the difficulties in financing such a project individually, the two counties partnered to build a 12-billion-gallon reservoir with the capacity to provide 62 million gallons per day of drinking water. The reservoir project has its own management board comprising representatives from each county. Begun in 2013, the project was funded by two 40-year loans, totaling $32 million, from GEFA and the Georgia Department of Community Affairs, along with bond issues by both counties. The Walton County Water and Sewer Authority owns the title to the project, and an intergovernmental agreement specifies the cost share between the two counties. The reservoir will initially provide 37 million gallons per day (MGPD) to Walton County and 15 MGPD to Oconee, with the option to ramp up output if a business with significant water needs locates in either county. Both counties recognized the need for more water but

neither could take on building a reservoir by itself. The counties' decision to collaborate on the project to meet future demand was seen as a strength by state partners.

Transportation

While major cities face problems with traffic congestion and a lack of adequate public transportation, rural parts of the country often cite a lack of funding to maintain existing roads as a serious issue. From 2009 to 2011, states spent an estimated 55% of their road money ($20.4 billion) on expansion and just 45% on maintenance ($16.5 billion) (Jaffe, 2015). Consider, for example, that the average age of a bridge on the U.S. interstate highway system is more than 45 years old. Most bridges were designed for a lifespan of 40 to 50 years. Over time, infrastructure deteriorates. Usually this deterioration is unheeded, but salient disasters serve as reminders of the importance of updating aging infrastructure. The fatal collapse of the I-35W Mississippi River Bridge in Minneapolis in 2007 brought attention to the condition of America's bridges. Roads have similar issues, though not nearly as dramatic: poor roads impose wear-and-tear costs on vehicles, can lead to accidents, and also require transit companies to increase spending on packaging to avoid damaged freight (Kahn & Levinson, 2011). Rural town and county road systems have similar maintenance issues, despite rural officials reporting that they spend a significantly larger portion of their budgets on maintenance of existing roads.

An emerging theme from the interviews was the importance of transportation infrastructure to rural economies. In sharp contrast to the more diversified economic base of large cities, the economies of rural areas are predominately resource-based. Agriculture, mining, and other forms of resource extraction (oil and natural gas, for example) depend on roads to transport inputs to production and finished products. Farming requires transportation of inputs such as seed, fertilizer, and fuel into rural areas as well as transportation of crops from the farm to urbanized areas for consumption or further processing. The mining and extraction industries, likewise, require efficient transportation systems to move raw products to processing and refining plants.

State and local partnership for maintenance of road systems

Local Maintenance Improvement Grant (LMIG) Program

The State of Georgia in 2012 initiated the Local Maintenance Improvement Grant (LMIG) program to help local governments in maintaining the state's roadways. In regions that passed a T-SPLOT the local match is 10% to be part of the program. Counties in regions without a dedicated tax to fund transportation are required to provide a 30% local match to draw down state road maintenance funds. Three regions of the state comprising 46 of the state's 159 counties passed a T-SPLOST, thus making their local match 10%. All counties can participate in the program and funds are provided for a wide variety of local road maintenance needs including engineering, construction management, patching, resurfacing, storm drains, turn lanes, bridge repair, and signage and signal improvements. Each applicant must provide a project list and funds are distributed based on a formula and required local match. Funds are allocated directly to each county for the projects approved for the year. Counties certify annual that projects funded are completed.

This is one example of how a state is helping counties receive funding to maintain roads.

Source:
http://www.dot.ga.gov/AboutGeorgia/Board/Presentations/LMIG.pdf

During the interviews with public officials conducted for this study, one theme quickly emerged: Although many citizens in rural America depend on private wells and septic tanks for water and waste disposal, and have little expectation of broadband service, they depend quite heavily on roads for their livelihood. Consequently, rural county infrastructure budgets are largely consumed by road and bridge maintenance. In states where a large share of the roads are owned by the state, local officials still advocate for a larger share of state and federal resources for their local road infrastructure.

The majority of these counties are rural and use their resources to encourage economic activity that will provide jobs to area residents. For example, in areas where the U.S. energy boom is occurring, the counties indicated that they need roads to move people, equipment, and product in and out of the communities. The types of equipment being used in these areas require good road systems. At the same time, they are transporting heavy cargo, placing additional wear and tear on the roadways. In agricultural areas, residents and businesses depend on their roadways to move their tractors, planting equipment, and harvesting equipment, as well as moving inputs and outputs through the county. In both instances, the county officials indicated that having a good road system is vital to their communities. One county manager mentioned that his county has 7,000 miles of roads to maintain, as well as being responsible for cutting rights-of-way and striping. This accounts for 90% of the county infrastructure budget. Given that the economies in these communities rely on the ability to transport heavy materials, the roads are critical not only to existing businesses but to potentially new businesses that might locate there.

Case Study: Assessing Rural Road Conditions

Macon County, Georgia

Even rural counties with relatively small populations and a seeming absence of traffic congestion can have serious road maintenance issues. They may also lack staff expertise to monitor and evaluate road maintenance issues, putting them at a disadvantage in seeking federal highway funds.

Macon County, Georgia, (population 13,314) is a rural county in the southwestern part of the state. Its economy is largely agriculture-based, with a total annual farm gate value of roughly $250 million. Primary cash crops include turfgrass, poultry, milk, corn, cotton, soybeans, and peanuts. The condition of the county's roads and bridges is similar to that of many other rural areas across the country: aging, deteriorating, and showing the effects of years of deferred maintenance. To show potential funders the effective impact of their rural economy on their roads, the county officials decided to take a different approach to establish the need for road maintenance funding. County officials estimated the number of tractor trailer trips required to support the county's agriculture industry. This calculation included estimates of the number of truckloads of turfgrass shipped outside the county, truckloads of poultry feed for broilers and layers moving into the county, loads of chickens and eggs moving out, tanker loads of milk from local dairy farms, and the truckloads of feed hauled in to feed those dairy cows. Tractor trailer loads of cotton, corn, soybeans, peanuts, peaches, pecans, blueberries, and strawberries were also estimated.

Figure 4. Location of Macon County in the State of Georgia

In total, officials estimated that more than 100,000 tractor trailer trips were made into and out of Macon County each year as the direct result of agricultural production. Based on conversion factors published by GAO (1979), it was determined that Macon County, with a population of a mere 14,000 residents, experienced wear and tear on its roads that was roughly equivalent to that of 722 million passenger car trips a year. While it is unknown at this point whether this calculation will improve the county's chances of receiving federal funds for road maintenance, it does highlight the stress placed on rural roads by the agricultural nature of rural economies, as well as the rapid rate at which deterioration can occur in areas with even very small populations.

Discussion

The most important lesson learned from this analysis, although perhaps not unexpected, is that despite the wealth of information and resources available on best practices for public infrastructure planning and budgeting, many rural communities use an informal planning process that relies more on staff recommendations than on quantitative analysis. This process may, however, not be as haphazard as it first appears, as most of the interviewees appeared to possess a comprehensive working knowledge of the inventory, condition, and deferred maintenance aspects of the infrastructure under their stewardship. This less formal system may work because the typical inventory of rural infrastructure is much smaller, simpler, and easier to keep track of than that of major cities.

Tools used by rural local governments for infrastructure decision-making include rating criteria, needs assessment data, a funding plan, and a financial forecast.

The data and interviews conducted confirm that rural county governments have primary responsibility for road systems and that rural municipal governments spend their infrastructure funds on sewer and water and electrical systems. Taken together, rural local governments are focused on maintaining roads, sewer and water and electrical systems. Numerous interviewees noted that rural water and sewer needs are often met by private wells and septic tanks, that electricity demand is frequently supplied by private enterprises rather than public utilities, and that rural residents often have no real expectation of broadband service. However, in other progressive areas like Ammon, Idaho, and Thomasville, Georgia, city leaders recognized the competitive advantage they would have if broadband were available.

Well-maintained roads and bridges were noted as being essential in rural areas whose economies rely on natural resources like agriculture or the oil and mining industries, which must move large quantities of product over long distances.

Water resources are important in rural areas that border rapidly expanding metropolitan areas and are seeing accelerated population growth due to the spillover effects. Water resource infrastructure projects, such as the Hard Labor Creek Reservoir in Georgia, are typically quite large, requiring considerable land and expensive dams and water treatment and delivery equipment. The scope of these projects lends itself to collaboration between cities, counties, and even groups of counties.

The sharp contrast in these two areas of infrastructure needs—transportation and water—highlights the differences that exist between rural counties that border metropolitan areas and find themselves in the path of population growth, and those that are "very" rural and view their infrastructure needs in terms of supporting local natural resource–based industries instead of planning for future population growth. In fact, many very rural counties face declining populations, which could lead to declining tax base even as their economies remain constant or grow due to gains in agricultural productivity or demand for natural resources such as oil.

Though best practices are well documented and available through government and trade associations, many rural communities are limited in their ability to develop and implement a formal asset management or capital improvement plan due to insufficient staff and funding.

That said, these kinds of plans and management practices are required to become eligible to apply for infrastructure grants and programs. Additionally, maintenance comes first. Most officials interviewed in rural areas indicated that 75-80% of their capital budget goes toward maintenance and that a reactive approach is most common, meaning that the government fixes assets when they break but often forgoes routine maintenance that would extend the useful life of the asset.

Future considerations to help rural communities may include assistance with basic capital planning and asset management processes and documentation so that they can meet the entry-level requirements to compete for federal and state infrastructure funds. Infrastructure is expensive, so economies of scale can help bring down the costs per government. Federal and state grant makers can encourage economies of scale and interagency cooperation when structuring incentives in their grant programs. Local governments strive to meet the needs of their own citizens. Only through a recognized mutual benefit, as was the case in Thomasville, Georgia, with broadband, or in Eatonton-Putnam County with water and sewer, do governments cooperate.

The number of organizations with some spending authority over infrastructure impacts the effectiveness and efficiency of decision-making and operating the systems. Future federal grant-funding requirements might insist that eligible grantees represent a consortium of infrastructure providers that show a joint effort at infrastructure needs assessment and that comprise a fair percentage of the total infrastructure investment for the community or county in question. This approach incentivizes collaborative planning, assessment, and investment.

Further Research

The authors recognize that they are more familiar with policies, collaborative relationships, and issues in Georgia than in other parts of the country. Due to the eight week timeframe to conduct the bulk of the research, the authors relied more heavily on case studies from Georgia. Future research would ideally include input from state agencies, counties, and municipalities in all 50 states. A large sample of governments and regions of the country would add strength to the findings.

Needs assessments and asset management plans are key inputs in the decision-making process, but they are often the most neglected. Additional research could identify ways that intermediaries and state organizations could help rural communities implement asset management and capital budgeting best practices so that they can meet the application prerequisites for infrastructure grants and loans. New tools and technology that can be deployed at minimal costs are needed to conduct an accurate needs assessment.

The interviews highlighted the different needs of rural communities located near urban centers that are gaining population versus truly rural communities, some of which are seeing their populations decline. More analysis is needed to better understand how aging and declining populations impact capital budgeting and capital improvement plan revenue and expenditure models.

As more and more communities deal with aging infrastructure, local governments would benefit from technical assistance on implementing safe and economical methods to extend the life of existing assets. Research on innovative maintenance strategies in rural governments could help cash-strapped rural communities.

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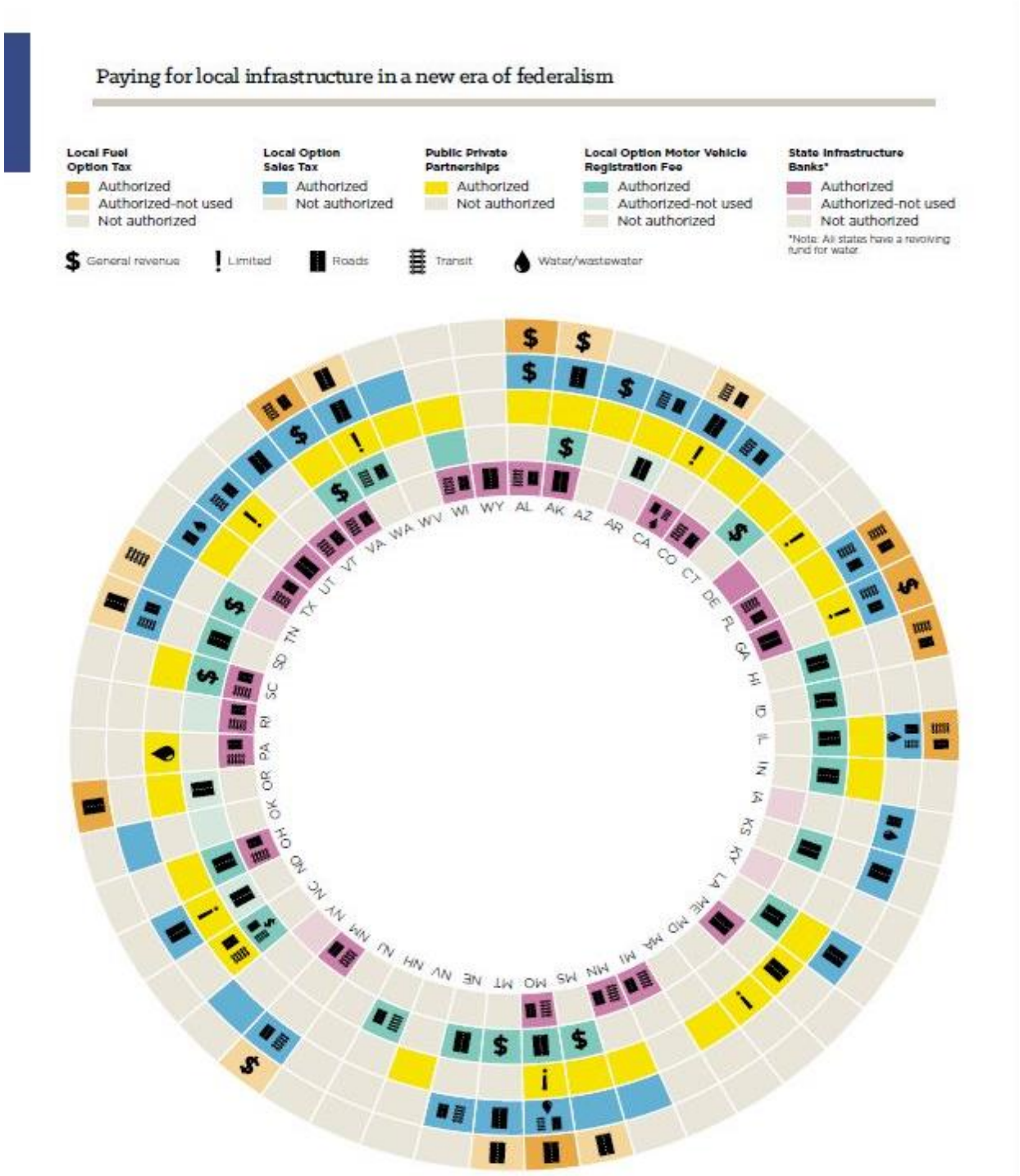
Appendix A: Innovative Infrastructure Funding Options

New Funding Sources	New Taxes	Local Option Sales Taxes
		Local Option Fuel Taxes
		Local Option Income and Payroll Taxes
		Local Option Vehicle Tax
	Value Capture	Impact Fees
		Special Assessment Districts
		Tax Increment Financing
		Joint Development
New Financing Mechanisms	New Credit Assistance Tools (Loan, Loan Guarantee, Lines of Credit)	Transportation Infrastructure Finance and Innovation Act (TIFIA) Loans
		Environmental State Revolving Funds: Clean Water State Revolving Funds Drinking Water State Revolving Funds
		Transportation State Revolving Funds: State Infrastructure Banks
	Alternative Bonds and Debt Financing Tools	Grant Anticipation Revenue Vehicle Bonds (GARVEEs)
		State Bond Banks
		Green Bonds
		Social Impact Bonds
New Financial Arrangements	Public-Private Partnerships	Design-Build
		Design-Build-Operate-Maintain
		Design-Build-Finance-Operate-Maintain
		Concession
	Privatization	Lease
	Infrastructure Investment Funds	Pension Funds
		Sovereign Wealth Funds
		Private Companies (Insurance and Investment Banks)
	Private and Nonprofit Philanthropic Partners	Donations
		Grants
		Program Investment
	Crowdfunding	Donation-Based (Public Goods)

Source: Chen, 2017

Appendix B: State Use of Innovative Financing Tools



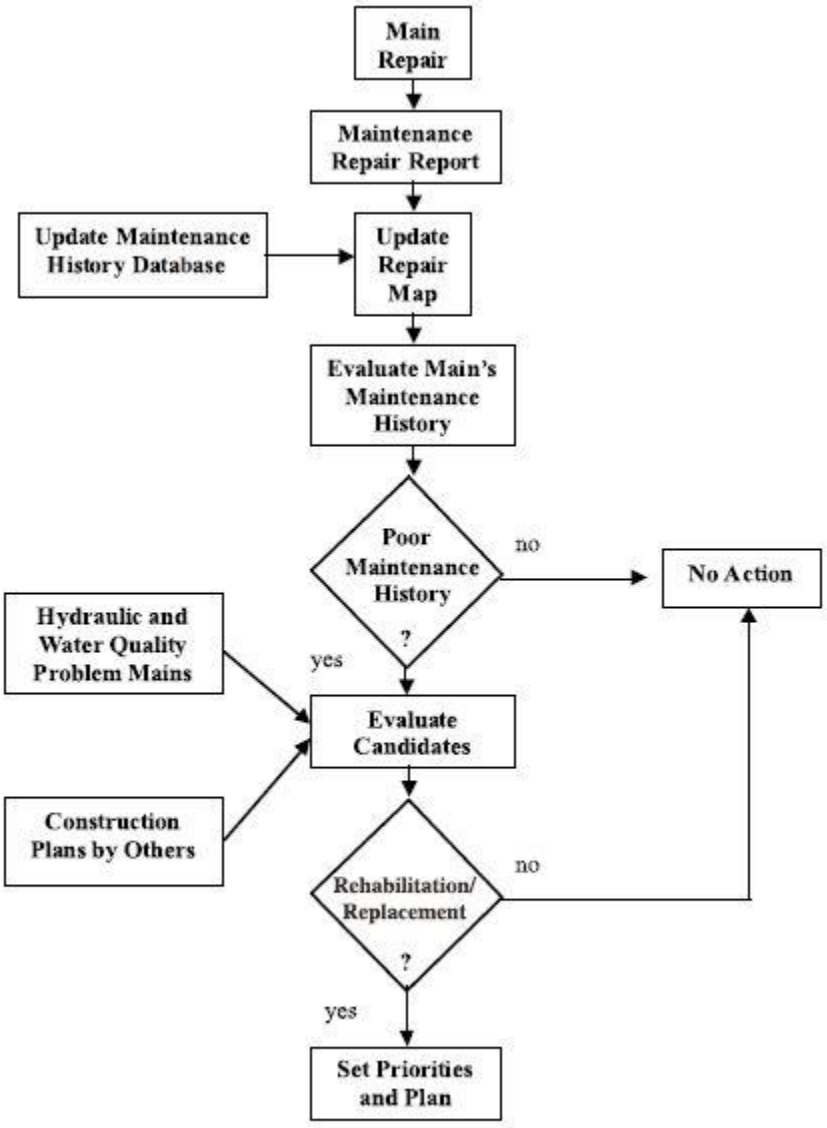
Source: DuPuis & McFarland, 2016

Appendix C: City of Suwanee Infrastructure Decision-Making Matrix

Criteria	Possible Scores					
Funding	SPLOST, Open Space Funds, etc. identified for project (15)	Funds identified from General Fund (9)	Potential funds to be applied for (grant or other non-City funding) (6)	No identified funds (0)		
Legal Mandates	Court decision (*)	Regulatory requirement (*)	Pending legal action (12)	Potential legal action (9)	Normal project liability (0)	
Public Health & Safety	Existing hazard (severe) (*)	Existing hazard (minor) (12)	Potential hazard (severe) (12)	Potential hazard (minor) (3)	No health or safety issue (0)	
Implementation Feasibility	No implementation obstacles identified (15)	Minor implementation obstacles (12)	Major implementation obstacles (3)	Implementation not likely (0)		
Operating Budget Impact	Decreases operating/ maintenance costs (10)	Minimal or no impact on operating/ maintenance costs (6)	Slight increase in operating costs and/or personnel requirements (-2)	Significant increase in operating costs and/or personnel requirements (-4)	Very large increase in operating costs and/or personnel requirements (-8)	
Environmental or Pollution Impact	Enhances environment/ reduces pollution (5)	Benefits environment/ slightly reduces pollution (3)	No environmental change/ status quo pollution (0)	Minor negative environmental change/ slight pollution (-1)	Diminishes environment/ creates pollution (-3)	
Percentage of City Population Served	100% (10)	50-99% (8)	10-49% (6)	<10% (2)		
Preservation of Facility	Loss of facility imminent without project (15)	Additional damage likely without project (12)	Project constitutes normal maintenance (9)	Project constitutes normal minor maintenance (3)	New facility (0)	
Project Life	≥20 years with no extraordinary maintenance (10)	≥20 years with extraordinary maintenance (8)	10-20 years with no extraordinary maintenance (6)	10-20 years with extraordinary maintenance (2)	<10 years (0)	
Conformity to City Plans & Goals	In the Comprehensive Plan, STWP, or other City-wide plan (10)	In the PBP, DSMP, Water System Study, or other small area plan (8)	Under consideration for plan inclusion (6)	Recommended by the City Council (4)	Recommended by staff (2)	Identified by staff (0)
Departmental Plans & Goals	Critical to accomplishing established goals/plans (15)	Will assist in accomplishing established goals/plans (9)	Necessary for department but may harm another (6)	Will not help or hinder accomplishing established goals/plans (0)		
Recreational/ Cultural/ Aesthetic Value	Major value (5)	Moderate value (4)	No value (0)	Slightly detrimental (-1)		
Estimated Frequency of Use (Average)	7 days/week (10)	Several days a week (8)	Several days a month (4)	Once a month or less (2)		

Source: City of Suwanee (2008). Georgia budget document: fiscal year 2009, 195.

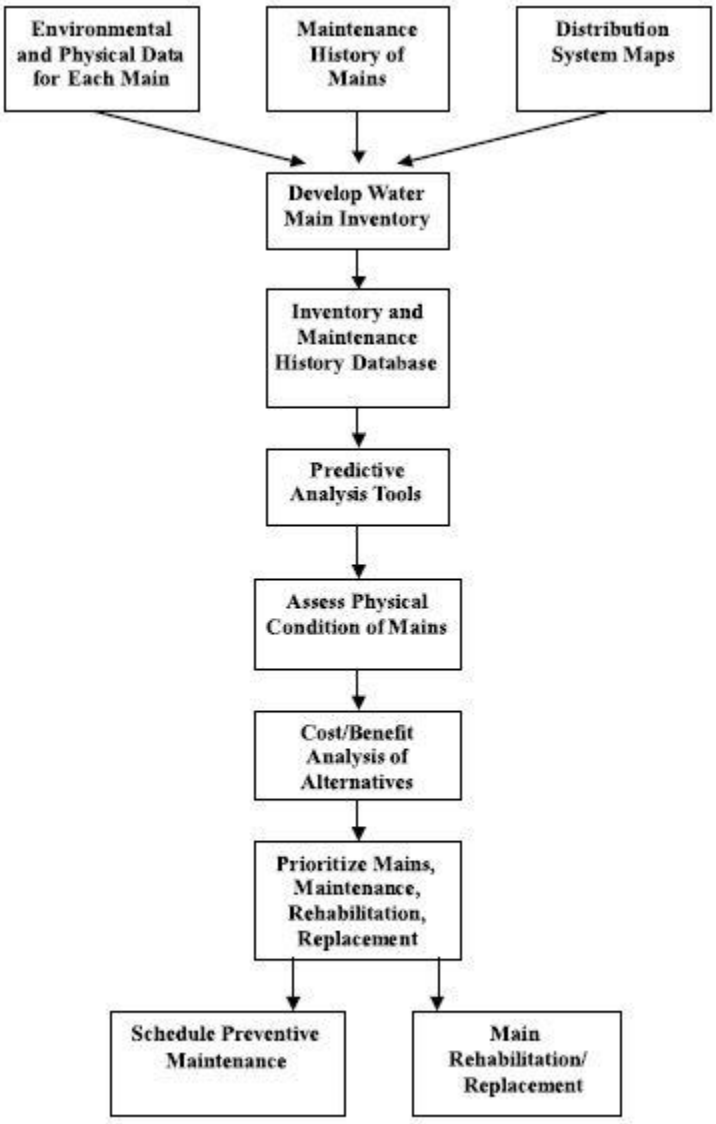
Appendix D: Reactive approach flow chart



Reactive approach to main replacement planning

Source: Cromwell et al., 2001

Appendix E: Proactive approach flow chart



Proactive approach to main replacement planning

Source: Cromwell et al., 2001

Appendix F: Infrastructure Spending by Rural Government Type

Table 1

Infrastructure spending by rural government type

Government type	Percent of total county-area spending
County	21.1%
City	53.7%
Township	5.1%
Special district	19.7%

Source: Census of Governments, 2012

Table 2

Rural county governments' spending

Type	Total spending (in thousands)	Percent of grand total
Roads	$624,324,580	84.3%
Water/sewer	$76,509,640	10.3%
Electric	$22,020,620	3.0%
Gas	$1,857,600	0.3%
Transit	$15,922,720	2.1%
Grand total	$740,635,160	100.0%

Source: Census of Governments, 2012

Table 3

Rural city governments' spending

Type	Total spending (in thousands)	Percent of grand total
Roads	$360,259,060	19.2%
Water/sewer	$686,147,460	36.5%
Electric	$735,247,840	39.1%
Gas	$83,138,760	4.4%
Transit	$15,785,160	0.8%
Grand total	$1,880,578,280	100.0%

Source: Census of Governments, 2012

Table 4

Rural township governments' spending

Type	Total spending (in thousands)	Percent of grand total
Roads	$149,942,040	83.4%
Water/sewer	$24,900,220	13.8%
Electric	$4,641,960	2.6%
Gas	$180,180	0.1%
Transit	$143,040	0.1%
Grand total	$179,807,440	100.0%

Source: Census of Governments, 2012

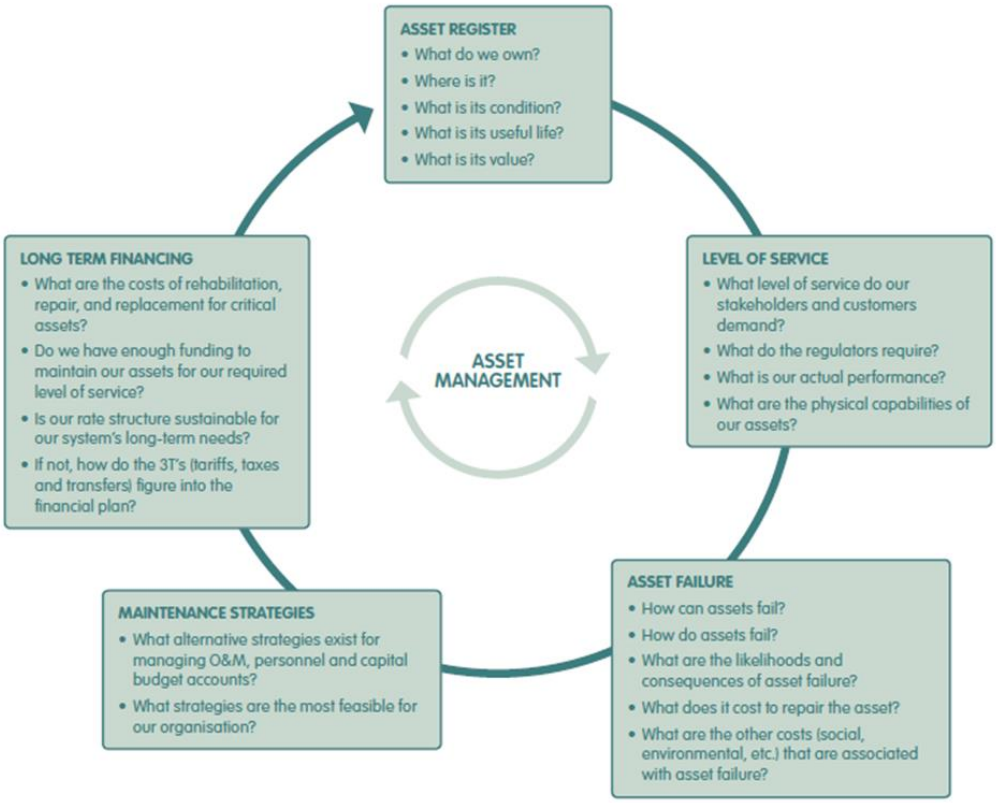
Table 5

Rural Special District Governments special district governments' spending

Type	Total spending (in thousands)	Percent of grand total
Roads	$13,931,520	2.0%
Water/sewer	$243,244,160	35.3%
Electric	$336,815,160	48.8%
Gas	$63,753,500	9.2%
Transit	$31,811,880	4.6%
Grand total	$689,556,220	100.0%

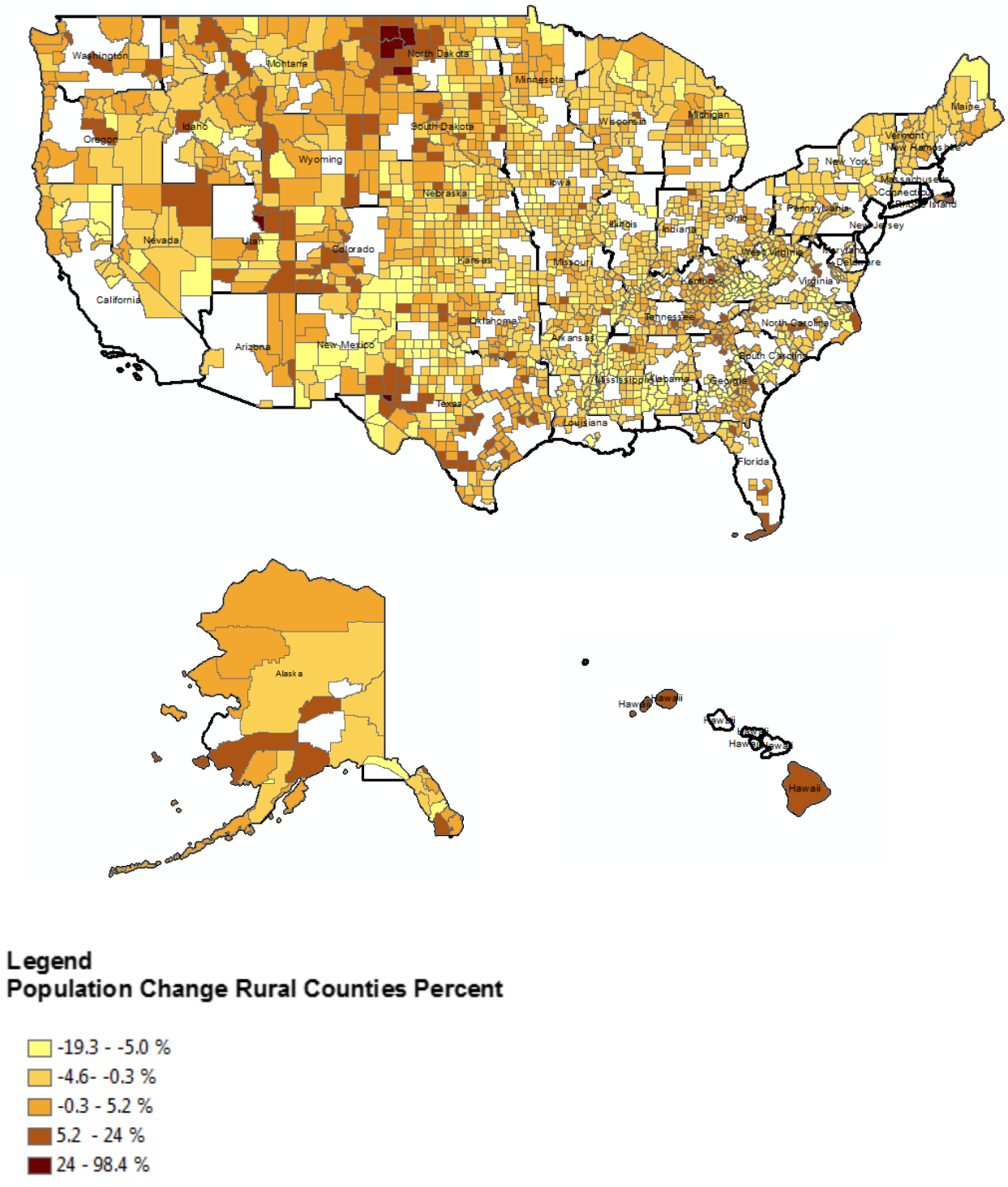
Source: Census of Governments, 2012

Appendix G: Asset Management Process



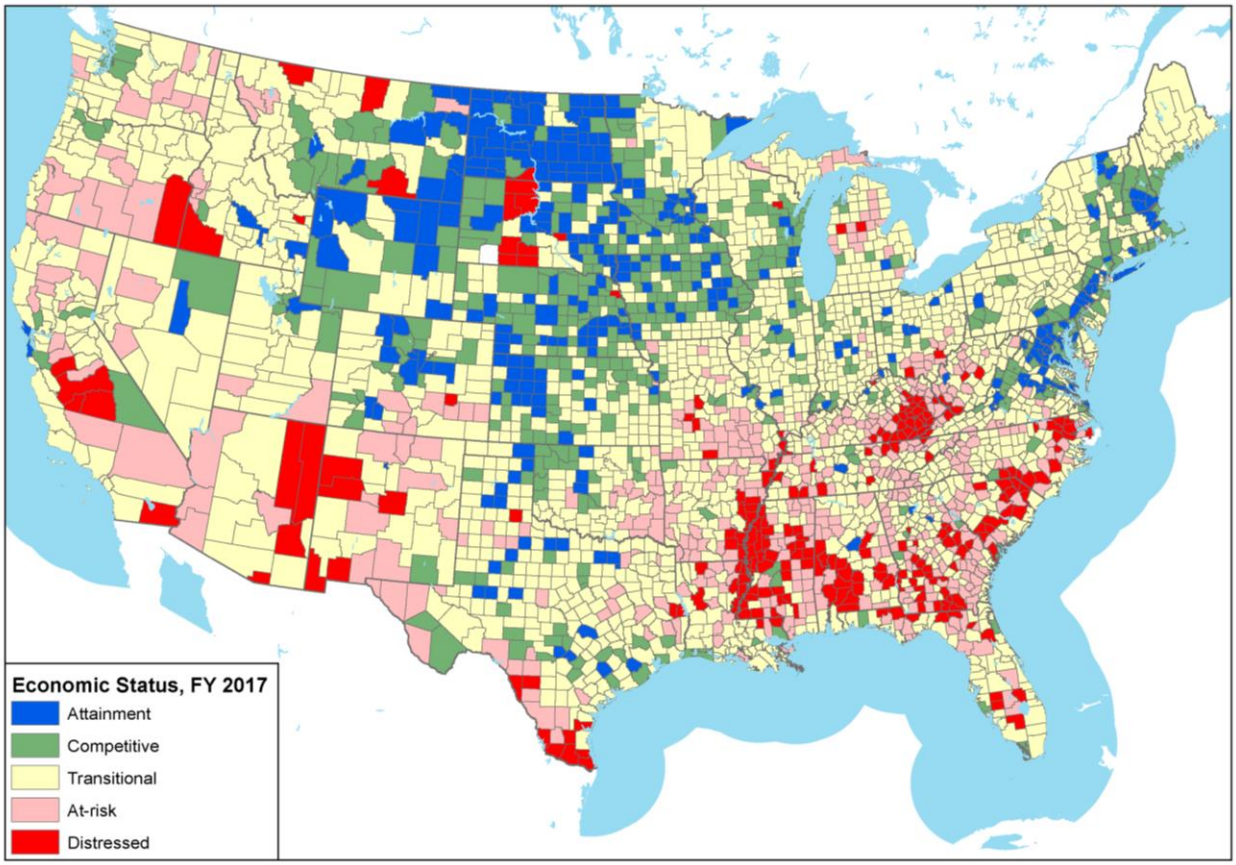
Source: Boulenouar & Schweitzer, 2015

Appendix H: Population Change in Rural Counties 2010–2017



Source: 2010 Census and the 2017 Census county population estimates

Appendix I: Economic Condition Map



Source: Adapted from methodology used by the Appalachian Regional Commission; Carl Vinson Institute of Government

The index is created using the county five-year average:

- unemployment rate,
- per capita market income, and
- poverty rate,
- and then comparing each county to the national average.

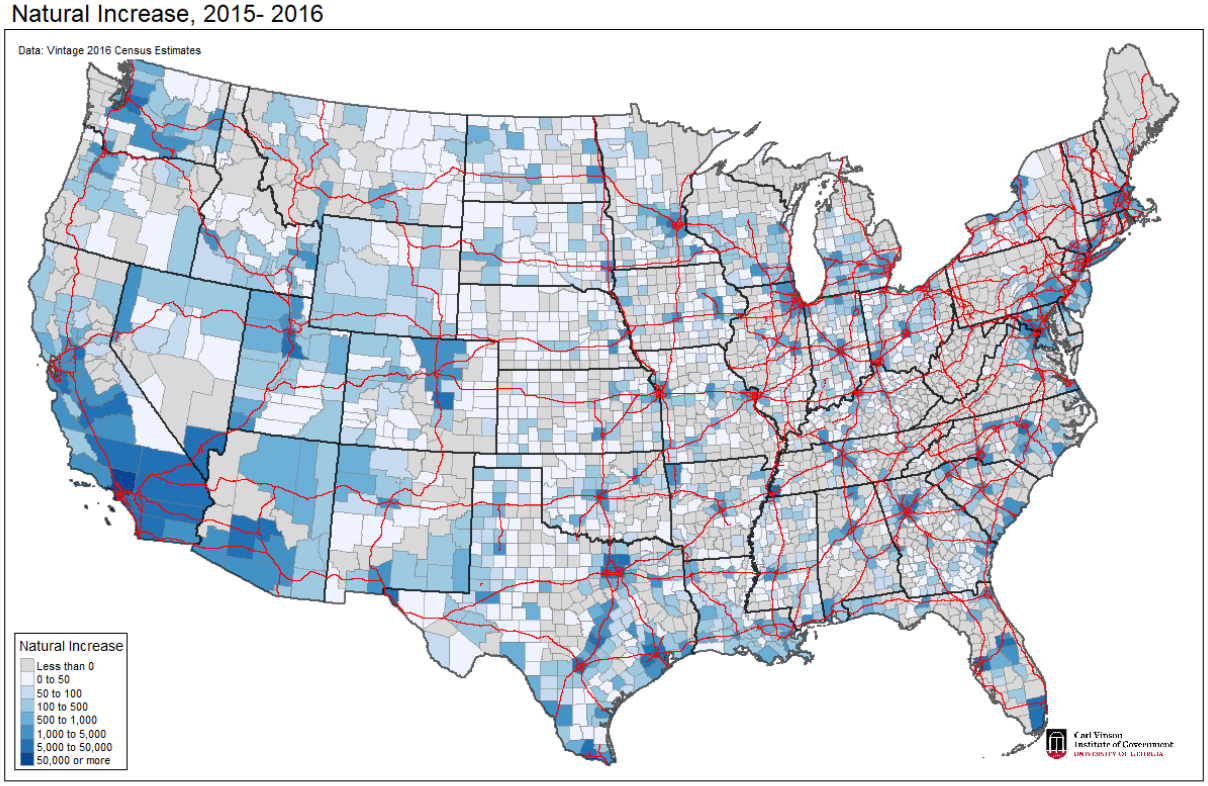
Original ARC map can be found at: www.arc.gov/research/MapsofAppalachia.asp.

The ARC uses the following five categories of economic conditions:

- Attainment – Attainment counties are the economically strongest counties. Counties ranking in the best 10% of the nation's counties are classified attainment.
- Competitive – Competitive counties are those that are able to compete in the national economy but are not in the highest 10% of the nation's counties. Counties ranking between the best 10% and 25% of the nation's counties are classified competitive.
- Transitional – Transitional counties are those transitioning between strong and weak economies. They make up the largest economic status designation. Transitional counties rank between the worst 25% and the best 25% of the nation's counties.
- At-Risk – At-risk counties are those at risk of becoming economically distressed. They rank between the worst 10% and 25% of the nation's counties.
- Distressed –Distressed counties are the most economically depressed counties. They rank in the worst 10% of the nation's counties.

Appendix J: Natural Population Increase 2015–2016 by County

Natural Increase, 2015- 2016



Counties in gray had more deaths than births.

Appendix K: Population Loss Counties, 2004–2007, 2010–2013