Analyzation of Transportation Spending for Infrastructure Capital Improvements versus Infrastructure Maintenance for Highways and Bridges: Which is More Advantageous?

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ABSTRACT

State departments of transportation face increasing pressure to balance capital expansion with the preservation of aging infrastructure amid constrained funding. This study examined how capital improvement and maintenance programs are defined, funded, and prioritized within three states' Departments of Transportation, and whether systematic relationships existed between each state's investment strategies. Using a qualitative, cross-state case study approach, semi-structured interviews were conducted with transportation professionals in California, Texas, and Georgia, states that represent diverse operating structures, funding arrangements, and planning perspectives. The findings revealed a consistent institutional distinction across all three states between capital improvement and maintenance programs. Participants discussed definitional boundaries between capital and maintenance programs, funding structures, planning horizons, programming stability, flexibility of funds, project delivery speed, and roles of Districts/MPO/Central Offices. Federal funding introduced significant procedural and eligibility constraints, while state funding provided greater adaptability. Despite differences in planning horizons and revenue structures, all three states demonstrated a preservation-first orientation. The conclusions indicate that capital and maintenance programs are not competing investment categories but have a tiered relationship, where maintenance and rehabilitation form the foundation of transportation system performance, and capital expansion functions as a targeted supplement. The results offer practical applications and implications for departmental programming, funding policy, and long-range planning, and a basis for future research examining preservation-first investment approaches that strategically maximize public value for capital investments.

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Chapter I

Introduction to the Study

The need for new public infrastructure has grown around the United States and worldwide in recent decades (Gil & Beckman, 2009). The pressures to add new infrastructure have been caused by population growth, increased migration to cities, deterioration and obsolescence of existing roadways and bridges, and the globalization of supply chains (Gil & Beckman, 2009). Public transportation infrastructure is vital to enabling and sustaining economic growth (Fernández, 2013) by supporting job creation and the maintenance of operations for many businesses and organizations. Nationwide government budget limitations make it nearly impossible to keep all their respective infrastructure facilities in "good" condition, despite the United States's obligation to build and maintain its infrastructure for economic growth. Transportation funding, called transportation revenue (Research and Innovative Technology Administration [RITA], 2012), is collected by all levels of government (federal, state, and local) to fund various transportation programs.

Expenditures are categorized in terms of highway, transit, railroad, air, water, pipeline, and/or general support (RITA, 2012). Capital transportation expenditures are long-term investments aimed at expanding or improving infrastructure capacity, whereas maintenance transportation expenditures are ongoing investments focused on preserving and maintaining existing infrastructure. These distinctions are important to understanding the funding strategies used by state departments of transportation, as

outlined in both state-level expenditure reports and federal guidance (American Society of Civil Engineers [ASCE], 2021a; Federal Highway Administration [FHWA], 2023a).

Most Recent Transportation Bills

The transportation act enacted for infrastructure improvement from 2013 to 2014 was called Moving Ahead for Progress in the 21st Century (Moving Ahead for Progress in the 21st Century [MAP-21], 2021). President Barack Obama signed MAP-21 into law on July 6, 2012. MAP-21 was designed to create a streamlined, performance-based, and multimodal program that addressed the challenges of the U.S. Department of Transportation System (FHWA, 2012). The challenges identified by the FHWA (2012) included improving safety, maintaining infrastructure conditions, reducing traffic congestion, improving the efficiency of freight movement, protecting the environment, and reducing delays in infrastructure project delivery.

In 2015, the transportation act enacted for infrastructure improvement was a five-year plan called Fixing America's Surface Transportation (FAST) Act (2015), which was signed by President Barack Obama on December 4, 2015, after much anticipation by states and their respective transportation departments. This five-year plan ran from FY 2016 to FY 2020 (Institute of Transportation Engineers [ITE], 2016). The FAST Act provided for $305 billion for highway, transit, highway safety, and railway improvements. It was considered the first long-term transportation bill passed by Congress in the prior 10 years, after which Congress had passed only 36 short-term extensions. According to ITE (2016), "Also, transportation funding was expected to increase by about 11% over the subsequent next five years" (p. 28).

The most current legislation, enacted in 2021, was the Infrastructure Investment and Jobs Act (IIJA, 2021), also known as the Bipartisan Infrastructure Law. It is one of the largest infrastructure bills in U.S. history, with an estimated cost of around $1.2 trillion. It was signed into law on November 15, 2021, by President Biden (National Conference of State Legislatures [NCSL], 2021). The IIJA was intended to invest heavily in various infrastructure projects, including roads, bridges, public transit, rail, electric vehicles, broadband, and climate resilience. It also focused on promoting clean energy and transportation equity. IIJA (2021) provided approximately $350 billion for federal highway programs over a five-year period (FY 2022 through FY 2026). Most of this funding is apportioned to states based on formulas specified in federal law. It also provides funding through competitive grant programs (FHWA, n.d.-c). The various considerations in transportation funding bills justified the need for this study, which held significance for practical application and economic impact by providing a qualitative view of how transportation infrastructure investments can be strategically managed to maximize system performance and public value.

Statement of the Problem

The problem this study sought to address was whether there was a strategic advantage to investing in transportation capital improvements or maintenance improvement projects. In this study, capital improvement was unambiguously defined as capacity expansion or new infrastructure and was subject to a higher administrative burden, longer delivery timelines, and greater funding strictness. In contrast, maintenance and rehabilitation programs were considered to be positioned as preservation-oriented strategies focused on sustaining existing assets, improving safety, and enhancing

operational performance. This study utilized the knowledge and experiences of transportation practitioners in three states, California, Georgia, and Texas, to qualitatively explore transportation investments in capital and maintenance projects.

The United States' national debt was approximately $16.1 trillion in FY 2012, $16.7 trillion in FY 2013, $17.4 trillion in FY 2014, and as of FY 2026, on April 4, 2026, $39 trillion (U.S. Department of the Treasury, 2025, 2026). When President Obama took office in early 2009, he worked to have Congress pass the American Recovery and Reinvestment Act of 2009 (2009), which provided a short-term increase in federal funding for many infrastructure programs; however, the rising federal deficit diluted support for large-scale government expenditures on infrastructure funding (Landers, 2013). Yet, in his 2013 State of the Union address, President Obama promoted the Fix-It-First Program, which focused on reducing the backlog of infrastructure repairs across the United States' transportation network (Obama, 2013). This program was planned to address transportation improvements, including the approximately 70,000 deficient bridges across the country (Obama, 2013). According to the American Road and Transportation Builders Association (2025), approximately 41,677 bridges were structurally deficient. Programs such as Fix it First, MAP-21, the FAST Act, and the Bipartisan Infrastructure Law functioned differently from administration to administration in terms of the focus areas. However, all were developed to address the infrastructure improvements needed to consistently impact the potential for economic development.

Transportation priorities vary from state to state and from region to region. This was illustrated in the Tri-State Transportation Campaign's (Tri-State Transportation

Campaign [TSTC], 2014) analysis of states' transportation spending, conducted to provide clarity to the public on transportation priorities. State transportation improvement programs generally fall into one of the following categories: new road capacity, bridge capacity expansion, road minor widening/maintenance, bridge maintenance/replacement, bicycle/pedestrian, safety, road/bridge projects with bicycle/pedestrian components, transit, and other (TSTC, 2014). Although some funding for these improvements comes from state and local governments, most state transportation programs are funded with federal funds (TSTC, 2014). This study focused on the capital improvements that included long-term investments in major infrastructure and assets such as highways, bridges, and other public facilities to increase capacity, and maintenance improvement projects that maintained existing transportation infrastructure.

Purpose of the Study

This study was exploratory in nature and employed a qualitative, multi-case study approach to examine how state departments of transportation define, fund, and prioritize capital improvement and maintenance investments. The study sought to identify patterns, institutional rationale, and decision-making dynamics across different states by referencing transportation spending data, transportation planning and programming methods, and other pertinent transportation data from the Georgia Department of Transportation (GDOT), Texas Department of Transportation (TxDOT), and California Department of Transportation (Caltrans).

The qualitative data were extracted from semi-structured interviews with state transportation officials to determine whether implementing capital improvements or maintenance improvements was more advantageous for transportation infrastructure

improvement programs. The interview data collected in conjunction with the transportation infrastructure expenditures in Georgia, Texas, and California were compared and qualitatively analyzed to determine whether the findings suggested prioritizing state investments in capital or maintenance improvements offered advantages to a given state's transportation infrastructure program. In addition, the aforementioned data provided in this qualitative study included transportation expenditures for all modes of transportation collectively (trucks, transit, rail, cars, etc.). Cultural norms in terms of standard operating procedures within organizations varied. Therefore, recognizing each state's transportation priorities from a qualitative perspective was important when analyzing their respective transportation expenditures.

Research Questions

Proposition 1: State DOTs vary in how they prioritize capital and maintenance projects based on their respective characteristics, institutional priorities and funding structures (FHWA, 2013d; Hendren & Niemeier, 2008; Puentes, 2019).

RQ1: How do state departments of transportation define and prioritize capital improvement and maintenance programs across different institutional and funding contexts?

Proposition 2: Capital and maintenance transportation investments are often competing priorities, shaped by institutional norms, performance objectives, and funding availability (FHWA, 2022a; Guevara et al., 2017; Labi & Sinha, 2003).

RQ2: How do institutional norms, performance objectives, and funding structures shape the balance between capital improvement and maintenance investments within state departments of transportation?

Proposition 3: Budgetary constraints shape how state DOTs prioritize capital and maintenance investments, and the degree of structured versus ad hoc decision making varies across institutional contexts (Macumber-Rosin & Hoffer, 2026; Mirza, 2006).

RQ3: How do budgetary constraints influence decision-making processes related to capital and maintenance investment prioritization within state departments of transportation?

Conceptual Framework

The conceptual framework for this study illustrates the decision-making dynamics that shape transportation investment priorities across state departments of transportation (DOTs). Maintenance and capital improvement transportation programs form the basis of tiered investment strategies, with maintenance transportation programs focusing on preserving existing infrastructure, improving safety, enhancing operational efficiency, and extending asset life and capital improvement programs representing expansion or new infrastructure initiatives that target capacity needs or strategic growth. These projects are more intensive in terms of the required resources, which are subject to federal and/or state funding requirements and typically have longer delivery timelines.

The framework also emphasizes the roles of funding sources and departmental context. Federal funding often imposes rigid procedural and eligibility constraints, whereas state-generated funding allows greater flexibility and rapid reallocation. The DOT's governance structure, planning horizon, and organizational norms characterize the allocation of resources and guide prioritization decisions. Finally, these investment strategies for each DOT come together to impact transportation system performance,

including infrastructure condition, safety, operational efficiency, economic benefits, and overall public value.

Significance of the Study

This study is significant across multiple areas, including policy, practical application, and economic impact, by providing a qualitative view of how transportation infrastructure investments can be strategically managed to maximize system performance and public value. From a policy perspective, the research offers actionable insights into state DOT leadership by demonstrating that the approaches to infrastructure investment can enhance the performance, reliability, and longevity of transportation systems while mitigating financial and operational risks. The findings highlight that maintenance and rehabilitation programs should likely form the core of a state's investment strategy, providing a foundation for system stability. Capital improvement initiatives are best applied strategically and selectively to address targeted capacity or mobility needs rather than as a default response to infrastructure deficiencies. These discernments can guide policy development, funding allocation, and long-term transportation planning at both state and federal levels, ensuring that limited public resources are applied to provide the greatest and most efficient public benefit.

From a practical application perspective, transportation agencies can leverage these findings to enhance decision making and improve project delivery efficiency. By understanding the isolated advantages of maintenance and capital investments, state transportation agencies can prioritize projects that generate measurable performance outcomes. The study provides a framework for integrating flexibility in funding and planning processes, allowing DOTs to respond effectively to both routine infrastructure

needs and future forecasted challenges. Therefore, this study contributes to public administration, transportation asset management, and public finance by qualitatively linking DOT practices, governance structures, and funding mechanisms with investment prioritization strategies. All of which are important because resources to implement transportation projects are limited. Overall, the significance of this study lies in its ability to provide practitioner-based guidance for improving infrastructure investment decisions, which contributes to both policy and academic discussions on improving transportation systems for performance, efficiency, and economic impact.

Assumptions, Delimitations, and Limitations

Assumptions

This study was grounded in key assumptions that support the design, data collection, and interpretation of the findings:

- Accuracy of Interview Responses: It was assumed that the DOT officials who were interviewed provided honest, informed, and representative insights into their organizations' practices, processes, and investment priorities. Their responses were considered reliable reflections of their respective institutional decision making.
- Relevance of Selected States: California, Georgia, and Texas were selected for their institutional, fiscal, and governance diversity, which provided enough variation to explore the research questions. It was assumed that these states collectively offered meaningful insights applicable to other complex state DOT environments with similar infrastructure management challenges.

- Consistency of Funding Categories: The study assumed that capital and maintenance expenditures were generally defined consistently within each state DOT. This consistency was critical for making valid cross-state comparisons and for interpreting how each type of investment was prioritized within differing institutional frameworks.
- Impact of Institutional Structures: It was assumed that differences in governance, planning horizons, and organizational structures materially affected how DOTs made investment decisions, prioritized projects, and balanced capital expansion with maintenance programs.

These four assumptions provided a necessary foundation for interpreting the study's findings. They allowed for the analysis of patterns and themes while acknowledging that the study reflected perspectives and practices rather than direct causal relationships between investment strategies and infrastructure outcomes.

Delimitations

The delimitations of this study established the scope and boundaries within which the research was conducted, ensuring that the analysis remained focused, manageable, and coherent. These delimitators can be categorized as geographic scope, mode of transportation, data source selection, timeframe of transportation improvements, and the qualitative research design. These delimitators are further explained as follows:

- Geographic Scope: The study was limited to three U.S. states—California, Georgia, and Texas. These states were selected to provide variation in institutional, fiscal, and governance contexts, rather than attempting to generalize findings across all 50 US states. They also have climates conducive

to most construction year-round and thriving port authorities that significantly contributed to each state's economic vitality and impacted the conditions of their transportation infrastructure.

- Mode of Analysis: The study concentrated specifically on highways and bridges, with data from professional organizations and governmental agencies, rather than other infrastructure types, such as airports, rail, and public transit. The primary focus on highways and bridges accounted for most of the participants' experiences with infrastructure investments.
- Data Source Selection: The analysis relied primarily on qualitative data from semi-structured interviews with key DOT officials, supplemented by archival data on state transportation expenditures. This approach emphasized institutional perspectives and decision-making processes.
- Timeframe: Data and information provided by the participants were primarily drawn from recent fiscal years, primarily 2020-2025, to reflect recent federal and state transportation funding policies and practices.
- Research Design: As an exploratory, qualitative study, the research focused on identifying patterns, institutional logics, and decision-making processes.

By defining these delimitations, the study maintained a clear focus on the institutional and fiscal factors that influenced transportation investment decisions, while acknowledging the boundaries within which its findings were applicable.

Limitations

While this study provided valuable insights into transportation investment decision making, it was subject to limitations that must be acknowledged in terms of

generalization, sample size, self-reported information, exclusion of quantitative correlative relationships, and external factors that were beyond the state DOT's direct control. Each of these limitations is further broken down as follows:

- Generalizability: The findings were based on California, Georgia, and Texas, and while these states have comprehensive transportation programs, they may not fully generalize to other states with significantly different governance structures, funding models, or infrastructure needs. The specific institutional and fiscal conditions in other states may influence investment strategies differently.
- Sample Size: Eleven DOT official interviews were included in this study. Although thematic saturation was achieved through repetitive and/or similar responses, this relatively small sample may not have captured all perspectives, unique organizational practices, or variations within each state department.
- Self-Reported Data: The study relied on interviews, which could have introduced potential biases such as selective reporting, personal interpretation, or emphasis on certain organizational roles. These factors could have affected the transferability of the findings.
- Exclusion of Quantitative Outcomes: The research did not measure the quantitative performance outcomes of maintenance versus capital investments. As a result, the study did not provide empirical evidence regarding the cost-effectiveness, efficiency, or long-term financial impact of these investment strategies in numerical terms.

- External Factors: Changes in federal legislation, economic conditions, or state budget priorities beyond the study period could have influenced investment decisions and limited the applicability of the findings. Such external factors may have affected how DOTs allocate funds or prioritize maintenance and capital projects, possibly randomly.

These limitations are acknowledged to frame the interpretation of the findings in a way that guides recommendations for future research approaches. Subsequent studies could expand the sample, include additional states, and incorporate quantitative performance data to enhance generalizations and further evaluate investment effectiveness.

Definitions

Capital transportation expenditures are investments that increase the capacity, efficiency, or quality of transportation infrastructure, providing long-term benefits that typically last long term. They include new construction, reconstruction, major rehabilitation, and restoration of roads, bridges, and transit facilities, as well as installation of guardrails, signs, signals, and other structural enhancements. Capital spending also covers land acquisition, right-of-way costs, construction engineering, purchase of equipment, and research activities that improve travel times, access, capacity for passengers and freight, and reduce safety or environmental risks (FHWA, 2020a; Bureau of Transportation Statistics [BTS], 2012). In essence, capital improvements expand or significantly enhance the existing transportation system.

Maintenance transportation expenditures include routine and recurring activities required to keep the transportation system in a safe and usable condition. These include

spot repairs, crack sealing, resurfacing, and upkeep of highways, shoulders, roadsides, bridge decks, traffic control devices, and highway safety features such as signs, guardrails, fences, signals, and lighting. Maintenance ensures that the infrastructure continues to function effectively without increasing system capacity, focusing on preserving the condition and safety of existing assets (FHWA, 2020a).

Chapter Summary

While this study focused on transportation spending for capital and maintenance infrastructure improvement projects, a more general question was, Where does federal/state transportation spending itself fall among the overall national spending patterns? Federal spending can be broken down into categories, such as social welfare (i.e., Social Security, Medicaid/Medicare, unemployment, public assistance); child tax credit; net interest; defense discretionary, and nondefense discretionary (Hungerford, 2016). Transportation spending falls under the nondefense discretionary category, which also includes expenditures such as education, research and development, food inspections, environmental protection, and other related services. In 2015, nondefense discretionary spending accounted for 16% of the nation's apportionment; however, projections showed that by 2026, the apportionment would be reduced to 11% while the social welfare apportionment would increase from 54% in 2015 to 56% by 2026 (Hungerford, 2016). The priorities of federal expenditures change over the years, with transportation spending fluctuating among other state expenditures. More recent state expenditure data that include transportation spending among other categories will be discussed further in Chapter II to provide more context around transportation prioritization.

Chapter II

Review of the Literature

Transportation infrastructure in the United States faces persistent challenges due to aging assets, constrained funding, and competing demands for capital expansion and maintenance. State DOTs must make complex decisions about allocating limited resources between preserving existing infrastructure and developing new capacity, yet more documentation is needed about how unique institutional practices, funding structures, and governance frameworks influence these priorities. The purpose of this study was to explore how three state DOTs, California, Georgia, and Texas, define, fund, and prioritize capital improvement and maintenance programs, and to identify recurring themes that reveal the advantages of focusing on capital or maintenance to improve transportation system performance, operational efficiency, and provide for favorable economic outcomes.

History of Transportation Policy in the U.S. Prior to 2010

In the mid-19th century, state and local roads were initially considered the responsibility of state and local governments, primarily because the rail industry dominated interstate travel and commerce (FHWA, n.d.-d). Bicycle usage initiated an interest in roadway improvements, which prompted the state of New Jersey to begin providing state aid for road improvements in 1891. Two years later, the federal government created the Office of Road Inquiry in 1893 (FHWA, n.d.-d) to advise state and local governments on the best methods to improve their roadway infrastructure.

Shortly thereafter, there was extensive debate over the need for the federal government to provide transportation aid to states, in part due to competing interests of interstate travel advocates and rural roadway users, as well as due to the appropriate apportionment formulas. Despite the controversy, the Federal Aid Road Act of 1916 was signed by President Wilson on July 11, 1916 (FHWA, 2022a). It is considered the first legislation to formally allow for a federal-aid highway program that mapped out the rules of engagement for federal-state coordination. Furthermore, the Federal Highway Act of 1921 and the Post Office Appropriations Act of 1923 authorized multi-year funding with annual apportionments (FHWA, 2017).

The interstate itself became the federal government's focal point for travel and commerce following the transportation achievements of the early 1900s. In 1933, President Roosevelt took Office with about 50% of the workforce unemployed or underemployed (Franklin D. Roosevelt Presidential Library & Museum, n.d.) due to the Great Depression. In the effort to improve the employment rate, President Roosevelt enacted the Second New Deal in 1935, which helped to employ millions in building and improving the nation's infrastructure, along with creating works of art and culture (Franklin D. Roosevelt Presidential Library & Museum, n.d.). Smith (2006) explained that New Deal public works programs "remade the built environment that managed the movement of people, goods, electricity, water, and waste" (p. 3) by funding some of the most significant infrastructure projects in U.S. history.

In the couple of decades that followed the initial New Deal policies, President Eisenhower embraced the New Deal policies (Harris, 1997) and signed the Federal-Aid Highway Act of 1956 for the construction of the interstate system over a 10-year period

with an allocation of $25 billion of federal funds (National Archives and Records Administration, 2022). At the time, it was the largest public works project in American history. The origins of the Interstate Highway System can be traced back to planning efforts in the 1930s, but the network was formally authorized and launched through the Federal-Aid Highway Act of 1956, which provided federal funding for the construction of a nationwide system of highways and bridges (U.S. Senate, 1956). The Highway Trust Fund was established under this Act, which assigns motor fuel user taxes to the funding of highway construction costs (FHWA, 2014b), thereby making it largely independent of the U.S. Treasury general funds.

Once approximately 46,871 interstate miles were built between the 1950s and 1990s, Congress focused on intermodal transportation, including improvements to public transportation and enhanced access to ports and airports. This focus materialized through the enactment of the Intermodal Surface Transportation Efficiency Act (ISTEA), signed by President Bush in December 1991, which provided for $155 billion over the fiscal years 1992 to 1997 (FHWA, 2020b). Later, the Transportation Equity Act for the 21st Century (TEA-21), enacted on June 9, 1998, authorized federal surface transportation programs for highways, highway safety, and transit through 2003 and continued the allocation of motor fuel tax revenues to the Highway Trust Fund to support those programs (FHWA, 2022b).

On August 10, 2005, President George W. Bush signed the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). This act was enforced from 2005 to 2009. It was renewed 10 times before being replaced by the MAP-21 in 2012. SAFETEA-LU allowed for additional tolling and private sector

funding for infrastructure projects. SAFETEA-LU's focus was on improving safety, reducing traffic congestion, easing freight movement, increasing intermodal connectivity, protecting the environment, and preparing for the future of transportation (FHWA, 2005). The historical significance of transportation systems provides a compelling foundation for this study and future research, as infrastructure has consistently been recognized as essential to supporting economic expansion and national prosperity.

Moving Ahead for Progress in the 21st Century: MAP-21 Further Detailed

In 2012, the Federal-Aid Highway Act was, in effect, renamed Moving Ahead for Progress in the 21st Century. President Obama signed MAP-21 on July 6, 2012, just before the start of the federal FY 2013. Under MAP-21, infrastructure funding was set up under several core formula programs that had formerly been implemented under the National Highway System Program, the Interstate Maintenance Program, the Highway Bridge Program, and the Appalachian Development System Program. These revised programs are as follows (FHWA, 2012):

- National Highway Performance Program (NHPP)
- Surface Transportation Program (STP)
- Congestion Mitigation and Air Quality Improvement Program (CMAQ)
- Highway Safety Improvement Program (HSIP)
- Railway-Highway Crossings, and
- Metropolitan Planning

New programs include the following:

- Construction of Ferry Boats and Ferry Terminal Facilities, and

- Transportation Alternatives (TA) – (Transportation Enhancements, Recreational Trails, and Safe Routes to School programs)

MAP-21 was written to authorize $82 billion in federal funding in FY 2013 and 2014 for road, bridge, bicycling and walking improvements, and freight movement improvements.

GROW AMERICA Act

On March 30, 2015, the U.S. Department of Transportation (U.S. Department of Transportation [USDOT], 2015b) Transportation Secretary, Anthony Foxx, submitted a new transportation proposal to Congress for consideration. This proposal was called the Generation Renewal, Opportunity, and Work with Accelerated Mobility, Efficiency, and Rebuilding of Infrastructure and Communities throughout America Act, or the GROW AMERICA Act (GAA), and was to be a six-year, $478 billion transportation reauthorization legislative proposal (USDOT, n.d.). The GAA proposed increased and stable funding for the U.S. highways, bridges, transit, and rail systems and was designed to improve the economy and global competitiveness. It proposed to authorize $317 billion for highway programs; $18 billion for a multimodal freight program; $7.5 billion for the Transportation Investment Generating Economic Recovery (TIGER) grant program; and the remainder would expand funding for safety programs. Half of the plan was proposed to be financed with a one-time 14% tax on U.S. corporations' overseas earnings (Mulero, 2015). The FY 16 Federal-Aid Highway Program proposed apportionments for California, Georgia, and Texas were $3.6 billion, $1.3 billion, and $3.1 billion, respectively (USDOT, n.d.).

The GAA explicitly would have accomplished the following: (a) change the Highway Trust Fund into a truly multi-modal Trust Fund that included intercity rail; (b)

allow tolling on existing interstate lanes; (c) make TIGER a permanent grant program; (d) focus on multimodal transportation; (e) identify freight as a multi-modal form of transportation; and (f) allow for exemptions for rail and transit from some historic and environmental preservation rules (Snyder, 2014). At the time the GAA was being proposed, a substantial portion of the nation's transportation infrastructure faced challenges, with many highways rated below good condition, a significant number of bridges classified as structurally deficient or functionally obsolete, and a notable share of Americans lacking access to public transit services (FHWA, 2016, 2019). Despite the transportation system's conditions, the GROW AMERICA Act failed to advance in Congress (GROW AMERICA Act, 2015). The GAA was ultimately superseded by the Fixing America's Surface Transportation (FAST) Act (2015) in the latter part of 2015.

Fixing America's Surface Transportation (FAST) Act

The transportation act, actually enacted in 2015 for infrastructure improvement, was the five-year plan called the FAST Act, which was signed by President Barack Obama on December 4, 2015. This was a five-year plan encompassing FY 2016 to 2020 (ITE, 2016). The FAST Act provided for $305 billion for highway, transit, highway safety, and railway improvements. It was enacted as the first long-term transportation bill passed by Congress in the prior 10 years, which previously had only passed 36 short-term extensions. Transportation funding was to increase by about 11% over the five years as a result of the FAST Act (ITE, 2016).

In terms of highways and freight, the FAST Act was planned to distribute (a) $1.2 billion to the states via a formula, (b) a discretionary program for nationally significant freight and highway projects in the amount of $900 million, (c) $4.5 billion as a grant

program, and (d) $6.3 billion for projects and technology that facilitate the flow of freight transportation systems (ITE, 2016). The FAST Act provided, for the first time, a dedicated federal funding source for freight projects (USDOT, 2015a) was planned to increase funding allocations from FY 2015 to FY 2020 (ITE, 2016).

Infrastructure Investment and Jobs Act

The most current transportation legislation, enacted in 2021, was the IIJA, also known as the Bipartisan Infrastructure Law. It is one of the largest infrastructure bills in U.S. history, allocating $1.2 trillion to various infrastructure priorities over a five-year period. This transportation bill provided funding for roads, bridges, climate change resilience, electricity grids, internet infrastructure, public transportation, railways, waterways, and airports (Greene, 2022). The IIJA was initially part of a multitrillion-dollar legislative package, the Build Back Better Act (BBBA), that was suspended in March 2021. Strong opposition to the cost of the BBBA prompted legislators to restructure the plan, splitting the IIJA from the BBBA and making it its own proposal. It was introduced in the U.S. Congress on June 4, 2021, as the INVEST in America Act by Democrat representative Peter DeFazio of Oregon (Greene, 2022). It was ultimately signed into law on November 15, 2021, by President Biden as the IIJA (NCSL, 2021). It currently provides the basis for FHWA programs and activities through September 2026. By tracing the evolution of U.S. transportation policy from the Federal-Aid Highway Act through the IIJA, this literature review demonstrates the long-standing reliance on structured funding programs and federal oversight. This historical context informs the study's results, revealing patterns in state DOT decision making and highlighting how federal frameworks shape contemporary investment strategies.

General Infrastructure Conditions and Financial Overview

From a funding standpoint, infrastructure facilities were designed and constructed based on direct costs (Mirza, 2006). There was little emphasis on future costs for maintenance and depreciation. Industries such as car manufacturing devote more attention to inspection, maintenance, and component replacements (Mirza, 2006). However, infrastructure facilities also require these same considerations because their costs are legitimate and often ignored by policymakers until the need to replace those facilities becomes imminent. Although the ASCE (n.d.) did not publish a formal "Report Card for America's Infrastructure" until 1998, its infrastructure grading effort is rooted in earlier national infrastructure assessments. ASCE's report card has evaluated major infrastructure categories at multiple points over the decades—including 1998, 2001, 2003, and 2005—assigning letter grades for roads, bridges, and other systems that reflect deteriorating conditions and funding deficiencies. Historical trend data compiled by ASCE (n.d.) show that roadways declined from a C+ grade in earlier assessments to a lower grade by 2005, and bridges declined from a C+ to roughly a C grade, demonstrating long-term deterioration in these critical infrastructure sectors that need sustained investment.

The compilation of these categorical grades led to an adjustment in the ASCE's 2009 estimate of the funds needed to correct infrastructure insufficiencies nationwide to $2.2 trillion (Petroski, 2009). However, the United States government continued to face challenges in determining how to finance the maintenance, expansion, and development of its highway systems (Krishen et al., 2010). This challenge reinforces a gap in the literature regarding the comparative emphasis on maintenance versus capital

improvements across states with diverse institutional and fiscal contexts. This study addresses that gap by providing detailed qualitative insights into the decision-making processes of three states, thereby contributing to the need for evidence-based strategies for infrastructure preservation (maintenance) and expansion (capital).

The 2025 ASCE Report Card for the U.S. infrastructure was an overall C grade, finding that legislation passed by Congress since the 2021 Report Card initiated improvements (ASCE, 2025c), but more work and investment are needed to overcome decades of underinvestment and adapt the country's transportation networks, water systems, electric grid and broadband services to meet current and future demands (ASCE, 2025b). Additionally, the 2025 grade, an improvement over the C- overall grade in 2021, was the highest grade given by ASCE (2021b) since it began its report card issuance in 1998. Although the report card showed that 2021 investments from the IIJA had started to pay off, ASCE (2025a) projected a $3.7 trillion gap between current planned infrastructure investments and what must be done to ensure the nation's infrastructure is working efficiently. This was an increase from the $2.59 trillion gap reported four years prior (ASCE, 2025b). According to Darren Olson, the 2025 Report Card Chair for ASCE (2025b):

> Every American household or business immediately feels the impact of just one inefficiency or failure in our built environment…However, if we maintain investments, each American household can save $700 per year. Better infrastructure is an efficient investment of taxpayer dollars that results in a stronger economy and prioritizes American jobs, resilience and connectivity. (para. 4)

In 2025, using an A to F school report card format, ASCE's "Report for America's Infrastructure" provides a comprehensive assessment of current infrastructure conditions and needs, evaluating 18 categories. Broadband is a new category added to the 2025 report. The individual 2025 category grades ranged from a B for ports to a D grade for stormwater and transit (ASCE, 2025b). Roads and bridges scored a D+ and C, respectively (ASCE, 2025a). No categories earned a D- grade for the first time since 1998, but nine categories still received a grade in the D range. Eight categories, dams, hazardous waste, inland waterways, levees, ports, public parks, roads, and transit, improved over the 2021 report; two categories, energy and rail, received lower grades in the 2025 report card (ASCE, 2025b).

A substantial portion of the nation's bridges continues to face significant structural challenges. In 2014, approximately 61,365 bridges were classified as structurally deficient, and these bridges were crossed an estimated 215 million times daily across the United States (BTS, 2017; Hill, 2015). These figures are derived from the "National Bridge Inventory," which systematically collects condition and usage data for all bridges under federal oversight. The availability of this data is made possible by regular inspections conducted by state transportation departments (FHWA, 2007). Such ongoing monitoring ensures that federal and state agencies can prioritize maintenance, rehabilitation, and replacement bridge projects, thereby supporting public safety and the efficiency of the transportation network. As the nation's roadways continue to age and experience deterioration, recent data indicate that more than 62% of transportation spending is allocated to preserving existing systems. Investments in

infrastructure, alongside improvements in vehicle safety technology, have the potential to decrease the severity of crashes or even prevent them in the future (ASCE, 2021b).

The larger question regarding the implementation of transportation improvement projects is whether the nation as a whole is creating additional transportation capacity or primarily maintaining existing infrastructure. Transportation infrastructure promotes economic growth through accessibility and safety. Ironically, transportation infrastructure investment has been linked to economic productivity and growth, while strategies focused solely on maintaining existing systems risk constraining economic expansion and depreciating the effectiveness of established economic networks (Aschauer, 1989; Gramlich, 1994). According to Carr and Bowman's (2011) article, "The Legal Implications of Container Fees: A Case Study of California Senate Bill 974," states have traditionally considered the following options for funding transportation infrastructure improvements: (a) maintaining status quo; (b) shifting funds from other state projects; (c) selling bonds; (d) public private partnerships (called ppps); (e) increasing excise taxes, income taxes, sales taxes; and (f) imposing regulatory fees, such as container fees.

Transportation Funding

The ASCE (2021b) report card stated that $120 billion is needed for targeted system expansion, and $105 billion for targeted system enhancements. On October 1, 2013, it had been officially 20 years since the federal tax on motor fuels had been raised. The taxes on gas and diesel fuels fund the Highway Trust Fund, which is the federal program that primarily pays for highway repairs and improvements and supports mass transit (Reid, 2014). According to Lohman (2025), it is also a federal accounting mechanism that receives revenue mainly from transportation-related excise taxes and

provides a dedicated source of funding for surface transportation. The Highway Trust Fund has two accounts: the highway account and the mass transit account. Since FY 2001, expenditures from the highway account have exceeded revenue. The persistent gap between the highway account's revenue and expenditures has raised questions about its long-term sustainability. Based on current trends, the Congressional Budget Office (CBO) projects that in FY 2028, the highway account may not have sufficient funds to fulfill federal obligations to states and local governments for transportation projects (Lohman, 2025).

The highway account receives revenue from fuel taxes and other transportation-related excise taxes. About 85% of the highway account's annual revenue comes from fuel taxes—currently set at 18.30 cents per gallon on gasoline and 24.30 cents per gallon on diesel—of which the highway account receives the majority. Congress has not raised fuel taxes since 1993 (Lohman, 2025). At the same time, construction input costs, including asphalt, concrete, construction machinery, and related materials, have increased significantly over the past decade, with federal cost indices indicating cumulative increases by 60% or more (U.S. Bureau of Labor Statistics, 2024; FHWA, 2024b).

Equally detrimental to transportation funding is the push for fuel-efficient vehicles. Since monitoring began in the 1970s, the average fuel economy of new light-duty vehicles sold in the United States has steadily increased, with model year 2026 vehicles achieving an average of 35 miles per gallon, the highest on record and a notable improvement compared to earlier decades (U.S. Department of Energy & Environmental Protection Agency, 2026; U. S. Environmental Protection Agency, 2026). In 2021, ASCE (2021a) indicated that deficiencies in transportation and other critical infrastructure

systems cost U.S. households approximately $3,300 per year through increased vehicle operating expenses, lost productivity, and other inefficiencies. These costs reflect the cumulative effect of deferred maintenance, aging assets, and constrained investment, highlighting the persistent challenges that state and federal agencies face in balancing capital improvements with routine maintenance. These findings emphasize the importance of this study, which investigates how state departments of transportation prioritize maintenance versus capital projects, allocate limited funding, and make evidence-based decisions to sustain transportation system performance and maximize public value.

A report issued by the Tax Foundation concluded that user taxes and fees do not cover all of the road spending in any state (Reid, 2014). User fees and taxes consist of tolls, fuel taxes, and vehicle license taxes (Henchman, 2014). Nationally, in 2011, roadway user fees and user taxes made up only 50.4% of state and local roadway expenses (Henchman, 2014). In 2021, state and local governments spent more than $200 billion on highways and roads (Urban Institute, n.d.), while user fees (motor-fuel & vehicle) taxes generated only about $125 billion of the expenditures (FHWA, 2023c), requiring substantial reliance on non-user revenues and intergovernmental transfers.

In 2022, Americans drove more than three trillion vehicle miles (FHWA, n.d.-a). However, most states fail to collect enough user fees to fully provide for roadway spending. This necessitates transfers from general funds or other revenue sources that are unrelated to road use to pay for road construction and maintenance (Macumber-Rosin & Hoffer, 2026). This indicates a persistent structural gap between roadway use and user-based funding. The challenge for most states is finding innovative ways for users to help

pay for the services they use (Henchman, 2014; Macumber-Rosin & Hoffer, 2026). In 2011, California, Georgia, and Texas were ranked as 4th, 30th, and 13th, respectively, in terms of the share of state and local road spending covered by user fees and user taxes (Henchman, 2014). Although state rankings have shifted over time, more recent analyses continue to find that user fees cover only a portion of roadway spending, requiring substantial reliance on general revenues and intergovernmental transfers (Macumber-Rosin & Hoffer, 2026).

Increasing toll fees, expanding toll capacity, and adjusting gasoline taxes for inflation are not politically popular strategies for increasing transportation funds. However, states need to focus on maximizing their collection of user fees and user taxes for transportation spending. As noted in Henchman (2014), subsidizing roadway spending with general revenues develops pressure to increase income through sales taxes, which can, unfortunately, compromise the economic growth of a given state. Some other suggestions for increasing transportation funding are to base the gas taxes on vehicle miles traveled, implement taxes on wholesale gasoline prices, increase states' sales taxes, and implement special transportation taxes (Reid, 2014). Reid (2014) highlights that vehicles cause wear and tear on infrastructure, placing responsibility for maintenance on users and putting pressure on limited funding sources. This context directly relates to my study, which examines how state DOTs in California, Georgia, and Texas prioritize maintenance versus capital improvements under fiscal and institutional constraints. By emphasizing focused strategies, DOTs can maximize system performance and public value while efficiently managing the financial pressures associated with user-based infrastructure costs.

Public Buy-In

One of the primary hurdles to securing support for infrastructure improvements is public buy-in. The University of Virginia's Miller Center (2011) released a conference report, entitled "Are We There Yet? Selling America on Transportation," that addressed public support for infrastructure improvements. The report recommended developing a communications strategy for infrastructure improvements. This communications strategy emphasized raising public awareness and facilitating public engagement. The first recommendation was to create a positive tone that brings economic growth, jobs, U.S. competitiveness, and quality of life to the forefront as benefits of infrastructure improvements. These were all aspirations that the general public could understand and have no problem with accepting roles in achieving them. The second recommendation for the communications strategy was to develop a detailed, flexible campaign for support tied to election periods and important transportation-related events (Miller Center, 2011). By shining the light on transportation deficiencies during political campaigns, transportation advocates can provide avenues for political support for election candidates. The third recommendation was to seek support for infrastructure improvements through traditional and social media, ensuring that the maximum number of individuals in the general public were at least presented with opportunities to be educated about transportation issues, as well as opportunities to voice their opinions to public officials through blogs, Facebook, Twitter, etc. The fourth recommendation was to link local transportation investment opportunities and benefits to national-level policy decisions. The idea behind this recommendation was that the public's knowledge of the risks and costs of inadequate transportation systems would motivate them to seek legislative action to remedy the

insufficiencies, as evidenced by the passage of the various transportation bills discussed earlier in this chapter (Miller Center, 2011). This could only be effective if the general public were informed of their options for influencing legislation.

Transportation Infrastructure Needs for California, Georgia, and Texas

This section focuses on the infrastructure needs of the states that were analyzed in this study. The data presented emphasizes the infrastructure needs in California, Georgia, and Texas, with a focus on bridges and roads. The indicators reflect the state of transportation infrastructure in terms of structural deficiencies and annual costs to motorists, as well as the percentage of roads in poor or fair condition.

In terms of bridges, California had a significant percentage (27.9% in 2013) categorized as structurally deficient or functionally obsolete (FHWA, 2013a, 2013c), though this dropped to 4.9% in 2025 (FHWA, 2025). Georgia reported a smaller proportion (17.6% in 2013) (FHWA, 2013a), with a decrease to 1.7% in 2025 (FHWA, 2025). Texas faced a similar issue, with 19% of bridges in poor condition in 2013 (FHWA 2013a), and a reduction to 1.2% in 2025 (FHWA, 2025).

In terms of annual costs to motorists from roads in need of repair, in 2013, California motorists faced the highest costs at $703 per motorist (ASCE, 2012a) versus $725 in 2023 (ASCE, 2025c). Georgia motorists incurred a cost of $260 per motorist (ASCE, 2014), versus $443 per motorist (ASCE, 2024). And Texas motorists incurred a cost of $373 per motorist due to roads needing repair (ASCE, 2012b), versus $959.36 per motorist in 2025 (ASCE, 2025d).

Additionally, in 2025, according to the ASCE Report card for each state in this study, the percentage of roads in poor or fair condition is as follows: California was 45%

(ASCE, 2025c); Georgia was 23% (ASCE, 2024), and Texas was 47% (ASCE, 2025d). This data collectively highlights the varying levels of deterioration in infrastructure across these states. The data reflect both current challenges and future projections, underscoring the importance of addressing these infrastructure needs through capital and maintenance improvement programs in the effort to reduce costs to motorists and improve road safety and quality.

California

California's infrastructure system has been described as being slightly better than the nation as a whole. In 2009, ASCE (2012a) gave the state an overall Grade of a C, whereas the nation received a D. Caltrans (2025) carries out its mission with six primary programs: Aeronautics, Highway Transportation, Mass Transportation, Transportation Planning, Administration, and the Equipment Service Center. Caltrans (2025) manages more than 50,000 miles of California's highway and freeway lanes, provides inter-city rail services, permits more than 400 public use airports and special use hospital heliports, and works with local government agencies. Based on the IIJA formula funding alone, California is anticipated to receive approximately $29.5 billion over the bill's five years in federal highway formula funding for highways and bridges (Padilla & Feinstein, 2021). The Department services the transportation needs of more than 39 million residents (State of California, n.d.). Additionally, California has 11 publicly owned ports, of which three are considered megaports: Los Angeles, Long Beach, and Oakland. These ports, along with other public and private ports in the state, serve as critical gateways for the distribution of freight domestically and internationally, supporting economic activity

and trade across multiple sectors (Caltrans, 2026a; California State Water Resources Control Board, 2022).

The California Transportation Asset Management Plan (TAMP) allows California to maximize results by managing the life cycle of transportation assets to minimize costs and manage risks. It provides a framework for understanding performance gaps, prioritizing actions to address them, and establishing business processes to streamline asset management activities. The TAMP combines these strategies into a constrained 10-year financial plan for projects and identifies the performance gap to achieve the 10-year targets that will improve the transportation system (Caltrans, 2026a). The TAMP is a coordinated plan by Caltrans and its partner agencies to maintain California's transportation infrastructure assets today and into the future. TAMPs are intended to evolve over time as changes in condition, budget, risks, constraints, and strategic priorities are identified. According to federal regulation 23 C.F.R. 515.13 (2025), the TAMP must be updated every four years to incorporate improvements and re-evaluate conditions, targets, and performance (see also Caltrans, 2026a).

California's Assembly Bill 515 (2017) requires submission of the draft State Highway System Management Plan (SHSMP) to the California Transportation Commission (CTC) by February 15th and the final SHSMP to the Governor and Legislature by June 1st of odd years. The SHSMP presents a performance-driven and integrated management plan for the State Highway System (SHS) in California. SHS needs, investments, and resulting performance for the 10-year period are presented in the SHSMP. The SHSMP is organized to align with the California Department of Transportation Strategic Plan. The SHSMP integrates the maintenance, rehabilitation, and

operation of the SHS into a single management plan that implements a number of state and federal asset management requirements with new resources from California Senate Bill 1 (SB 1). The SHSMP operationalizes the aforementioned California TAMP by utilizing the CTC-adopted asset classes, performance measures, and performance targets as defined in California Senate Bill 486. The SHSMP utilizes objective analysis to focus investments on measured conditions and performance objectives. The historic asset-based funding approach has been replaced by a performance-driven methodology that provides greater local flexibility to achieve multiple objectives within a single project (Caltrans, 2023).

The Office of State Highway Operations and Protection Program (SHOPP) Management has primary responsibility for planning, developing, managing, and reporting the four-year SHOPP portfolio of projects. This includes preparation of the four-year program, participating in the development of the aforementioned SHSMP, coordinating the formal amendment of adopted SHOPP projects, coordinating with California Transportation Commission staff, management of the annual Minor Program, coordination with Districts and Headquarters divisions, and upkeep of project information in the Department's California Transportation Improvement Program System (CTIPS) database (Caltrans, 2026b, 2026c). Caltrans institutional plans illustrate how governance structures, funding flexibility, and asset management practices shape investment priorities, which are critical to this study's focus on how state DOTs define, fund, and prioritize capital improvements versus maintenance projects.

Georgia

The State of Georgia is an economic hub of the Southeast. Atlanta, the state capital, is the major economic and population center of the state, with major regional economic and population centers in Augusta, Savannah, and Macon. Its economic base is diverse, with major port facilities on the coast, agricultural resources throughout the state, manufacturing and service industries, and it is a major transportation center with one of the busiest airports in the nation. Georgia is the eighth-largest state with an estimated population of 11 million people (State Accounting Office, 2024). GDOT (n.d.) is tasked with planning, constructing, and maintaining Georgia's state and federal highways. GDOT is involved in programs for bridges, waterways, public transit, rail, general aviation, bikes, and pedestrians. The Department also assists local governments in maintaining their infrastructure facilities as well.

GDOT's specific duties include performing location and environmental studies; conducting mapping and photogrammetric surveys; acquiring rights of way needed to construct and maintain highways; supervising all construction and maintenance activities let to construction; ensuring the quality of materials used for construction; planning and implementing maintenance improvement projects to maintain existing infrastructure; issuing permits for special vehicles such as overweight carriers; and conducting research to improve planning and engineering methodologies (Georgia Office of the Governor, 2013).

GDOT's (2024a, 2024b) transportation programs reflect the state's overall policy priorities, as outlined in the 2021 Statewide Strategic Transportation Plan/2050 Statewide Transportation Plan (SSTP/SWTP). The SSTP/SWTP serves as Georgia's official,

intermodal, comprehensive, fiscally constrained transportation plan, including programs and other activities to support the implementation of the state's strategic transportation goals and policies. The SSTP/SWTP is developed simultaneously with the federally required 2050 SSTP/SWTP, the long-range multimodal transportation plan for the state that identifies the conditions and trends of the transportation system components over a minimum 20-year planning horizon (GDOT, 2024a, 2024b).

The Statewide Transportation Improvement Program (STIP) is Georgia's four-year transportation and capital improvements program. The STIP lists federally funded transportation projects located outside Metropolitan Planning Organization (MPO) boundaries. Each MPO develops its own Transportation Improvement Program (TIP). The TIPs are included in the STIP by reference without modification once approved by the MPO and the Governor, or his designee. Projects include highway, bridge, public transit, bike, pedestrian, railroad, and other improvements (GDOT, 2024b). GDOT's approach to transportation investment illustrates its practical application of balancing maintenance with capital expansion, directly aligning with the focus of this study on DOT decision making under fiscal and institutional constraints.

Texas

The Texas Department of Transportation's (n.d.-a) vision is "a forward-thinking leader delivering mobility, enabling economic opportunity and enhancing the quality of life for all Texans" (para. 2), and its stated priorities are safety, delivery, innovation, and stewardship. It is tasked with providing safe and reliable transportation solutions and is primarily involved with the construction and maintenance of the state's highway system, though it also oversees aviation, rail, and public transportation systems. Transportation

infrastructure in Texas plays a vital role in facilitating trade between the United States and Mexico. Given current and projected travel demand, improving the capacity and operations of the existing multimodal infrastructure is critical to alleviate traffic congestion, facilitate international and e-commerce trade, reduce environmental impacts, and enhance the state's economic competitiveness in trade and beyond (TxDOT, n.d.-b). Texas has one of the most robust, multimodal transportation systems in this country. This system comprises extensive roadways, bridges, railroads, public transit systems, sidewalks and bikeways, airports, seaports and waterways, and border crossings, connecting communities and the economy (TxDOT, 2024a). Texas's 2050 Transportation Plan notes that a forward-looking and innovative approach is critical to delivering transportation investments that preserve existing transportation assets while enhancing transportation options that will accommodate the current 30 million Texans and 13 million jobs, in addition to the more than 11 million new residents and six million new jobs projected by 2050 (TxDOT, 2024a).

Texas leads the states in total road and street mileage with 322,113 miles, total railroad mileage at 20,000+ miles, over 4,000 airports, 56,000+ bridges (American Road and Transportation Builders Association, n.d.), 423 miles of Gulf intracoastal waterways, and 28 ports (U.S. Army Corps of Engineers, n.d.). The Texas Statewide Transportation Improvement Program (STIP) is TxDOT's (2024a) federally required, fiscally constrained capital improvement program that includes multimodal transportation projects and investments expected to be funded and ready for construction or implementation within the next four years. The STIP lists multimodal projects, indicating in which year the project activity will proceed and is developed in accordance with Title

23 of the United States Code Section 135 Statewide Planning, and 43 Texas Administrative Code 16.103. The STIP must be approved by both the FHWA and the Federal Transit Administration (FTA) for projects to be eligible for federal funding under 23 USC and 49 USC, Chapter 53. It is one of several planning and programming documents developed by TxDOT, MPOs, and partner agencies to guide planning and programming activities and ensure that TxDOT plans and develops projects that best address state, regional, and local transportation needs.

The STIP is developed through collaboration with partner agencies at the local, regional, state, and federal levels and is the final step in the statewide planning process leading to the implementation of projects and programs. Connecting Texas 2050, TxDOT's (2024b) Statewide Long Range Transportation Plan (SLRTP), is TxDOT's strategic policy plan for establishing statewide transportation goals and priorities. The SLRTP is updated every four years and has a planning horizon of 24 years or more. MPOs also develop regional long-range plans called metropolitan transportation plans (MTPs), which are updated every four to five years and have a planning horizon of 20 years or more. The SLRTP and MTPs, corridor studies, and other planning efforts provide a foundation for TxDOT's Unified Transportation Program (UTP). The UTP is updated annually and covers a 10-year planning horizon (TxDOT, 2024b). TxDOT's planning and programming efforts can be divided into two categories, each of which addresses different time horizons: long-term and near-term. This allows TxDOT to program projects in the near-term while anticipating the state's transportation needs in the long-term (TxDOT, 2024c). TxDOT's Unified Transportation Program (UTP) plays a substantial role in managing its near term project planning and implementation. It is

updated annually and approved by the Texas Transportation Commission; the UTP serves as an intermediate programming and development roadmap that is used to define, prioritize, and assign available funding to thousands of Texas transportation projects over a continuous 10-year period (TxDOT, 2024c).

The Texas case demonstrates the practical application of maintenance and capital improvements. This also directly aligns with the study's focus on how state DOTs make investment decisions under institutional and fiscal constraints. Table 1 provides further insight into transportation spending in Georgia, California, and Texas by highlighting the differences in federal highway program apportionments among the three states under the IIJA. California and Texas receive the largest allocations, reflecting both their extensive transportation networks and high population and freight volumes, while Georgia receives comparatively smaller amounts due to its smaller network and population base compared to the other two states. These disparities in federal funding illustrate the fiscal context within which each state DOT operates and must make investment decisions, balancing maintenance, rehabilitation, and capital expansion projects.

Table 1

Comparison of Federal Highway Program Apportionments

State	2023 Actual	2026 Estimated	FY 2022 to FY 2026
California	$5,616,208,254	$5,919,801,027	$428,562,033,352
Georgia	$1,832,537,410	$1,939,770,298	$9,332,293,130
Texas	$5,473,439,501	$5,796,102,848	$27,878,403,732

Note. This table was created using data from "Infrastructure Investment and Jobs Act (IIJA)," by FHWA, n.d.-b (https://www.fhwa.dot.gov/infrastructure-investment-and-jobs-act/docs/Est_FY_2022_026_Formula_Programs_Infrastructure_Investment_State-by-

State_Year-by-Year.pdf)

By examining these apportionments alongside state-specific planning frameworks and asset management strategies, this study qualitatively investigated how DOTs prioritized capital and maintenance investments under varying funding levels and institutional constraints, providing insight into the strategic allocation of federal resources to maximize transportation system performance.

State Expenditures

Each state prioritizes its overall expenditures and determines how transportation fits into each state's plan from fiscal year to fiscal year. The typical state spending categories include elementary and secondary education, higher education, public assistance, Medicaid, corrections, transportation, and all other (i.e., unemployment insurance, public health, housing assistance, emergency management, economic relief, aid to local governments, and technology upgrades) (National Association of State Budget Officers [NASBO], 2020). On a high level, comparison data can be found within the 2025 State Expenditure Report developed by the NASBO, which found that state spending (of state and federal funds) across the United States reached $3.2 trillion in fiscal year 2025, representing a 3% increase in all program areas. According to NASBO (2025), in FY 2025, federal funds increased 5.5% following three consecutive years of decreases from FYs 2022 to 2024.

The coronavirus outbreak (COVID-19) began in the fourth quarter of 2020, thereby limiting states' ability to balance their budgets late in the fiscal year (NASBO, 2020). In response, however, the United States Congress passed multiple bills to alleviate state burdens, including the Coronavirus Aid, Relief, and Economic Security (CARES)

Act. Additionally, in March 2021, the American Rescue Plan Act of 2021 (ARPA) was signed into law, allocating $195.3 billion to states and the District of Columbia and $4.5 billion to territories. The passing of the COVID-19 relief bills led to significant increases in federal funds in FYs 2020 and 2021, but the slowdown in federal funds from FY 2022 to 2024 was due to a number of factors, including states having expended funding from the CARES Act, reduced unemployment insurance benefit payments, states' exhaustion of the ARPA funds, and the end of assistance funding due to the expiration of the public health emergency (NASBO, 2025).

Transportation Expenditures

To put state transportation spending in perspective, it should be noted how it fits into total state expenditures. Transportation spending in this context represents operating and capital expenditures for highways, mass transit, railroads, airports, road assistance for local governments, and administrative-related costs. Transportation spending accounted for 7.8% of total state expenditures in FY 2025. Additionally, transportation spending itself increased 15.5% in FY 2024 and 7% in FY 2025 (NASBO, 2025). Other pertinent state funding statistics, as they relate to states' transportation spending and other types of spending, can be found in Appendix A, All Funds Percent Changes from FY 2023 to FY 2024 and FY 2024 to FY 2025, FY 2025, and Appendix B, Total State Expenditures by Function, FY 2025.

States have been expending federal funds from the aforementioned IIJA, which provides for new transportation spending over FY 2022 through FY 2026 for roads, bridges, major projects, rail, public transit, broadband, airports, ports, water infrastructure, and resiliency in general. Furthermore, motor fuel taxes represent a

significant state revenue source for transportation funds at 36.5% (NASBO, 2025). The remaining sources include license and registration fees, vehicle sales and use taxes, tolls, and other sources (NASBO, 2020).

The states highlighted within this study, Georgia, California, and Texas, all experienced changes in transportation expenditures over the last two fiscal years. The data indicate that California saw significant increases from FY 2024 to FY 2025 in both total expenditures (from $452,730 million to $510,283 million) and transportation expenditures (from $26,154 million to $32,982 million). Georgia's total expenditures are much smaller, with a slight decrease in transportation spending from $5,682 million to $5,456 million. Texas has a more moderate increase in both total and transportation expenditures, from $144,594 million to $146,620 million and from $19,471 million to $22,765 million, respectively (see Table 2).

Table 2

Comparison of State Expenditures and Transportation Expenditures

State	2024 Expenditures ($ Millions)	2025 Expenditures ($ Millions)	2024 Transportation Expenditures ($ Millions)	2025 Transportation Expenditures ($ Millions)
California	452,730	510,283	26,154	32,982
Georgia	76,398	74,942	5,682	5,456
Texas	144,594	146,620	19,471	22,765

Note. This table was created using data from "2025 State Expenditure Report," NASBO, 2025 (https://www.nasbo.org/reports-data/state-expenditure-report). It synthesizes general funds, federal funds, other state funds, and bonds**.**

California demonstrated the largest increase in both total expenditures and transportation expenditures, reflecting a larger state population than the other two states and more significant infrastructure investments, particularly in capital improvement projects. Georgia had a stable total expenditure trend but a slight decline in transportation funding, which may have reflected a prioritization of other state needs or more balanced allocation strategies. Texas also showed an increase in transportation spending, likely keeping pace with growing infrastructure demands. California showed a modest increase in the percentage of its total expenditures allocated to transportation (from 5.8% to 6.5%) (see Table 3).

Table 3

Transportation Expenditures as a Percent of Total State Expenditures

State	2024 Transportation Expenditures as a Percent of Total State Expenditures	2025 Transportation Expenditures as a Percent of Total State Expenditures
California	5.8	6.5
Georgia	7.4	7.3
Texas	13.5	15.5

Note. This table was created using data from "2025 State Expenditure Report," NASBO, 2025 (https://www.nasbo.org/reports-data/state-expenditure-report).

BTS (n.d.) provides detailed information on state and local transportation expenditures categorized by capital vs. non-capital/maintenance expenses in all three states. As defined by BTS (2025) in their "Transportation Public Finance Statistics," capital outlays included new equipment and structures, and for improving or enhancing the capacity and quality of the existing equipment and structures, which were defined by

an asset's useful life. Non-capital outlays included operation and maintenance costs, as well as research, administration, and other costs government agencies incurred in managing transportation systems not classified as capital investments (BTS, n.d.). The data set included specific spending types, funding sources, government level, total transportation expenditures, and yearly data from 2020 to 2022 for California, Georgia, and Texas. Appendix C includes a table with this information and also captures the population size of each state each year. From the table, one can infer that California and Texas prioritize capital investment, with significant allocations to future infrastructure, while Georgia has a more balanced focus on both maintenance and capital expenditures.

Texas and California both showed steady growth in public roads, though Texas was ahead with a significantly larger total number of roads. Georgia's public roads remained stable, with minor increases in bridges over time. In terms of freight railroads, Texas led in freight railroad miles, while California and Georgia had only about half that of Texas's railroad miles. As far as bridges are concerned, each state showed an increase in its number of bridges, with Texas leading in total bridges and showing an average yearly increase (see Table 4).

Table 4

State Transportation Infrastructure Inventory

Location	Measure	2023	2024	2025
United States	Miles of public road	4,219,172	4,228,430	
	Miles of freight railroad	135,375		
	Bridges	621,581	623,218	624,193
California	Miles of public road	177,334	177,607	

	Miles of freight railroad	4,985		
	Bridges	25,818	25,848	25,975
Georgia	Miles of public road	127,279	127,308	
	Miles of freight railroad	4,633		
	Bridges	15,058	15,069	15,090
Texas	Miles of public road	322,113	326,028	
	Miles of freight railroad	10,251		
	Bridges	56,313	56,729	56,951

Note. This table was created using data from "State Transportation Infrastructure," BTS, n.d. (https://www.bts.gov/state-transportation-infrastructure).

These inventory comparisons highlight the strategic investment decisions in transportation infrastructure across the three states. California invests heavily in infrastructure expansion and maintenance, while Texas shows a steady increase in funding to meet growing demands. Georgia's investment is relatively stable but slightly declining, potentially reflecting changes in budget priorities. For this study, these inventory comparisons provide essential context for examining how state DOTs allocate resources between capital improvements and routine maintenance. By linking infrastructure scale and growth patterns to federal and state funding levels, this study explores how institutional priorities, funding availability, and planning strategies shape the effectiveness and efficiency of transportation system management. Understanding these differences is critical for identifying best practices in balancing expansion and maintenance across diverse state transportation environments.

Other Relevant Research and Publications

Similarities in this study are evident in the statistical data and analyses collected and calculated for transportation spending. Kane and Tomer (2019) list five U.S. infrastructure spending trends:

1. From 2007 to 2017, total public spending on infrastructure fell by $9.9 billion in real terms
2. Although total spending fell over the previous decade, spending on infrastructure operation and maintenance rose by $23.2 billion (9.5%)
3. State and local spending declined over the previous decade, but continued to account for more than three-quarters of all U.S. Infrastructure spending, driven largely by operation and maintenance
4. U.S. spending on transportation infrastructure had been down $4.2 billion (1.4%) since 2007, but has shown signs of a rebound in the past five years
5. U.S. spending on water infrastructure saw a sharper decline, falling $5.6 billion (3.8%) since 2007, with a precipitous drop in capital spending. (heading titles in "Shifting into an Era of Repair")

The intent in capturing these data trends was to emphasize the perceived need to balance spending on current and future infrastructure needs by showing the imbalance between operations/maintenance and capital projects.

Another such spending study, published by the Eno Center for Transportation, focused on overall state spending, comparing transportation spending to education, corrections, environment, housing, and other areas. The publication noted transportation spending had the strongest growth rate in state spending in 2018 among other

expenditures (Puentes, 2019). Furthermore, Puentes (2019) noted that the five largest states spend the most on transportation (California, Texas, Florida, New York, and Pennsylvania), suggesting that transportation spending correlations exist. It provided additional data from the NASBO regarding various state transportation fund revenue sources, which indicate a variety of fiscal approaches to transportation spending by states (Puentes, 2019).

Lastly, Gordon et al.'s (2016) research report, "Assessing Fiscal Capacities of States," expanded upon how states and local governments raise and spend funds. Specifically, one part of this report emphasized how much state and local governments spent on public goods and services such as schools, hospitals, and roadways, correlating it with the revenue raised on the state and local levels. The report also suggested that federal allocation formulas could be modified to equitably fit states and local governments based on individualized needs and fiscal capacities, thereby justifying the propositions presented in Chapter III that transportation spending on capital and maintenance programs can be compared and perhaps strategically implemented by state DOTs (FHWA, 2024a).

Chapter Summary

Transportation infrastructure in the United States faces ongoing challenges due to aging assets, limited funding, and competing demands between capital expansion and maintenance (ASCE, 2025a; Mirza, 2006). Historically, federal programs—from the Federal Aid Road Act of 1916 through the New Deal, the Interstate Highway System, ISTEA, TEA-21, SAFETEA-LU, MAP-21, FAST Act, and IIJA—have shaped how states plan, fund, and implement infrastructure projects (FHWA, 2017; FHWA, 2014a;

Franklin D. Roosevelt Presidential Library & Museum, n.d.; Greene, 2022; Smith, 2006). These programs provide structured funding, performance guidance, and multi-year planning frameworks that state DOTs use to balance maintenance, rehabilitation, and capital improvements while supporting economic growth and public safety (FHWA, 2023a, 2023b; NASBO, 2025).

State-specific analyses reveal differences in investment priorities and strategies. California, Georgia, and Texas employ strategic asset management and short- and long-range planning tools—such as TAMP, SHSMP, SSTP, STIP, and UTP—to integrate maintenance and capital projects over multi-year horizons (Caltrans, 2026a; GDOT, 2024a, 2024b; TxDOT, 2024b). Federal highway apportionments and state funding levels further influence how DOTs allocate resources (FHWA, n.d.-b). Historical and contemporary trends in infrastructure spending highlight the growing emphasis on operations and maintenance relative to capital projects (Kane & Tomer, 2019; Puentes, 2019). This study addresses a critical gap in the literature by qualitatively examining how state DOTs prioritize maintenance versus capital investments under institutional and fiscal constraints, providing insights into strategic resource allocation to maximize transportation system performance and public value.

Chapter III

Method

This study referenced transportation spending archival data from the Georgia, Texas, and California Departments of Transportation, documented transportation planning and programming methods, and transportation data extracted from semi-structured interviews with state transportation officials to determine if implementing capital improvements or maintenance improvements was more advantageous for infrastructure improvement programs. This study provided insight into each state's approaches to transportation infrastructure spending, thereby determining how capital improvements and maintenance improvements were and possibly should be prioritized in relation to one another.

Analytic propositions resulting from existing literature were used to guide data collection and analysis. These propositions served as concepts to inform interview protocols and create comparisons, while allowing patterns and themes to emerge from participant accounts. The propositions for this study were centered on whether there was an advantage to investing in capital improvement programs over maintenance programs or vice versa. The research questions, noted below, correspond to the propositions to support the exploratory qualitative inquiry into state transportation investment decision making. These questions seek to understand how capital and maintenance priorities are defined, balanced, and prioritized by institutional and fiscal constraints across different

state departments of transportation in terms of evaluating participant accounts of how their respective organizations approach transportation funding allocations.

Proposition 1: State DOTs vary in how they prioritize capital and maintenance projects based on their respective characteristics, institutional priorities, and funding structures (FHWA, 2013d; Hendren & Niemeier, 2008; Puentes, 2019).

RQ1: How do state departments of transportation define and prioritize capital improvement and maintenance programs across different institutional and funding contexts?

Proposition 2: Capital and maintenance transportation investments are often competing priorities, shaped by institutional norms, performance objectives, and funding availability (FHWA, 2022a; Guevara et al., 2017; Labi & Sinha, 2003).

RQ2: How do institutional norms, performance objectives, and funding structures shape the balance between capital improvement and maintenance investments within state departments of transportation?

Proposition 3: Budgetary constraints shape how state DOTs prioritize capital and maintenance investments, and the degree of structured versus ad hoc decision making varies across institutional contexts (Macumber-Rosin & Hoffer, 2026; Mirza, 2006).

RQ3: How do budgetary constraints influence decision-making processes related to capital and maintenance investment prioritization within state departments of transportation?

Research Design

According to Yin (2002), case studies can be conducted by using either qualitative or quantitative evidence. Yin goes on to note that evidence originates from fieldwork, archival records, verbal reports, observations, or any combination of these data sources. This study demonstrates these characteristics in that it investigates real-world experiences in the form of state DOT investment decisions by practitioners in an exploratory manner. In his comparison of case study approaches article, Yazan (2015) notes Yin's six data gathering tools: documentation, archival records, interviews, direct observations, participant observation, and physical artifacts. Data analysis "consists of examining, categorizing, tabulating, testing, or otherwise recombining both quantitative and qualitative evidence to address the initial propositions of study" (Yin, 2002, p. 109).

According to Maramwidze-Merrison (2016), successful completion and quality of research typically require organizational respondents suitable for answering research questions meaningfully (Cunliffe & Alcadipani, 2016; King, 1994; Mikecz, 2012; Robson, 2002). Obtaining access to elite or executive respondents can be difficult (Maramwidze-Merrison, 2016), but it is necessary for high-quality qualitative research. Executive respondents possess the influence and authority required to answer questions or inquiries about topics that only decision makers would know. In this study, planning and programming managers responsible for programming transportation infrastructure projects were sought to respond to transportation spending interview questions about their respective organizations.

Sixteen semi-structured interviews were conducted for this study, and themes were extracted from 11 DOT officials, three from California, four from Georgia, and four

from Texas, in an effort to match similar transportation roles and responsibilities across all three states. All participants had over 10 years of experience in the transportation field. Ten of the 11 officials from which themes were extracted had over 10 years of tenure within their respective DOT organizations, and nine had over 18 years of tenure within their organization. The titles of the participants consisted of Planning Directors, Finance Managers, Asset Management Directors, Program Managers, and Program Delivery Managers. Six participants, with at least one in each state, had planning-level roles in that they had direct or semi-direct transportation project programming responsibilities for their respective state programs. Two participants had exclusive financial programming responsibilities focused on assigning federal fund codes and required close coordination with their planning counterparts. Five of the participants also overlapped technical input on projects and the development of design policies with planning and programming responsibilities; of these five participants, four participated in the project process delivery to implementation.

The interview questions were designed to align with the study's conceptual framework by addressing fiscal year durations, program areas, funding allocation methods, and performance measures. This focus allowed the collection of data directly related to how state DOTs prioritize capital and maintenance investments. Responses were analyzed to identify spending patterns, compare organizational behaviors across states, and assess how institutional structures and funding strategies influence decision making. In this way, the interview protocol served as a practical tool for extracting themes into actionable insights that answered the study's research questions.

Interviews are a commonly used data collection method in qualitative research (Holloway, 2005). The goal for qualitative research data collection is to explore the "insider perspective" (Holloway, 2005, p. 39). In terms of technique, it is better to begin the interviews with background information inquiries and then progress to more complex questions (Holloway, 2005). The progression of the questions in this study was developed for interviewing the transportation officials with this in mind. The participants' knowledge and level of influence were key in drawing conclusions about relationships regarding transportation spending within their respective organizations.

Furthermore, Huberman's (1994) paper, "Research Utilization: The State of the Art," emphasized the interaction between practical application and research. Huberman referred to the diffuser/user model, which specifically addressed how researchers produce educational knowledge. This knowledge was then transferred to education practitioners. However, that practitioner experience must then be conveyed to the researcher so that insights come full circle. Interactive encounters between researcher and practitioner were key to extending a research study beyond the original study itself (Huberman, 1994), which in turn allows for present-day relevancy of the research. In keeping with Huberman's position on interactivity between research and practical application, the qualitative findings from this transportation spending study could be utilized by states' Planning and Programming Departments to inform decision making and forecast transportation improvement project programming capacities for future fiscal years.

Site and Participant Selection

This study employed a purposeful, multistate selection strategy designed to maximize variation in findings across institutional and fiscal contexts. California, Texas,

and Georgia were selected to compare across three different state transportation governance and funding environments. California represented a highly centralized, performance-based asset management system with a strong separation between maintenance, rehabilitation, and capital expansion, and a funding structure that relied heavily on federal resources for major capital investments. Texas provided a contrasting case characterized by a category-based, formula-driven programming framework and a strong reliance on state-generated revenues, enabling long-range funding stability through its Unified Transportation Program. Georgia represented a hybrid institutional model, combining centralized fiscal control with decentralized project identification and a funding structure that was heavily influenced by federal eligibility requirements. These three cases captured substantial variation in governance structure, funding mix, planning horizon, and system demand that allowed for analytic examination of whether observed patterns, particularly the dominance of maintenance and rehabilitation over capital expansion or vice versa, were contingent on state-specific conditions or represented broader institutional dynamics within state departments of transportation.

The unit of analysis for this study was state DOT investment decision-making frameworks, specifically as they related to the definition, funding, and prioritization of capital improvement and maintenance programs. While interviews were conducted with individual practitioners, the analytic focus was on how they represented the institutional views and practices of the DOT organizations. Accordingly, organizational roles and programs embodied prevailing institutional practices and decision-making rationales (Yin, 2002).

The 11 participants had planning, programming, and/or delivery roles within GDOT, TxDOT, and Caltrans. Per the descriptive information in Table 5, the participants held roles in project delivery and programming, serving as key decision-makers for funding requests and/or project selections. Each participant had significant experience in the transportation industry, and most had 10 or more years within their respective organizations.

Table 5

Description of Participants

Pseudonym ID	Organization, Years Served	Role/Title	Primary Responsibilities
Participant A	Caltrans, 18	Deputy District Director for Program & Project Management	Oversees capital improvement and maintenance project delivery, asset management, and performance targets for state highway systems.
Participant B	Caltrans, 19	Chief of Technical Policies & Guidance	Leads bridge design standards and technical policies for Caltrans; involved in asset management and transportation policy development.
Participant C	Caltrans, 33	State Asset Management Engineer	Manages the asset management program; oversees rehabilitation

Pseudonym ID	Organization, Years Served	Role/Title	Primary Responsibilities
			and replacement programs for capital improvement and maintenance.
Participant D	TxDOT, 21	Director of the Design Division	Manages design-related programs, focusing on project development, technical guidance, and coordination with districts for project delivery.
Participant E	TxDOT, 19	Finance Portfolio Project Manager	Provides financial oversight and advises on the budget, focusing on funding allocations, forecasting, and IT projects related to TxDOT's financial management.
Participant F	TxDOT, 10	Unified Transportation Program Manager	Coordinates the 10-year funding plan, including project scoring and funding allocation for TxDOT's transportation infrastructure.

Pseudonym ID	Organization, Years Served	Role/Title	Primary Responsibilities
Participant G	TxDOT, 18	State Bridge Engineer	Oversees bridge design, asset management, and the bridge inspection program, focusing on capital and maintenance funding for bridges.
Participant H	GDOT, 22	State Maintenance Engineer	Manages capital and routine maintenance programs, overseeing funding allocation and project delivery for GDOT's state-maintained roads.
Participant I	GDOT, 24	Traffic Operations Program Manager	Manages traffic-related programs including safety, operational improvements, and signal/ITS programs, coordinating with districts and local governments for project delivery.
Participant J	GDOT, 20	Financial Management Assistant Administrator	Oversees financial programming, project funding allocation, and fiscal constraints for GDOT, working closely

Pseudonym ID	Organization, Years Served	Role/Title	Primary Responsibilities
			with planning and budgeting offices.
Participant K	GDOT, 2	Deputy Director of Planning	Oversees planning for GDOT, including project programming, STIP development, and funding allocation for transportation infrastructure projects.

Data Collection

Interviews

The data analyzed for this study were collected using semi-structured interviews that sought to extract standard information about the transportation industry from similar state agencies but were broad enough to also allow for other relevant data to materialize for follow-up questions and/or research. Participants were recruited at each state's DOT based on their planning, programming, and/or project delivery roles within their respective organizations. Emails were sent to the participants with the researcher's signed DPA candidacy and proposal forms and the IRB protocol exemption report to provide assurance that the requested interviews were validated. Also, the email requested their voluntary participation.

Participants were allowed to review the 13 scripted questions before their interviews (see Appendix D). During the interviews, it was noted that not all of the 13

scripted questions were necessarily relevant to a given participant's role within their Department of Transportation. In keeping with semi-structured interviews, follow-up questions were used to clarify and/or expand upon participants' responses. Additionally, the interviews were conducted either via Microsoft Teams or in-person. Recordings of each interview were established for the purpose of creating transcripts. Each interview lasted 1 to 1.5 hours, depending on how long the participant took to answer the questions.

Data Analysis

Interviews were recorded and transcribed. The interviews were initially transcribed using Otter.ai, then refined by the researcher for greater accuracy and clarity. Recent studies highlight that transcribing interviews is a labor-intensive task in qualitative research, often requiring extensive manual effort or costly outsourcing for researchers (Battaglia, 2024). AI-powered transcription tools, such as Otter.ai, have emerged as solutions, offering automated transcription capabilities that can significantly reduce researcher workload while still preserving the original data (Abdul et al., 2025; Campbell, 2025). These tools enhance efficiency by enabling researchers to generate transcripts from in-person or virtual interviews and review them for accuracy, allowing for immediate coding and analysis (Hersch, 2025; Wollin-Giering et al., 2024). In this study, the use of Otter.ai facilitated the rapid transcription of semi-structured interviews with the participants and helped support the identification of patterns in capital and maintenance investment decision making. However, as noted in prior literature, AI tools, such as Otter.ai, struggle to fully understand human speech (Abdul et al., 2025). All of the interview summaries and transcripts produced by Otter.ai had to be reviewed and significantly revised for accuracy. The speakers had to be differentiated, and throughout

the transcript, multiple words and punctuations had to be either revised, replaced, added, or even removed. A positive feature of Otter.ai was that it had a feature that allowed for listening and revising simultaneously.

The transcripts were analyzed using qualitative coding methods from *The Coding Manual for Qualitative Researchers* (Saldaña, 2016). This included reviewing the transcripts for first-cycle in vivo and descriptive coding, second-cycle pattern coding, and subcoding. AI tools such as Otter.ai, GPT-4 Turbo, ChatGPT 4, and ATLAS.ti's AI coding platform supported first-cycle coding by identifying initial outputs that could later be organized as themes. However, to ensure accurate contextual insight, human intervention was vital in using AI transcription tools and in performing accurate higher-level coding and interpretive analysis for thematic development (Gustavsen et al., 2025; Jones, 2025; Shen et al., 2025; Williamson et al., 2025). In this study, the use of hybrid AI-human transcription and coding processes facilitated the final development of themes and supported specific findings and implications about both the prioritization and programming of capital and the maintenance strategies for transportation infrastructure projects. The coded data were substantiated through quotes drawn directly from participants' interview transcripts.

In vivo coding refers to a word or short phrase from actual language in the raw data transcripts and is applicable to qualitative studies, particularly for studies that promote a heavy emphasis on the participant's words and statements (Saldaña, 2016). In this study, the first-cycle in vivo coding was used to capture specific phrases from participants that ultimately supported the development of themes.

Descriptive coding is also appropriate for qualitative studies in that it lays the foundation for second-cycle pattern coding. This method categorizes data to provide a level of control or organization of the data produced in each study (Saldaña, 2016). In this study, descriptive coding was used to label first-cycle in vivo participants' verbatim statements.

Pattern coding, used as a second-cycle method, is a way to streamline the themes and categories created in the first-cycle coding. This coding type seeks to create more meaningful, concise units of phrases and words captured in the first-cycle coding (Saldaña, 2016). This study utilized pattern coding to place the first-cycle coding words and phrases into buckets such as "preservation of infrastructure," "speed of delivery," "governance of funding," and so on.

Subcoding, used as a second-cycle method, was used in this study to further break down the categories developed in the pattern coding in relation to the context of the participants' statements. For example, most, if not all, participants in this study noted boundaries between the programming and delivery of maintenance and capital transportation infrastructure projects. The subcoding effort sought to consolidate and isolate these differences into clearer categories than those captured in the pattern coding.

Finally, "theming the data," as Saldaña (2016) calls it, is an outcome of coding and categorizing rather than coding itself. A theme "brings meaning and identity to a recurrent experience and its variant manifestations. As such, a theme captures and unifies the nature or basis of the experience into a meaningful whole" (DeSantis & Ugarriza, 2000, p. 362). This study developed themes that emerged from the first- and second-cycle coding techniques described in this methodology. The primary themes captured in the

interview transcripts were related to transportation funding, flexibility for project delivery and funding, definitional boundaries, governance, and planning.

Microsoft Excel was used to create a codebook for coding the study's interview transcripts, with the format consisting of a grouping of each participant by state DOT, an anonymous ID for each participant known only to the researcher, first- and second-cycle codes that were categorized to themes from the participant's responses and quotes, and the researcher's notes for clarification purposes (see Appendix E).

Data Interpretation

According to Gelo et al. (2008), "In qualitative research, data interpretation is based on inductive inference (Tashakkori & Teddlie, 2003), which is a process of creating meaningful and consistent explanations, understanding, conceptual frameworks, and/or theories drawing on a systematic observation of phenomena" (p. 277). In this study, transportation spending data for the states of interest, along with qualitative results from interviews with transportation officials, allow for an interpretive discussion that could provide insight into whether the transportation industry is better served by capital or maintenance programs.

Data Management

The qualitative data collected through the interviews were approved through Valdosta State's Institutional Review Board (see Appendix F), which verified the anonymity and protection of the data collected from participants. The statement provided to each participant included the following language:

> The interviews will be audio-taped in order to accurately capture your concerns, opinions, and ideas. Once the recordings have been

transcribed, the data will be destroyed. No one will be able to associate your responses with your identity. Your participation is voluntary. You may choose not to participate, to stop responding at any time, or to skip any questions that you do not want to answer.

Trustworthiness

The trustworthiness of this study was ensured through multiple interviews with individuals in leadership roles within their respective organizations, who were considered credible and dependable in their areas of expertise. Credibility and dependability were established by purposively selecting 11 experienced state DOT officials across California, Georgia, and Texas who had over 10 years of institutional experience and direct involvement in transportation project planning, programming, and delivery. Use of secondary documentation resources from each state in conjunction with the interviews further supported the trustworthiness of the findings, while detailed documentation of coding methods and thematic development provided an audit trail that enhanced transparency and allowed for replication or verification in future research.

Ethical Considerations

Ethical considerations were central to this study, particularly given the use of semi-structured interviews with high-level transportation officials. The study received IRB approval through Valdosta State University, ensuring compliance with federal and institutional research ethics standards. Participants provided informed consent, were informed of their voluntary participation, and had the option to withdraw at any time without consequences. Interviews were conducted with assurances of anonymity, and identifiers were removed to protect participants' identities. Audio recordings were

securely stored, transcribed for analysis, and will subsequently be destroyed after the completion of this dissertation. These procedures safeguarded confidentiality, minimized risks to participants, and ensured that data collection and reporting adhered to ethical standards in social science research (Gelo et al., 2008; Tashakkori & Teddlie, 2003).

Chapter Summary

Chapter III outlined the research methodology used to explore how state DOTs in California, Georgia, and Texas define, fund, and prioritize capital improvement versus maintenance programs. A qualitative, multi-state case study design was employed, primarily drawing on semi-structured interviews with 11 senior transportation officials but also referencing transportation policy historical records and state planning documents, allowing for an in-depth understanding of institutional decision making and funding practices (Maramwidze-Merrison, 2016; Saldaña, 2016; Yin, 2002). Data analysis involved systematic first- and second-cycle coding to develop themes related to funding allocation, project prioritization, and performance objectives. Participant selection was purposeful to capture variation in governance structures, fiscal environments, and planning approaches, ensuring that findings reflect both state-specific practices and broader institutional dynamics. This chapter also detailed the unit of analysis, the propositions informed by prior literature, and strategies for ensuring trustworthiness and ethical compliance, providing a robust framework for answering the study's research questions on how DOTs navigate capital versus maintenance investment decisions under institutional and fiscal constraints.

Chapter IV

Findings

This chapter presents findings from semi-structured interviews with transportation professionals across three state departments of transportation: California, Texas, and Georgia. The analysis examines how capital improvement and maintenance programs are defined, funded, programmed, and prioritized, and identifies cross-state patterns that inform the relationship between these two investment strategies. The three states were selected to represent variation in DOT governance, funding mix, and transportation system demand, providing an analytic basis for cross-state comparison. The findings are organized thematically and comparatively across the three states while remaining supported by participant accounts and experiences. The analysis draws on first- and second-cycle coding methods (Saldaña, 2016), including in vivo, descriptive, and pattern codes, to identify formal practices and decision logics.

Definitional Boundaries Between Capital and Maintenance Programs

Participants in all three states articulated clear distinctions between capital improvement projects and maintenance improvement projects. Capital improvement was consistently defined as capacity expansion or new infrastructure, while maintenance was framed as preservation of existing assets. These distinctions were crucial to each state DOT's application of project funding allocations. Caltrans participants defined capital improvement as expansion activities, such as new lanes or interchanges, and treated it as categorically separate from rehabilitation and maintenance. Rehabilitation and

replacement were positioned as preservation-oriented but more intensive than routine maintenance. TxDOT participants similarly differentiated between expansion and preservation, with maintenance and rehabilitation embedded in specific funding categories. GDOT participants employed a hybrid model, formally distinguishing routine maintenance, capital maintenance, and capital expansion, particularly in relation to project delivery mechanisms. A key cross-state finding was that capital expansion was not treated as a default solution for system performance issues. Instead, expansion was selectively applied, institutionally and financially constrained, reinforcing a common participant understanding that capital investment serves a fundamentally different purpose than maintenance or rehabilitation.

Participant C supported these findings by stating, “There is no expansion within our maintenance program. It’s purely taking care of what we already built previously.” Participant E discussed this in more detail, stating, “Historically, we’ve been about 60/40 maintenance to capital…used to be 70/30 maintenance heavy.” They explained further that “Texas has really good maintenance…preserves system and avoids higher cost rehabilitation later.” Furthermore, Participant K stated:

> “We don’t manage maintenance funding out of our office. So what we'll do is, from the federal, we will establish that maintenance lump sum, that’s the federal program, and so that’s a specific pot of money that then the maintenance office will manage…The same thing with safety, bridges will have bridge money...So there have been state money to go for bridges…Again, that’s not managed out of our office…And the Talmadge bridge is an example that kind of got pulled out of,

out of the maintenance program. It's a maintenance project, but it's way too big of a project to be in by itself…So that one is treated like a capital project."

Funding Structures and Revenue Dependence

Findings indicated variation in funding composition across states, but a consistent pattern emerged regarding the functional role of federal versus state funding. In California and Georgia, federal funding was primarily concentrated in rehabilitation, replacement, and large-scale capital projects, while maintenance relied on state-generated revenue with some exceptions. Texas demonstrated a stronger reliance on state funding, driven by dedicated revenue sources such as energy-sector taxes and sales tax allocations. Even with these variations, participants across the states emphasized that state funding provides greater flexibility, while federal funding introduces additional procedural and compliance constraints. Federal funds shaped project scope, eligibility, and delivery timelines, particularly through environmental documentation and right-of-way requirements. State funds were consistently described as more adaptable and responsive to short-term delivery needs.

This finding is supported by Participant C, who stated:

"So, in California, most of our funding comes from state and federal gas tax on fuel sales. We have, you know, a comparable, actually, our state gas tax is higher than the federal type of gas tax. So, we generate a lot of revenue for transportation infrastructure through the tax of fuel. And then, you know, we get other funds from toll revenues, from permit fees, weight fees, electric vehicle charges."

Participant D also addressed this theme, stating, "From my perspective…fairly consistent, 60 to 80%…number of projects we do…maintenance…but dollar volume…

wouldn't surprise me if it's 80/20 the other way." Participant E added to this theme: "Maintenance would be a mix of both…we try to knock out 100% state funding on bigger mobility projects for efficiency."

Planning Horizons and Programming Stability

The three state DOT participants referenced different planning horizons, which influenced how capital and maintenance investments were balanced over time. TxDOT participants mentioned Texas's 10-year Unified Transportation Program, updated annually, and supplemented by its near-term STIP planning document covering four years. This structure provided stability and predictability, particularly for maintenance and preventive programs. Caltrans participants noted the development of its SHSMP, covering a 10-year period, supplemented by the near-term SHOPP document, allowing for regular rebalancing between maintenance and rehabilitation based on system performance. GDOT participants relied on long-term planning documents, STP, and the SSTP, but emphasized its reliance on its near-term four-year STIP supplemented by annual adjustments, balancing long-range planning with short-term responsiveness to transportation needs. Despite subtle differences in planning documents, participants across states emphasized that maintenance programs are stable and less politically volatile than capital programs. Capital investments were more likely to fluctuate in response to leadership priorities, revenue changes, or external funding opportunities.

Participant K's description of funding supported this theme:

"Our state fiscal year runs from July 1 through June 30…federal starts October 1…We tend to align everything on the state fiscal year because we are a state

agency, so all of our budgets run on the state fiscal year, but we do recognize the federal fiscal year when it comes to federal funds."

Participant F stated, "The unified transportation program…is the 10-year plan for TxDOT…determines how much funding we have available for that decade, the next decade, and how we're going to use it, and which projects we're going to program."

Participant H described shifts in how funding can be managed as follows:

"My typical rule of thumb is the smaller work that you're doing, so like a pavement preservation project or a project where you're milling off less than two inches of road surface, that's likely to be a routine maintenance project. But as you, as you get bigger and bolder, you start milling off more, there's more likely to be a capital project…So it's not necessarily dollar sign, but the bigger, the bigger more expensive the project, the more likely it is to be capital."

Flexibility and Reallocation of Funds

A significant finding across all three state DOT participant responses was that funding flexibility primarily existed prior to formal obligation or encumbrance, particularly with respect to federal funds. Participants noted that once federal funds were obligated or encumbered, reallocation opportunities diminished substantially. Caltrans participants described rebalancing funding between maintenance and rehabilitation during biennial planning updates as a "valve" that shifts resources in response to changing needs. GDOT participants reported shifting projects between federal and state funding during early project development phases, though not after obligation. TxDOT participants indicated limited flexibility due to category-based constraints but acknowledged annual opportunities for adjustment through program updates. Overall,

participants' responses suggested that maintenance programs offered greater adaptability than capital programs, both financially and procedurally.

Participant H supported this theme when stating:

> "Once funds are obligated for one of our projects…and those funds are usually obligated right before we let it…Once those funds are obligated, that typically ties that project to that funding source or where it's coming from. You, you can't really then change the funding source to a different program."

Discussing more about this process, Participant I stated, "If we start the project on the state side, it basically has to stay there because we don't, you know, we don't do the (environmental)…but if it starts in the federal, we can always shift to the state." Participant F also discussed shifts in funding, stating, "Funding sources are frequently changed during the development stage of a project before it reaches letting for construction, we commonly will switch the category or the state versus federal apportionments...There's a lot of shifting."

Participant J stated, "Scope of work, location, and functional classification determine what federal fund sources the project qualifies for…There's more flexibility with state funds…We don't have all those eligibility requirements."

Speed of Delivery and Administrative Burden

Across the three states, maintenance projects were consistently described as faster to deliver and subject to fewer administrative burdens than capital projects. Participants attributed this difference to reduced environmental requirements, limited right-of-way involvement, and simplified procurement processes. Both California and Texas have NEPA assignments, placing them in direct control of environmental compliance and

allowing them to manage project delivery timelines for both capital and maintenance projects.

Routine maintenance projects, particularly those delivered outside formal project development workflows, were identified as the most expedient. Capital maintenance projects occupied an intermediate position, while capital expansion projects were described as the slowest and most complex to deliver from preconstruction to construction. This pattern reinforced the operational and fundamental distinction between capital and maintenance programs and highlighted the time-efficiency advantage of preservation-oriented investments.

Participant C supported this theme, stating:

> Our maintenance projects are faster. They tend to have less overhead associated with them. And so, you know, if we can get it done in by contracting it in our maintenance program. That that's usually pretty advantageous for us, but there are still some limitations of what our maintenance program can do. So, when we get into environmental documents that are more involved than categorically exempt projects, generally, they would move into our major capital rehab programs. We don't take right of way in our maintenance programs. So, if there's any right of way takes required with the project, or, you know, utility relocations, things like that, that'll move it into our capital programs, as opposed to maintenance.

Participant B discussed another aspect of this theme: "We're resisting widening because of environmental impacts." Differentiating the types of project delivery in more depth, Participant A stated, "Maintenance projects are simple…capital projects are multi-year."

Considering funding, Participant J stated, **"**If a project started 100% state funded…we can't just start putting federal funds on it if we haven't done the federal NEPA document."

Role of Districts, MPOs, and Central Offices

Findings revealed variation in decentralization across states, though all three employed a mix of centralized and decentralized decision making. In Texas, districts and MPOs were described as having discretion within defined funding categories, particularly for maintenance and mobility projects. California relied heavily on local agencies for capital expansion while retaining centralized control over maintenance and rehabilitation. Georgia employed centralized programming with decentralized identification of needs, particularly for maintenance and operational improvements. Despite these organizational differences, participants across the state DOTs emphasized the importance of local knowledge in identifying maintenance needs, even when final programming decisions occurred at the central level, by noting the openness to receive requests for project improvements from the local/public levels.

In support of this theme, Participant K stated:

> We program projects for our capacity program and set funding levels for lump sum programs like…maintenance and safety. We don't program all those projects specifically, but we do set funding levels as part of the overall program setting. We conduct studies with that could be local studies, county-wide studies, corridor studies, or statewide studies, and plans that help determine programming priorities for the state's transportation infrastructure funding…Our planners are also responsible for relationships with our state's 16 MPOs metropolitan planning

> organizations. So, we interact with them…in the use of federal funds and programming federal projects and making sure that federal requirements are met for the use of federal funds.

Participant F also discussed this theme:

> There are 12 categories…So then that funding is allocated to each of the...districts around the state, and...they have a certain dollar amount that has to be used on preventive maintenance and rehab projects, and similarly, with capital improvements or expansions and mobility improvements, there are certain categories of funding that have to be used on those kind of projects...the Commission dictates how much funding is going to be dedicated to maintenance versus capital improvements. And then from there…its projects are selected much more regionally and locally.

Participant J stated, "If a project's in the Atlanta TMA, it wouldn't be eligible for the 50k–200k category…location determines eligibility."

Participant D discussed structure as well, stating, "We have districts…25 of them around the state…and they're the one's responsible for the design, construction and maintenance…and the division's role is basically providing guidance."

Cross-State Pattern Summary

This study's findings revealed a consistent cross-state pattern of preservation-oriented investment-dominated transportation programming, with capital expansion applied selectively, cautiously, and politically concurred upon. Maintenance and rehabilitation programs were favored due to their flexibility and expedience, as well as their performance impact. However, capital expansion was constrained by funding

availability, regulatory requirements, and long-term risks. These findings suggest that the relationship between capital and maintenance programs is tiered rather than competitive, with maintenance forming the foundation of system performance and capital investment serving as a strategic supplement. Participant G supported this, stating, “There has to be a hybrid…population growth requires capital, but maintenance is crucial.”

Participant B also addressed these patterns: “We have enough infrastructure to keep us so busy fixing our deteriorating assets.” This concept was echoed by Participant J, who stated, “We have enough infrastructure to keep us so busy fixing our deteriorating assets.” Participant H described the process more symbolically:

> Owning a road network is like owning a house. You have to keep painting it, replacing windows, replacing the roof. You can’t ignore it for twenty years and then expect to rebuild it overnight…From my perspective, consistent maintenance is non-negotiable.

Attention was given to deliberate data alignment for each research question, specifying the number of interviews per state and the roles of participants. Eleven participants were selected from key decision-making roles within each of three states’ DOTs to ensure a comprehensive perspective on capital vs. maintenance decision-making processes. They provided insights into institutional practices, funding constraints, and program prioritization. Table 6 highlights how these data sources inform the analysis and themes presented in Chapter IV.

Table 6

Data Set Alignment Between Data Sources and Chapter IV Thematic Findings

Research Question	Primary Data Sources	Analytic Approach	Outputs (Chapter IV)
RQ1: How do state departments of transportation define and prioritize capital improvement and maintenance programs across different institutional and funding contexts?	Semi-structured interviews with 11 DOT officials(three from California, four from Georgia, four from Texas); participant roles: planning directors, finance managers, asset management directors, program managers, program delivery managers	First-cycle coding (in vivo, descriptive) to identify definitions and identification of prioritization language. Second-cycle pattern coding to identify cross-state similarities and differences	Thematic findings on definitional boundaries between capital and maintenance Cross-state comparison of prioritization approaches
RQ2: How do institutional norms, performance objectives, and funding structures shape the balance between capital improvement and maintenance investments within state DOTs?	Interview data focused on funding rules, performance measures, and organizational practices from 11 DOT officials (three from California, four from Georgia, four from Texas) Interview roles: program managers, funding	Pattern coding to identify institutional logics and funding-driven constraints. Cross-state comparisons of how norms and structures influence investment balance	Findings on preservation-first strategies. Analysis of state vs. federal funding flexibility and the associated institutional effects

Research Question	Primary Data Sources	Analytic Approach	Outputs (Chapter IV)
	analysts, performance officers		
RQ3: How do budgetary constraints influence decision-making processes related to capital and maintenance investment prioritization within state DOTs?	Interview segments addressing fiscal constraints, tradeoffs, and uncertainty from DOT officials (three from California, four from Georgia, four from Texas) Interview roles: budget directors, senior planners, financial analysts	Process-oriented responses focused on rules and adjustment mechanisms. Pattern coding to distinguish structured vs. adaptative decision making	Findings on fiscal constraints, reprogramming flexibility, and timing effects. Cross-state patterns in budget-driven decision logic

Chapter Summary

This chapter documents how three state DOTs define, fund, and manage capital and maintenance programs, aligning the themes with the research questions presented in Chapter III. Despite governance differences in structures, most participants demonstrated a shared orientation toward preservation-first investment strategies. Based on the experiences and roles of the 11 DOT officials interviewed, which span planning, programming, and project delivery, maintenance programs consistently emerge as more adaptable, faster to implement, and less susceptible to funding volatility compared to capital expansion programs. This recurrent finding across interviews provided

confidence that saturation was reached in the qualitative data. The observed thematic consistency implies that further data collection from these three states would yield diminished returns. The implications of these results for theoretical frameworks, policy development, and practical applications are further discussed in Chapter V.

Chapter V

Discussion

This study examined how state departments of transportation define, fund, and prioritize capital improvement and maintenance programs, seeking systematic advantages or correlations between these investment strategies. Using qualitative interviews across three states, California, Texas, and Georgia, this research analyzed institutional practices with Saldaña's first and second cycle coding methods to identify cross-state patterns. Chapter IV presented findings derived from coding techniques. Across all three states, a consistent fundamental pattern emerged: capital improvement and maintenance are not competing programs but are tiered and systematically related investment strategies. Participants' experiences showed that maintenance and rehabilitation formed the foundation of system performance, while capital expansion was applied selectively in accordance with federal and state laws and policies. This chapter presents the findings, draws conclusions across cases, and discusses implications for transportation policy, asset management practice, and future research.

Capital Improvement Defined as Expansive and Fiscally Constrained

In all three state DOTs, capital improvement was defined as capacity expansion or new infrastructure. Expansion projects generally were described as requiring more resources and extra time and effort to deliver than maintenance improvement projects. Capital investment as a strategic tool reserved for specific capacity enhancement and infrastructure growth needs.

Maintenance Dominates Transportation Investment Logic

Maintenance programs were consistently described as requiring routine efforts to deliver results. The tendency to maintain adherence to scheduled milestones makes maintenance projects more predictable and less susceptible to the complexities associated with capital projects, all the while addressing operational system or physical asset condition improvements. Participant D went as far as to imply that more projects are programmed as maintenance improvements than capital improvements, which emphasizes the preference and/or inclination of state DOTs to prioritize programming maintenance projects.

Funding Sources Shape Decision Making

Participants communicated that federal funding introduced rigidity through eligibility rules and obligation constraints. State funding enabled flexibility and faster delivery, including the option to switch from federal to state funds without schedule delays. Agencies strategically aligned project types with funding sources, often reserving state funds for maintenance and time-sensitive needs on capital improvements.

Preservation-First Strategies Prevail

Despite differences in governance structures, planning horizons/forecasts, and revenue sources, most state DOT participants demonstrated a preservation-first orientation when asked Question 13, which inquired about their opinion of prioritizing capital or maintenance improvement projects. This suggests a uniform response to aging infrastructure and performance accountability.

Implications for Public Administration Practice

Capital vs. Maintenance Investment Balance

The interview findings indicate that leaning toward maintenance does not represent underinvestment but rather a rational, performance-driven allocation of limited resources. Maintenance investments consistently prove to allow for the fulfillment of their envisioned scopes of work with less volatility and risks when compared to the delivery of capital expansion projects.

Capital improvement projects did not demonstrate fundamental advantages over maintenance in terms of speed or funding flexibility. Instead, they functioned as targeted interventions to address transportation problems, often above and beyond what could be achieved through a maintenance scope, rather than primary investment drivers. Participant E's statement that "Texas has really good maintenance…preserves system and avoids higher cost rehabilitation later," further supports this implication because the statement captures the state DOT's desire to preserve first in the effort to avoid the larger, more costly capital improvements for as long as possible.

Programming and Planning Implications

This study found that although longer planning horizons promote the capture the identification of needed improvements, participants experienced shorter cycle or near-term responsiveness to project needs and delivery. Maintenance programs were more insulated from political and fiscal volatility than capital programs. This implies that transportation agencies can improve resilience by strengthening maintenance programming frameworks, even within long-range planning environments.

Organizational and Institutional Implications

A notable conclusion is that institutional clarity matters. The interview data suggest that states that clearly defined the boundaries between maintenance, rehabilitation, and capital expansion demonstrate greater consistency in programming decisions. Vagueness between these categories increases the likelihood of project reclassification, funding delays, or administrative complexity. Furthermore, the findings highlighted the value of local knowledge combined with centralized fiscal control/decision making, particularly for maintenance identification and overall prioritization of programming efforts.

Theoretical Implications

From a theoretical perspective, the findings support and extend viewpoints from transportation asset management and public finance literature.

- Asset Management Theory: The dominance of maintenance aligns with lifecycle cost optimization and performance-based management (American Association of State Highway and Transportation Officials & U.S. Department of Transportation, 2011; FHWA, 2013b), reinforcing the concept that preservation yields higher long-term returns than expansion.
- Public Finance Theory: The differentiated use of federal and state funds reflects rational behavior under constrained and rule-bound funding environments (Musgrave & Musgrave, 1989; Oates, 1999).
- Organizational Theory: The separation of capital and maintenance functions illustrates institutional specialization as a response to complexity and risk (Mintzberg, 1979; Perrow, 1986).

The qualitative data collected in this study suggest that transportation agencies are evolving toward more adaptive and responsive preservation-oriented systems, rather than expansion-driven models. Funding is not limitless, and therefore, the lower costs of maintenance projects make them more attractive for programming to address transportation deficiencies. Participant J's response to the question regarding how funding allocations fluctuate from year to year was that "it really depends on the federal apportionment levels and the obligation authority that the department receives every year, and on the state side, how much HB 170 or motor fuel funding is appropriated at that year," indicating that state DOTs have to be constantly insightful and strategic because their annual allotments can and do fluctuate.

Policy and Practice Implications

The findings of this study carry several practical implications for transportation agencies. First, maintenance programs should be treated as strategic priorities rather than residual funding categories in that they play critical roles in sustaining system performance. Capital expansion initiatives should be evaluated in comparison to maintenance alternatives, specifically in areas where performance outcomes overlap such that either option would satisfy deficient conditions. Preserving state-level funding flexibility is essential, allowing agencies to respond strategically to evolving needs and emerging challenges when changing funding types is needed for expeditious delivery. Furthermore, allocation decisions should be guided by performance metrics, ensuring investments maximize system effectiveness and long-term value. These implications are especially relevant as transportation agencies face aging infrastructure, constrained budgets and increasing demands as described in the literature review.

Limitations of the Study

This study focused on three states and relied on qualitative interview data. While cross-state consistency strengthens confidence in these findings, the results may not be fully transferable to all state transportation agencies, particularly those with different operating and/or funding structures, and topographical dissimilarities. The study examined individuals' institutional perspectives rather than quantitative performance outcomes, limiting inductive and/or causal implications regarding transportation investment effectiveness.

Recommendations for Future Research

Future research could build on this study by (a) quantitatively analyzing performance outcomes of capital versus maintenance investments, (b) expanding the analysis to additional states or metropolitan agencies, (c) examining political and public perceptions of maintenance versus expansion, (d) investigating long-term fiscal sustainability of preservation-first strategies, (e) expanding the scripted questions to solicit more open ended responses to further identify additional themes regarding project prioritization practices, and (f) interviewing external stakeholders' perspectives regarding project selection and prioritization. The perspectives of the officials interviewed are valuable for their long-term experience in transportation careers. However, external stakeholders play a key role in prioritizing and selecting projects, as evident in participant responses.

Chapter Summary and Conclusion

This study concludes that maintenance and rehabilitation are the basis of effective transportation investment, while capital improvement serves a complementary, strategic

role. Based on the responses from the participants in this study, one can conclude that agencies that emphasize preservation demonstrate greater flexibility, faster delivery, and stronger alignment with performance objectives. Therefore, rather than asking whether capital or maintenance transportation projects are superior to or more advantageous than one another, this research suggests a reframing of the question as follows: How can capital investment be used strategically within a preservation-dominated and preservation-preferred system to maximize public value? That reframing represents the central contribution of this dissertation.

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Appendix A:

All Funds Percent Changes from FY 2023 to FY 2024 and FY 2024 to FY 2025

Major Spending Category	2023 to 2024	2024 to 2025
K-12	8.4	0.8
Higher Education	4.9	3.9
Medicaid	5.3	8.4
Corrections	3.8	4
Transportation	15.5	7
All Other	1.2	6.2
Total	5.2	5.7

Note. Adapted from "2025 state expenditure report: Fiscal years 2023-2025," by National Association of State Budget Officers, 2025 (https://higherlogicdownload.s3.amazonaws.com/NASBO/9d2d2db1-c943-4f1b-b750-0fca152d64c2/UploadedImages/SER%20Archive/2025_SER/2025_NASBO_State_Expenditure_Report_S.pdf)

Appendix B:

Total State Expenditures by Function, FY 2025

Expenditure	% of State Expenditures
K-12	18.2%
Higher Education	8.8%
Medicaid	30.7%
Corrections	2.5%
Transportation	7.8%
All Other	31.9%

Note. Adapted from "2025 state expenditure report: Fiscal years 2023-2025," by National Association of State Budget Officers, 2025 (https://higherlogicdownload.s3.amazonaws.com/NASBO/9d2d2db1-c943-4f1b-b750-0fca152d64c2/UploadedImages/SER%20Archive/2025_SER/2025_NASBO_State_Expenditure_Report_S.pdf)

Appendix C:

Total Transportation Expenditures on Highways, 2020 to 2022 for California, Georgia, and Texas

Cash Flow	Expense Type	Govt Level	Description	State Code	Year	Value ($)	Pop.
E	NC	State and Local	SNCE - maintenance	CA	2020	2,842,985,000.00	39,555,674
E	C	State and Local	SCE	CA	2020	5,200,594,000.00	39,555,674
E	NC	State and Local	SNCE- maintenance	CA	2021	2,058,607,000.00	39,142,565
E	C	State and Local	SCE	CA	2021	5,591,777,000.00	39,142,565
E	NC	State and Local	SNCE - maintenance	CA	2022	2,432,563,000.00	39,142,414
E	C	State and Local	SCE	CA	2022	5,503,271,000.00	39,142,414
E	NC	State and Local	SNCE - maintenance	GA	2020	698,323,000.00	10,713,755
E	C	State and Local	SCE	GA	2020	2,035,538,000.00	10,713,755
E	NC	State and Local	SNCE - maintenance	GA	2021	646,089,000.00	10,792,060
E	C	State and Local	SCE	GA	2021	1,962,103,000.00	10,792,060
E	NC	State and Local	SNCE - maintenance	GA	2022	645,137,000.00	10,931,805
E	C	State and Local	SCE	GA	2022	1,991,075,000.00	10,931,805
E	NC	State and Local	SNCE - maintenance	TX	2020	2,107,446,000.00	29,149,458
E	C	State and Local	SCE	TX	2020	11,682,062,000.00	29,149,458
E	NC	State and Local	SNCE - maintenance	TX	2021	2,173,159,000.00	29,570,351
E	C	State and Local	SCE	TX	2021	11,664,250,000.00	29,570,351
E	NC	State and Local	SNCE - maintenance	TX	2022	2,384,799,000.00	30,113,488
E	C	State and Local	SCE	TX	2022	10,178,805,000.00	30,113,488

Note. Adapted from "State transportation infrastructure," by Bureau of Transportation Statistics, n.d. (https://www.bts.gov/state-transportation-infrastructure), which provides comprehensive state-level transportation expenditure and infrastructure statistics. For all data, the values are actual, not estimates. All transportation modes are highways. C = Capital, E = Expenditure, NC = non-capital, SCE = State capital expenditures, SNCE = State non-capital expenditures

Appendix D:

Interview Questions for Transportation Officials

Organization of Employment:

Job Title:

How long have you worked for your current organization?

How long have you held your current position?

1. What is your organization's standard funding fiscal year?
2. In your organization, how are the transportation infrastructure jurisdictions assigned?(i.e. DOT responsible for all roads/bridges; DOT responsible for US/State Routes only; etc.)
3. What are the transportation funding program areas/categories in your organization?
4. What are your organization's funding sources for transportation infrastructure projects per program area/category? (i.e. federal, state, local, private, etc.)
5. In what ways do funding allocations fluctuate from fiscal year to fiscal year for capital and maintenance programs?(if applicable)
6. What dictates application of funding for capital and maintenance projects?
7. Are funding sources interchangeable throughout the life of a project in your organization? If so, does this offer flexibility for funding capital or maintenance programs?
8. What Office(s) provide approval for funding allocations per project?
9. Summarize your organization's Planning and Programming Processes for transportation infrastructure projects.
   a. How are improvement projects identified?
   b. Are there variations in programming approaches per program area/category? If so, in what ways?
10. How does your organization prioritize funding for capital and maintenance programs?
    a. What strategies or methods are utilized for prioritization?
    b. How often are prioritizations re-evaluated?
11. How does your organization deliver projects to construction?(i.e. Preconstruction to Construction)
12. In what ways does your organization measure performance for project delivery in terms of transportation spending per fiscal year?
13. What are your thoughts regarding a focus on capital improvements, maintenance projects or a hybrid combination?

Appendix E:

Codebook Template

ID	State	Agency	Role	Source File	Time	Excerpt (quoted)	Ch. IV Section Link	Finding Supported (Ch. IV language)	First-cycle: In Vivo	First-cycle: Descript	Second-cycle: Pattern Code (Combined)	Second-cycle: Subcoding (from transcript context)	Theme	Analytic Memo/ Notes

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Appendix F:

IRB Protocol Exemption Report

DocuSign Envelope ID: 46565E03-3714-414D-8818-333A088F588A

Institutional Review Board (IRB)
for the Protection of Human Research Participants

PROTOCOL EXEMPTION REPORT

Protocol Number: 04383-2023

Responsible Researcher: Chandria Brown

Co-Investigator: Dr. M. Blair Thomas

Project Title: *Analyzation of Transportation Spending for Infrastructure Capital Improvements versus Infrastructure Maintenance for Highways and Bridges: Which is more advantageous?*

INSTITUTIONAL REVIEW BOARD DETERMINATION:

This research protocol is exempt from Institutional Review Board (IRB) oversight under 45 CFR 46.101(b) of the federal regulations, category 2. If the nature of the research changes such that exemption criteria no longer apply, please consult with the IRB Administrator (irb@valdosta.edu) before continuing your research study.

ADDITIONAL COMMENTS:

- *Exempt guidelines permit recording of interviews provided the recordings are made to create an accurate transcript. Upon creation of the transcript recordings must be permanently deleted from all recording and storage devices. Exempt guidelines prohibit the collection, storage, and/or sharing of recordings.*
- *In keeping with the informed consent process, the research consent statement must be read aloud to each interview participant at the start of recording.*
- *Upon completion of the research study all data (e.g. data, correspondence, email lists, etc.) must be securely maintained (e.g. locked file cabinet, password protected computer, etc.) and accessible only by the researcher for a minimum of 3 years. At the end of the required time, collected data must be permanently destroyed.*

☒ *If this box is checked, please submit any documents you revise to the IRB Administrator at irb@valdosta.edu to ensure an updated record of your exemption.*

Elizabeth W. Olphie 02.01.2023

Elizabeth W. Olphie, IRB Administrator Date

Thank you for submitting an IRB application.
Please direct questions to irb@valdosta.edu or 229-259-5045.

Revised: 05.02.16