

2024



REPORT CARD FOR
MISSISSIPPI'S
INFRASTRUCTURE

MISSISSIPPI SECTION
OF THE
AMERICAN SOCIETY
OF CIVIL ENGINEERS



TABLE OF CONTENTS

2024 MISSISSIPPI REPORT CARD COMMITTEE	4
GRADES.....	5
EXECUTIVE SUMMARY.....	5
2024 REPORT CARD FOR MISSISSIPPI’S INFRASTRUCTURE	6
ABOUT THE INFRASTRUCTURE REPORT CARD	7
GRADING CRITERIA	7
GRADING SCALE	8
INFRASTRUCTURE GRADES BY CATEGORY	9
AVIATION	9
BRIDGES.....	18
DAMS	29
DRINKING WATER	38
ENERGY.....	36
INLAND WATERWAYS	46
LEVEES	55
PORTS.....	61
RAIL.....	76
ROADS	83
SOLID WASTE	94
WASTEWATER	102

2024



REPORT CARD FOR
MISSISSIPPI'S
INFRASTRUCTURE

2024 MISSISSIPPI INFRASTRUCTURE REPORT CARD COMMITTEE

We thank each infrastructure professional for contributing for the *2024 Report Card for Mississippi's Infrastructure*.

COMMITTEE CHAIR
Jennifer Sloan Ziegler

RELEASE AND LOGISTICS SUPPORT

William D. Carruth
Sarah McEwen
Christy Prouty
Dennis Truax

AUTHORS/CONTRIBUTORS

Category leads are listed below in bold.

Aviation

Tom Henderson

Bridges

Aaron Cagle

Dams

Jennifer Sloan Ziegler

Drinking Water

Laurel Lynn Rowse
Edith Martinez Guerra

Energy

Dustin Pittman
Josh Hancock

Inland Waterways

Blake Palmer

Levees

Alex Reeb

Ports

James Buras
Payton Billingsley
Patrick Border

Rail

Jacob Forrester

Roads

Wayne Black
Brent French

Wastewater

Phillip Gibson



Grades

- Aviation – **2024: C** | 2020: C | 2021 Nat'l: D+
- Bridges – **2024: D+** | 2020: D- | 2021 Nat'l: C
- Dams – **2024: D+** | 2020: D | 2021 Nat'l: D
- Drinking Water – **2024: D-** | 2020: D | 2021 Nat'l: C-
- Energy – **2024: C** | 2020: C | 2021 Nat'l: C-
- Inland Waterways – **2024: D** | 2020: D | 2021 Nat'l: D+
- Levees – **2024: D** | 2020: D | 2021 Nat'l: D
- Ports – **2024: B-** | 2020: B- | 2021 Nat'l: B-
- Rail – **2024: B** | 2020: B- | 2021 Nat'l: B
- Roads – **2024: D-** | 2020: D- | 2021 Nat'l: D
- Solid Waste – **2024: C+** | 2020: C | 2021 Nat'l: C+
- Wastewater – **2024: D-** | 2020: D | 2021 Nat'l: D+
- **Overall – 2024: C-** | 2020: D+ | 2021 Nat'l: C-

Executive Summary

Mississippi's infrastructure systems play a critical role in the state's economic prosperity and preserves – and even enhances – the quality of life for all Mississippians. However, our infrastructure systems have faced numerous challenges, from natural disasters and funding trials to a lack of sufficient trained personnel to design, construct, operate, and maintain the infrastructure systems in the recent past. Yet, every time Mississippians face a challenge, they rise to meet it. Over the past four years, Mississippi has answered the Mississippi Section of the American Society of Civil Engineers (ASCE) 2020 call to invest in our infrastructure systems to improve the lives, well-being, and future of not only its citizens but all who visit the Hospitality State. The impact of these investments can be seen through the overall improvement trends for our state's infrastructure systems. Between 2020 and 2024, four of the infrastructure categories improved (bridges, dams, rail, and solid waste), six remained the same (aviation, energy, inland waterways, levees, ports, and roads), and only two categories deteriorated (drinking water and wastewater). Additionally, the overall GPA for Mississippi's infrastructure rose and, for the first time since the inception of the *Report Card for Mississippi's Infrastructure*, the GPA improved to a C-, the same level as the 2021 *Report Card for America's Infrastructure*.

Mississippi ASCE's Report Card Committee of engineering experts assessed the overall GPA as a C-.

Mississippi ASCE has continued to find that when there is investment in Mississippi's infrastructure, there are more jobs, resulting in more economic growth. However, we still face challenges due to aging infrastructure, lack of routine maintenance, inconsistent data collection, and limited funding. Ongoing issues continue to impact residents' quality of life and threaten Mississippi businesses. Fortunately, Mississippi is seeing where investments from the state and federal governments and the private sector – including dams, ports, and rail – continue to result in benefits, including economic productivity, increased protection of human health and safety, and community capacity building.

2024



REPORT CARD FOR
MISSISSIPPI'S
INFRASTRUCTURE

2024 REPORT CARD FOR MISSISSIPPI'S INFRASTRUCTURE



 AVIATION  C

 LEVEES  D

 BRIDGES  D+

 PORTS  B-

 DAMS  D+

 RAIL  B

 DRINKING
WATER  D-

 ROADS  D-

 ENERGY  C

 SOLID WASTE  C+

 INLAND
WATERWAYS  D

 WASTEWATER  D-

2024

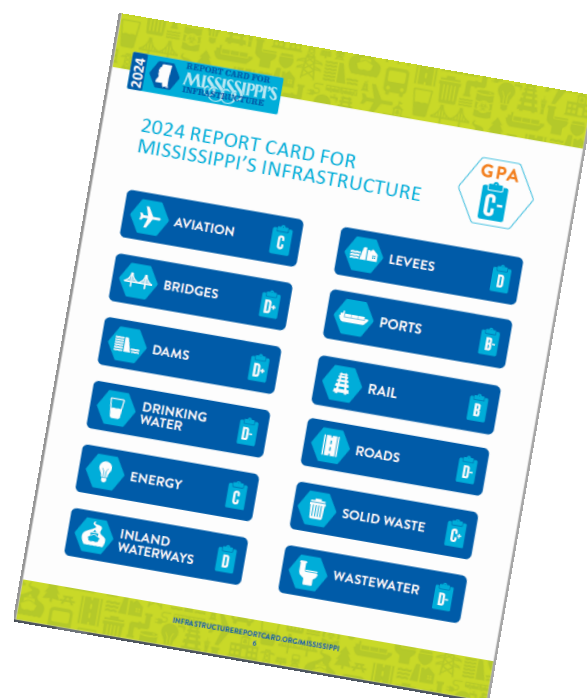


REPORT CARD FOR MISSISSIPPI'S INFRASTRUCTURE

ABOUT THE INFRASTRUCTURE REPORT CARD

GRADING CRITERIA

ASCE-MS's 2024 Report Card Committee is a group of dedicated civil and environmental engineers from Mississippi, who volunteered their time to collect and analyze data, prepare, review, and revise each section, and develop the final Report Card. The committee worked with ASCE's Committee on America's Infrastructure and ASCE Infrastructure Initiative staff to provide Mississippi with a snapshot of the state of our infrastructure, as it relates to us at home, and on a national basis.



The Report Card Sections are analyzed based on the following eight criteria:

CAPACITY Does the infrastructure's capacity meet current and future demands?

CONDITION What is the infrastructure's existing and near-future physical condition?

FUNDING What is the current level of funding from all levels of government for the infrastructure category as compared to the estimated funding need?

FUTURE NEED What is the cost to improve the infrastructure? Will future funding prospects address the need?

OPERATION AND MAINTENANCE What is the owners' ability to operate and maintain the infrastructure properly? Is the infrastructure in compliance with government regulations?

PUBLIC SAFETY To what extent is the public's safety jeopardized by the condition of the infrastructure and what could be the consequences of failure?

RESILIENCE What is the infrastructure system's capability to prevent or protect against significant multi-hazard threats and incidents? How able is it to quickly recover and reconstitute critical services with minimum consequences for public safety and health, the economy, and national security?

INNOVATION What new and innovative techniques, materials, technologies, and delivery methods are being implemented to improve the infrastructure?



GRADING SCALE



EXCEPTIONAL: FIT FOR THE FUTURE

The infrastructure in the system or network is generally in excellent condition, typically new or recently rehabilitated, and meets capacity needs for the future. A few elements show signs of general deterioration that require attention. Facilities meet modern standards for functionality and are resilient to withstand most disasters and severe weather events.



GOOD: ADEQUATE FOR NOW

The infrastructure in the system or network is in good to excellent condition; some elements show signs of general deterioration that require attention. A few elements exhibit significant deficiencies. Safe and reliable with minimal capacity issues and minimal risk.



MEDIOCRE: REQUIRES ATTENTION

The infrastructure in the system or network is in fair to good condition; it shows general signs of deterioration and requires attention. Some elements exhibit significant deficiencies in conditions and functionality, with increasing vulnerability to risk.



POOR: AT RISK

The infrastructure is in poor to fair condition and mostly below standard, with many elements approaching the end of their service life. A large portion of the system exhibits significant deterioration. Condition and capacity are of significant concern with strong risk of failure.



FAILING/CRITICAL: UNFIT FOR PURPOSE

The infrastructure in the system is in unacceptable condition with widespread advanced signs of deterioration. Many of the components of the system exhibit signs of imminent failure.



AVIATION



BIG PASSENGER AIRPLANE TAKING OFF AND FLYING FROM AN AIRPORT.
SOURCE: BIGSTOCKPHOTO.COM



AVIATION GRADE: C

EXECUTIVE SUMMARY

Mississippi's 73 public-use airports – with three primary in the National Plan of Integrated Airport Systems (NPIAS) – employ over 20,000 people and produce a total economic output of \$2.5 billion. Though recent years (2021-2023) have seen a modest uptick (2%) in air travel, it pales in comparison to the longer-term trend (2007-2021) where air travel declined by 18%. This overall decrease impacts the amount of funding for aviation infrastructure the state receives from passengers and the federal government. Aviation infrastructure in Mississippi is heavily dependent on support from the federal government. Almost half of the airports in the state have had runway rehabilitation projects over the past five years. As more active airports experience less demand, the existing infrastructure's life is extended, leaving no significant operation and maintenance (O&M) needs unmet. However, O&M is not eligible for federal funding and, as a result, is deferred in more rural and low-income communities.

CONDITION

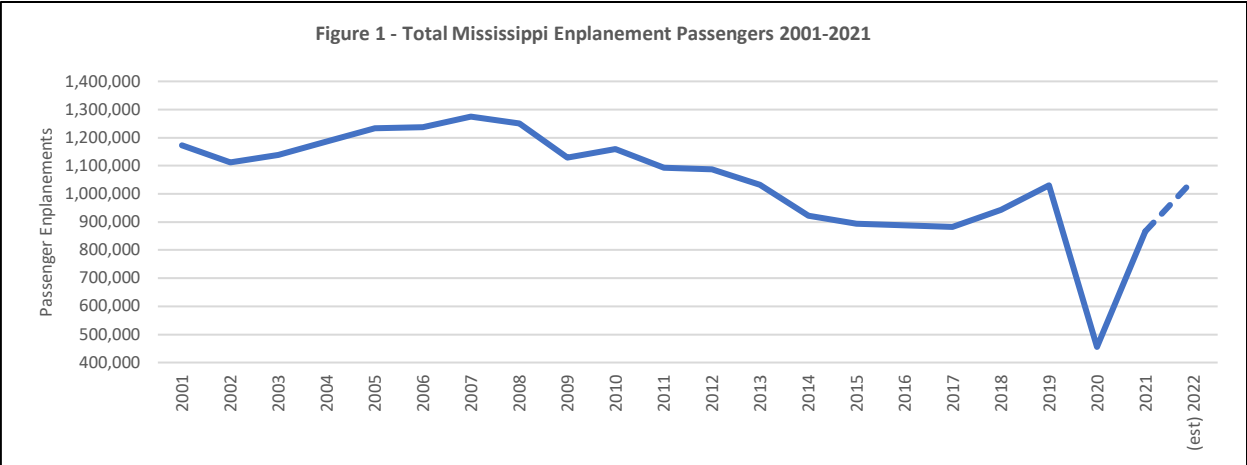
In Mississippi, there is currently no statewide database that contains information about the condition of the airports. In other states, the aviation divisions of transportation agencies have conducted statewide pavement condition index (PCI) surveys to quantify runway pavement of the airport system. This process standardizes the results across every airport and allows state and federal aviation officials to efficiently allocate funding to airports based on need and activity.

We do know that over the past six years, runway rehabilitation projects have either been completed or are underway at 45 airports statewide. While this is a major step in maintaining the state’s airports, there are a few smaller airports struggling to maintain their infrastructure due to inadequate funding. This lack of funding is often caused by the sponsor’s inability to cost share for federal grants as well as the inability to fund the pursuit of federal grants. Lack of funding has likely led to pavement conditions deteriorating, navigation equipment outages, and outdated passenger and pilot facilities.

CAPACITY

There are 7 cargo-serving airports in the state. The Jackson-Medgar Wiley Evers International Airport (JAN) is the busiest cargo airport in Mississippi. In 2019, over 10,000 tons of freight landed in Mississippi’s airports. The United Parcel Service (UPS) accounted for nearly 97% of all cargo services to Mississippi. Additionally, over 99% of air cargo activities took place at JAN in 2019. Based upon data from the Bureau of Transportation Statistics, air cargo into the state remained relatively stable from 2017 through 2021 with a slight dip of less than 500 tons of freight in 2020.

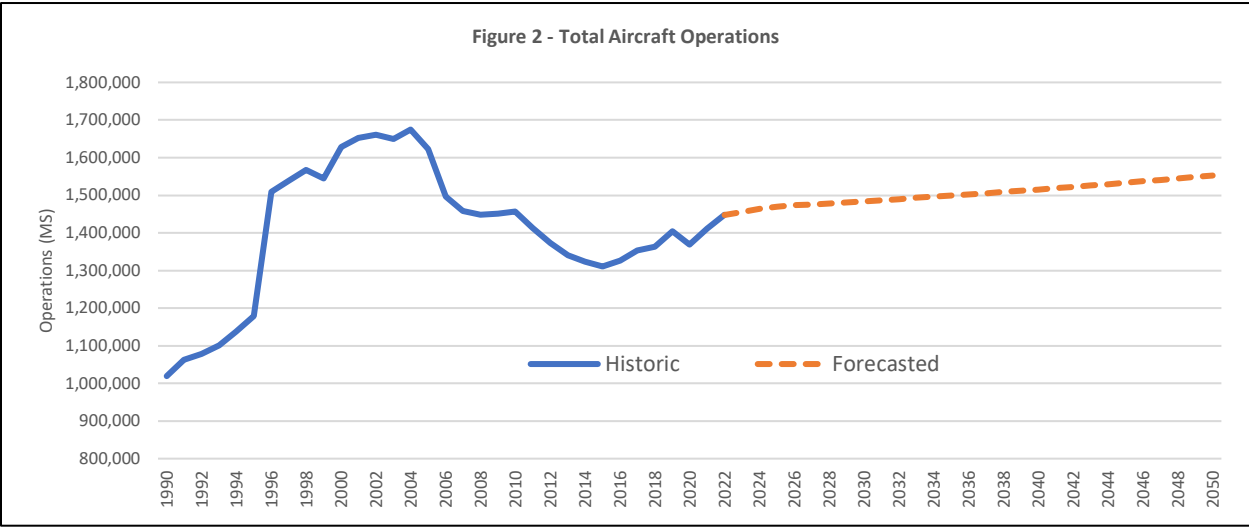
Figure 1 depicts NPIAS data for total enplaned passengers at commercial service airports from 2001 to 2021. The chart illustrates an approximate 31% decline in passengers across the highest and lowest spread excluding 2020 due to impacts from the COVID pandemic – from 1,274,625 in 2007 to 874,226 in 2017. From 2014 to 2017, there were no low-cost airlines operating in the state, thus leading to a



decrease in passengers. In 2018, the Jackson-Medgar Wiley Evers International Airport secured new low-cost carriers through Frontier, Sun Country and Allegiant.

These carriers operated on a limited basis until the COVID-19 pandemic in 2020 impacted air service around the world. The enplanements rebounded from 455,503 in 2020 to 866,873 in 2021. The increase is due to the end of the pandemic and the addition of Southwest Airlines service to the Jackson airport in June 2021. Preliminary passenger numbers for 2022 indicate enplanements will be more than 1.05 million. This reflects a 2% increase in passengers from pre-COVID 2019 to post-COVID 2022; however, the overall trend shows an 18% decrease in passengers across the state from 2007 to 2022.

Aircraft traffic is typically measured in terms of operations, where an operation is defined as a landing or a takeoff. Aircraft operations experienced a significant decline during the Great Recession (2007 – 2009) and due to the Delta/Northwest Airline merger, then again during the COVID-19 pandemic. However, aircraft operations are recovering, and are anticipated to continue to grow at a modest rate through 2050. The Federal Aviation Administration (FAA) publishes historic and forecasted aircraft operations through their Terminal Area Forecasts (TAF). A summary of the TAF for Mississippi is shown in Figure 2. Many commercial service airports and general aviation airports in Mississippi have multiple runways. However, the facilities have excess capacity given the existing commercial traffic demand and the fact that none of the facilities meet the current capacity requirements of 130,000 annual operations.





OPERATIONS AND MAINTENANCE

Many of the airports in Mississippi have critical, yet unseen resources that ensure safe, efficient travel for the flying public. Runway lengths vary from 10,003 feet at Key Field (Meridian Regional Airport) to 3,000 feet at several general aviation airports. From a navigation standpoint, almost 70% of the airports have published runway approaches to assist in landing during inclement conditions. Automated weather observation systems are located at 34 Mississippi airports, which provide current weather conditions. Air traffic control towers exist at six commercial service airports and five general aviation airports. 39 airports have both aviation gas and jet fuel, while another 20 have aviation gas only. Hangars of various sizes are available for monthly rental or for an overnight stay. Fueling and hangar rental provides a source of revenue to assist airports in providing the local match to federal and state infrastructure funding.

The majority of the general aviation airports in Mississippi do not have full-time maintenance staff, so the maintenance regimen is more reactive than proactive. The FAA has funding available for most airfield deficiencies, but the day-to-day maintenance falls on the airport owner. They must rely on city and/or county personnel to maintain the grounds and keep the paved surfaces clear. This can place a financial burden on rural communities with small airports.

FUNDING AND FUTURE NEED

Mississippi airports' operation and maintenance (O&M) costs remain challenging for the aviation industry in the state. Not all O&M costs are eligible for federal funding through the FAA Airport Improvement Program (AIP) and specific state grant programs. Some of these O&M costs can be offset by aeronautical revenues, but airports rely on the local government for support as well as earned revenue. Furthermore, airport infrastructure projects are generally funded through a mixture of local, state, and federal funding streams and/or grants.

Local funds include bonds, loans, airport revenue from landing fees, fuel sales or hangar rentals, or general city funds. Most general aviation airports are only guaranteed \$150,000 per year in non-primary entitlement through the AIP if the airport has nine or more aircraft stored at the airport. General aviation airports can save this money for a period of four years for a larger \$600,000 project, but in many cases, that is still not enough to fund a major runway or taxiway rehabilitation. State apportionment funds based on the state's population are also available for general aviation airports. Airports are eligible to apply for a larger amount of discretionary funds through the AIP but must compete against other airports in the state and in the southern region. If the AIP was discontinued by the federal government, Mississippi would lose its primary funding source for aviation improvement.

The Passenger Facility Charge (PFC) is another available source of income for commercial services airports. The PFC levied on each enplaning passenger at a commercial airport has a federally mandated cap of \$4.50. PFC fees can be used to fund FAA-approved projects that enhance safety or capacity, reduce noise, or increase air carrier competition. The PFC is regulated through the FAA, but the authorized amount for



Mississippi airports has been decreasing over the last few years as total enplaned passengers have decreased as shown in Figure 1. This decrease is limiting the funding of airports in the state.

Until the FY2023 appropriations bill, AIP funding remained flat from 2005 to 2022. This stagnation resulted in a backlog of unfunded projects. Supplemental discretionary funding announced in the 2018 omnibus resulted in 11 funded projects in Mississippi from 2019 through 2022, totaling just under \$20 million. Additionally, the Bipartisan Infrastructure Law (BIL) passed in 2021 with the goal of providing funding to airports for terminal buildings through the Airport Terminal Program (ATP) and air traffic control towers through the FAA Contract Tower Competitive Grant Program (FCT) over a five-year period. To date, two Mississippi airports have received ATP funds totaling \$16.8 million and two have received FCT funds totaling almost \$1.7 million.

The Mississippi Department of Transportation (MDOT) has a multimodal grant program that provides the state's airport system with \$3.4 million annually and generally funds revenue-producing projects or the local match required for a federal grant. In 2022, the Mississippi Legislature appropriated an additional \$30 million for non-highway (airport, port, and rail) infrastructure projects. To date, it has not been determined what portion will be available for airports.

Overall, the current NPIAS five-year plan shows a demand of \$465 million in capital improvements and large maintenance projects needed for Mississippi's airports. The NPIAS needs do not account for O&M. Over the last five years, Mississippi airports have received \$35 million of federal funding per year on average. However, the rising costs of construction have resulted in a greater dependence on state and federal funding for needed projects, so if these cost and funding trends continue, it will result in an estimated shortfall of \$290 million over the next five years.

PUBLIC SAFETY

The Safety and Standards Branch of the Southern Region Airports Division of the FAA is primarily responsible for ensuring the certifications, operations, and safe practices of airports in Mississippi. The FAA sets design standards to ensure safe aircraft operations. The design standards include airfield geometry, pavement strength, wayfinding signage, lighting, navigational aids, stabilized safety areas, and clear approaches. All airports that receive federal funds are required to meet set standards. Standards for Aircraft Rescue and Firefighting (ARFF) are also required to be followed at all commercial service airports.

The FAA inspects the commercial service airports and the larger general aviation airports certified to accommodate charter aircraft. The remainder of the public-use general aviation airports are inspected annually by MDOT, which frequently notes maintenance items which may impact safety on inspection reports, such as navigation equipment outages, runway light deficiencies, runway approach obstructions (trees), grounds maintenance (grass), or pavement deterioration and debris on the airfield.



Wildlife strikes are one of the most difficult aspects of Mississippi aviation safety to control. These strikes are a threat to human safety. The FAA maintains a wildlife strike database on their website. Over the past 20 years, there have been 881 reported strikes (857 birds, 19 mammals, and 5 reptiles) compromising over 77 species and show collisions between wildlife and aircraft have been increasing. Fortunately, none of these strikes have caused major human injury or property loss. Each commercial service airport is required to have a wildlife hazard management plan created by a certified airport wildlife biologist. Each plan is designed specifically for the airport and the airports are required to employ mitigation approaches outlined in the plan.

INNOVATION

Mississippi is becoming more innovative in its aviation systems. The state continues to implement satellite-based navigation systems (aRea NAVigation GPS) to help improve the process of tracking and planning air travel. Nationally, solar farms are being installed adjacent to airports to help offset energy costs. In Mississippi, a solar farm is slated to be installed at the Golden Triangle Regional Airport (Columbus) within the next couple of years.

In addition to using new aviation technology, Mississippi schools are supplying industry with professionals. Delta State University in Cleveland, Miss offers Bachelor's and Master's degrees in Commercial Aviation. Some of the community colleges offer technology programs, which include Unmanned Aircraft Systems (UAS) flight training and maintenance and manned aircraft maintenance. As UAS becomes more popular, rules and regulations must be established. Mississippi State University continues to be the state's leading researcher on this issue and directs the FAA's Center of Excellence for UAS Research. This center is designed to integrate UAS regulations safely and efficiently into the aviation system. In Mississippi, Golden Triangle Regional Airport (Columbus) and Trent Lott International Airport (Moss Point) house UAS production and testing facilities. UAS is also being used to help with airport self-inspections. Staff at Golden Triangle use drones to inspect the perimeter and other areas on airport property.

RESILIENCE

Mississippi's airports have varying challenges and potential responsibilities regarding extreme weather events. While southern Mississippi's airports face the continued threat of hurricanes and tropical storms coming from the Gulf of Mexico, airports such as Jackson and Meridian are further inland and share their facilities with National Guard installations, making them the ideal locations for staging hurricane relief operations.

Mississippi's commercial airports are required to conduct emergency preparedness training and have on-site fire and emergency response units. However, Mississippi's 68 general aviation

2024



REPORT CARD FOR
MISSISSIPPI'S
INFRASTRUCTURE

airports depend largely on their local first responders to address emergency needs. With additional funding, training, and planning, Mississippi's aviation industry, infrastructure, and assets could be leveraged to comprehensively build the state's resilience before, during, and after disasters.

Climate change is predicted to increase the frequency and severity of adverse weather events. Strong winds and hail can cause significant damage to aircraft parked on open aprons. Aircraft are a significant investment, and aircraft owners have an increasing desire to house their aircraft in covered, secured hangars. Mississippi airports report a shortage of hangar space, with some airports having waiting lists of over a year. These waits are exacerbated by difficulties in adding new hanger space due to increasing cost of construction.



AVIATION



RECOMMENDATIONS TO RAISE THE GRADE

- Mississippi should adopt a statewide pavement condition index and a facility condition index for other key landside assets to allow airports to be systematically graded and prioritized for funding to efficiently address the most dangerous and deteriorated areas.
- Funding for operations and maintenance continues to be one of the largest hurdles facing Mississippi's airports. Additional funding has been provided by the FAA over the past couple of years that allowed the airports to make necessary improvements; however, this provided a temporary solution. Another possible solution for bridging the funding gap would be to explore third-party funding, including public-private partnerships.
- More funding for training and planning should be set aside for Mississippi's aviation industry, infrastructure, and assets to comprehensively build the state's resilience in light of increasingly frequent and severe disasters.

Finally, PFCs should be increased to support the increased costs of construction, operations, and maintenance. While this is a federal issue, Mississippi should support changes to federal law to increase the current cap on PFCs or, better yet, eliminate the cap altogether.



AVIATION



FIND OUT MORE

CDM Smith. Economic Impacts of Mississippi Airports. Economic Impacts of Mississippi Airports, Mississippi Department of Transportation.

Alliance for Aviation Across America, www.aviationacrossamerica.org "Federal Aviation Administration." United States Department of Transportation, 8 Jun. 2023, www.faa.gov/.

AirportIQ 5010, Civix, <https://www.airportiq5010.com/5010Web/>

WJTV. "Mississippi receives \$35 million for Airport Improvement Projects." 21 Apr 2023, <http://www.wjtv.com/news/state/mississippi-receives-35-million-for-airport-improvement-projects/>

Homeland Security Today US, "DHS Awards \$18.7 Million Contract to MSU for UAS Research, Testing, and Evaluation." 7 Jan 2023, <https://www.hstoday.us/federal-pages/dhs/dhs-awards-18-7-million-contract-to-msu-for-uas-research-testing-and-evaluation/>

Mississippi Statewide Freight Plan. 2022. 12 November 2023, <https://mdot.ms.gov/documents/Planning/Plan/MS%20Freight%20Plan/MS%20Statewide%20Freight%20Plan%202022.pdf>

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BRIDGES



BRIDGES

GRADE: D+

EXECUTIVE SUMMARY

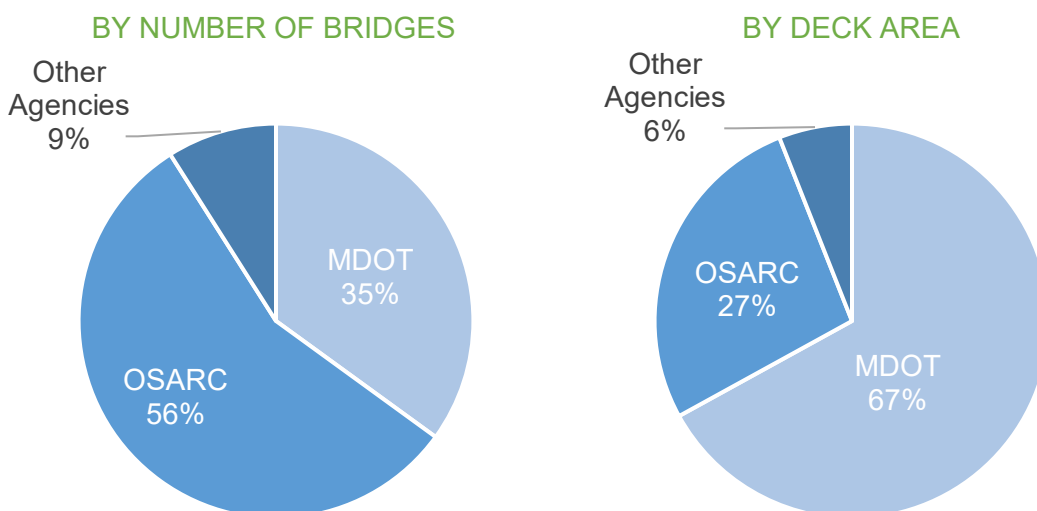
Mississippi's 16,756 bridges move people and freight for essential supply chain functions and access to opportunities in a largely rural state. 1,053 of those structures, 6.3%, are classified as poor (formerly structurally deficient) – down from 1,484 in 2019 - and 26th among all states. The average age of Mississippi's bridges is approximately 38 years-old, with 29% of the state's inventory exceeding their design life of 50 years. By deck area, approximately 57% of Mississippi's bridges are in good condition, 40% are in fair condition, and 3% are in poor condition, which is better than nationwide values. In 2022, MDOT dedicated roughly \$952 million of its \$1.1 billion budget towards road and bridge projects and repairs, representing 83% of the total budget. MDOT estimates that, for the fiscal year ending in June 2023, 50% of revenue will be from federal funds, 22% from state fuel taxes, and the remaining 28% from various other state and local taxes and fees. Generating revenue for bridge projects has been challenging, as Mississippi's fuel tax has stagnated at 18 cents per gallon since 1989. From a funding perspective, raising the fuel tax and adjusting for inflation would directly and significantly benefit the transportation network with minimal impact on taxpayers.



CONDITION AND CAPACITY

The National Bridge Inventory (NBI) by the Federal Highway Administration (FHWA) shows in 2023 that Mississippi has 16,756 bridges. By number of bridges, approximately 35% of these structures are maintained by the Mississippi Department of Transportation (MDOT), 56% are maintained by the Office of State Aid Road Construction (OSARC), and the remaining 9% are maintained by other local agencies. However, when considering the percentage of deck area maintained by each, the data shows that MDOT maintains 67%, OSARC maintains 27%, and other local agencies maintain 6%. A comparison of these values is shown in Figure 3.

FIGURE 3: BRIDGE MAINTENANCE RESPONSIBILITY BY OWNER



Bridges in Mississippi are inspected according to the National Bridge Inspection Standards (NBIS). Structures subject to the NBIS are inspected at least every two years (with some exceptions), and while this is the minimum requirement, circumstances may arise that require more frequent inspection. Bridges that are posted for load or include fracture critical elements are inspected every 12 months. Fracture critical is defined as a component in tension whose failure is expected to result in the collapse of the bridge or the inability of the bridge to perform its function. Similarly, if a bridge with timber features is posted for load or fracture critical elements, it is inspected every six months. Inspecting posted bridges more frequently ensures replacement prior to failure. Additionally, posting a bridge helps with placing it appropriately on MDOT's replacement prioritization list.

The nationally accepted measure of bridge condition is defined by FHWA using a nine-point scale, where higher values indicate better condition. "Good" condition begins at a rating of seven, while "Poor", which was formerly defined as "structurally deficient" (SD), has a rating of four or lower. The full deck area of the bridge will be counted as Good, Fair, or Poor according to the rating of the lowest-scoring

component (deck, superstructure, or substructure). The process used to assign these ratings is outlined in Table 1.

TABLE 1: NBI BRIDGE CONDITION CLASSIFICATION

NBI Condition Rating	Condition Classification
Bridges: All of the 3 NBI items for a bridge are ≥ 7 . Culverts: The NBI Culvert Condition item is ≥ 7 .	Good
Bridges: Lowest rating of any of the 3 NBI items for a bridge is 5 or 6. Culverts: The NBI Culvert Condition item is 5 or 6	Fair
Bridges: Lowest rating of any of the 3 NBI items for a bridge is ≤ 4 . Culverts: The NBI Culvert Condition item is ≤ 4 .	Poor

By deck area, approximately 57% of Mississippi’s bridges are in good condition, 40% are in fair condition, and 3% are in poor condition. Though these percentages are better than nationwide values, the percentage of bridges classified as being in good condition has been on a steady decline since 2009 after remaining consistent since the early 1990’s. A comparison of Mississippi’s bridge condition classification to nationwide values is given in Figure 2, while the historical trend of the state’s bridge condition is given in Figure 4. Figure 5 shows recent bridge condition counts for Mississippi for 2019 through 2023 according to the National Bridge Inventory.

FIGURE 4: BRIDGE CONDITION CLASSIFICATION BY DECK AREA

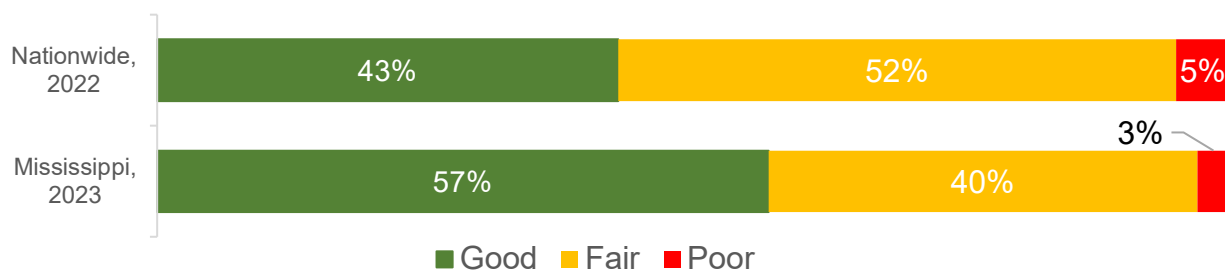


FIGURE 5: HISTORICAL BRIDGE CONDITION CLASSIFICATION FOR MISSISSIPPI

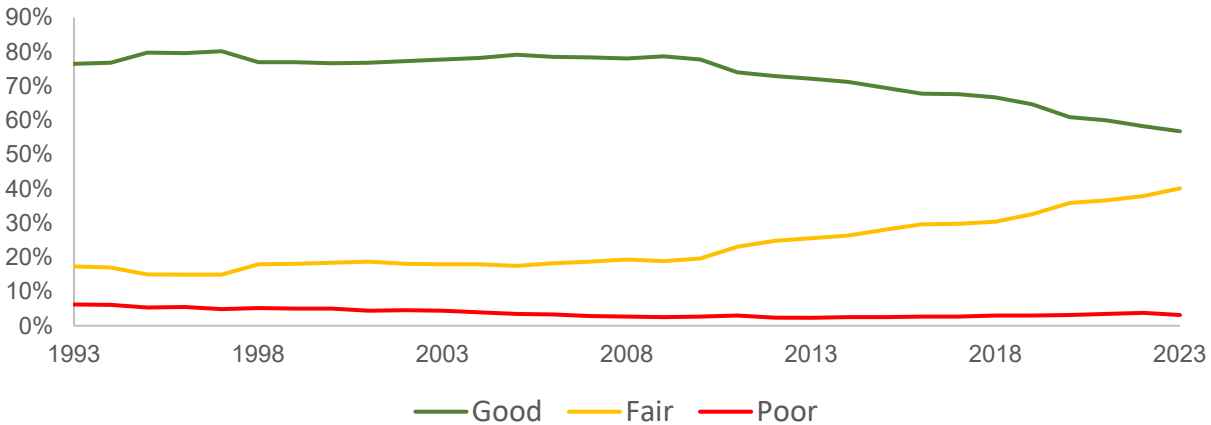
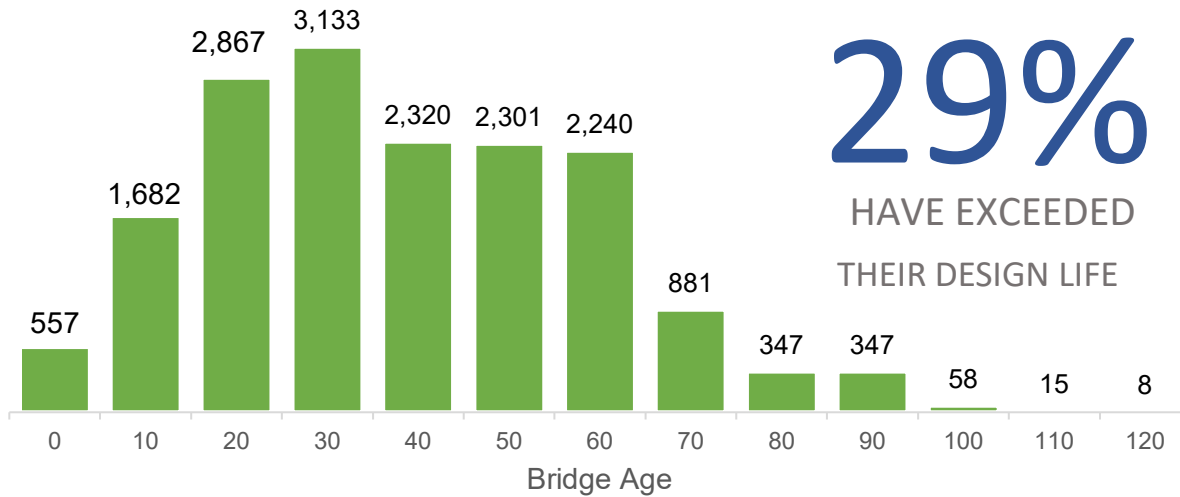


TABLE 2: BRIDGE CONDITION IN MISSISSIPPI (2019-2023)

Year	Good	%Good	Fair	%Fair	Poor	%Poor	Load Posted	% Load Posted	Total
2023	9,399	56.09%	6,304	37.62%	1,053	6.28%	2,883	17.21%	16,756
2022	9,660	57.56%	6,025	35.90%	1,097	6.54%	2,190	13.05%	16,782
2021	9,921	59.10%	5,693	33.91%	1,174	6.99%	2,218	13.21%	16,788
2020	10,098	59.83%	5,394	31.96%	1,386	8.21%	2,459	14.57%	16,878
2019	9,938	58.39%	5,416	31.82%	1,665	9.78%	2,437	14.32%	17,019

The average age of Mississippi’s bridges is approximately 38 years old, with 29% of the state’s inventory exceeding their design life of 50 years. While cyclical and condition-based preventive maintenance practices can slow the deterioration of highway structures and extend their service lives, an increased level of funding is required to prevent gradually declining conditions of the state’s transportation infrastructure and achieve the goal of creating a “state of good repair.” Figure 6 below shows an outline Mississippi’s bridges, organized by age.

FIGURE 6: MISSISSIPPI BRIDGE AGE RANGES



OPERATIONS AND MAINTENANCE

While much of the local system that is maintained by OSARC and other agencies primarily engage in reactive maintenance, MDOT does have an annual preventive maintenance program that applies a systematic procedure to highway structures with the expectation of extending the structural element’s service life as well as the overall bridge service life. This program of aggressive and strong preventive maintenance will slow the deterioration of the state’s highway structures and allow MDOT to efficiently manage its bridge inventory by effectively using a portion of its federal funding source.

MDOT-maintained bridges are more well-maintained than OSARC-maintained bridges due to their annual preventative maintenance program and their larger maintenance budget. This can be seen by comparing the condition of OSARC-maintained bridges and MDOT-maintained bridges. Table 3 shows bridge condition for each responsible party in 2023.

TABLE 3: BRIDGE CONDITION IN MISSISSIPPI BY RESPONSIBLE PARTY (2023)

	Year	Good	%Good	Fair	%Fair	Poor	%Poor	Load Posted	% Load Posted	Total
OSARC	2023	5,709	52.18%	4,339	39.65%	894	8.17%	2,554	23.34%	10,942
MDOT	2023	3,690	63.47%	1,965	33.80%	159	2.73%	329	5.66%	5,814



Preventive maintenance activities are divided into two categories: cyclical and condition-based maintenance. Cyclical maintenance activities are performed at pre-determined intervals that aim to preserve and delay deterioration of bridge elements or component conditions. The frequency of cyclical preventive maintenance activities can change as a result of environmental or condition changes. Examples of such activities are joint repairs, bearing replacements, deck overlays, and painting. Condition-based maintenance activities are performed on bridge components or elements in response to known defects. Condition-based maintenance improves the condition of that portion of the element, but may or may not result in an increase in the component's condition rating. Condition-based maintenance activities are identified through an inspection process. Some examples of these types of maintenance activities are crack sealing, fatigue retrofits, and beam strengthening.

FUNDING

Use of bridge funding is largely prioritized by the condition of the bridge and the aim to minimize the closure of bridges, driven by a concern for safety. Load-posted and closed bridges impact Mississippi's economy by hindering the movement of goods.

The two main sources of funding in the state come from the federal government and revenues collected from taxes and fees. According to MDOT's annual report for the fiscal year ending in June 2022, 53% of MDOT's revenue came from federal funding, 28% from state fuel taxes, and the remaining 19% from various other state and local taxes and fees. Those revenues support the MDOT budget. In 2022, MDOT dedicated roughly \$952 million of their \$1.1 billion budget, representing 83% of the total budget, towards road and bridge projects and repairs. MDOT estimates that, for the fiscal year ending in June 2023, these percentages will change slightly, with an estimated 50% of revenue from federal funds, 22% from state fuel taxes, and the remaining 28% from various other state and local taxes and fees. Additionally, Mississippi is set to receive \$225 million in bridge formula funds under the Infrastructure Investment and Jobs Act (IIJA).

In April 2023, the Mississippi Legislature approved MDOT to receive \$2 billion, including \$1.5 billion in earmark-free appropriations, and \$620 million in supplemental appropriations. The \$620 million supplemental appropriation will be allocated as follows:

- \$450 million for capacity projects;
- \$100 million for the Emergency Road and Bridge Repair Fund (ERBR);
- \$30 million for a new fund for multimodal projects; and
- \$40 million in federal matching funds.

In 2018, the Mississippi State Lottery was authorized with scratch off sales beginning December 2019 and draw game ticket sales beginning in 2020. MDOT will receive the first \$80 million generated by the lottery every year which is specifically diverted to the upkeep of two-lane highways.



In 1987, the Mississippi Legislature passed a \$1.6 billion long-range highway bill to build roads and bridges, which is still being implemented today. While one of the largest highway bills of the time, the legislation did not consider the need for future maintenance and rising construction costs. Meanwhile, the state's fuel tax that funds most of the state's road work has remained at 18 cents per gallon since 1989, on par with the national gas tax of 18.4 cents per gallon (unraised since 1993).

FUTURE NEED

MDOT acknowledges that funding has been one of the agency's major challenges for years and most of the received funding is being spent on maintenance and rehabilitation with little left to build new transportation infrastructure. MDOT estimates a \$50 million per year gap in funding bridge needs across the state and a \$400 million funding gap for roads. In 2019, MDOT received \$250 million for the ERBR during an emergency legislative session after hundreds of bridges across the state were closed; they received over \$900 million in applications. In 2020, another \$110 million was added to the ERBR and, again, over \$900 million in applications was received.

With construction costs rising due to inflation and supply chain concerns, there will be fewer bridges replaced each year, and the percentage of bridges classified in "Good" condition has and will continue to decrease. As this trend progresses, the funding that is currently used for cyclical maintenance and other preventive measures could potentially be diverted back to replacing bridges, which will aid in slowing the decline for the short term. However, a long-term effect of needing to employ this strategy will be the accelerated deterioration of bridges that are no longer receiving maintenance activities, which could result in "Good" and "Fair" bridges seeing their condition worsen. Projected population growth, increases in traffic counts, and the possibility of increased legal loads are all factors that will need to be considered as the percentage of "Good" bridges drops.

From a funding perspective, raising the fuel tax and adjusting for inflation would be a direct and significant benefit to the transportation network with minimal impact on taxpayers.

PUBLIC SAFETY

State agencies are dedicated to providing a safe intermodal transportation network for the traveling public. For bridges, some of the core principles for achieving this goal include minimizing posted and closed bridges and replacing structures containing timber components. Table 4 shows that while load posted bridges have increased slightly over time, the number of closed bridges, based on the National Bridge Inventory data, has decreased.

TABLE 4: BRIDGE POSTINGS AND CLOSURES IN MISSISSIPPI (2019-2023)

Year	Load Posted	% Load Posted	Closed	%Closed	Total
2023	2,883	17.21%	61	0.36%	16,756
2022	2,190	13.05%	64	0.38%	16,782
2021	2,218	13.21%	69	0.41%	16,788
2020	2,459	14.57%	77	0.46%	16,878
2019	2,437	14.32%	78	0.46%	17,019

Another key concern with regards to safety is reducing the number of structures with fracture critical elements. For newly constructed bridges, fracture critical elements are avoided unless absolutely necessary, and for those that are currently in service, efforts are made each year to prioritize their replacement where practical. There are 206 bridges with fracture critical elements in use in Mississippi as of 2023.

INNOVATION

MDOT is currently working to develop bridge element deterioration models and incorporate life-cycle cost optimization models. Deterioration modeling is designed to forecast the future conditions of bridges and aid in developing optimal actions to take on the bridge over time. This approach utilizes Element-Level Bridge Inspection, which breaks down each structure into individual elements and provides a more detailed assessment of the bridge. By using element level data, structure performance can be more accurately analyzed by predicting structure deterioration based on the average condition ratings collected for each bridge component. Ultimately, the final goal of optimized maintenance, rehabilitation, and repair is to use probability, cost data, and condition rating data to determine the most cost-effective option for extending the service life of each structure.

MDOT has also been investigating the use of several concrete-related preservation products, including hybrid polymer concrete, polymer cement surfacing, and internal cure admixtures. Hybrid polymer concrete and polymer cement surfacing are bridge deck preservation treatments that help restore deteriorated concrete and delaminated areas while reducing the penetration of chlorides and moisture. Internal cure admixtures use nanosilica to reduce the amount of water loss as concrete is placed. This makes the concrete easier to finish for contractors and, ultimately, the result is a more consistent final product.

RESILIENCE

Some of the most common natural threats to Mississippi’s resiliency are extreme weather events such as hurricanes in coastal regions and flooding from rainfall. In 2022, MDOT

2024



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conducted an evaluation of assets repeatedly damaged by emergency events to mitigate the recurring need for federal funds to conduct emergency repair and reconstruction activities and better protect both the traveling public and the natural environment.

From 2023 to 2024, MDOT is developing a Resilience Improvement Plan in accordance with the federal PROTECT Formula program. The plan will include the immediate and long-range planning activities and investments of MDOT with respect to the resilience of the surface transportation system. Various types of seismic analyses are being conducted in pertinent locations and results are being used to inform bridge design to withstand deformations during potential earthquake events. Additionally, scour analysis is conducted on all bridges and culverts during design of bridge replacement, rehabilitation, or decommissioning to determine how flowing water and flooding will impact soil around bridge foundations.

Bridges in those seismic zones are also being designed with a displacement-based analysis approach. The displacement-based methodology addresses the inelastic nature of the structural system by designing components with sufficient capacity to withstand deformations during an earthquake. Further investigation is being done by MDOT to determine the validity of using seismic isolation bearings to dissipate the movement experienced in the bridge superstructure so that the seismic load on the substructure is significantly diminished.



RECOMMENDATIONS TO RAISE THE GRADE

Some recommendations to see improvements and raise the state's grade for bridge infrastructure include:

- Increase existing revenue sources, such as raising the fuel tax and adjusting for inflation.
- Increase the use of element deterioration models and incorporate life-cycle cost optimization models to determine the most cost-effective option for extending the service life of each structure
- Investigate ways to bundle bridge preservation and maintenance work to increase the economy of scale for each project, which would potentially increase the number of projects that could be feasibly advertised for letting each year.





FIND OUT MORE

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AERIAL VIEW OF ABERDEEN LOCK AND DAM ON THE TOMBIGBEE RIVER
NEAR ABERDEEN, MONROE COUNTY, MISSISSIPPI, USA.



DAMS



DAMS
GRADE: D+

EXECUTIVE SUMMARY

Mississippi's 6,853 dams, owned by federal, state, or local governments, private owners, and public utilities, provide flood control, navigation, water supply, and recreation. Of those structures, the Mississippi Department of Environmental Quality (MDEQ) classifies 347 as high-hazard potential (HHP) dams – describing potential harm to property and life under failure – with 51 significant-hazard and 6,445 low-hazard. The vast majority of HHP dams in the state – 323, or 93% - have an Emergency Action Plan (EAP). That rate is more than double the rate from 2019 and better than the national average. Mississippi's legislature created the Mississippi Dam Safety Fund in 2020 to provide grants for HHP dam work, but only \$4 million has been allocated through September 2023. Available funding streams are insufficient compared to a backlog of \$760 million needed to rehabilitate the state's HHP dams and the \$9.68 billion cost to upgrade dams with conditions rated less than satisfactory.



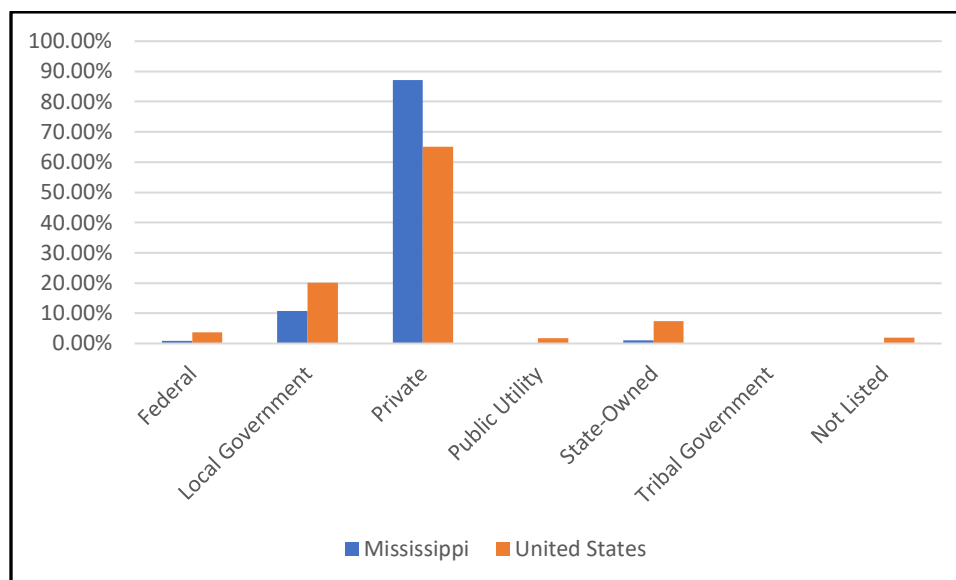
BACKGROUND

Dams are used for irrigation, flood control, navigation, water supply, fire protection, fish and wildlife habitat, debris control, and tailings associated with mining activity. In Mississippi, 76% of the state's dams are relied upon for recreational purposes. The Mississippi Department of Environmental Quality (MDEQ) regulates the state's dams. However, not all dams are regulated – namely those less than 8 feet in height, that impound less than 25 acre-feet of water, or do not retain a continuous flow of water.

CONDITION AND CAPACITY

There are currently 6,849 state-regulated dams in Mississippi and 6,114 structures registered in the National Inventory of Dams. A breakdown of dam ownership in the United States and Mississippi, by primary owner type, is shown in Figure 1.

FIGURE 1: DAMS BY PRIMARY OWNER TYPE



Mississippi classifies its regulated dams as having either high hazard potential, significant hazard potential, or low hazard potential. If a low hazard dam fails, it would result in damage to agricultural land, farm buildings (excluding residences), or minor roads. If a significant hazard dam fails, threat to human life is not probable, but may cause significant damage to main roads, minor railroads, and/or cause interruption of use or service of public utilities. If an HHP dam fails, loss of life is probable, as is serious damage to residential, industrial, or commercial buildings; or damage to, or disruption of, important public utilities or transportation facilities such as major highways or railroads.

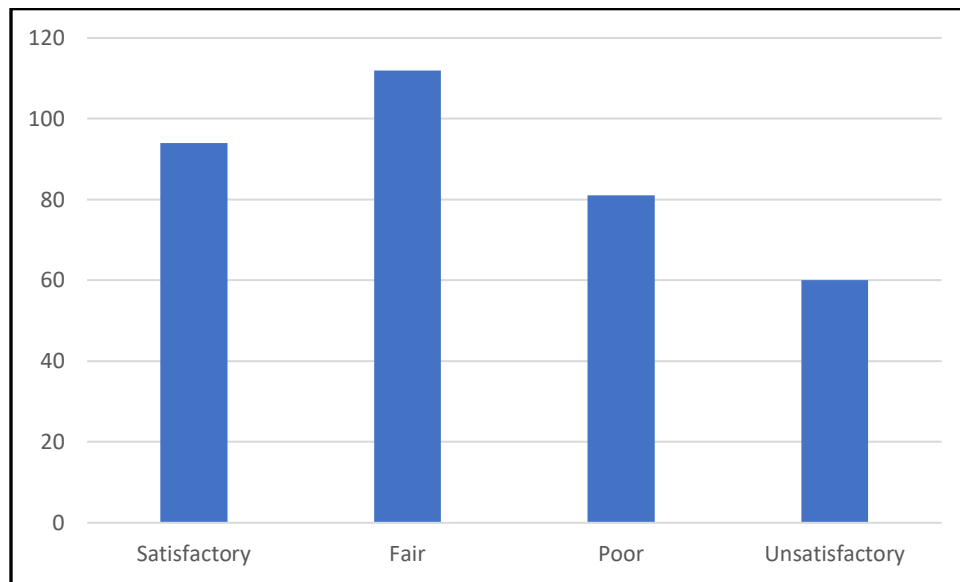
Of state regulated dams, there are 347 high hazard dams, 51 significant hazard dams, and 6,445 low hazard dams. Since 2017, the Mississippi Department of Environmental Quality (MDEQ) Dam Safety

Division has been working to reclassify both significant/low hazard and unclassified/undetermined dams. From 2017 to 2019, MDEQ has increased the number of structures carrying high-hazard classification from 256 structures to 381 structures. From 2020 to 2023, the number of high-hazard dams was reduced from 381 to 347. This was accomplished by MDEQ staff working with dam owners to enact risk reduction modifications such as lowering the top of dams to reduce the hazard classification.

Since 2019, the number of significant hazard dams has decreased from 73 to 51 and the number of low hazard dams has increased from 3,586 to 6,445. These changes are due to dam classification and reclassification across Mississippi. The classification and reclassification of dams and the creation of needed EAPs across Mississippi is a direct result of increased legislative funding for the Dam Safety Program.

The Association of State Dam Safety Officials’ (ASDSO) 2022 Dam Safety Performance Report for Mississippi collected information about the condition of state-regulated high hazard potential dams. Figure 2 shows that approximately 27% are rated as satisfactory, 32% are fair, 23% are poor, and 17% are in unsatisfactory condition.

FIGURE 2: 2022 CONDITION RATING OF STATE-REGULATED HIGH HAZARD POTENTIAL DAMS



Of the dams in Mississippi with a known age, the average age is 49 years. However, only 2,056 out of 6,114 listed dams in the National Dam Inventory have a known age. Usually, dams are designed for a 50 to 100-year lifespan. There are 735 dams built less than 50 years ago, 1,318 dams aged 50 to 99 years, 3 dams over 100 years old.

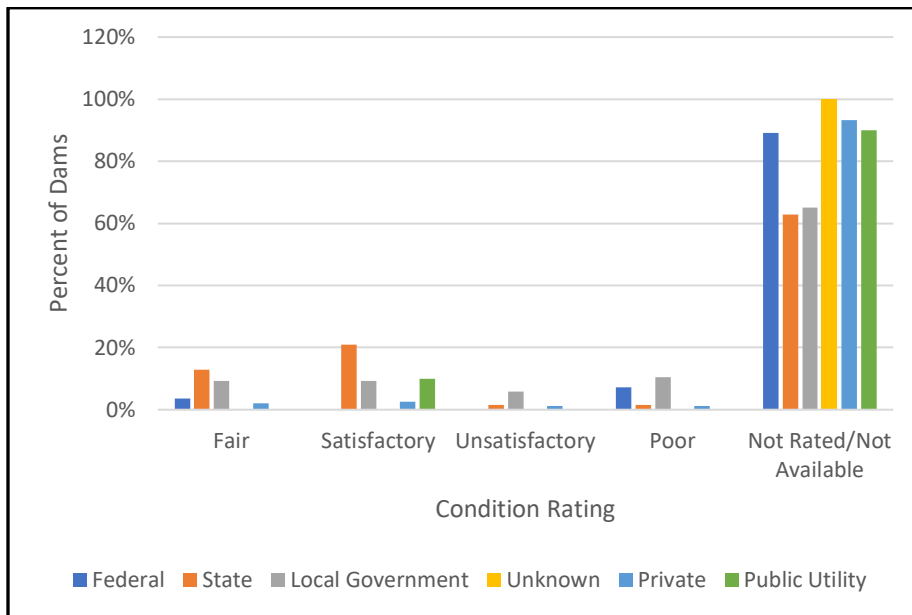
Currently, of the 5,325 privately-owned dams in the state, 120 HHP and SHP dams are currently rated as

unsatisfactory or poor. The average age for privately owned dams across Mississippi is 47 years; the age of 1,370 of 5,325 dams is known.

Of Mississippi's 55 federally owned dams, four are in poor condition, two are in fair condition and the condition of the remaining federally owned dams is either not available or the dam has not been rated.

The condition rating for the 62 state-owned dams in Mississippi is shown in Figure 3. The average age for state-owned dams is 56 years; however, the age is only known for 32 state-owned dams. Of the 664 dams owned by local governments, 107 dams are currently rated as unsatisfactory or poor. The average age for dams owned by local governments is 55 years; the age of 587 of 664 dams is known. Figure 3 shows the percent of dams in each condition rating based upon owner type.

FIGURE 3: 2021 CONDITION RATING OF DAMS IN MISSISSIPPI BY OWNER TYPE



OPERATIONS AND MAINTENANCE

The Dam Safety Division of MDEQ regulates all the dams in the state except for 244 dams. MDEQ oversees all dam inspections in the state, even for the dams over which it does not have regulatory authority.

Although MDEQ oversees regulation of dams and maintenance of inspection records, it is the responsibility of dam owners to maintain their dams, have them inspected as needed, and submit their inspection reports to MDEQ. These inspections involve a periodic visual inspection to spot any developing problems. Informal inspections require that personnel conducting the inspection be knowledgeable about the dam and its accessories. An informal inspection must be performed every 60 days as well as after



significant storm events for high and significant hazard dams. In addition to having their dams inspected periodically, owners must also ensure that the EAP for their dams is updated at regular intervals and distributed to downstream stakeholders.

According to the 2022 Association of State Dam Safety Officials' Dam Safety Performance Report for Mississippi, MDEQ Dam Safety Division has 7.5 full time equivalent (FTE). This number has remained stable for over 5 years and is an increase from 4 FTE in 2010. Although the Dam Safety Division of MDEQ has an overall increase in staffing, staffing is much lower than the national average FTE per state-regulated dams and state-regulated high hazard potential dams. Nationally in 2021, one FTE was responsible for just under 200 dams and 30 high hazard potential dams; in Mississippi, one FTE was responsible for over 900 dams and 47 high hazard potential dams.

Further challenges are present regarding MDEQ's regulation and inspection of dams. For instance, private owners continue to construct new dams, without acquiring proper permits or notifying the Dam Safety Division. This increases the difficulty for the Dam Safety Division to maintain updated records of all the dams in the state, potentially contributing to the large number of unclassified dams. Another concern is insufficient/inadequate inspection reports, which are due to inspections being performed by unqualified persons on behalf of the owner. According to Mississippi law, only high hazard and significant hazard dams must be inspected by a professional engineer.

PUBLIC SAFETY

MDEQ regulations require an EAP to be developed for all high hazard potential dams. A well-prepared and maintained EAP can greatly reduce the potential risk of loss of life in the event of a dam breach. In 2023, 323 (93%) HHP dams had an EAP in Mississippi. This number is up from 140 (38%) in 2010. The national average of percent of dams with an EAP is 82%. The increase in EAPs across Mississippi is a direct result of state legislature appropriations targeted to increase the number of EAPs in the state.

To date, Mississippi has not experienced a dam failure resulting in loss of life; however, dam failures have resulted in a loss of property and homes. In May 2023, residents were warned of "potential breach conditions" at U.S. Army Corps of Engineers' (USACE) Arkabutla Dam in Tate and DeSoto Counties. The dam, originally constructed in the 1940s, underwent emergency repairs. In July 2023 heavy rains and flooding resulted in a dam breach in Clarke County at Archusa Water Park in Quitman. The breach did not result in loss of life or property. Records indicate the same low, earthen dam had also breached in January 1998.

FUNDING

Funding is necessary for inspection and regulation of dams as well as for repair and maintenance. The funding available for maintenance and repair will differ based on dam ownership.

The funding for federally owned dams in Mississippi depends on the budget available to the federal agency that owns and is tasked with the dam's maintenance and repair. There are 55 federally owned dams in Mississippi. Of these dams, one is owned by the Bureau of Indian Affairs (BIA), three by the Department



of the Navy, 22 by the Forest Service, three by the Fish and Wildlife Service, and 26 by the USACE. Funding is insufficient for the repair of federally owned dams. Due to lack of appropriated funding, the BIA is only able to meet critical needs of their dams to prevent failure. The U.S. Fish and Wildlife Service can cover routine yearly maintenance and utility bills with its funding. Lack of sufficient funding results in failure to proactively manage and maintain dams.

Funding for state-owned dams can come from different sources. However, the primary four funding sources are the Land and Water Conservation Fund, the Natural Resources Conservation Service (NRCS), bonds, and the budget of the state agency responsible for the specific dams.

The majority of funding for local government owned dams comes from local taxes and is limited by the municipality's budgets. Local governments limited resources often leaving dams further down the funding list unless emergency action is needed. As dams are often out of sight and out of mind until significant flooding or failure occurs, it is often too late to catalyze more funding for rehabilitation by the time the public advocates for it.

Most of the dams in Mississippi are privately owned, and the responsibility for maintaining and repairing these dams falls on the owners. This means that the funding needs are primarily associated with private entities which do not have the same financial resources as federal and state-owned dams.

There are 10 dams owned by public utility companies across Mississippi. Generally public utilities have more funding for operation, maintenance, and rehabilitation of infrastructure including dams. The condition rating for public utility owned dams in the state is not well known; one dam is rated as satisfactory while the remaining nine dams have not been rated. However, these dams are assumed to be in satisfactory condition or better simply because the average age of these dams is 15 years. The age of seven out of ten dams is known.

In 2020, the State of Mississippi established and funded the *Mississippi Dam Safety Fund* to provide funds for owners of high hazard potential dams with funds to be used for draining, repairing, rehabilitating, breaching, or removing high hazard potential dams in the state. Funded every year since 2020, this Fund has thus far only been funded at a total of \$4 million. Dam owners are applying for funds to execute projects across the state.

FUTURE NEED

According to a 2023 ASDSO report, the total cost to rehabilitate the Mississippi's dams rated less than satisfactory is approximately \$9.68 billion. The cost to rehabilitate high-hazard potential dams in the state is \$760 million. The majority of high hazard potential dams in need of repair are privately-owned or owned by local governments, the latter of which struggle to fund best practices maintenance work as described above. Mississippi is in the top 10% of states in need of total funding for dam rehabilitation.

RESILIENCE AND INNOVATION

Mississippi is undertaking a project that is substantially increasing the number of updated inundation

2024



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models using HEC-RAS. Currently, over 50% of HHP dams across the state have updated models in place and there is a goal to have 100% coverage of HHP dams by the end of the 2024 calendar year. This modeling can be used to estimate flooding potential and risk associated with HHP dam breaches and can be used for risk-based decision making to better protect the public.

Mississippi currently has 1,391 dams that are considered unclassified due to lack of information. MDEQ has a goal to have all 1,391 unclassified dams modeled in DSS-WISE by July 2025 (the state's fiscal year begins on July 1). Any dams found to be HHP as a result of this modeling exercise will have a HEC-RAS model created for it with a goal delivery date of the end of 2025. Currently, MDEQ is working towards a goal to have EAPs for 100% of currently-identified HHP dams by the end of the 2023 calendar year.



RECOMMENDATIONS TO RAISE THE GRADE

Mississippi's dams will benefit from additional improvements. These improvements include:

- Expand the Mississippi Dam Safety Fund with additional funding, an order of magnitude greater than current levels, so that HHP dams have a path to close the investment gap in 10-20 years.
- Increase the number of FTEs in MDEQ's Dam Safety Division to reduce the number of state-regulated dams per FTE. Without increased FTE positions, MDEQ could miss out on the ability to take full advantage of federal funding programs due to lack of personnel to manage awards.
- Work with the Mississippi State Personnel Board and the Mississippi Legislature to increase compensation to reflect state averages to help retain and recruit engineers.
- Support MDEQ's continued efforts to classify/reclassify the dams across the state.
- Strengthen permitting language and fines for dam owners who construct dams without acquiring proper permits and/or coordinating with MDEQ's Dam Safety Division prior to construction.
- Expand the Dam Safety Regulations, Title II, Part 7, Chapter 3 to require owners of all dams – regardless of hazard designation – to have their dams inspected by a registered professional engineer. The dam inspection reports submitted to MDEQ accompanying the dam inspection should be written and sealed by a registered professional engineer.
- Support MDEQ's continued efforts to create and enforce EAPs for all high hazard potential dams across Mississippi.
- Expand MDEQ Dam Safety Division's information and educational outreach programs to increase dam owners' and the public's knowledge of dams, where they are located, the purposes they serve, their funding needs, and the risk they pose.
- Create and fund a Dam Rehabilitation State Revolving Loan Fund which would allow dam owners, including owners of non-high hazard potential dams, to receive low-interest loans for dam rehabilitation purposes.
- Require all MDEQ personnel inspecting dams to be registered professional engineers.



FIND OUT MORE

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DRINKING WATER



DRINKING WATER

GRADE: D-

EXECUTIVE SUMMARY

Mississippi's drinking water infrastructure urgently needs rehabilitation. The state has 1,189 water systems, many operating infrastructure assets beyond their design life. In 2022, 13% of public water systems in the state had a documented Safe Drinking Water Act violation or were listed as an enforcement priority. A federal emergency disaster was declared in the City of Jackson following August 2022 flooding, resulting in low to no drinking water pressure for many customers for multiple days and a boil water notice in place for most of the city for approximately 17 days. Many Mississippi water systems experience between 30% and 40% non-revenue water loss, compared to a 15% industry standard. One-time funding infusions have helped, with \$600 million for Jackson alone from the federal government and \$770 million in additional federal money available statewide from 2023-26. However, this funding rate is only 10% of the total repair needs, which EPA now estimates at \$8 billion over the next 20 years. Decision-makers and owner-operators at all levels of government should partner to improve financial conditions and innovate to deliver projects that improve water quality and reliability.



BACKGROUND

Mississippi is a rural state with population of 2.94 million people (U.S. Census Bureau, 2022). Eighty-seven percent (87%) of the population is supplied by public drinking water systems, and there are a total of 1,188 public water systems in the state (Mississippi State Department of Health (MSDH), 2020; Mississippi State University Extension, 2019). Of these, about 11% are small water systems serving between 3,300 and 10,000 persons, and the rest are very small water systems serving less than 3,300 persons (MSDH). Most of these systems have limited financial resources. This is due to multiple factors, one of which is that small and very small water systems in Mississippi often serve primarily rural population with median household income (MHI) less than the statewide MHI of \$49,111. About 75% of the State depends on groundwater (2.5 billion gallons per day) and the rest on surface water (1 billion) for all water needs (including public water supply, private water supply, agriculture, and industry).

The water crisis in Jackson, from August to November 2022, exposed the advanced deterioration of the drinking water infrastructure in Mississippi, which includes distribution/transmission systems, treatment plants, storage capacity and conditions, groundwater wells, and other sources. Due to this event, Congress appropriated \$600 million to Jackson through the December 2020 Omnibus Spending Bill.

As part of the base and supplemental Bipartisan Infrastructure Law funding, Mississippi received \$32.6 million through the Drinking Water State Revolving Fund (DWSRF) to upgrade drinking water infrastructure for fiscal year 2023 (FY2023). This is much less than the predicted \$8.1 billion 20-year need in the 7th Drinking Water Infrastructure Needs Survey and Assessment published by the U.S. Environmental Protection Agency (EPA) in April 2023. However, several communities will benefit from the increase in federal funds.

CONDITION AND CAPACITY

The current condition of drinking water infrastructure in Mississippi is poor and in need of immediate attention. In Jackson, deteriorating infrastructure has left systemic leaks that have drastically increased the non-revenue water loss to more than 40% (MSDH, 2021). Water loss in many systems in Mississippi is greater than 30% by volume and can range to greater than 40 % (MSDH). The leak detection and repair component of a water distribution maintenance program, along with asset management, are best practices to decrease water loss in a distribution system. Fifteen percent (15%) or less by volume is considered an industry standard goal for water loss. , The MSDH reported that Mississippi may have difficulty in meeting compliance requirements dictated by the America's Water Infrastructure Act (AWIA) due to infrastructure improvements long overdue (MSDH, 2020).

The capacity of drinking water facilities in the State is mediocre, and the condition of drinking water infrastructure affects system capacity. While Mississippi has groundwater resources accessible, many small or very small water systems have one water supply source and need a second water supply source for resilience and redundancy. While a majority water systems are not at 75% capacity of their existing water supply source – the industrywide standard for adding additional capacity – there is a need for backup water supply in many communities. Additionally, many water systems groundwater wells and

intake structures are beyond the infrastructure design life, indicating the need for a replacement or rehabilitation of the existing infrastructure.

FUNDING AND FUTURE NEED

The MSDH DWSRF Program executed \$177.8 M in SRF loan agreements with eligible entities from 2018 to 2022. (Table 1) Totals in 2020 through 2022 were higher thanks to increased federal investment.

TABLE 1: NUMBER OF DWSRF LOANS EXECUTED BY MSDH, 2018-22

Federal Fiscal Year (FFY)	MS DWSRF Executed Loans (Million \$)	Number of Executed Loans
2022	39.4	18
2021	40.9	13
2020	40.8	24
2019	33.9	8
2018	22.8	13

The state legislature appropriated \$470 million in American Rescue Plan Act (ARPA) funds to municipal and county drinking water and wastewater infrastructure projects as a one-time investment through the Mississippi Department of Environmental Quality (MDEQ); unfortunately, many projects have been deemed “ineligible” for reimbursement through the program, meaning the funding will not be utilized to improve drinking water, wastewater, and stormwater infrastructure. In addition, the state legislature appropriated \$300 million in ARPA funds to rural water association drinking water infrastructure projects as a one-time investment through the MSDH. Last, the legislature appropriated \$22.5 million to state parks for drinking water, wastewater, and stormwater infrastructure projects. These grant awards are currently in progress.

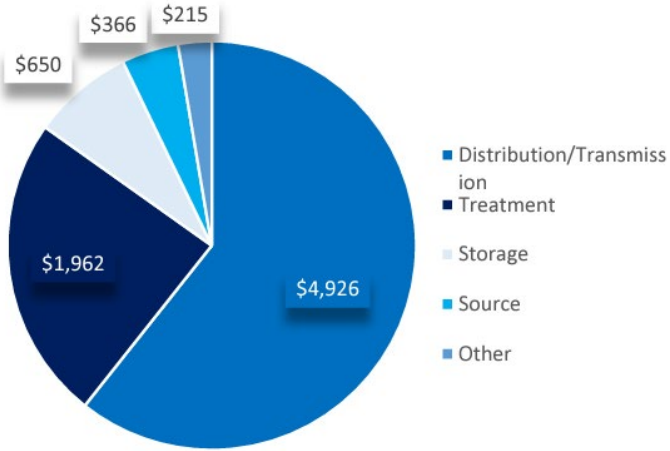
Across the nation, state and local government investment has comprised two-thirds of public funding for capital improvements to water infrastructure since the 1980s (ASCE National Report Card for Infrastructure, 2021). Further, an overarching contributor to the current and future need is the deferral of investment in capital improvements (Congressional Research Service, 2023). Additional investment in water infrastructure is needed from all levels of government, including federal, state, and local. The State DWSRF program is currently investing about 10% of the total yearly drinking water infrastructure needs of the State.

The 7th Drinking Water Infrastructure Needs Survey and Assessment (DWINSA), a national survey conducted every four years by EPA with data collected by DWSRF programs in each state, found that the 20-year need for Mississippi to upgrade its drinking water infrastructure **increased** from \$4.8 billion to \$8.1 billion, or \$406 million annually through 2039.

Most of this need is for rehabilitation and replacement of existing infrastructure. Figure 1 shows the 20-year funding needed in drinking water infrastructure by category in Mississippi in 2021 (DWINSA, 2023). Water systems that have not prioritized adequate distribution system asset management and leak

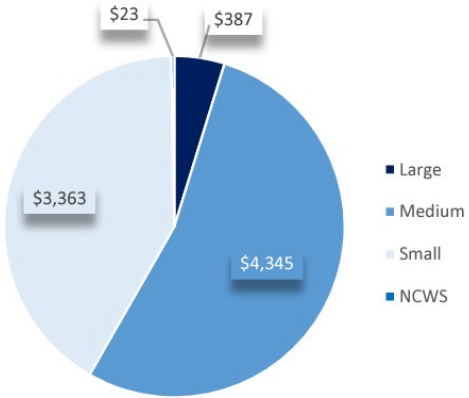
detection programs in their distribution systems have proportionally greater aged infrastructure and therefore a higher level of need. This is particularly true of Jackson where the drinking water treatment plant failed.

FIGURE 1: 20-YEAR MISSISSIPPI DRINKING WATER INVESTMENT NEEDS, BY PROJECT TYPE
Mississippi Total Need by Project Category
 (in millions; January 2021 dollars)



That needs assessment estimated that \$3.4 billion of Mississippi’s total drinking water needs exist in small systems, while \$4.3 billion investment is needed in non-community water systems – decentralized set-ups serving 13% of the state (Figure 2).

FIGURE 2: 20-YEAR MISSISSIPPI DRINKING WATER INVESTMENT NEEDS, BY SYSTEM TYPE
Mississippi Total Need by System Size
 (in millions; January 2021 dollars)





OPERATIONS, MAINTENANCE, AND PUBLIC SAFETY

Public safety is threatened if Mississippi's drinking water infrastructure condition remains as is. Letting drinking water infrastructure degrade to dangerous levels can have serious consequences for state economies in addition to the impact to public health.

Vacs Renwick et. al. (2019) concluded that there have been 43 waterborne disease outbreaks in the U.S. from 2005 to 2014 attributed to water distribution system deficiencies. Investment in rehabilitation and replacement distribution system infrastructure projects is therefore essential to mitigate negative impacts to public health (Vacs Renwick et. al., 2019).

In 2019, the average water utility required between 1% and 4.8% replacement of their water distribution pipelines on an annual basis. One-half of water utilities nationally reported in 2019 declining or flat total water sales over the previous 10 years, in part due to water efficiency improvements (ASCE National Report Card for Infrastructure, 2021).

The water workforce and specifically, drinking water operators, needs skilled workers in many water systems in Mississippi. Nationally, between the year 2016 and 2026, 10.6% of water sector workers are expected to retire or transfer each year. Some water utilities expect as many as one-half of their staff to retire within the next five to 10 years (ASCE National Report Card, 2021).

An O&M plan must be in place to reduce infrastructure failures. Infrastructure should be regularly inspected for wear and tear and leaks. Preventive maintenance would ensure that damaged infrastructure is replaced in a timely manner.

RESILIENCE and INNOVATION

With antiquated and crumbling drinking water infrastructure, it is difficult to focus on resilience and innovation, as many water operators, board members, and utilities managers are struggling to maintain the existing water infrastructure. However, the disruption of weather patterns from the imminent threat of climate change should encourage resilience as infrastructure is upgraded. Backup to critical equipment within water treatment plants and redundant distribution systems would ensure fewer communities are without water for prolonged outages. Having multiple water sources, pipelines, backup pumps, backup power systems, and continuous water quality monitoring would increase resilience. Moreover, the implementation of an OM&T program that allows regular infrastructure maintenance and upgrades. This would also keep track of condition and lifespan of infrastructure components. Communicating and educating local communities on the importance of water conservation and preparedness, as well as maintaining a continuity of operation plan, would also increase resilience. Resilient water systems could lead to significant cost savings by extending the infrastructure lifespan, which would help avoiding major failures and reduce emergency costs. A robust system would prevent expenses due to water loss or prolonged outages; thus, attracting more customers.

A well-prepared resiliency plan could create space for innovation, as continuously monitoring water quality will help detecting emerging contaminants. The early detection of emerging contaminants could avoid regulatory fines and the saved funds could be used to invest in more sophisticated water

2024



REPORT CARD FOR
MISSISSIPPI'S
INFRASTRUCTURE

treatment technologies for the removal of these contaminants and the treatment of non-traditional water sources, such as wastewater effluent.



RECOMMENDATIONS TO RAISE THE GRADE

The following recommendations would enhance the drinking water infrastructure, and therefore, raise the assigned grade:

- Pursue water treatment technologies that would allow the removal of emerging contaminants.
- The state legislature should commit to sustained additional investment in the DWSRF Program after the expiration of BIL and ARPA investments in 2028.
- The state legislature should raise the cap on the DWSRF program budget, enabling the program to utilize a Cash Flow Model, which would increase the annual investment in DWSRF projects by eliminating the waiting period (executing loans only at one time during the year).
- The stakeholders in the Jackson water system - including - MSDH, U.S. Department of Justice, EPA, the third-party manager, and the City of Jackson – should prioritize determining a good water governance structure for Jackson.
- Incentivize water systems' investment in transmission and distribution system infrastructure, particularly for systems with high water loss rates.
- Implement asset management systems and plan for capital investment as infrastructure reaches the end of its design life. This would help prioritizing the replacement of aging transmission and distribution piping system(s).
- Utilize digital mapping tools such as GIS for asset management.
- Appropriate O&M of water systems including pump and valve operation, leak detection and repairs, water storage tanks, and water quality monitoring to ensure compliance with standards and regulations.
- Improve metering and monitoring systems.
- Engage multiple stakeholders to build the pipeline of future water workforce members through marketing and engaging young Mississippian's interest in STEM water professions, including civil engineering, water operations, utility management, and physical chemists.
- Review utility rates against the full cost of service including operation, maintenance, and capital needs. MS has one of the lowest average water bills in the U.S., \$23 compared to the \$40.92 national average (wisevoter.com).



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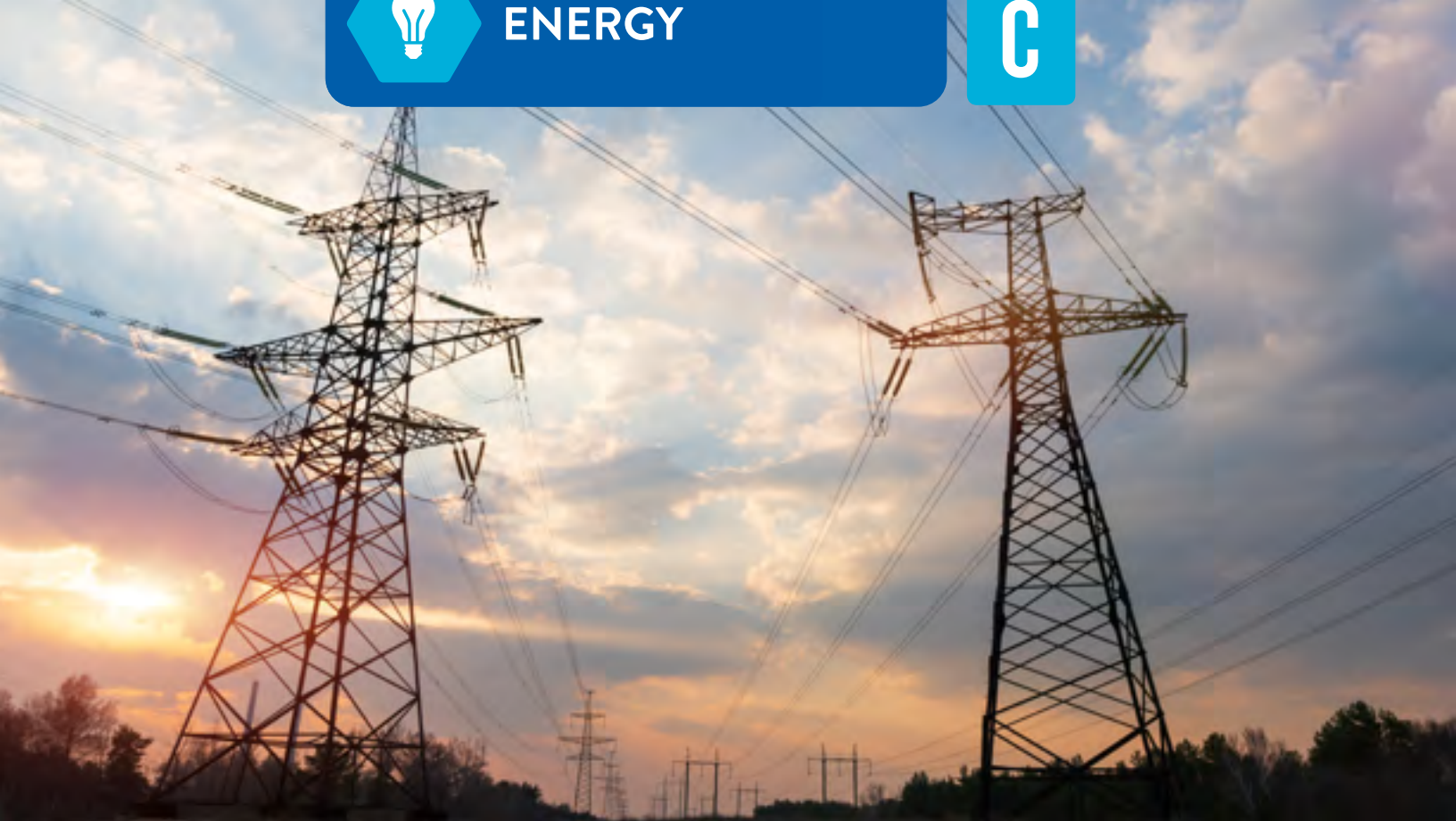
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ENERGY



ENERGY GRADE: C

EXECUTIVE SUMMARY

Mississippi has diverse and abundant electric power generation assets and reliable transmission and distribution capacity, making the state a dependable energy state. Approximately 75% of Mississippi's energy infrastructure is privately owned and 25% is cooperatively owned. The state has over 27,000 miles of natural gas pipelines and more than 4,000 miles of high and low-voltage transmission lines. In general, pipelines are in adequate condition. However, the electricity grid is aging, with 67% of the transmission and 37% of the distribution systems constructed before 1970. Mississippians pay roughly the same as the national average for natural gas, coal, and electricity. Continued investment in energy infrastructure has increased reliability and reduced both duration and frequency of disruptions.

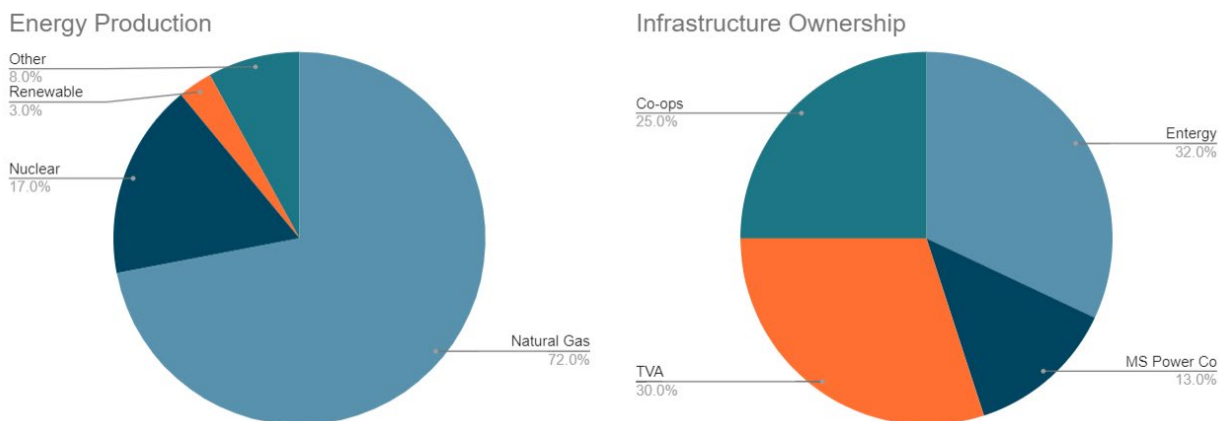


BACKGROUND

In 2021 Mississippi's total energy needs were met by natural gas (72%), nuclear (17%), renewable resources (3%), and other sources (8%), according to U.S. Energy Information Administration (EIA).

The majority of Mississippi's energy infrastructure belongs to three leading companies: Entergy (32%), Mississippi Power Company (13%), and the Tennessee Valley Authority (TVA) (30%). The remainder (25%) is the responsibility of the Electric Cooperatives of Mississippi, rural municipalities, and local utilities throughout the state. The Electric Cooperatives of Mississippi includes 25 not-for-profit distribution electric cooperatives and one generation and transmission cooperative that delivers electricity to over 802,700 meters across the state (ECM, 2023). Altogether, these electric utilities are responsible for the condition, capacity, operation, and maintenance of the state's energy infrastructure, including responding to outages.

FIGURE 1: SOURCES OF ENERGY AND WHO OWNS THE INFRASTRUCTURE



CONDITION AND CAPACITY

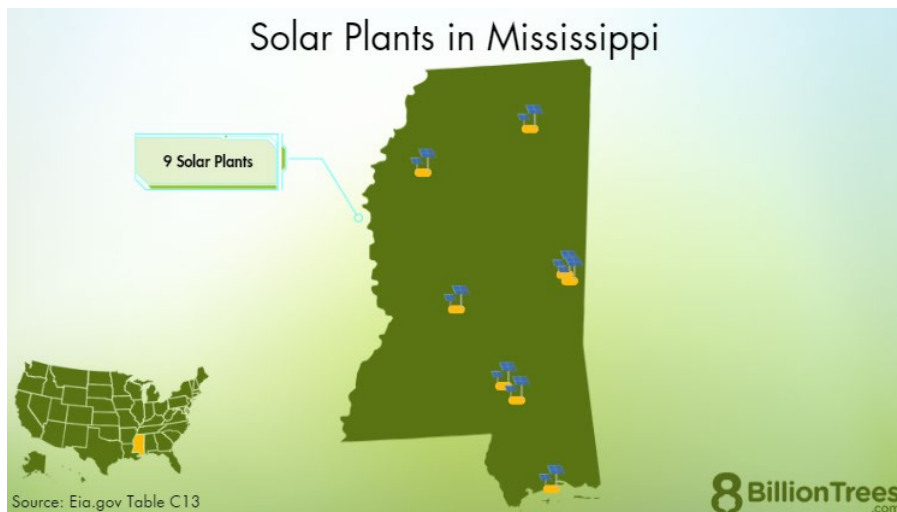
Due to the state's dependence on natural gas as its primary resource for producing electricity, Mississippians also rely on its associated infrastructure. According to the U.S. Department of Energy's (DOE) State of Mississippi Energy Sector Risk Profile, the energy infrastructure portfolio includes over 27,000 miles of natural gas pipeline (10,300 miles of transmission pipeline and 17,000 miles of distribution pipeline), 15 major gas storage facilities, one natural gas processing plant, 31 natural gas-fired power plants, and more than 4,000 miles of high and low voltage transmission lines.

The pipelines have proven to be reliable with few long-term maintenance challenges. The transmission lines, however, experience periodic disruptions, most commonly due to faulty equipment, operator errors, or natural disasters. 67% of the transmission system and 37% of the distribution system in Mississippi were constructed prior to 1970. Weather or falling trees lead as the annual cause of outages

for Mississippians. The average Mississippi electric customer experienced 1.5 service interruptions per year that lasted 4.5 hours on average; this is down considerably from 19 hours of service disruptions annually in 2017.

In addition to natural gas, renewable energy is helping the condition and capacity of Mississippi energy portfolio. Solar installations across Mississippi have increased steadily since 2015; currently there are nine solar plants in the state (see Figure 2), in addition to solar installations at industrial sites. Mississippi's solar installations produce 438 MW, which is enough to power 47,548 homes in the state. The Solar Energy Industries Association estimates Mississippi's solar industry will grow from 438 MW in 2023 to 2,064 MW by 2028.

FIGURE 2: LOCATIONS OF SOLAR PLANTS IN MISSISSIPPI



OPERATIONS AND MAINTENANCE

Currently, Mississippi's electric cooperatives energize a total of 95,360 miles of lines throughout the state which covers 85% of the state's physical area, providing electricity to 50% of the electric meters in Mississippi. They serve an average number of 8.3 consumers per mile of line, compared to the national average of 32 for investor-owned utilities and 41 for municipal-operated systems.

Mississippi Power, a subsidiary of Southern Company, owns and operates six electric generating plants providing over 3.5 million kW to Mississippi customers. Additionally, Mississippi Power operates four individual solar facilities producing 158,000 kW. Mississippi Power maintains more than 2,100 miles of transmission lines in the state.

Entergy Mississippi provides power to approximately 461,000 customers in 45 counties. The company also owns and operates Mississippi's only nuclear power reactor – Grand Gulf Nuclear Station – which generated 11,700,00 MWh in 2021.



TVA provides power to approximately 346,000 customers across 36 counties in Mississippi. TVA provided 5 billion kW hours of electricity to residential customers and 5 billion kW hours of electricity to 86,000 commercial and industrial customers in fiscal year 2019. The TVA operates and maintains 2,124 miles of transmission lines across the state. Additionally, TVA has five combustion turbine sites in northeastern Mississippi producing 3.5 million kW per year and operates two solar facilities producing 53 kW per year

FUNDING

Mississippi's energy sector primarily meets its financial needs through sustained user fees or through sale of the product. The cost of Mississippi energy products is generally equal to or slightly lower than the U.S. Average (Table 1)

TABLE 1: ENERGY PRICES IN MISSISSIPPI (EIA, 2023)

Sector	Mississippi	U.S. Average
Domestic Crude Oil – First Purchase	\$77.54/barrel	\$77.22/barrel
Natural Gas – City Gate	\$4.45/thousand cu ft	\$4.34/thousand cu ft
Natural Gas – Residential	\$16.64/thousand cu ft	\$14.47/thousand cu ft
Coal – Average Sales Price	\$27.32/short ton	\$36.50/short ton
Electricity – Residential	\$0.1408/kWh	\$0.1611/kWh
Electricity – Commercial	\$0.1281/kWh	\$0.1222/kWh
Electricity – Residential	\$0.0672/kWh	\$0.0762/kWh

Mississippi ranks among the five states with the lowest average gasoline prices but among the top 10 states with the highest gasoline expenditures per capita. The low cost of gas is due to the state's proximity to the Gulf of Mexico. The high rate of gasoline consumption is the result of a large number of rural residents and minimal public transportation available in urban areas. Additionally, Mississippi ranks among the top five states in residential sector electricity sales on a per capita basis. Climate is the primary reason for high electricity usage.

In 2013, Governor Phil Bryant signed landmark legislation into law resulting in a plan called Energy Works: Mississippi's Energy Roadmap, published in 2017. Consequently, Senate Bill 2564: The Energy Infrastructure Revolving Loan Program was signed into law in 2023. The Energy Infrastructure Revolving Loan Program provides funding to municipalities or counties to finance energy infrastructure or improvements needed to support large economic development projects that involve a private corporate investment of at least \$50 million. The maximum loan amount is \$5 million.

Additionally, the Mississippi Development Authority has the Mississippi Industrial Energy Efficiency Program, made possible through the DOE State Energy Program. This competitive grant program helps Mississippi companies to make energy-efficient upgrades to their facilities to reduce energy consumption and operating costs. The program can also be used to create and/or retain jobs. The total funding released under the program in 2023 was \$500,000.



The Electric Division of PSC regulates the rates investor-owned electric utilities (Entergy and Mississippi Power Company) can charge. However, the PSC has limited authority over municipal and cooperative electricity providers.

FUTURE DEMAND

In 2019, Mississippi Public Service Commission Rule of Procedure 29 was established requiring all electric utilities regulated by the PSC to create and maintain Integrated Resource Plans (IRPs). IRPs are planning tools to help provide transparency in the design and leveraging of energy portfolios to ensure the energy utility can meet the growing demands of the future. A 2021 Integrated Resource Plan written by Entergy Mississippi projected nearly flat growth in electricity consumption, with a total energy growth of <0.1% annually and peak demand to growth of just over 0.1% over the forecast horizon of 2022 to 2041. This nearly flat energy consumption was projected due to planned increases in industrial loads and slight increases in customer count growth for residential, commercial, and government sectors. However, the customer growth is offset by declines in the average energy consumption due to energy efficiency and increasing decentralized generation through the adoption of rooftop solar systems.

The future need of Mississippi's energy sector is not expected to outpace the sector's ability to handle the demand due to the state's slow population growth rate.

PUBLIC SAFETY & RESILIENCE

According to the DOE's Mississippi Energy Sector Risk Profile, tornadoes, floods, and thunderstorms and lightning are the most frequent natural disasters in Mississippi and result in the most property damage. Between 2009 and 2019, there were 19 reported tornadoes resulting in \$134 million of damage per year, 38 floods resulting in \$117 million of damage per year, and 89 thunderstorm and lightning events resulting in \$67 million of damage per year. Hurricanes are also a common occurrence in Mississippi resulting in millions of dollars of damage given the correct circumstances. Incorporating resiliency into the state's energy systems is essential as it can help prevent impacts to public safety. Currently Mississippi's energy portfolio is managed in a proactive way that includes debris/obstruction removal and tree trimming to prevent widespread power outages. Additionally, lines that result in frequent loss of power events are being moved underground, after benefit-cost analysis, to help reduce the frequency of loss of power events.

While petroleum in Mississippi only accounts for 0.3% of the nation's crude oil, Mississippi is home to 3 petroleum refineries, processing 394,000 barrels of crude oil per day. Chevron's Pascagoula Refinery is one of the nation's largest refineries, supplying gasoline, diesel fuel, jet fuel, and other products to markets in the southeastern United States. The Ergon refinery in Vicksburg is the leading global manufacturer of naphthenic process oils. To support these refineries, petroleum pipelines cross the state. Due to the potential human and ecological health consequences of a petroleum spill, it is imperative to reduce and eliminate, to the extent practicable, petroleum spills and leaks. Petroleum spills and leaks are not a common occurrence in Mississippi. In June 2023, a barge leaked 3,402 gallons of oil into the Mississippi River near Natchez. According to the International Tanker Owners Pollution



Federation, petroleum spills have been steadily declining since the 1970s. In the 1970s there were 24.5 large (greater than 700 tons) oil spills, while in the 2010s, oil spills have decreased to 1.7 per year.

Gas pipeline leaks release powerful greenhouse gases into the environment making the long-term effects of pipeline leaks particularly troubling. There are nearly two dozen interstate natural gas pipelines that pass through Mississippi. To avoid putting Mississippians at an increased risk of pipeline leaks, improved materials and construction practices are put in place to help ensure that risks are minimized, providing safety for the public.

INNOVATION

Mississippi Power finalized a large conversion from coal to natural gas in Plant Watson (Gulfport) and Plant Sweatt (Meridian). This conversion, along with retirement of other units, resulted in Mississippi Power's energy mix being 60 percent powered by natural gas starting in 2021. Cooperative Energy followed suit and completed a coal-to-natural gas conversion at R.D. Morrow Sr. Generating Station in 2023.

Another Mississippi Power plant, Plant Daniel in Jackson County, is the site of a United States Department of Energy-sponsored carbon dioxide sequestration demonstration project. This project is intended to demonstrate safe and secure injection and storage of carbon in the Lower Tuscaloosa Formation.

In January 2023, a change to Mississippi's power generation laws began allowing over half the state's public school districts to start saving money by generating their own solar energy. The 95 school districts served by Entergy Mississippi or Mississippi Power can enter into a power purchase agreement where a third party pays for the solar panels to be installed on the school district's property and the power company would purchase the generated power and credit the district on its energy bill. The Forrest County School District was one of the first school districts to take advantage of this change. They installed 300 solar panels on the roof of the performing arts center. On a monthly basis, these panels create \$3,000 of electricity, or approximately half the center's electric bill. As of mid-2023, 10 public school districts in Mississippi had entered into agreements to place solar panel systems on their structures.

In addition to energy generation innovation across Mississippi, multiple energy companies are using helicopters and drones to conduct routine inspections and post-natural disaster inspections. This allows the company to inspect transmission lines and other energy infrastructure more efficiently while also allowing inspections of hard-to-reach places without endangering human lives.



ENERGY



RECOMMENDATIONS TO RAISE THE GRADE

To raise the energy grade, the Mississippi Section of the American Society of Civil Engineers recommends the following action:

- Increase funding through the Energy Infrastructure Revolving Loan Fund and consider reducing the private corporate investment from \$50 million to \$30 million.
- Adopt a Renewable Portfolio Standard to diversify Mississippi's energy mix, promote its economic development, and reduce emissions. The standard should require utilities to sell a specified percentage or amount of renewable electricity and should include investor-owned utilities as well as municipalities.
- Incentivize resiliency activities for resiliency projects such as moving overhead wires underground to reduce outages caused by falling trees and other debris.
- Continue promoting and increasing public awareness regarding energy conservation. Mississippi's energy conservation can be improved by educating the public regarding utility's environmental footprint and possible energy alternatives, such as sustainable transportation and renewable electricity. Provide incentives for industries across Mississippi to increase energy conservation efforts.
- Encourage privately-owned and cooperatively owned utility companies to provide incentives for consumers to deploy energy-saving and harnessing technologies which focus on conserving the state's energy and promoting renewable energy usage.
- Lobby for research and development funds to support the adoption of new clean energy technologies.



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ENERGY



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INLAND WATERWAYS



A CARGO FLOAT PASSES THE BRIDGES OVER THE MISSISSIPPI AT VICKSBURG IN THE USA.



INLAND WATERWAYS

GRADE: D

EXECUTIVE SUMMARY

Mississippi has 870 miles of inland waterways and eight locks throughout the Tennessee-Tombigbee Waterway, the Yazoo River, the Mississippi River, the Pearl River, and the Gulf Intracoastal Waterway. The top two locks in the state for cargo passage – the John C. Stennis Lock and Dam and the Jamie Whitten Lock and Dam – are located on the Tennessee-Tombigbee Waterway. Nearly 2,000 vessels pass through the state’s locks every year, carrying over 4.3 million tons of domestic and foreign commodities, including coal, petroleum products, paper, concrete, steel, grain, and farm products. Adequate reinvestment and modernization of the state’s inland waterways is critical. Over the next 20 years, approximately \$4.9 billion will be needed for Mississippi inland waterways, totaling nearly \$250 million annually.



CONDITION AND CAPACITY

The inland waterway system for Mississippi has been in operation since the Federal Water Power Act of 1920. Today, most inland waterways are the domain of the federal government. These waterways include the Tennessee-Tombigbee Waterway on the eastern border of Mississippi; the Mississippi River along the state's western border; the Yazoo River and its associated backwaters; and the Pearl River, which runs through the lower half of the state, emptying into the Mississippi Sound.

The inland waterway system in Mississippi is 870 miles long and is maintained by the U.S. Army Corps of Engineers (USACE). Along these waterways, important infrastructure contains levees and dams that control floodwaters as well as locks to maintain the surface elevation of water for boat traffic. The Mississippi River has as systems of 29 locks and dams upstream of the Mississippi border between Minneapolis and St. Louis; however, there are no lock and dam systems downstream of St. Louis. As Mississippi ports continue to expand, the inland waterway capacity must also increase to keep pace. The only two cargo passage lock and dams in the state, located on the Tennessee-Tombigbee Waterway, are the John C. Stennis Lock and Dam and the Jamie Whitten Lock and Dam. The Jamie Whitten Lock and Dam is the northernmost lock and dam on the Tennessee-Tombigbee Waterway and impounds Bay Springs Lake. The John C. Stennis Lock and Dam is located near Columbus, MS and impounds Columbus Lake. The John C. Stennis and Jamie Whitten Lock and Dams were designed and built by USACE and completed in 1980 and 1983, respectively. The Jamie Whitten Lock and Dam was closed for two months in 2020 to correct a design flaw. The design flaw was identified by USACE while investigating excessive cracking discovered during routine inspections in 2014. No other improvements have been made to either of these cargo passage lock and dams in Mississippi.

According to a 2016 report from the SACE's Navigation and Civil Works Decision Support Center, the John C. Stennis Lock and Dam and the Jamie Whitten Lock and Dam reported the passage of nearly 2,000 vessels—carrying over 4.3 million tons of domestic and foreign commodities, including coal, petroleum products, paper, concrete, steel, grain, and farm products. However, barges have encountered delays along Mississippi's inland waterways, with the Whitten Lock and Dam yielding the highest percentage of delays with upwards of 16% per year.

OPERATIONS, MAINTENANCE, AND PUBLIC SAFETY

Inland waterway operation and maintenance (O&M) efforts include dredging, clearing, and snagging (debris removal) of the waterways, which is critical for keeping them navigable. Furthermore, O&M for the aging infrastructure is vital to ensure the systems function properly, meet their full design lives, and guarantee public safety.

Public safety is an important factor for Mississippi's inland waterways because the potential impact of failure could cause extensive damage. For instance, the Great Flood of 1927 catalyzed the failure of dams and locks along the Mississippi River, which resulted in catastrophic flooding, property damage, and loss of life. Much of the damage occurred in low-lying farmland areas, which impacted households and the agricultural sector while spurring a mass migration of displaced persons out of the state.



Potential dam or lock failures would disrupt the movement of millions of tons of agricultural goods along the river, yielding significant economic and livelihood impacts. Currently as local and global trade demands (e.g. transportation and agriculture) increase, so too will the demand for dredging for the ever-growing size of cargo ships. A balanced approach to inland waterway dredging that does not neglect environmental and public safety concerns is necessary. Furthermore, changing the sediment supply to an area through dredging activities can create conditions for land loss, bank erosion, scour, and flooding—which may impact public and/or private property. Accommodating these needs requires adequate funding, technical capacity, and planning to meet current needs, ensure public safety, and prepare for increasingly frequent extreme weather events.

FUNDING AND FUTURE NEED

Inland waterways in Mississippi are mainly funded by the federal Inland Waterways Trust Fund (IWTF). The year-to-year O&M expenses for these thoroughfares are funded by general appropriations as well as from the Harbor Maintenance Trust Fund (HMTF), a separate fund from the IWTF that is based on an ad valorem tax applied to waterborne imports and domestic traffic. In fiscal year (FY)2017, the federal government invested \$127 million into the O&M of Mississippi's inland waterway infrastructure; in FY 2018, \$85 million was spent, and approximately \$92 million was spent during FY 2019.

Additionally, other sources of funding include the lock and dam system's self-generated revenue, private sector investments, resources from local governments, and state funding from the Mississippi's Development Authority or Department of Transportation. Due to the highly competitive nature of IWTF dollars and limited statewide funding, the total funds needed for Mississippi's inland waterways are not regularly met. Specifically, over the next 20 years, approximately \$4.9 billion will be needed for Mississippi's inland waterways. This figure translates to a nearly \$250 million need annually. Additional funding is needed to fully clear sediment along the Tennessee-Tombigbee waterway; by one USACE estimate, an additional \$100 million is needed to return the canal to its original depth and width.

While the navigation locks are aging and rehabilitation is needed, regular dredging is also required to maintain channels. As such, Mississippi should begin working to attain the funds necessary for reinvestment and modernization of the current inland waterways situated throughout the state. Whether the funds come from the federal government or the state, reinvestment will be necessary to maintain quality of life, agricultural abundance, and the transportation industry, which all benefit from the waterways.

INNOVATION

The USACE's formal vision for the future of the Inland Marine Transportation System is a world-class maintenance management system to help sustain the vast aging infrastructure of navigation locks and dams. A key pillar of this plan includes standardization of component designs that can be readily shared across the hundreds of miter gate structures, spillway gates, and other infrastructure components. The USACE's Navigation Research and Development Strategy, based at its Engineer Research and Development Center (ERDC), also has several efforts underway to help improve the safety and efficiency of marine transportation along the inland waterways. For example, the Structural Monitoring and

2024



REPORT CARD FOR
MISSISSIPPI'S
INFRASTRUCTURE

Analysis in Real Time of Lock (SMART) Gate application uses structural health monitoring technologies to provide real-time awareness to lock operators concerning damage detection, fatigue cracking, barge impacts, and other risks to the overall structural integrity of these vital infrastructure assets. Finally, the River Information Services (RIS) initiative seeks to leverage modern information technologies to improve real-time domain awareness for marine operators and the public at large. Communication protocols such as the Automatic Identification System (AIS) are being used in a variety of applications to avoid collisions, address hazardous navigable conditions, and improve operational logistics.

RESILIENCE

The resiliency of Mississippi's inland waterways is affected by factors such as tidal extremes, climate change, extreme weather events, adjacent land use changes, operations of the structures, and the species that live within the waterways, among others. The federal government identifies vulnerabilities and determines efforts that contribute to greater resilience. These efforts include providing the infrastructure with layers of operational capability and improving the quality and capacity of the intermodal connectors. Intermodal connectors are just as important as the waterways and can often be a limiting factor to capacity. When connectors are in poor condition, it may reduce service reliability, negatively impact response speed during and after a service interruption, and increase shipping costs. To increase the resilience of the waterway system, intermodal connectors should be properly designed and in sufficient condition to service the needs of the waterways.



INLAND
WATERWAYS



RECOMMENDATIONS TO RAISE THE GRADE

- Systematize project planning, O&M practices, and spending between USACE, state agencies, and stakeholders to avoid disturbances, duplication, and congestion.
- Coordinate appropriately how funds are allocated to each project through both state and federal collaboration on inland waterway projects.
- Consider rehabilitation of the largest state waterway, the Tennessee-Tombigbee Waterway locks and dams, to reduce delays and increase design life.
- Develop reserve and surge capacity in the Inland Marine Transportation System while coordinating with industry on response and recovery operations to improve resilience and adapt to reduced capacity from intermodal connectors.
- Ensure enough funds are available and distributed to meet dredging needs.



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ON MAY 17, 2011, FLOOD WATERS FLOWING OVER A LEVEE IN THE MISSISSIPPI DELTA CAUSED SIGNIFICANT DAMAGE TO HOMES, FARMS, WILDLIFE AND CROPS. (FILE PHOTO BY MSU EXTENSION SERVICE/SCOTT COREY)



LEVEES



LEVEES

GRADE: D

EXECUTIVE SUMMARY

Mississippi is home to over 979 miles of concrete floodwalls and earthen levees that protect more than 300,000 people and \$21.8 billion in property. Of the state's 108 individual levee systems, 26 were constructed by the U.S. Army Corps of Engineers (USACE) and receive regular inspection. Of these 26, 14 levee systems are rated unacceptable, meaning the condition of the system may prevent it from performing as intended or a serious deficiency has gone unaddressed. Little to no information is available about the conditions of non-USACE levees. The lack of publicly available information regarding Mississippi's locally-owned levees poses a challenge when assessing the state's overall condition, funding, and safety.



BACKGROUND

After the Great Flood of 1927, USACE was authorized by Congress to control the Mississippi River with a system of levees. This also led to the Mississippi Rivers and Tributaries Act (MR&T). Established in 1928, the MR&T was installed in Mississippi, Louisiana, Tennessee, Arkansas, Kentucky, Missouri, and Illinois to organize and fund a comprehensive and unified public works system. The intention was that this would provide enhanced protection from floods and an efficient navigation channel. This system added supplemental techniques to the flood control system through four major features: levees and floodwalls, channel improvement and stabilization, tributary basin improvement, and floodways. This system also authorized higher levee grades and stronger levee sections to be made. Nationally, levees' most cited failure causes include under-seepage, hydraulic piping, and overtopping. Aging and poorly maintained levees contribute to a higher probability of levee failure. Exceptional events such as extreme water flow rates and water surface elevation associated with severe flooding events also lead to levee failures.

CONDITION AND CAPACITY

Mississippi has 978 miles of earthen levees. The average age of these levees is 63 years. On the 26 levees owned by the U.S. Army Corps of Engineers (USACE), the agency conducts regular inspections. Inspection frequency depends on the level of risk associated with the levee. When inspected, levees are assigned one of the following conditions: acceptable (A), minimally acceptable (M), or unacceptable (U). If an inspected levee is deemed acceptable, this means the system is in satisfactory condition with no deficiencies. The minimally acceptable levee condition indicates that one or more items have minor deficiencies that should be corrected, but the deficiencies would not prevent the system from performing as intended during the next flood event. An unacceptable levee condition rating means that one or more items that make up the levee system are predicted to prevent the system from performing as intended or that a serious deficiency noted in past inspections has not been corrected within the established timeframe.

According to the National Levee Database (NLD), 0 levee systems are currently rated acceptable, 12 levee systems are rated minimally acceptable and 14 levee systems are rated unacceptable. Only USACE constructed levees are currently rated. No information is publicly available on the condition of locally constructed levees.

OPERATIONS AND MAINTENANCE

Of the 108 Mississippi levee systems in the NLD, 82 are locally operated and maintained, 22 are USACE federally operated and maintained, and four are maintained by public sponsors. For FY 2023, USACE allocated \$46.6 million for operation and maintenance of MR&T projects located in Mississippi, including levees. Additional federal funding and USACE assistance are available after major floods. No O&M funding information is publicly available for levees that are not federally operated and maintained.

PUBLIC SAFETY

Levees play a critical role in protecting many Mississippi communities from dangerous flooding. Over

2024



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300,000 people and more than \$21.8 billion in property are protected from flooding by these levees. The two high-risk USACE-constructed levees in the Mississippi protect 206,000 people, \$7.3 billion in property value, and 81,000 individual structures.

The MR&T created a flood risk management plan designed to control the project design flood that was developed in 1956 based on the largest maximum possible flood discharge data from an investigation of 35 different hypothetical storm series by the National Weather Service. The adequacy of the project design flood was reaffirmed following additional review in 1973. Despite the magnitude of the 2011 flood, which is the largest on record for the MR&T system, the system is estimated to have provided a 98% overall flood risk reduction.

In addition to the condition inspections discussed above, levees in the NLD are also assigned one of the following risk levels, based on the likelihood that should a breach or system malfunction occur, the incident would cause loss of life, economic, or environmental consequences: very high risk, high risk, moderate risk, low risk, and very low risk. These risk characterizations are not indicative of condition, but instead reflect the potential damage to life and property, should a failure occur. Of the 26 USACE-constructed levees, two have been rated high risk, three have been rated moderate risk, and the remaining 21 have been rated low risk. Since this rating system reflects the risks due to a failure, the large number of low-risk levees intuitively represents a lack of development that would be impacted. No project levee built by the MR&T has ever failed; however, performing regular reviews and thorough inspections is necessary to ensure that this record continues. No locally constructed levees have been assessed by the USACE, and, as a result, no information is available about their risk levels.

FUNDING

Over \$15.5 billion has been invested across the MR&T system for planning, construction, and operation and maintenance since 1928. \$1 trillion in flood damages are projected to have been prevented since 1928. An estimated \$234 billion in flood damages were prevented in 2011. There is an estimated 67-to-1 return on each dollar invested in MR&T.

Twenty-two of Mississippi's 108 levee systems are constructed, owned, and maintained by USACE at the federal level. The funding for these levees comes from USACE's budget. For FY 2023, Congress appropriated \$370 million for MR&T projects, of which the USACE allocated \$46.6 million for operation and maintenance and \$36.9 million for projects located in Mississippi, including levees. Based on the lack of acceptable-rated levee systems, it is clear that more funding for O&M is needed.

Eighty-six out of 108 levee systems in Mississippi are operated and maintained by localities and public sponsors. Little information is publicly available on funding for these systems. In Mississippi's FY 2023 Budget Recommendation Report, no funding was specifically allocated to levees.

FUTURE NEED

The Engineering Research and Development Center (ERDC) in Vicksburg, MS, completes a very thorough and well-engineered approach to considering the impacts of past, present, and future weather events in



order to assess the robustness of the levee systems. Continued funding for this type of research will be necessary to ensure that risks to agricultural and personal assets are minimized due to inadequate funding structures.

More O&M funding is needed in the future to bring the levees up to acceptable condition and prevent excessive flooding and damage. Additionally, localities need increased funding to create an assessment framework and inventory their levee systems.

RESILIENCE

No levee built in the MR&T has ever failed, despite more than 10 major floods in the last 100 years. The resilience of Mississippi's levee system is a direct function of its design, construction, and continued maintenance to the extent that funding has been allocated to do so. Where state and federal funding is limited, ecosystem restoration work performed by non-profit organizations has an increasingly important role to play. Nonprofits like Ducks Unlimited and the National Fish and Wildlife Foundation work with communities and agency partners. Their work not only restores floodplain habitat and Mississippi River aquatic ecosystems but, also improves some of the original hydrological connectivity of these areas. That enables the water systems to accommodate better and withstand flood events. As more of the natural ecosystems adjacent to levees are able to accommodate flood events, less pressure is put on the levee infrastructure itself.

INNOVATION

In its efforts to widen levees along the Mississippi River, the USACE has implemented "avoid and minimize" design techniques to reduce the amount of fill material needed, including relief wells and dredged berms. Relief wells allow seep water to discharge through a controlled mechanism under the levee without displacing material. Dredged berms are excavated and used to raise the levees when near enough to the river and containing suitable material. Dredged berms decrease the environmental impacts of these kinds of projects. By making use of local resources and not bringing outside materials to build up the levees, the environmental impacts are minimal, and the carbon footprint is smaller. Upgrades to the Mississippi River levees are scheduled for completion in 2031.



RECOMMENDATIONS TO RAISE THE GRADE

- Develop a mechanism to provide local governments funding assistance for O&M needs.
- Prioritize environmentally friendly practices, such as dredged berms, when improving and maintaining levees.
- Fully fund operation and maintenance budget for USACE levees.
- Dedicate new funding or programs to support the resilience and restoration work already underway in partnership with non-profit organizations.
- Create a state revolving fund and principal loan forgiveness program to provide localities with resources to inventory and collect data on their levee systems.
- Request Congress fully fund the national levee safety program at its authorized level of \$79 million.
- Invest in innovative technologies to minimize the probability of catastrophic failure along the levees.



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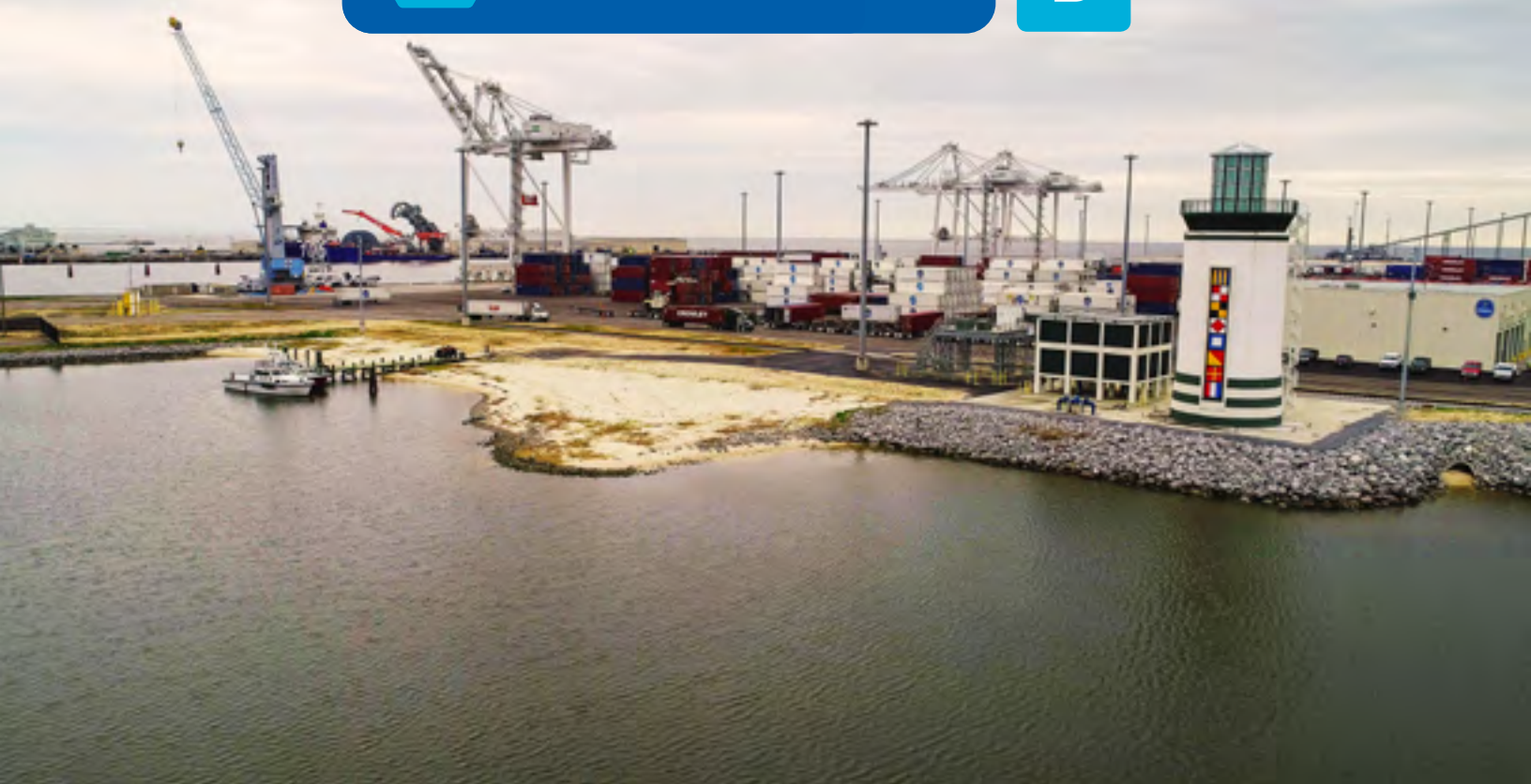
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PORTS



PORTS GRADE: B-

EXECUTIVE SUMMARY

As major import and export points for the state's industries, Mississippi's 16 ports are essential to a thriving economy. They provide access to three waterway systems: the Mississippi River, the Tennessee–Tombigbee Waterway, and the Gulf of Mexico. Port conditions vary widely across the state, as the coastal ports were almost entirely rebuilt after the devastation of Hurricane Katrina in 2005. Recent upgrades include a \$570 million restoration program at the Port of Gulfport and rail investments at both the Port of Bienville and Lowndes County Port. In 2023, the Mississippi legislature provided the largest-ever investment for port infrastructure by setting aside 38% of the \$10 million Multi-Modal Transportation Improvement Program (MTIP) for the state's ports. However, challenges remain, including the current dredge depths of the three coastal ports. Since the expansion of the Panama Canal in 2016, "Neopanamax ships" with design drafts up to 50 feet are increasingly replacing Panamax ships. These smaller vessels were previously the largest capable of passing through the Panama Canal. For Mississippi to continue accepting ocean freight ships, ports must be designed to take these larger Neopanamax vessels. The funding of routine maintenance also challenges many ports, as external grants often favor expansion and internal budgets sometimes fall short of maintenance costs. Mississippi is geographically well-positioned to continue growing its port commerce, a vital portion of its economy. To seize the opportunity of future markets, Mississippi ports need to continue improving multi-modal connectivity and increasing ship size capacity within the ports.



BACKGROUND

There are 16 Mississippi ports, with the three largest located on the coast: the Port of Gulfport, the Port of Pascagoula, and Port Bienville. Ports provide bulk, break-bulk, and ship construction and repair services, with there being one container port on the coast. The limited channel depth at the container port is a potential hindrance to expanding overseas trade, and multimodal connections for domestic shipping.

According to the Mississippi Department of Transportation (MDOT), Mississippi's ports create approximately \$5.4 billion annually in income, generating approximately \$17 billion in gross state product each year. The ports directly create more than 125,000 jobs in Mississippi and indirectly support as many as one out of every 10 jobs across the state.

CONDITION AND CAPACITY

Mississippi ports face challenges consistently allocating adequate funding to facility maintenance, as most funding must be generated directly from port operations and must be used on a reactive basis. Ports with large reconstruction and refurbishment projects following natural disasters such as Hurricane Katrina in 2005 have 'newer' and 'older' terminals, with the older ones frequently falling behind on serviceability. Maintenance of the 'newer' terminals will also be needed over time. Older terminals, such as Gulfport's East Terminal constructed in the 1950s, may be decades older than their refurbished counterparts and lack modern hardening against severe weather in addition to being at or near the end of their service life. The economy creates perpetual competition between ports, and ports are incentivized to prioritize expansion for new revenue streams over large refurbishment projects. Outdated infrastructure that restricts larger and deeper draft ships from coming to port results in lost opportunities, especially for ore and textile shipping. Ships with drafts too deep for the Port of Gulfport are diverted elsewhere to unload part of their cargoes before accessing Gulfport with a lesser draft. USACE is studying possible future expansions to the Gulfport channel. Most Mississippi ports are operating at capacity, so declines in port condition quickly affect operations.

The Port of Gulfport is the only Mississippi container port; the others are barge ports, bulk ports, or are focused on shipbuilding and related trades. Ports tend to have adequate and functioning equipment in fair condition, including cranes, scales, and multimodal transloading capacity for the industries they serve. Of note are recent acquisitions of specialty equipment to help mitigate river fluctuations. Lowndes County Port recently purchased its own dredging machine to ensure its local dredging needs are met.

Over half of the ports in Mississippi are looking to expand operations or their real estate footprint. Expansions for riverine ports occur when ports are operating at capacity and are looking to grow. Coastal port expansions are driven both by economic growth and the need to accommodate ever-larger ships to stay relevant. Challenges to expansion often include unsuitable neighboring terrain or encroaching industrial, commercial, and tourism areas. Expansions at the Port of Gulfport, for example, would consume sandy beach space adjacent to a popular tourist area in downtown Gulfport. Multimodal connections to and from the Port of Gulfport already pass through the busy downtown area.



The Port of Vicksburg's ongoing expansion is disconnected from its original footprint and features the construction of an entirely new terminal facility. The electricity and land available is much greater than at the old site. Highlighting the importance of multimodal connections, a major justification of the Vicksburg expansion is direct access to the recently merged Canada Pacific and Kansas City Southern railroads. The functional capacity of a port hinges upon the condition and accessibility of nearby channels, roads, and railroads.

Many of Mississippi's ports would benefit from improved road and rail access, which can cause a capacity chokepoint for the ports. Although road access is generally adequate, existing road and rail routes may be circuitous, adding time to connections between industrial or agricultural centers and the ports serving them. Improving rail access is especially important for supporting the growth of bulk commodities. Ports with current rail improvement projects include Lowndes County Port and City of Aberdeen Port.

The condition of navigable channels around and approaching Mississippi's ports also contributes to the capacity of a port facility. Navigable channel dimensions are generally up to 38 feet deep by 400 feet wide for Mississippi coastal ports, and up to 12 feet deep by 250 feet wide for Mississippi riverine ports. Compared to deep draft channels with depths nearing 50 feet, the ports along the Mississippi Gulf Coast are suitable for medium-sized ships.

The Port of Pascagoula is working to expand its size and capacity and has expanded its channel width from 450 feet to 550 feet. The dredge material from this project was used to replenish Round Island, a rapidly disappearing island in the Mississippi Sound, which provides protection for both marine life and the port during flood events or hurricanes. This width expansion is a reaction to the increasing ship size. The Port of Gulfport is working with the USACE on a channel deepening and widening feasibility study to increase the channel depth to 46 feet and channel width to 550 feet.

OPERATIONS AND MAINTENANCE

Operations and maintenance are crucial elements of successful, uninterrupted port operations. Mississippi ports are typically expected to maintain their facilities using their internal budgets, as most external funding opportunities are used for projects that can expand existing markets or introduce new markets to the state. This dynamic can make maintenance challenging for smaller ports that have smaller operating budgets. Smaller ports also have more limited access to private bonds which could be used to fund maintenance operations, as well.

One of the most consistent maintenance needs across all the Mississippi ports is dredging. Districts of the U.S. Army Corps of Engineers (USACE) are responsible for ensuring navigation on rivers, as well as to and from ports. Ports are prioritized for receiving dredge services based on reported tonnage passing through the port. For smaller ports, such as the Port of Rosedale and Yazoo County Port, this means not enough dredging occurs to guarantee continuous access despite river fluctuations. The Port of Gulfport, which is situated on the coast, does not have an estuary providing a natural channel. This means a significantly



greater amount of dredging is required to support its operation.

USACE performs dredge surveys and river dredging, and frequently bids out a dredging package for the ports in the district. USACE-funded dredging will dredge up to 50 feet away from port infrastructure. Individual ports are responsible for their own dredging within 50 feet of their docks. Ports can coordinate with the USACE to use their own funds to obtain dredge services while the dredge team is in the vicinity.

USACE funding is granted at the federal level. The optimal time for dredging in Mississippi is during the summer months, so it is essential that dredge funding is included in early year budgets to ensure funding is approved in time for bidding and award by dredge season. To reduce dredging costs, packaging more ports together, potentially across state or USACE district lines, could reduce mobilization costs and make packages more attractive to potential bidders.

PUBLIC SAFETY

Several ports along the Mississippi and Gulf Coast have Coast Guard stations that provide for public safety along with other Coast Guard functions. Resilient road access to these ports allows the Coast Guard to continue functioning in a disaster while minimizing response times toward those of first responders. Ports would benefit from emergency planning drills that stress communications across all stakeholder organizations including ports, tenants, and emergency services. Most port operations do not pose public safety risks, as most port locations are isolated from populated areas. However, operational hazards associated with the basic functions of moving cargo within the port area could pose hazards to port workers and boat crews in emergencies. Hurricanes continue to pose a threat to the infrastructure, and therefore functionality, of the Gulf Coast ports.

FUNDING

The major source of working capital for port operations in Mississippi comes through self-generated revenue. Capital improvements are typically funded through a combination of sources, including revenue, federal grants and programs, private sector investment, and state funding. Nearly all of these funding streams require “matching” funds from the sponsoring port. A non-exhaustive list of funding opportunities that could be applied to port operations in Mississippi is summarized in the table below.



Federal Grants

- Consolidated Rail Infrastructure and Safety Improvements (CRISI) Program – Federal Railroad Administration
- Port Infrastructure Development Program (PIDP) – Maritime Administration
- National Infrastructure Project Assistance Program (Mega Grant Program) – United States Department of Transportation
- Nationally Significant Multimodal Freight & Highway Projects program (INFRA) – United States Department of Transportation
- Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Discretionary Grant program – United States Department of Transportation
- United States Marine Highway program – Maritime Administration

Federal Loans

- Transportation Infrastructure Finance and Innovation Act (TIFIA) Credit Program – Department of Transportation
- Paycheck Protection Program (PPP) Loans – United States Small Business Administration

State Grants

- Multimodal Transportation Improvement Program – Mississippi Department of Transportation
- MDEQ Gulf Coast Restoration Fund – Mississippi Department of Environmental Quality
- MDA Site Development Grant – Mississippi Development Authority
- MDA Port Improvements Fund – Mississippi Development Authority
- Gulf of Mexico Energy Security Act – Mississippi Department of Marine Resources via Bureau of Ocean Energy Management
- MDOT Strategic Multi-Modal Investments Fund – Mississippi Department of Transportation

Other Funding

- Opportunity Zones – Internal Revenue Service
- New Market Tax Credit Program – Community Development Financial Institutions Fund
- Municipal Bonds
- Maintenance Dredging – United States Army Corps of Engineers

Mississippi has made considerable efforts to increase funding for ports due to their impact on state and local economies. In fiscal year 2023, 38% of the \$10 million from the Multi-Modal Transportation Improvement Program (MTIP) has been allocated to the state's ports. This was the largest percentage allocated for one mode of transportation through the MTIP. The Multi-Modal Investments Fund was passed into law during the Mississippi 2023 legislative session, but the funding limits have not been established at the time of this report.

In recent years, some improvements have been made through significant investments. The Port of Gulfport recently finished the final project associated with its \$570 million Restoration Program. The Port of Gulfport Restoration Program was funded by the Community Development Block Grant through the U.S. Department of Housing and Urban Development. (Port of Gulfport, Mississippi, 2013). In February



2020, the U.S. Department of Transportation provided the Port of Gulfport with a grant of \$15.8 million for improving highway access. Hancock County Port and Harbor Commission's Port Bienville was awarded \$4.14 million for new rail infrastructure in 2021 through the USDOT's Port Infrastructure Development Program. Additionally, the Lowndes County Port also received \$6.1 million in Port Infrastructure Development Program funds in 2022 for rail infrastructure expansion.

FUTURE NEED

Currently, Mississippi ports are not capable of receiving larger draft Neopanamax ships. These ships are becoming increasingly common. If Mississippi wishes to capture the portion of the market that uses deeper draft vessels, it must partner with the state's ports in their efforts to improve navigation channels. Some of these channels are federal navigation channels, which require Congressional authorization and funding. Working with the state and federal delegations will be crucial to Mississippi ports competing in global markets.

Mississippi must anticipate the needs of future markets in order to bring new industries to the state. These innovations, while varied, will almost certainly require two things: increased surface area and improved multimodal connectivity. Acquiring land in anticipation of market expansion requires meticulous forward planning by each port, seizing opportunities as they arise in anticipation of future market expansion. Poor port connectivity is already hindering some of Mississippi's largest industries; forestry, for example, would greatly benefit from improved access between the state's saw mills and the state's ports. Mississippi expects to see an import increase in electric vehicle (EV) battery raw materials, which will need to be transported to Detroit via Interstate 65. Improving access now will position Mississippi to better win markets in the future. As noted earlier, investments in the future are in addition to the needed investments for maintenance as both 'older' and 'newer' ports age, manage current and expanding supply demands, and adapt to future needs/technological advancements.

RESILIENCE AND INNOVATION

Hurricane Katrina underscored the need for port resilience, which was heavily incorporated into the post-storm rebuilding efforts. The Port of Gulfport rebuilt to a significantly higher elevation after Hurricane Katrina, and Port Bienville implemented an improved records protection system after all their records were destroyed in the storm. With Mississippi subject to regular hurricane and tornado events, resiliency must be heavily considered in all port planning. Showcasing other forms of resilience, the Port of Rosedale is studying floating docks that would rise and fall with the river level, allowing continuous loading operations where low water levels could prevent such activity.

The Mississippi Development Authority considers the creation of port master plans to be a best practice. Port master plans, in which ports plan out activities and aspirational goals over a lengthy period, allow ports to prioritize efforts and intentionally build momentum toward large goals. The Hancock County Port and Harbor Commission has an extensive master plan for Port Bienville. The Port Bienville master plan's goal is to "maximize development potential within the environmental constraints" of the port, in alignment with the United Nations Sustainable Development Goals. The deliberate analysis and planning

2024



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that goes into the creation of a master plan could be a great benefit to other ports across the state.

In the post-COVID era, the influence of supply chains on safety should be recognized. Mississippi's river ports ship food regionally and coastal ports do so internationally; delays can be costly in terms of food perishing in transit and not making it to markets. Resilience and rapid repairs after weather events bolster safety across the region as well as the economy. Resilience is key as an overarching strategy against preventable damages. While disaster repairs may be prioritized over other projects in the wake of an extreme weather event, these projects still tend to be long-term endeavors that could be avoided or minimized with proper resiliency planning.



RECOMMENDATIONS TO RAISE THE GRADE

- Increase federal and state grant money to further expand the ports and fund the necessary projects laid out in the Capital Improvement Plans.
- Increase the USACE budget and spend down the balance of the Harbor Maintenance Trust Fund for dredging to allow ports to maintain the water depth of channels and berth areas.
- Bundle port dredging into larger regional contracts to reduce mobilization costs for potential bidders. This could include bundling dredging projects for bid across USACE district lines where geographically feasible.
- Support for ports with smaller operating budgets and reported tonnages, as these ports are often excluded from larger maintenance and improvement packages.
- Expand the local workforce along the Gulf Coast by providing educational opportunities and encouraging the hiring of local citizens.
- While promoting tourism to the coastal port cities, utilize zoning and other forms of master planning to allow for future port expansion.
- Determine innovative methods for funding, planning, permitting, engineering, and constructing the improvements needed at ports to reduce project costs and expedite the completion of projects.
- Government agencies should provide seed money for planning charrettes to help ports produce standardized master plans that balance maintenance needs with economic and real estate expansion.
- Maintenance should be covered by the ports and tenants as much as possible, but some additional maintenance funds should be incentivized separately from expansion projects in order to balance condition improvements with capacity expansions. Approach multimodal improvements from a statewide point of view to improve access to and from ports for producers and consumers.
- Prioritize the refurbishment of infrastructure vulnerable to hurricanes .



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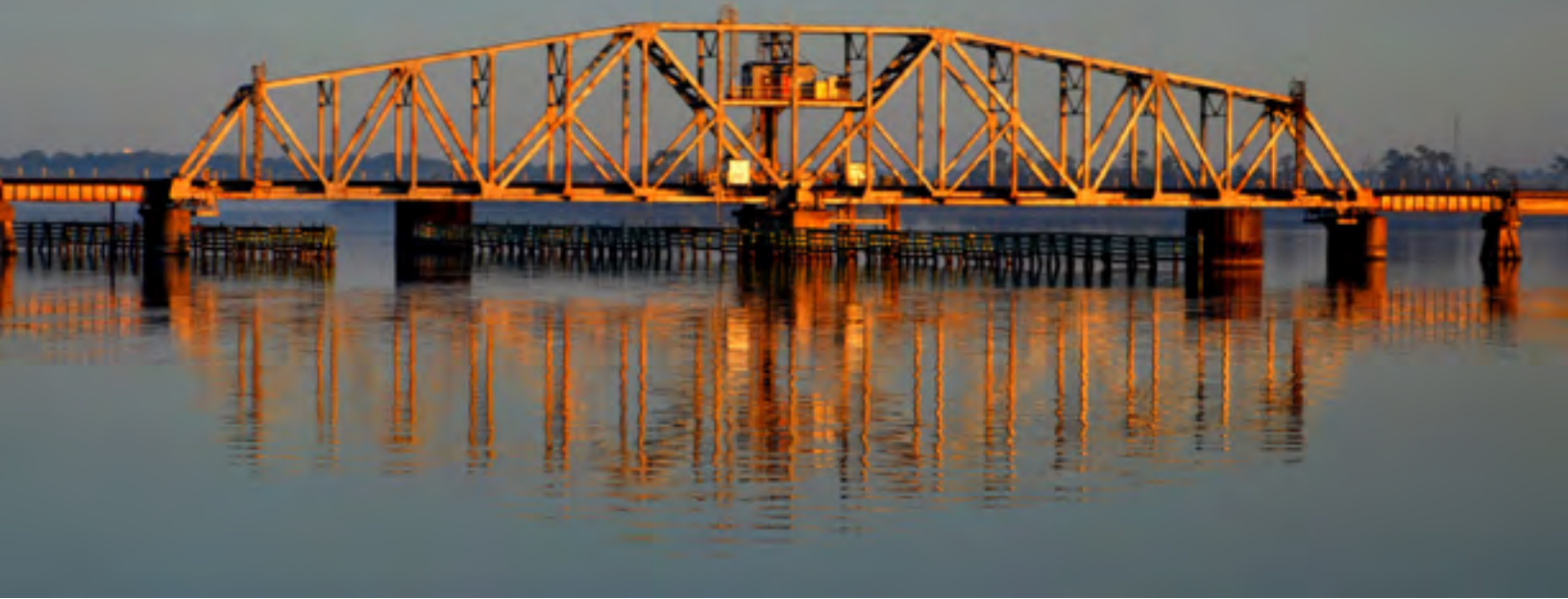
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RAIL



RAIL
GRADE: B

EXECUTIVE SUMMARY

Mississippi's 2,400-mile railroad system includes five Class I freight rail owners; their mainlines serve five of the state's six top-tier freight corridors. Less than 9% of the Class I system is weight-restricted, below the industry goal of 10%, indicating the rail lines are in good condition. Some 35% of short-line Class II and III track miles had that restriction in 2020, down from 57% in 2017. Class I systems invest revenue in their infrastructure, but smaller-budget Class II systems struggle to leverage complicated public funding opportunities resulting in deteriorating conditions. Half of the state's 2,200 grade crossings lack active warning devices, and 10% lack any warning devices. Currently, two long-distance passenger routes operate through Mississippi, connecting New Orleans to Memphis via Jackson and New Orleans to Atlanta via Meridian. The Infrastructure Investment and Jobs Act (IIJA) delivers dollars to restore a third long-distance passenger route on the Gulf Coast and upgrade rail bridges. Still, poor coordination with freight operations on the Gulf Coast will remain a significant challenge for the rail's potential to move people.



CONDITION AND CAPACITY

The Mississippi rail system is composed of 2,772 miles divided into two main categories: Class I (major) railroads, Class II, and III (regional or short line) railroads. Major rail lines are privately owned and make up most of the system, with 1,817 miles. There are 52 miles of Class II railroads and 903 miles of Class III railroads in the Mississippi network. Most rail operations in Mississippi are for freight purposes, but passenger services are also available via two long-distance trains operated by Amtrak. These trains have 11 stops throughout the state.

Class I Railroads

In Mississippi, five major railroads are owned and operated by Burlington Northern Santa Fe Railway, CSX Transportation, Canadian National Railway, Canadian Pacific Kansas City Limited, and Norfolk Southern Corporation (BNSF, CSXT, CN, CPKC and NS, respectively). In 2017, over 115 million tons of freight valued at over \$120 billion were transported by rail in Mississippi. Historic trends show that rail volumes have remained consistent between 2010 and 2017.

Of the total 1,817 miles in Mississippi's Class I system, only 162 miles were weight limited in 2020, a figure that has remained consistent since 2017. The relatively small percentage of weight-limited rail miles – fewer than 10% – demonstrate Mississippi's railways are in good condition. Needs for rehabilitation in these corridors are focused on bridges, some of which cannot sustain the needed 286,000-pound car loading and have insufficient vertical clearances.

Class II and III Railroads

Short line railroads provide connecting service to major railroads. Class II Alabama and Gulf Coast Railway (AGR) near Columbus serves the Mississippi – Alabama state line. The 15 miles of track owned by AGR are limited to 268,000-pound carloads. The 21 Class III railroads vary in condition and capacity, but only four railroads cannot fully accommodate the industry-standard 286,000-pound car loadings. In 2021, approximately 36% of the total short line rail system was weight limited, while 20% was embargoed, or out-of-service due to deteriorating rail lines. These numbers represent a drastic decrease from 2017, when 57% of the total short line rail system was weight limited and 27% was embargoed. These numbers are expected to continue to decrease with ongoing and planned rail rehabilitation projects across the state.

Passenger Services

Two long-distance trains operated by Amtrak run through Mississippi with financial support from the state. The *Crescent* service operates once per day between New Orleans, Meridian, Miss., and Birmingham, Ala., using CN tracks. It makes four stops in Mississippi and takes 90 to 120 minutes longer than traveling the same route by car. The *City of New Orleans* service also only operates once per day and travels between New Orleans, Jackson, Miss., and Memphis, Tenn., using CSX tracks. It makes seven stops in Mississippi and is also 90 to 120 minutes slower than driving.

Ridership trends for both Amtrak lines show a steady decline since peaking in 2010, 2.2% annually for the *City of New Orleans* and 4.5% for the *Crescent*. Some 123,000 passengers boarded or alighted in Mississippi on both routes in fiscal year (FY) 2019. In the wake of the COVID-19 pandemic, that number



had recovered to 86,775 in FY 2023.

Amtrak is working on restoring service between New Orleans and Jacksonville, Fla., along the Mississippi Gulf Coast through the line formerly known as *Sunset Limited*. The service halted after Hurricane Katrina. All the Mississippi stations are ready to receive trains; however, the Mobile, Ala., station is awaiting a grant for construction. In September 2023, the Federal Railroad Administration (FRA) announced over \$178 million in Consolidated Rail Infrastructure Safety and Improvements (CRISI) grant funding will go toward the restoration and improvement of *Sunset Limited* service within Mississippi.

A new passenger line from Meridian to Dallas, meeting with existing passenger rail running from Meridian to Birmingham, is being proposed. In 2022, Amtrak and state, local, and federal Mississippi legislators submitted a \$14 million grant application to study how to make the passenger route work as part of the Bipartisan Infrastructure Law of 2021.

Freight Corridors

Freight rail lines in Mississippi mainly move freight to origins and destinations outside the state. Mississippi's Statewide Freight Plan has identified seven Tier I freight corridors and eight Tier II freight corridors. Tier I freight corridors carry most of the rail freight volume in the state and are key connectors to Mississippi's ports and interstate commerce. Of the identified Tier I freight corridors, six are main line Class I railways and one is a waterway. Tier II corridors are key rural and regional freight corridors that play a vital role in Mississippi's rail network. Tier II corridors provide connecting routes to Class I operations.

OPERATIONS AND MAINTENANCE

While the major rail lines are owned, operated, and maintained by private companies, Mississippi Department of Transportation (MDOT) railroad safety specialists inspect tracks, grade crossing signal systems, hazardous material, and operating practices under the guidance of the FRA. The most recent data available shows FRA Reportable Railroad Incidents in Mississippi (2009 through 2018) remained stable. Train incidents and highway-rail incidents decreased over this period by 36% and 12%, respectively; however, other incidents increased overall by 31% over the same period.

On-time performance on Mississippi's two operating passenger rail lines varies widely by year, but the *Crescent* on CN tracks was the worst of the two between FY 2019-2022. In FY 2022, neither route operated with more than 60% on-time performance. The primary reason for delays is freight train interference, which occurs when freight trains are dispatched ahead of and/or in conflict with passenger trains. Amtrak has graded the two freight railroads over which Mississippi long-distance trains operate as "F". Due in part to poor freight and passenger cooperation, the long-distance passenger rail network has the weakest cost recovery ratio in the Amtrak system. Amtrak's ridership and revenue for the trains operating through Mississippi depend on the freight railroad's management of infrastructure, including maintenance and track-renewal capital investments.



PUBLIC SAFETY

Within the past 10 years, the total railroad-related incidents in Mississippi remained stable, with fatalities decreasing slightly. However, maintenance and safety improvements at grade crossings and along the rail lines remain vital. One feature continuously being improved is highway-rail grade crossings. There are about 2,200 public highway-rail grade crossings and 1,800 private at-grade crossings in Mississippi. Over 50% of the public grade crossings have no active warning devices and 10% have no warning devices at all. Between 2010 and 2020, MDOT completed 11 crossing surface projects, eight LED flasher projects, and 90 signal and gate projects. Additionally, MDOT was scheduled to complete an additional 82 signal and gate projects and two crossing surface/profile projects in 2021.

Priority for continued grade crossing improvements — including the addition of warning devices and resurfacing — should be included in future railroad capital programs. For future purposes, the Multimodal Transportation Improvement Fund (MTIF), established in 2002 by the Mississippi Legislature, could be amended to include language requiring a minimum level of safety improvement at railway crossings as criterion for awarding grants. The MTIF grant program allows for 12% of MDOT's multimodal funding to be allocated for this type of improvement program, and through MDOT's administration of the project, there is a higher probability of successful implementation of safety standards.

FUNDING

Freight carrier operating revenue differs greatly by size. The five Class I railroads in Mississippi had minimum carrier operating revenues of \$490 million in 2018. One Class II railroad had an annual operating revenue between \$39 million and \$490 million. Twenty-one Class III railroads had operating revenues of \$39 million or less. Short line railroads struggle to make improvements using revenue, as do the Class Is. Shipper charges are generally insufficient to meet railroad maintenance and capital improvement needs. Public funding is used to sustain connecting railroad operations, but the application processes can be difficult and matching or local share funding is often not available to support applications for available federal loans or grants.

The MDOT Railroad Revitalization Fund provides no-interest loans for up to 75% of the cost of rail and highway-rail grade crossing rehabilitation and upgrade projects. Funds can be expended separately or in combination with federal-aid funds. Since the loan program's inception in 1984, MDOT has administered 31 loans totaling more than \$14 million. For example, in September 2021, the Grenada Railroad completed a multi-year rehabilitation project to upgrade the entire track to Class III operating standards. The project was supported with a \$4.3 million MDOT Railroad Revitalization Fund loan and \$15 million in federal funding.

Established in 2001, the MDOT Multi-Modal Transportation Improvement Program provides \$1.2 million annually for rail track and bridge improvements. Between 2016 and 2020, \$6.3 million was awarded to five railways.

MDOT also administers the Federal Highway Administration's (FHWA) Railway-Highway Crossings



Program, and this account allows MDOT to fund 10 to 15 projects each year. Other rail funding comes through the Mississippi Development Authority (MDA) Rail Funding Programs, which awarded \$11.6 million to various projects from 2016 through 2020 across Mississippi.

Tupelo's RAIL Improvements Program received \$1.5 million from the Department of Transportation's (DOT) Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program, contributing to safety upgrades at the city's 19 rail crossings. A 2016 MDOT award helped spur the effort, which will add a new road overpass. Separately, the Gloster Southern Railroad received a \$52 million CRISI award to restore short line freight rail service between the town and the CN track in Louisiana. In late 2020, CN announced it would invest \$50 million in Mississippi's rail infrastructure. The majority of the investment focused on positive train control, the replacement of rail and ties, 31 road crossing surface rebuilding projects, and track infrastructure maintenance. Altogether, the company has contributed \$350 million to its rail network in Mississippi since 2015.

FUTURE NEED

MDOT estimated the need for more than \$170 million in short-term freight program investments and more than \$37 million in short-term passenger rail improvements between 2021 and 2024. MDOT also estimated the need for more than \$833 million in long-term freight program investments between 2025 and 2045. While multiple state and federal loan and grant programs exist to help address funding needs, additional resources are needed to fully fund freight and passenger rail in Mississippi.

INNOVATION

Mississippi has demonstrated innovative ways to sustain and repurpose rail lines. Since its 81-mile embargo in 2011, the Grenada Railroad has implemented a series of substantial improvements, which were completed in 2021. In 2015, Iowa Pacific Holdings, LLC (IPH) began a 15-year operation agreement for the line. This line, slated for abandonment by its previous owners in 2011, now supports 11,174 jobs, \$1.3 billion in gross product, and \$1 billion in personal income.

In cases where out-of-service lines lead to full abandonment, rail banking is often used to preserve the corridors for any possible future rail use. The Rails-to-Trails Conservancy has transformed 120 miles of abandoned rails into 13 recreational trails for public use throughout the state. Two Rails-to-Trails of note are the Tanglefoot Trail covering 43.6 miles between New Albany and Houston and the Longleaf Trace covering 40.25 miles between Prentiss and Hattiesburg. Starkville decision-makers are currently waiting for a response from CPKC to repurpose its disused tracks, which bisect the town, into a rail trail.

RESILIENCE

Mississippi has experienced multiple floods in recent years. Due to the infrastructure's grade, many of Mississippi's rail systems have withstood major catastrophes in the recent past. In 2019, the Yazoo Backwater Area, a tributary of the Mississippi River, was flooded for 219 consecutive days. While three highways were completely inundated with water, the Class III local rails nearby were not submerged. In early 2020 and again in 2022, the Jackson metropolitan area flooded. While local roads flooded, the Class I railroads in the area remained above water.



RAIL



RECOMMENDATIONS TO RAISE THE GRADE

To raise the rail grade, the Mississippi Section of the American Society of Civil Engineers recommends the following actions:

- Increase funding availability to short line rail systems through additional state funding of grant and loan programs.
- Allow MDOT and Class Is to partner together to apply for federal grants that Class Is are not typically eligible as direct recipients for.
- Lower upfront costs and shorten application processes for existing grant and loan programs for Class II/III railroads.
- Increase and focus funding and operations to improve safety features and design of grade crossings.
- Increase frequency of current passenger routes.
- Facilitate continued work restoring Sunset Limited passenger service and implement transportation demand management (TDM) initiatives so that riders are encouraged to use two existing and one soon-to-be-restored passenger lines.
- Raise track elevations in flood-prone areas and over bodies of water to meet current and future weather patterns.
- Provide workforce development programs to improve the education, skills, and knowledge of the railroad workforce.



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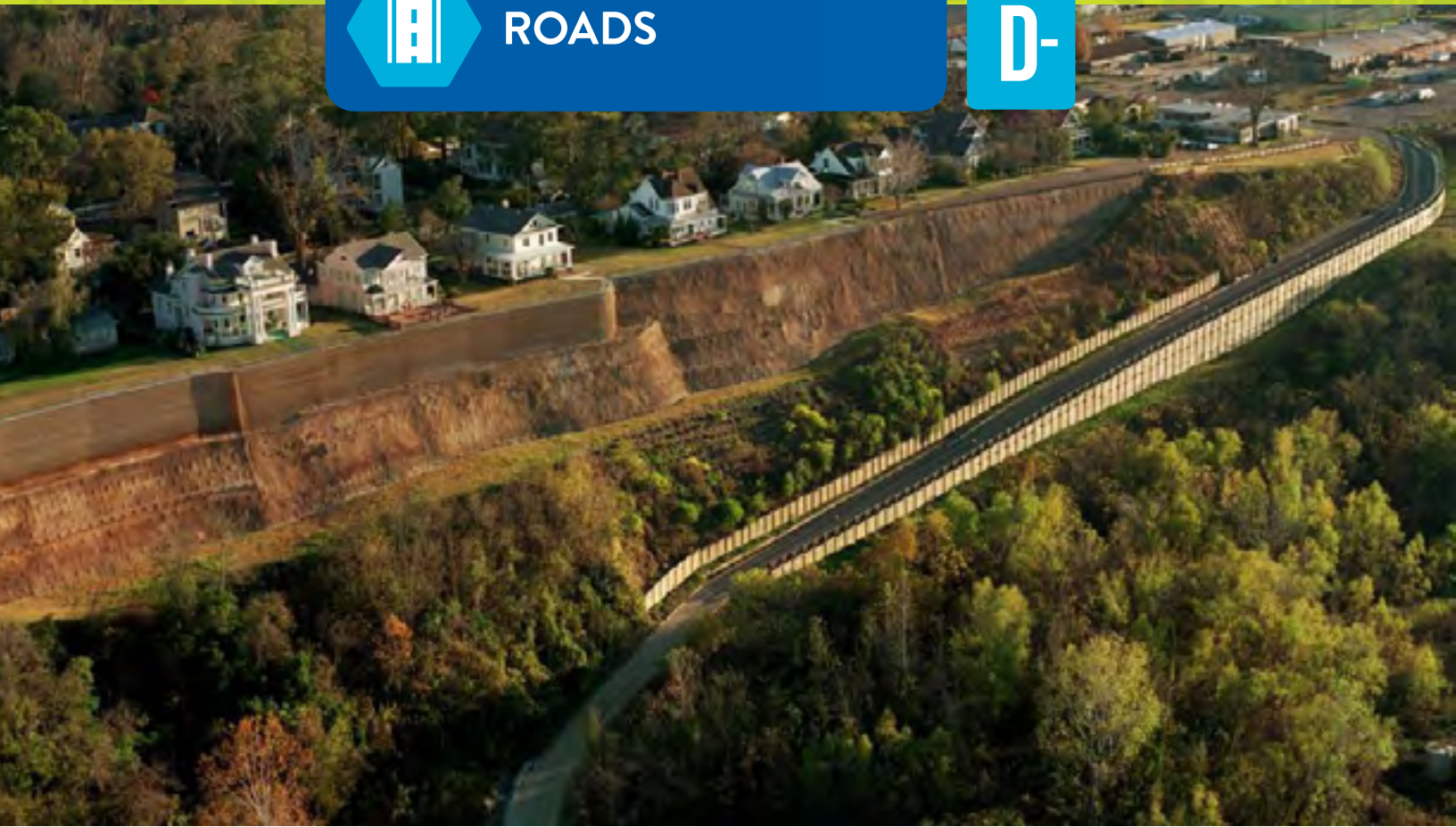
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ROADS



ROADS GRADE: D-

EXECUTIVE SUMMARY

Mississippi has 85,845 road miles, which are made up of 74,887 miles of roadway and 10,958 miles of county roads. Mississippi's road infrastructure is essential to life in the State as most residents travel via private vehicle versus public transportation. In 2022, the state had one of the worst road conditions in the country, with over half of its major urban roads and a quarter of its rural roads in poor shape. These conditions cost the average driver \$840 per year in additional vehicle expenses due to the poor quality of the roads. Moreover, the state had a very high fatality rate on its roads, with 1.71 deaths per 100 million vehicle miles traveled, compared to 1.36 nationally. The state's gas tax, which funds most roadway projects in Mississippi, has been stagnant at 18.4 cents –per gallon for over three decades. Further, the state's purchasing power continues to erode due to inflation and other factors, resulting in a lack of funds for essential road repairs and upgrades across the state. The gas tax could be increased slightly and adjusted to inflation to address the annual shortfall of at least \$400 million. The state is implementing innovative methods to evaluate road conditions more accurately and to improve the efficiency and effectiveness of road maintenance and improvement projects



CONDITION AND CAPACITY

Mississippi's network of roads span over 85,000 miles and support the state's transportation and economic development. The Mississippi Department of Transportation (MDOT) is responsible for maintaining only 11,000 miles (13%) of highways across the state. The state's population grew by 5% from 2000 to 2022, reaching 2.94 million people. More than two-thirds of Mississippians are licensed drivers who traveled a total of 39.7 billion miles in 2022, up by 12% from 2000. This growth in travel reflects the state's economic expansion, as its gross domestic product (GDP) increased by 111% in the same period. Mississippi drivers also traveled more miles per person than the national average in 2022, with 13,503 miles versus 9,822 miles.

Mississippi's major urban roads and highways are in worse shape than the national average. The Mississippi Department of Transportation (MDOT) inspects 28,029 (32%) miles of roadway pavement across the state and calculates pavement condition rating. MDOT performs this analysis on the most used interstates, 4-lane highways, and 2-lane highways across the state: I-55, US 45, US 61, US 49, US 82, MS 15, US 84, MS 25, I 59, US 98, and US 51. The most recent pavement rating condition found 10,414 (37.2%) miles in good condition, 10,825 (38.6%) in fair condition, and 6,790 (24.25%) in poor condition. Pavement condition ratings for less used roads are not available; however, MDOT conducted an analysis in 2021 that noted 89% (9,790 miles) of state-maintained lane miles need to be repaired or rehabilitated or require preventative maintenance while 47% of those miles (4,600 miles) are beyond preventative maintenance. Figure 1 shows a breakdown of the pavement condition rating for MDOT-inspected routes across the state.

FIGURE 1: PCR FOR INSPECTED ROUTES IN MISSISSIPPI

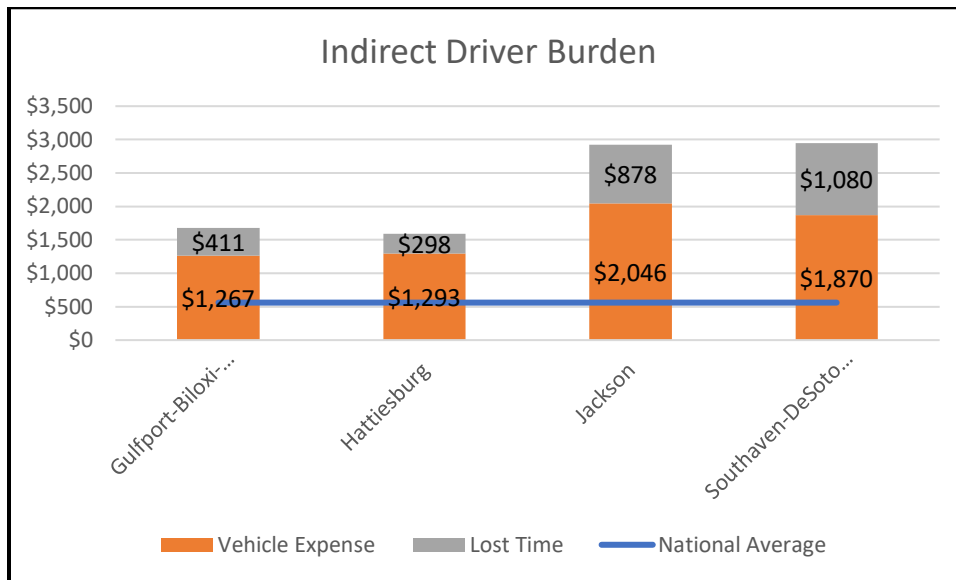


The condition of urban roads in the higher population areas is worse than in the smaller ones. The

percentage of urban roads in poor condition for each area is as follows: 41% for Gulfport-Biloxi-Pascagoula, 51% for Hattiesburg, 63% for Jackson, and 44% for Southaven-DeSoto County.

The MDOT's Five-Year Road and Bridge Plan) prioritizes investment in the state's infrastructure system. MDOT uses four key program areas for prioritization: system preservation which focuses on current pavement condition, significance of the route, traffic needs, surface connectivity, economic development, and future construction programming; bridge replacement which focuses on structural condition, length of detour, and average annual daily traffic; highway safety improvement program which are prioritized according to federal regulations to correct or improve hazardous road locations or features; and highway capacity which focuses on year of need, volume to capacity ration, and average annual daily traffic. However, many of these roads are in mediocre to poor shape, with visible damage such as rutting, cracking and potholes. Some of these roads can be fixed with resurfacing, but others need to be rebuilt completely. Driving on these deficient roads costs Mississippi drivers a lot of money and time. The transportation research group TRIP estimates that drivers in the state's largest urban areas pay \$2.9 billion per year in extra vehicle expenses due to bad roads. Figure 2 below shows the average indirect driver burden in dollars incurred by urban motorists in Mississippi. The indirect driver burden is composed of the vehicle expense and time lost in traffic. As seen, the indirect driver burden in all four Mississippi metropolitan areas is at least triple the national average of \$561.

FIGURE 2: AVERAGE INDIRECT COST INCURRED BY URBAN MOTORISTS IN MISSISSIPPI



OPERATIONS AND MAINTENANCE

The federal, state, and local governments provide funds for Mississippi roads. However, these sources are not enough to cover the operation and maintenance costs of Mississippi's highways, which have deteriorated significantly. Currently, only 5% lane miles that are in poor shape are rehabilitated annually. Moreover, the traffic volume (vehicle miles traveled) on Mississippi roads increased 12% between 2000



and 2022 which results in exceeding the capacity of roads that were built for less traffic over the service life of the road. This worsens the operation and maintenance funding gap and delays new projects and ongoing maintenance activities. For example, the U.S. Highway 82 bypass around Greenville and the Mississippi Highway 15 bypass around Ripley in Tippah County have been put on hold because funding has been diverted to pay for road maintenance needs in the state. These projects, and other similar projects, would improve the state’s road system by diverting commercial traffic from the city centers and streets.

FUNDING AND FUTURE NEED

The main sources of funding for MDOT, which fully operates and maintains 13% of Mississippi’s road network, are federal funds, the state fuel tax, and other state taxes that are dedicated to transportation (such as fees for trucks and buses, the Mississippi Road and Bridge Privilege Tax, which is paid with the purchase or renewal of a vehicle license tag, weight permits, a tax on lubricating oil, and interest income). Federal funds make up 53.2% of MDOT’s total budget which is in line with neighboring states (Figure 3). Federal funds make up 42.5% of the Louisiana Department of Transportation and Development budget, 55% of the Alabama Department of Transportation budget, and 52% of the Tennessee Department of Transportation. the state fuel tax provides 27.8% of MDOT’s budget. Table 1 shows the details of MDOT’s total revenue for fiscal year (FY) 2022, which was about \$1.1 billion and has remained relatively stable over the past five FYs (Figure 5). It should be noted that the figure below shows the percentages acquired from new receipts and does not account for the remaining receipts carried over from FY 2021. Figure 4 shows the components of the MDOT budget between FY2018 and FY2022. Figure 5 shows historic trends of the MDOT budget between FY2018 and FY2022. The increase in funding in FY2021 can be attributed to increases in federal funding, mostly from the Infrastructure Investment and Jobs Act (IIJA) funding. Mississippi is expected to receive \$3.3 billion in federal-aid highway programs from IIJA between 2021 and 2026.

TABLE 1: REVENUE ALLOCATIONS

Receipts:	
Federal Funds	\$604.2M
Fuel Tax	\$317.0M
Truck & Bus Tax	\$83.3M
Other Receipts	\$88.2M
Tag Fees	\$18.7M
Interest	\$5.2M
Contractor's Tax	\$16.4M
Commercial Vehicle Fees	\$4.3M
Lubricating Oil Tax	\$0.96M
Total New Receipts	\$ 1,138.M

FIGURE 3: SOURCES OF REVENUE FOR MISSISSIPPI Roads

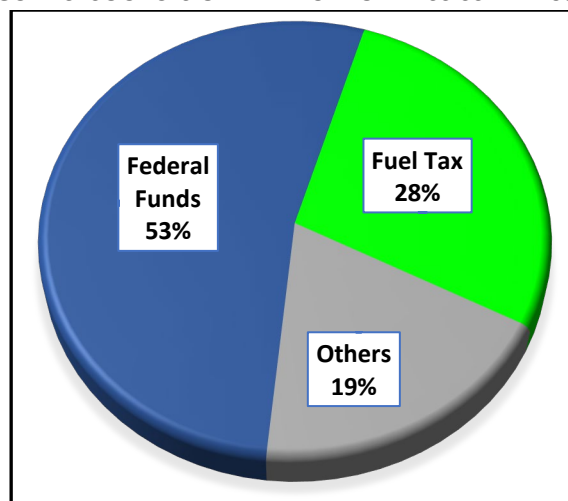




FIGURE 4: RECEIPTS AND DISBURSEMENTS BY FISCAL YEAR FOR MDOT

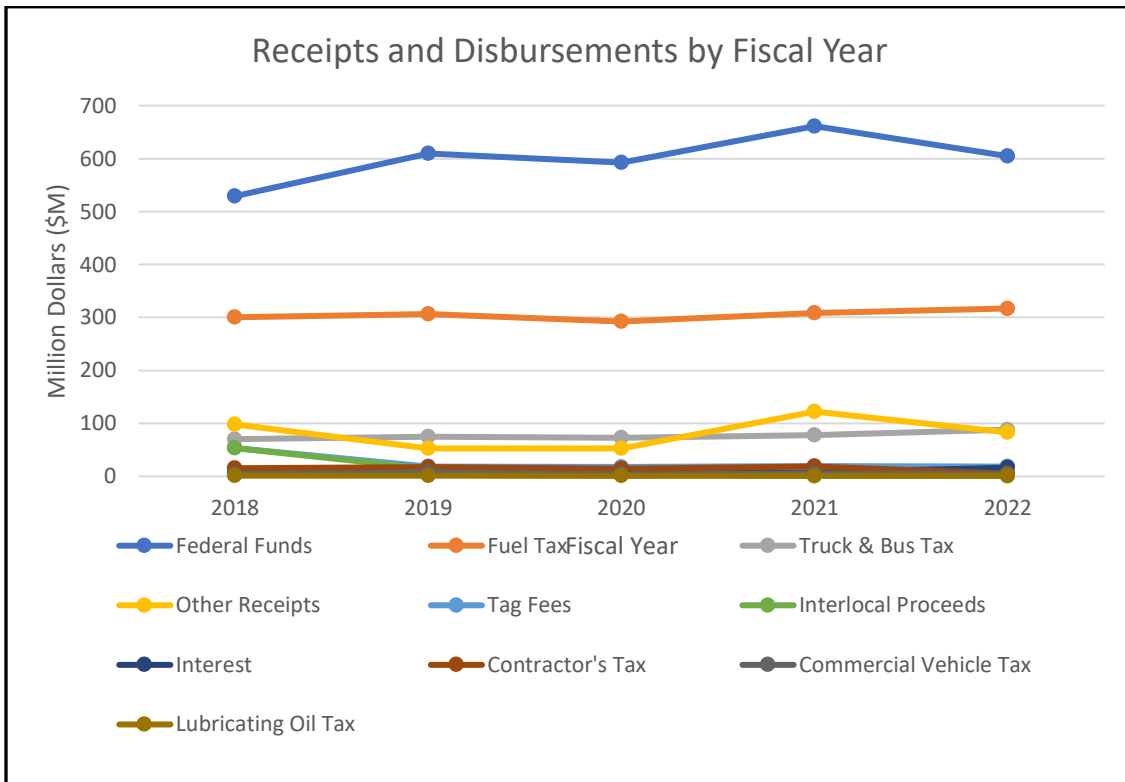
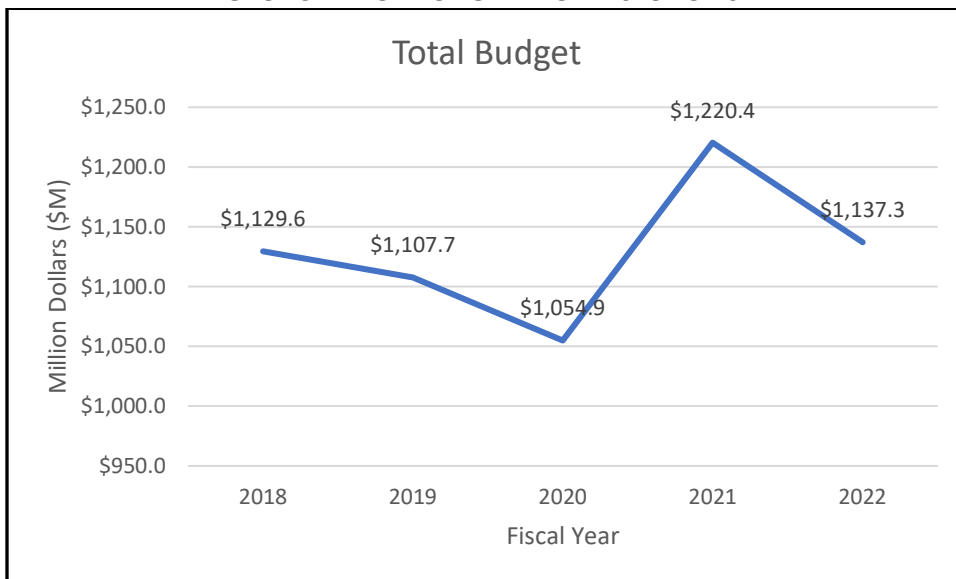


FIGURE 5: MDOT BUDGET FROM 2018 TO 2022



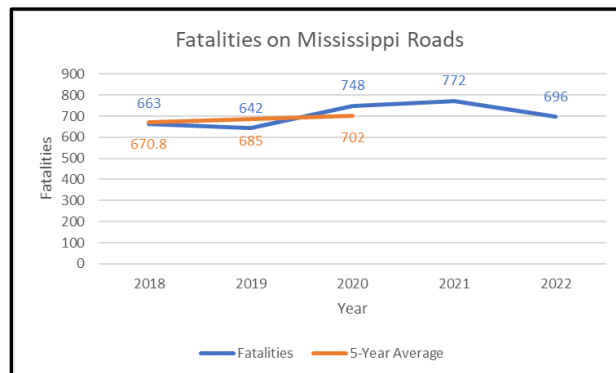
The remainder of Mississippi’s roads are fully or partially operated and maintained by local governments, sometimes in conjunction with MDOT under the Office of State Aid Road Construction (OSARC). Local governments fund road operation and maintenance activities using federal funds, MDOT funds, and local taxes. Some local governments also levy municipal or county taxes on petroleum products. Unfortunately, funding and future need data for local roads is not available.

To avoid further deterioration of the state’s roadway system, strategic changes are needed. The highway system needs an additional \$400 million over current funding levels for maintenance and rehabilitation work every year. MDOT estimates it would take \$3 billion to rehabilitate, repair, or perform preventative maintenance on all of the state-maintained highway miles that need it. At present funding levels, the state meets approximately 5% of the pavement needs annually. Many projects that could boost the state’s economy, enhance safety, and reduce future costs for maintenance and repair of the roadways are either unfunded or severely underfunded. With the projected population growth and increasing vehicle miles traveled, the system needs additional investment to expand capacity and maintain efficient operation and management. This can be achieved through increased funding – mainly by raising the gas tax slightly and indexing it to inflation, as other states have done recently including Georgia (2015), Tennessee (2017), and Alabama (2023).

PUBLIC SAFETY

The condition and design of Mississippi's roads has a significant impact on public safety, as well as the enforcement of traffic laws on public road networks. MDOT’s 2040 Multiplan reports that 60% of the state's roads are in fair or better condition, but many of them are approaching the end of their useful lives and may deteriorate rapidly. Therefore, many these roads will require rehabilitation in the next 25 years. In an analysis by the National Highway Traffic Safety Administration (NHTSA), Mississippi ranked first in deadliest roads in the U.S. with 25 deaths per 100,000 people. Figure 4 shows fatalities on Mississippi roads from 2018 to 2022 in blue. The report noted that “Mississippi has a high proportion of rural highways, which are often more dangerous than urban roads thanks to higher speed limits and lack of police supervision, which could explain the high proportion of lethal accidents.” Almost half (43%) of the fatalities in 2021 were due to drunk drivers, and 12% of fatalities (94) involved pedestrians. A 5-year rolling average of fatalities on Mississippi roadways is trending up (Figure 4 in orange).

FIGURE 4: FATALITIES ON MISSISSIPPI ROADS FROM 2018 TO 2022





MDOT reported that statistically, 1 out of 2 fatalities in Mississippi vehicle crashes are not using seatbelts and that teenage drivers and passengers are the most likely demographic to not wear seatbelts. Nationally, 90.1% of passengers and drivers wear seatbelts but in Mississippi, only 77.9% use seatbelts. MDOT also noted that drivers who use hand-held devices are 4 times more likely to get into serious crashes than those who do not use them. Mississippi does have a law that states “no driver in Mississippi may: write, send, or read a text message, email, or similar. Access, read, or post to a social networking site. Otherwise use a hand-held mobile telephone to read or write a text-based message.” However, data shows that for teenagers, distracted driving plays a role in nearly 60% of accidents.

In addition to distracted or impaired driving, insufficient funding and the rising construction costs pose challenges for MDOT to perform routine maintenance and implement projects that aim to enhance public safety. Some project types that increase public safety include replacing deficient bridges, replacing existing traditional intersections with roundabouts, mill and overlay projects, intersection reconfigurations, construction of directional median crossover, and installation of cable barriers.

RESILIENCE

The increase in severe weather events is damaging key roadways across Mississippi, sometimes even completely blocking access to homes, schools, businesses, and other essential community aspects. MDOT’s Traffic Asset Management Plan (TAMP) considers extreme weather and resilience as part of the life-cycle planning and risk management analyses. In recent years, MSOT has integrated resiliency planning considerations into decision-making to help anticipate, prepare for, and adapt to changing conditions and help the transportation systems in the state withstand, respond to, and rapidly recover from disruption.

To manage state-maintained highways, MDOT the International Roughness Index (IRI) with other stressors (including transverse cracking, longitudinal cracking, alligator/fatigue cracking, patching/potholes, rutting, and faulting) into their Pavement Condition Rating (PCR) to tailor Mississippi’s PCR approach to the state’s unique weather and soil conditions. MDOT uses the PCR to identify pavements that are in need of rehabilitation due to multiple influence, including extreme weather.

In order to help manage risk and increase the resiliency of the road network, MDOT develops a comprehensive risk register that allows them to identify risks, prioritize risks, and identify risk treatments to ensure that mitigation measures are taken to bring an identified risk within acceptable risk tolerances. One of the highest rated risks for disruption-causing properties are extreme weather events. To mitigate for extreme weather, MDOT plans to monitor areas prone to damage in invest in more resilient infrastructure and continue to use Load and Resistance Factor Design to design structures to withstand flooding and seismic activities.

MDOT and city/county road departments apply for PROTECT (Promoting, Resilient Operations for Transformative, Efficient, and Cost-saving Transportation Program) grants to help plan for extreme weather events and pay for otherwise unfunded projects to increase resiliency.

2024



REPORT CARD FOR
MISSISSIPPI'S
INFRASTRUCTURE

INNOVATION

Mississippi is among the first states in the southeast to adopt drone technology for state transportation work. LIDAR (Light Detection and Ranging) drones enable MDOT to gather roadway characteristics and assess land conditions more quickly and safely than traditional surveying. The technology also enhances safety for MDOT workers, minimizing the time spent working near or in moving traffic.



ROADS



RECOMMENDATIONS TO RAISE THE GRADE

Based upon the infrastructure needs, recommendations to improve Mississippi's roadways include:

- Boost existing funding sources, such as increasing the gas tax, consideration of alternatives to fuel taxes, using the state's lottery profits, and through coordinated long-term funding approaches/agreements across all levels of government..
- Applying state and federal funds to perform timely maintenance and test/adopt new solutions to stop Mississippi's worsening infrastructure.
- Continue evaluating staff pay and benefits to help recruit and retain employees to the public sector including MDOT employees and law enforcement officers.
- Increase Toward Zero Deaths (TZD) activities across Mississippi to reduce the number of fatalities.
- Promote innovative technologies and contracting mechanisms that reduce project costs and delivery timeline.
- Research technologies, products, and approaches to increase the resiliency of Mississippi's roads and apply execute projects aimed at increasing resiliency.



ROADS



FIND OUT MORE

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ROADS



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SOLID WASTE



SOLID WASTE

GRADE: C+

EXECUTIVE SUMMARY

Mississippi generates over six million tons of municipal waste annually, which has been steady for years. There are 20 permitted landfills for non-hazardous industrial and municipal solid waste and 131 commercial rubbish disposal facilities. The average person in Mississippi generates 5 pounds of solid waste per day, above the national average of 4.5 to 4.9 pounds per person per day. Fortunately, Mississippi’s landfills have 42 years of remaining capacity on average, although five individual facilities have less than 20 years and require more immediate expansion. These expansions are being pursued to ensure continued adequate disposal capacity statewide. Mississippi Department of Environmental Quality (MDEQ) has seen a substantial downward trend in violations and fines over the past 20 years, indicating the state is trending in the right direction for protecting public health. One area of potential improvement lies in recycling. Just 5% of the waste generated in Mississippi is diverted to recycling, compared with approximately 35% of municipal solid waste nationally.



CONDITION AND CAPACITY

Mississippi defines Municipal Solid Waste (MSW) as “any nonhazardous solid waste resulting from the operation of residential, commercial, governmental, industrial or institutional establishments except oil field exploration and production waste and sewage sludge.” Generally speaking, unless a waste is recycled or reused in some manner, everything generated is MSW.

In 2021, approximately 6 million tons of waste was generated within Mississippi. Almost one million tons, ~17% of the total waste generated, was reused, recycled, composted, or processed in some other manner of beneficial use. The remaining 5 million tons of solid waste was disposed of in various types of landfill facilities in Mississippi: 2.7 million tons (~54%) went to commercial MSW landfills, 1.6 million tons (~32%) to Class I and II Rubbish Landfills, and the remaining 700,000 tons (~14%) went to Industrial and Institutional Landfills. Landfills remain the primary outlet for disposition of solid waste. In addition to the in-state waste, ~1.1 million tons of out of state waste was disposed of in Mississippi landfills in 2021. The average MSW produced per Mississippi resident was approximately 5 pounds which is above the national average which is between 4.5 and 4.9 pounds.

TABLE 1: 2021 WASTE DISPOSITION BY FACILITY TYPE

Active Facility Type	No.	Disposal Tons		Processing/Reuse Tons		Total
		In State	Out of State	In State	Out of State	
Municipal Solid Waste Landfill	20	2,703,733	899,198			3,602,931
Class I Rubbish Landfill	67	1,475,650	242,196			1,717,846
Class II Rubbish Landfill	40	131,577	128			131,705
Industrial & Institutional Landfill	24	677,527				677,527
Land Application	7			14,486		14,486
Processing Facilities	4	6,380		118,895		125,275
Compost	12			39,350		39,350
Industrial by-product Distribution	63			801,556		801,556
Commercial Waste Tire Processors	4			22,147	25,933	48,080
Totals	241	4,994,867	1,141,522	996,434	25,933	7,158,756
Total In-State Waste				5,991,301		
Total Out of State Waste					1,167,455	

Solid waste facilities of all types located in the state are permitted through The Mississippi Department of Environmental Quality (MDEQ). MDEQ maintains a substantial backlog of necessary permitting activities, especially permits requiring renewal due to workforce shortages across the agency. However, if permit renewals



are submitted more than 6 months in advance of expiration, the facility can continue to operate under the expiring permit. This allows facilities to continue operating without being in violation of state law until new permits are obtained. In 2021, there were 368 active permitted solid waste facilities as follows:

TABLE 2: 2021 ACTIVE SOLID WASTE FACILITIES

Municipal Solid Waste (MSW) Landfills	20
Class I Rubbish Disposal Facilities	67
Class II Rubbish Disposal Facilities	40
Transfer Stations	31
Land Application Sites	7
Composting Facilities	12
Solid Waste Processing Facilities	4
Industrial/Institutional/Special Waste Landfills	24
Industrial/Institutional/Special Waste Rubbish Sites	8
Waste Tire Processing Facilities	4
Commercial Waste Tire Collection Sites	4
Local Government Waste Tire Collection Sites	140
Generator Waste Tire Collection Sites	3
Processing Facilities	4

Most landfills in the state are privately owned. Thirteen of the twenty MSW Landfills are privately owned (65%). Approximately 70% of Class I, and 52% of Class II Rubbish Landfills are privately owned.

Historically, disposal volumes at Mississippi's MSW landfills have increased slightly year over year. However, that trend was disrupted in 2019 and 2020. A slight dip in 2019 turned into a significant decrease in 2020. This may be correlated to closures and shutdowns related to the Covid 19 response. In 2021, the in-state MSW volume was almost back to the 2016 level but remains lower than 2017- through 2019 volumes.

TABLE 3: 2017-2021 ANNUAL MSW LANDFILL TOTALS

MSW (tons)	CALENDAR YEAR				
	2017	2018	2019	2020	2021
Total	3,425,569	3,646,933	3,579,091	3,343,294	3,602,931
In State	2,755,901	2,851,721	2,796,737	2,512,710	2,703,733
Out of State	669,668	795,212	782,354	830,584	899,198

Table 4 shows further details concerning the waste received by individual landfills and their estimated remaining life. Although 5 of the 20 MSW landfills report less than a 20-year remaining life, several of them are pursuing expansion and overall there remains adequate disposal capacity state wide to handle such a modest increase in volume. There remains sufficient capacity statewide. The average current life expectancy is 42 years, with several facilities reporting at least 50 years of remaining life capacity.

TABLE 4: DISPOSAL INFORMATION ON MSW LANDFILLS FOR 2021 WITH LIFE EXPECTANCY

ID	County	Facility Name	Owner	Permitted Acreage	Total Waste Received tons/year	Out of State Waste Received tons/year	%	Est. Life Remaining years
1	Adams	Plantation Oaks Landfill	Waste Management of MS, Inc.	80	82,289	13,011	15.81	76
2	Chickasaw	Prairie Bluff Landfill	Waste Management of MS, Inc.	236	78,460	16,628	21.19	149
3	Clay	Golden Triangle Regional Landfill	Golden Triangle Regional SWMA	288	167,315	876	0.52	50
4	Harrison	Pecan Grove Landfill	Waste Management of MS, Inc.	176	363,396	3,291	0.91	12
5	Jackson	MacLand Landfill	MacLand Disposal Center, Inc.	49	26,689	598	2.24	25
6	Jefferson	Greenway Env. Services Landfill	Greenway Env. Services, LLC	162	125,791	18,200	14.47	26
7	Kemper	Kemper County Landfill	Kemper County Landfill Company	22	43,735	274	0.63	10
8	Lauderdale	Pine Ridge Landfill	Waste Management of MS, Inc.	75	91,502	23,380	25.55	36
9	Leflore	Leflore County Landfill	Leflore Co. Board of Supervisors	56	77,275	0	0	11
10	Madison	Canton Sanitary Landfill	City of Canton, MS	49	39,781	0	0	1
11	Madison	Little Dixie Landfill	BFI Waste Systems of MS, LLC	165	181,657	23	0.01	30
12	Marshall	Quad County Landfill	Quad County Env. Solutions, LLC	110	162,270	134,105	82.64	21
13	Pearl River	Central Landfill	TransAmerican Waste, Inc.	109	59,450	835	1.4	93
14	Perry	Pine Belt Regional Landfill	Pine Belt Regional SWMA	107	184,877	0	0	22
15	Pontotoc	Three Rivers Regional Landfill	Three Rivers Regional SWMA	207	273,821	0	0	42
16	Scott	Clearview Env. Control Facility	Chambers of MS, Inc.	145	514,730	219	0.04	22
17	Tippah	Northeast MS Regional Landfill	Northeast MS Regional SWMA	82	533,876	332,344	60	3
18	Tunica	Tunica Landfill	Waste Management of Tunica, Inc.	203	437,794	346,926	79.24	42
19	Washington	Big River Landfill	BFI Waste Systems of MS, LLC	148	118,925	8,487	7.14	107
20	Winston	Louisville Landfill	City of Louisville, MS	39	19,298	0	0	66

OPERATIONS AND MAINTENANCE

While all the private owners also operate their landfills, several of the publicly owned MSW landfills in the state contract their operations with one of the larger landfill management companies. Two critical areas of landfill operation and maintenance are daily cover and stormwater control. State regulations require waste at MSW landfills to be covered daily with 6 inches of earthen material or an approved alternate complying with EPA regulations. Those regulations help to protect groundwater, so bulk liquids cannot be accepted, and the levels of liquid maintained within the landfill are restricted. To comply with



these requirements, it is critical that stormwater be diverted as much as possible away from the active working face of the landfill and be managed as site drainage usually controlled by the requirements of a federal permit in compliance with the Clean Water Act..

Once a facility has reached its capacity, both state and federal regulations require proper closing and maintenance. Generally speaking, the disposal area has to be covered with 24 inches of low permeability soil, 6 inches of topsoil and planted with shallow rooted grasses indigenous to the area. The purpose of the final cover system is to minimize infiltration of liquid and soil erosion. Once properly closed, the owner/operator is responsible for maintaining the facility for a minimum of 30 years, unless released earlier by proper authority.

Historically, many old landfills were filled, the operator left, and the burden of closing and maintaining the facility then fell onto the local city and county governments. The consequence of this series of events is that many of the landfills were never properly closed due to lack of adequate funding on the local level and therefore may pose a hazard to public health and safety. This should no longer be the case as RCRA, Subtitle D regulations, which took effect in the early 1990s, require financial assurance for closure and post closure activities. Closed facilities also pose a safety hazard due to the generation of landfill gas which has to be controlled throughout the landfill life and the post closure period.

FUNDING AND FUTURE NEED

Solid waste management infrastructure is funded by a mixture of public and private funds. Of the twenty MDW landfills in the state, the 13 privately owned facilities operate off the tipping fees collected from their customers. The same is generally true for the public owned facilities in the state, but there are 3 facilities that are owned by local governments that may be supplemented by tax funds.

Mississippi also uses financial resources from trust funds like the Environmental Protection Trust Fund and the Mississippi Non-Hazardous Solid Waste Corrective Action Trust Program. The main priority of these programs is to provide a sustainable source of funding to prevent interruption of solid waste collection in the state. The latter program allows for landfill and site owners to have federal assisted funding if they choose to take over closed or abandoned municipal solid waste facilities.

PUBLIC SAFETY

State regulations are utilized to ensure the safe disposal of solid waste to protect human health and the environment. In 2021 there were 236 solid waste complaints, 71 waste tire complaints and 5 hazardous waste complaints received by the MDEQ. MDEQ also conducted approximately 1,000 solid waste related inspections. They issued 3 solid waste compliance orders with a total of \$37,000 in penalties. The low violation rate indicates that the majority of the time, solid waste facilities are meeting or exceeding the requirements of their permits and state and federal law.

One of the areas of most concern for public safety is due to the generation of landfill gas at every MSW landfill. Landfill gas is a by-product of the waste degradation process and is most prevalent when that process is in anerobic decomposition. Typically landfill gas is around 50% methane (CH₄). It is explosive



in the 5-15% range, and if not in that range, will burn. It accounts for approximately 14.3 %of human related methane emissions in the United States. (6) To mitigate the hazardous potential, MSW landfills are required to collect and dispose of landfill gas. The requirements for these systems vary greatly and are quite extensive.

INNOVATION

Gas collection and control systems are very expensive but do have the opportunity to generate revenue through the production of electricity or beneficial use of the gas. Currently there are 6 operational landfill gas to energy projects in Mississippi which beneficially utilized over 5 million standard cubic feet per day of landfill gas.(7) This gas capture and use reduced carbon emissions by over 0.55 million metric tons of carbon dioxide equivalent per year in both direct and avoided reductions.(7) However, there are 10 potential candidate landfills where projects could be installed. (7)

While there are several composting and recycling operations around the state, accurate numbers of the amount of waste diverted from disposal are difficult to secure. Some of the factors that contribute to the low recycling/reuse rate include the cost of recovering the materials, transportation costs and low commodities prices. Recycling and waste diversion/reuse programs offer innovation opportunities for Mississippi.

RESILIENCE

Waste generation rates are generally related to the population of an area. The primary factor that creates a spike and negatively impacts the generation of waste materials in Mississippi is weather. A familiar statement in the State is: if you don't like the weather, just wait a few minutes, it will change. Therein lies the problem. Thunderstorms, tornados, floods, and hurricanes are all "ordinary" in the state. Each of these natural disasters can create a large volume of waste quickly in isolated areas. A single catastrophic event such as a category 5 hurricane can cause massive destruction and volumes of waste over a large geographic area, sometimes hundreds of miles across. All these events affect the statewide disposal capacity. Mississippi's solid waste professionals have consistently proven they can quickly adjust to current events and have provided adequate disposal capacity when needed. Officials with MDEQ have been quick to assist in processing requests for emergency facilities and processes without allowing for any negative impact on the environment. For instance, when hurricanes strike the Mississippi gulf coast, landfills across the state begin receiving waste from the struck area, allowing the landfills impacted to quickly clean up and reopen to serve the public.

While new landfills are not a common occurrence in the state, when landfills are opened or expanded, they are sited in places to try to minimize the impact of natural disasters, where possible. For instance, professionals work to site landfills outside of the 500-year flood plan, outside of the known flooding impact areas from historic hurricanes, etc. To help ensure continued operations during natural disasters, landfills must have disaster plans as part of their operating procedures, including where they will divert waste to during natural disaster recovery.



RECOMMENDATIONS TO RAISE THE GRADE

Mississippi's solid waste infrastructure will benefit from additional improvements. These improvements include:

- Create a plan laying out a roadmap to help the state achieve their statewide goal of 25% waste reduction.
- Significantly increase the length of time landfill and related permits are valid for, where the State has the ability to do so
- Increase the funding for and the pay scale of the Mississippi Department of Environmental Quality to allow them to recruit and retain professional qualified staff.
- Ensure all landfill facilities have adequate funding set aside, as per State law, to complete closure and post closure requirements.
- Maintain or increase funding for the Waste Tire Management Program to help with collection, processing, and beneficial use of waste tires.
- MDW landfills and their management should continue to incorporate emerging technologies into their comprehensive solid waste management planning. Due to the lead times and significant investments required, actively planning for and implementing new technologies will reduce future solid waste management costs.
- Increase the number of LFG to energy projects statewide to reduce the safety hazards and provide carbon release reduction.
- Continue to increase the amount of waste that is reused, recycled, composted or processed in some other manner of beneficial use.
- Increase State funding to identify and correct issues at old, abandoned disposal locations when the responsible party cannot be identified.
- Increase funding and staff at the State (MDEQ) level to investigate illegal and/or unpermitted disposal facilities, have them cleaned up and shut them down from operating.



SOLID WASTE



FIND OUT MORE

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Email dated 16 June 2023 from Charles Bock, P.E., Manager Policy, Planning & Special Programs Branch, Waste Division, MDEQ



WASTEWATER



ROUND-BASSIN WHERE THE WASTED WATER IS BEING FILTERED
SOURCE: BIGSTOCKPHOTO.COM



WASTEWATER

GRADE: D-

EXECUTIVE SUMMARY

Mississippi has a widely dispersed population, with more than 50% of its residents living in rural areas. As such, approximately 40% of Mississippians (nearly 400,000 households) use onsite wastewater treatment such as septic systems. The remaining residents are connected to a nearby sanitary sewer system where their household sewage is collected and transported to a wastewater plant for treatment. Insufficient funds to cover plant operation and maintenance expenses has resulted in backlogged upgrades and wastewater leaks into the environment, endangering the public. While some utilities are raising rates to meet budget deficits, much of the state's wastewater infrastructure is heavily dependent on federal funding; new approaches to closing the budget gap and financing wastewater improvements, particularly O&M and upgrades, should be considered. As the state's population remains stable, threats from increasing wet weather conditions, inconsistent maintenance, and a lack of rehabilitation pose extreme threats to the state's wastewater infrastructure.



CONDITION AND CAPACITY

Approximately 60% of Mississippians rely on sewer systems and WWTPs to remove wastewater from their households and treat it before releasing effluent into the environment. The majority of the State's wastewater systems were built beginning in the early 1900's. Some of the City of Jackson's wastewater lines were laid as early as 1917. While wastewater collection lines were laid in the early 1900's, WWTPs providing secondary treatment, specifically mechanical facilities, were not built until decades later. A majority of the WWTPs in Mississippi were originally funded through the Federal Water Pollution Control Act Amendments of 1972 in the 1970's and 1980's. While systems receive regular maintenance on WWTPs and collection systems, major investment into wastewater systems across the State have not occurred.

Across Mississippi, there are 299 incorporated municipalities, and the majority own and operate WWTPs with individual discharge permits. The 6 most populous counties in Mississippi have between 110,000 and 220,000 residents that are served by a network of WWTPs that range in capacity from 150,000 gallons per day to a multi-county system of 47 million gallons per day (MGD).

While most WWTPs maintain adequate capacity and do not pose concerns under dry conditions, increasingly frequent and severe wet weather events expose insufficient capacity for many WWTPs resulting in sanitary sewer overflows (SSOs). The scale of these SSOs are exacerbated as inflow and infiltration (I&I) occur in legacy wastewater collection systems that are aging and in need of extensive rehabilitation.

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Over the past five years, there have been thousands of Notices of Violation (NOVs) issued by the



Mississippi Department of Environmental Quality. These enforcement actions represent at least two system failures every day over a five-year span. Additionally, multiple wastewater system owners have been placed under consent decrees including the City of Jackson (2012), City of Meridian (2019), and City of Hattiesburg (2020). In early 2023, the City of Jackson appointed a third-party manager to oversee and expedite needed repairs of the wastewater system.

Mississippians use OWTS to treat their wastewater on-site for 40% of households, which is significantly greater than the national average of 25%. OWTS are continually being installed at private residences across the State. While there has been more of a push by officials to move away from OWTS to wastewater systems with WWTPs, the State is largely rural and the price to install, maintain, collect, and treat wastewater across rural areas of Mississippi are prohibitive. The Mississippi State Department of Health (MSDH) is responsible for overseeing OWTS across the state. Since 2002, MSDH has used an electronic system to track the age of OWTS across the state; however, any system installed prior to 2002 did not have their data retroactively added to the electronic tracking system. Unfortunately, this system is not available to the public and thus, the average age and condition of OWTS in the State is unknown.

OPERATIONS AND MAINTENANCE

In Mississippi, operation and maintenance costs of public wastewater systems are subsidized by customers connected to the system. For OWTS, the homeowner is responsible for operation and maintenance and the required funding for their privately owned system. For WWTPs and collection systems, ratepayers carry the burden of paying for operation and maintenance needed on the system. For publicly owned systems, some loans and grants are available to assist with routine rehabilitation and needed upgrades; however, no such funding is available for privately owned systems.

Across the state, operation of WWTPs occurs but usually only minor maintenance occurs due to lack of funding. Oftentimes, maintenance, rehabilitation, and upgrades for collection systems is not undertaken until a major issue occurs within the system such as major line breaks in which raw wastewater is allowed to escape into the environment. Deferred maintenance, rehabilitation, and upgrades have resulted in numerous consent decrees and continued notice of violations for systems across Mississippi. Deferred operation and maintenance typically results in much more costly “reactive” maintenance when compared to systematic “proactive” operation and maintenance activities.

To combat the deferral of needed maintenance, many municipal wastewater utilities across the state are raising rates, but the funds collected are not adequate to cover the growing operation and maintenance costs or meet already present budgetary shortfalls. Low- and moderate-income population areas struggle to provide the revenue necessary to support the operation and maintenance needs for the existing WWTPs and collection systems, let alone put aside funding for rehabilitation and upgrades. Furthermore, federal funds cannot be used to cover operation and maintenance costs. These dynamics leave owners and operators of many WWTPs struggling to meet stringent water quality standards with aging and inefficient systems – resulting in violations and expensive fines.

FUNDING AND FUTURE NEED

A report released in summer 2021 states that over the next 20 years, the United States needs to invest



\$1 trillion in water and wastewater infrastructure just to maintain these systems in good repair. In Mississippi, it is estimated the state needs \$2 billion investment in wastewater infrastructure across the state, not including investment in OWTS. However, in 2021, only \$14.4 million was provided to the Clean Water State Revolving Loan Fund from the federal government with the state only matching a fraction of that funding.

MDEQ manages the state's primary funding program the Clean Water State Revolving Loan Fund (SRF). The program is capitalized with federal money to provide loans to public entities. Eligible loan recipients are expected to contribute a 20% match to the borrowed funds. This funding mechanism is meant to act as an infrastructure bank where low-interest loans are provided to finance infrastructure improvements and/or rehabilitation projects. Over time, as the loans are repaid with interest, the monies in the CWSRLF are recycled or "revolve".

Many communities in Mississippi, are oftentimes hesitant to apply for CWSRLF funds due to concerns about taking on more debt and the challenges they will face with repayment. MDEQ works with communities to mitigate this challenge by making it possible for small, low-income communities (< 4,000 households with a median household income of < \$40,000) to receive up to a 75% subsidy on their requested loan amount; however, these subsidies are extremely limited and difficult to obtain. Other communities taking part in CWSRLF loans couple these funds with grant resources to minimize the amount that must be repaid with interest. Furthermore, emergency repairs, replacements, and improvements to wastewater collection and treatment facilities that cannot wait for the planning and time requirements associated with the CWSRLF program, can apply for Mississippi's Emergency Loan Funds that come from the state's budget.

The Water Pollution Control Emergency Loan Fund (WPCEL) program is funded fully by the state and it is intended to provide limited, low-interest, shorter-term loan assistance for emergency repairs, replacement, and improvements that cannot wait for a regular funding cycle for CWSRLF. The funding in the WPCEL program has remained stable since the mid-2010's while funding for the CWSRLF program has varied over time. In 2015, the CWSRLF funded over \$75 million in projects; however, more recently, the CWSRLF has received funding around \$14.5 million annually. In 2021, the EPA provided Mississippi's SRF program with nearly \$14.4 million to assist with modernizing aging wastewater infrastructure, implementing water reuse and recycling and addressing stormwater. In early 2023, it was announced that over \$20.9 million would be directed to Mississippi for the CWSRLF.

Other forms of funding for wastewater infrastructure include U.S. Department of Agriculture's Rural Utility Service's Water and Environment Programs, Community Development Block Grants (CDBG) administered through the Mississippi Development Authority, and U.S. Army Corps of Engineers Section 592 funding and Section 219 funding and Water Infrastructure Finance and Innovation Act (WIFIA) authorized through the Water Resources Development Act. These funding sources are extremely competitive due to the number of applicants and in a rural state like Mississippi, meeting the requirements in WIFIA can be a challenge.



In 2021, the Coronavirus State and Local Fiscal Recovery Funds program, part of the American Rescue Plan Act (APRA), delivered \$350 million to state, local, and Tribal governments across the U.S. Following the passage of APRA, the Mississippi Legislature and Governor Reeves created the Mississippi Municipality & County Water Infrastructure Grant Program (MCWI) that provides matching funds to eligible entities for making necessary investments in water, wastewater, and stormwater infrastructure. MDEQ has set aside \$90 million in funding for wastewater.

Even with all of the funding from various sources, Mississippi is still experiencing a severe funding gap of more than \$1 billion for their publicly owned wastewater systems.

While the state's overall population is staying relatively stable, around 3 million people, new developments in some of the more populated counties - including Madison County, Jackson County, Rankin County, and DeSoto County – are increasing the demand for larger treatment capacities. The state's WWTPs are heavily dependent upon federal funding; while multiple federal programs have resulted in short-term funding streams, the state is still facing a more than \$1.5 billion shortfall over the next 20 years for its wastewater systems. To help close this gap, both traditional and innovative approaches need to be taken to address the state's wastewater needs, particularly operation and maintenance needs.

PUBLIC SAFETY

As Mississippi's wastewater infrastructure continues to age, it poses a threat to both public safety and the environment. MDEQ monitors the water quality data from permitted treatment systems and helps resolve any issues that arise. The main public safety concern for the state's wastewater infrastructure is the potential for members of the public to interact with raw, untreated sewage, particularly SSOs. SSOs occur when the inflow exceeds the capacity of the system or infiltrates the sanitary sewers. Once the stormwater fills the sewer system, the sewage overflows through manholes and can overwhelm the treatment facilities, causing poorly-treated or untreated sewage to enter the environment.

To help ensure public safety from effluent releases from WWTPs, MDEQ began the wastewater operator training program in 1969; however, collection system operator training is not required in Mississippi. They have provided classroom and on-site training to hundreds of facilities and more than 2000 individuals operators. In 1984, the program published the Mississippi Operations/Training Manual which provided a single reference as a basis of instruction and certification; the manual is now in its fifth edition printing and can be downloaded from MDEQ's website. Certification of wastewater operators became mandatory in 1987 with the passage of the Municipal and Domestic Water and Wastewater System Operator's Certification Act. Since then, more than 1,000 wastewater operators have been certified through the program. Certification is offered in four classes of treatment and two classes of collection based on the size and type of facility.

In addition to public safety concerns from WWTPs and collection systems, OWTS also have the potential to pose a threat to public health and safety. OWTS create miniature wastewater treatment plants in people's backyards, but the property owner is responsible for the cost and maintenance of the system,



often without training. The effluent from OWTS is often discharged to land or a surface water which can impact the water quality of surface waters, depending on the effluent quality that is discharged.

Additional threats from failing wastewater systems can be seen around Mississippi through degraded roads. As pipes age and fail, wastewater leaves the system eroding soil around the pipes and undermining roadbeds, leading to potholes, sinkholes, and other roadway problems. In August 2022, a City of Jackson school bus became stuck in a deep pothole during morning pickups.

INNOVATION

Across the state, WWTPs are moving from natural treatment types (such as lagoons and constructed wetlands) to dewatered sludge processes. In 2021, the City of Starkville announced upgrades to the city's WWTP. The 25-acre lagoon has been nearing capacity and instead of dredging the lagoon which would provide a temporary fix, leaders decided to invest in new technology to be advantageous for customers and the environment while looking towards the future. The new system will include two dewatering screw presses designed to process sludge into a soil-like byproduct which will be applied to pastureland, farms, greenhouses, and campus gardens. The \$10 million investment is the first major upgrade to the plant since its construction in 1980.

RESILIENCE

As Mississippi has seen with multiple natural disasters, including the Yazoo Backwater Flood in 2019 and 2023, the wastewater infrastructure in the state is not designed or sited to operate during or withstand natural disasters. Jackson County Utility Authority (JCUA) partnered with the EPA, US Army Corps of Engineers, and NOAA's National Centers for Coastal Ocean Science to identify a site for the location of their new WWTP, which is currently under construction, that would "remain dry for the next 50 years." To do so, JCUA considered 3-5 ft sea level rise and storm surge scenarios to determine an appropriate site and configure protective berms. Current projections estimate JCUA could save millions in costs associated with flood damage.



RECOMMENDATIONS TO RAISE THE GRADE

Mississippi's wastewater infrastructure will benefit from additional improvements. These improvements include:

- Full funding for the SRF in both the state and federal budgets.
- Full funding from the State of Mississippi for SRF loan forgiveness.
- Sustained, long-term federal funding streams that meet the needs of communities.
- Sustained state and federal funding programs that allow operators to address operation and maintenance needs for existing facilities.
- Assessment of wastewater rates and alignment of those rates to reflect the true cost of wastewater services including operation and maintenance, debt services, and capital improvements. Rates should also be evaluated to ensure separate categories including private residences, commercial industry, agricultural industry, etc.
- Increase state funding to the Mississippi Department of Environmental Quality and the Mississippi State Department of Health to allow hiring more staff and to increase staff pay to be in-line with pay across the industry.
- Develop a workforce development program to recruit, train, and retain wastewater operators and staff across the state.



WASTEWATER



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