MDOT
MISSISSIPPI DEPARTMENT OF TRANSPORTATION

Interim Report Task 05

Existing Conditions of Transportation Systems Management and Operations

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MULTIPLAN 2050

This Plan was prepared as a cooperative effort of the U.S. Department of Transportation (USDOT), Federal Highway Administration (FHWA), Federal Transit Administration (FTA), Mississippi Department of Transportation (MDOT), and local governments in partial fulfillment of requirements in Title 23 USC 134 and 135, amended by the IIJA, Sections 11201 and 11525, October 1, 2021. The contents of this document do not necessarily reflect the official views or policies of the USDOT.

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1.0 Introduction to TSMO in Mississippi

Transportation Systems Management and Operations (TSMO) refers to a set of strategies aimed at maximizing the efficiency and safety of transportation systems. It encompasses a variety of tools and technologies designed to enhance highway safety performance, improve traffic flow, reduce congestion, and create a better overall travel experience. TSMO is essential for managing the complexities of modern transportation networks, allowing agencies to respond swiftly to incidents, disseminate real-time information to travelers, and optimize infrastructure use.

In Mississippi, the Mississippi Department of Transportation (MDOT) leads TSMO initiatives to ensure a safe and efficient transportation network. Through the deployment of Intelligent Transportation Systems (ITS), supported and interconnected by an extensive communications network, MDOT leverages technologies such as Traffic Management Centers (TMC), Closed-Circuit Television (CCTV) cameras, and Dynamic Message Signs (DMS) to monitor and manage traffic conditions effectively. These efforts are complemented by collaborations with local agencies, emergency services, and other stakeholders to create a unified approach to traffic management.

The impact of TSMO in Mississippi is significant, as it not only enhances the safety and efficiency of roadways for road users, but also supports the state's economic growth and environmental sustainability goals. By utilizing advanced data analytics and proactive management techniques, TSMO helps to minimize travel delays, reduce emissions, and improve the overall quality of life for residents.

2.0 Agency Involvement

2.1 Roles of Stakeholders

The successful implementation of ITS and TSMO strategies in Mississippi relies on the collaboration of various stakeholders, each contributing unique capabilities and responsibilities. Table 1 outlines the primary roles of key stakeholders involved in transportation systems management and operations across the state.

Table 1. Roles and Responsibilities of TSMO Stakeholders

Stakeholders	Primary Roles
MDOT	1. Construct, maintain, and operate state roadways. 2. Oversee statewide TSMO activities and ITS deployment. 3. Manage Traffic Management Centers. 4. Disseminate transportation information via traveler information systems. 5. Allocate state funds for TSMO initiatives. 6. Assist stakeholders with securing federal and state funding. 7. Conduct statewide traffic studies and data collection. 8. Conduct evaluations of TSMO projects and their impacts. 9. Promote public awareness campaigns to educate citizens about TSMO. 10. Develop strategic partnerships with technology providers for innovative TSMO solutions.
Metropolitan Planning Organizations (MPO)	1. Lead regional transportation planning and strategy development.
	2. Drive regional transportation improvements by focusing on the distinct challenges within metropolitan areas.
	3. Develop and update regional ITS Architecture Plans to receive federal funds for ITS projects.
	4. Facilitate stakeholder coordination and collaboration in TSMO efforts.
	5. Promote interoperability among regional transportation systems.
	6. Assist local agencies in implementing TSMO projects.
Local Counties	1. Construct, maintain, and operate county roadways. 2. Address county-level transportation concerns and needs. 3. Coordinate traffic management initiatives with municipalities and MDOT. 4. Provide law enforcement support through the Sheriff's Office. 5. Manage emergency services in collaboration with local agencies. 6. Participate in regional planning efforts with MPOs and MDOT.
Local Cities	1. Manage traffic control and public safety measures within city limits.
	2. Implement local TSMO strategies, such as traffic signal coordination.
	3. Collaborate with MDOT and MPOs on regional transportation initiatives.
	4. Respond to incidents and manage local emergencies.
	5. Engage with the community to raise awareness about TSMO efforts.

Stakeholders	Primary Roles
Mississippi Highway Patrol	1. Enforce traffic laws on state highways. 2. Assist in incident response and emergency situations. 3. Collaborate with MDOT for traffic safety initiatives. 4. Provide data and reports on traffic incidents for analysis. 5. Participate in public education campaigns on traffic safety.
Emergency Medical Services (EMS)	1. Provide timely response to traffic incidents.
	2. Collaborate with MDOT and law enforcement to optimize incident response strategies.
Weather Agencies	1. Provide weather forecasts and alerts that impact transportation safety. 2. Collaborate with MDOT to integrate weather data into traffic management systems. 3. Assist in developing protocols for responding to severe weather conditions affecting roadways.
Public Transit Agencies	1. Operate and maintain public transit systems.
	2. Coordinate with MDOT to implement ITS technologies in transit.
	3. Share ridership data with stakeholders to enhance multimodal transportation planning.
Media Outlets	1. Disseminate real-time traffic updates, road conditions, and safety information to the public. 2. Support public awareness campaigns related to TSMO initiatives and traffic safety.
Private Sector Entities	1. Provide technological solutions and services that enhance traffic management systems.
	2. Offer traveler information services, such as navigation apps and traffic reporting.
	3. Offer towing services to remove disabled and crashed vehicles, support quick clearance programs, and assist in roadway incident response.
	4. Collaborate on pilot projects to test new transportation technologies and TSMO strategies.

Sources: Central Mississippi ITS Architecture Plan,[1] Memphis Urban Area Regional ITS Architecture and Deployment Plan[2]

[1] Central Mississippi Planning & Development District. (August 2024). *Central Mississippi ITS Architecture Plan*. Retrieved October 2024 from https://cmpdd.org/images/transportation/Intelligent-Transportation-Systems-Architecture/Central-Mississippi-ITS-Architecture-Plan-Update.pdf

[2] Memphis Metropolitan Planning Organization. (August 2024). *Memphis Urban Area Regional ITS Architecture and Deployment Plan*. Retrieved October 2024 from https://memphismpo.org/sites/default/files/documents/plans/safety-mobility/its/DRAFT%202024%20Memphis%20RITSA%20Deployment%20Plan.pdf

2.2 Funding

The successful implementation and sustainability of TSMO initiatives in Mississippi rely on a diverse array of funding sources. These funds are essential for the deployment of ITS and the ongoing operational and maintenance activities necessary for effective traffic management. The primary funding sources for TSMO initiatives in Mississippi are outlined below.

Federal Funding

Mississippi leverages various federal programs and grants to secure funding for its TSMO initiatives. These programs are designed to enhance transportation safety, improve operational efficiency, and support a wide array of activities essential for modern traffic management. Through the Bipartisan Infrastructure Law (BIL),[3] Mississippi has access to numerous targeted funding opportunities aimed specifically at TSMO-related projects. By capitalizing on these federal resources, the State implements advanced technologies and infrastructure improvements necessary for optimizing traffic flow and ensuring safer roadways. Table 2 outlines some of the key federal grants available to support TSMO efforts in Mississippi.

[3] Federal Highway Administration. (August 2023). *Bipartisan Infrastructure Law Fact Sheet*. Retrieved October 2024 from https://www.fhwa.dot.gov/bipartisan-infrastructure-law/fact_sheets.cfm

Table 2. Available Federal Grants for TSMO

Federal Grant Program	Description
Highway Safety Improvement Program (HSIP)[4]	Funds infrastructure projects aimed at improving road safety and reducing traffic-related fatalities and injuries across the nation.
Surface Transportation Block Grant (STBG)[5]	Provides flexible funding for a variety of surface transportation projects, allowing states and localities to address their unique transportation needs and priorities.
Transportation Alternatives (TA)[6]	Supports projects that enhance non-motorized transportation options, including biking, walking, and recreational trails to improve accessibility and promote active lifestyles.
National Highway Performance Program (NHPP)[7]	Focuses on maintaining and improving the condition of the National Highway System, ensuring it remains safe and efficient for the traveling public.
Congestion Mitigation and Air Quality (CMAQ)[8]	Funds initiatives aimed at improving air quality and reducing traffic congestion, particularly in urban areas facing pollution challenges.
National Electric Vehicle Infrastructure (NEVI)[9]	Provides funding to develop the infrastructure necessary for the widespread adoption of electric vehicles.

[4] Federal Highway Administration. (February 2022). *Highway Safety Improvement Program (HSIP).* Retrieved October 2024 from https://www.fhwa.dot.gov/bipartisan-infrastructure-law/hsip.cfm

[5] Federal Highway Administration. (October 2022). *Surface Transportation Block Grant (STBG).* Retrieved October 2024 from https://www.fhwa.dot.gov/bipartisan-infrastructure-law/stbg.cfm

[6] Federal Highway Administration. (February 2022). *Transportation Alternatives (TA).* Retrieved October 2024 from https://www.fhwa.dot.gov/bipartisan-infrastructure-law/ta.cfm

[7] Federal Highway Administration. (February 2022). *National Highway Performance Program (NHPP).* Retrieved October 2024 from https://www.fhwa.dot.gov/bipartisan-infrastructure-law/nhpp.cfm

[8] Federal Highway Administration. (February 2022). *Congestion Mitigation and Air Quality (CMAQ) Improvement Program*. Retrieved October 2024 from https://www.fhwa.dot.gov/bipartisan-infrastructure-law/cmaq.cfm

[9] Federal Highway Administration. (February 2022). *National Electric Vehicle Infrastructure Formula Program*. Retrieved October 2024 from https://www.fhwa.dot.gov/bipartisan-infrastructure-law/nevi_formula_program.cfm

Federal Grant Program	Description
Strengthening Mobility and Revolutionizing Transportation (SMART)[10]	Supports innovative approaches and technologies that enhance mobility and improve transportation systems through the use of data and advanced analytics.
Advanced Transportation Technology and Innovation (ATTAIN)[11]	Focuses on research and deployment of cutting-edge transportation technologies designed to enhance system performance and user experience.
Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD)[12]	Supports the integration of advanced technologies to improve traffic management and enhance overall transportation efficiency.
Safe Streets and Roads for All (SS4A)[13]	Aims to promote safety for all road users by funding projects that create safer and more accessible roadways, emphasizing community engagement and collaboration.

State Funding

The MDOT allocates State funds specifically for TSMO initiatives. These funds support the development and maintenance of essential infrastructure necessary for effective traffic management. State funding helps cover operational costs, technology upgrades, and personnel training for traffic management personnel, ensuring that the systems in place can function optimally.

Local Contributions

Local agencies and municipalities also play a role in funding TSMO efforts. They contribute financial resources for community-specific projects, which helps ensure that TSMO initiatives are tailored to the unique needs of local populations. Local funding can cover initiatives such as the installation of CCTVs and traffic signals, as well as other localized traffic management technologies and strategies.

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[10] U.S. Department of Transportation. (October 2024). *SMART Grants Program*. Retrieved October 2024 from https://www.transportation.gov/grants/SMART

[11] Federal Highway Administration. (October 2022). Advanced Transportation Technologies and Innovation. Retrieved October 2024 from https://www.fhwa.dot.gov/bipartisan-infrastructure-law/attain.cfm

[12] Federal Highway Administration. (August 2023). *Accelerated Implementation and Deployment of Advanced Digital Construction Management Systems (ADCMS)*. Retrieved October 2024 from https://www.fhwa.dot.gov/bipartisan-infrastructure-law/adcms_fact_sheet.cfm

[13] Federal Highway Administration. (May 2022). *Safe Streets and Roads for All (SS4A).* Retrieved October 2024 from https://www.fhwa.dot.gov/bipartisan-infrastructure-law/ss4a_fact_sheet.cfm

Public-Private Partnerships (PPPs)

Mississippi engages in PPPs to help fund TSMO initiatives. These partnerships leverage private sector investment to enhance public funding, allowing for more extensive deployment of advanced technologies and infrastructure improvements. A notable example is the collaboration with private entities to expand Electric Vehicle (EV) charging networks.[14]

3.0 Statewide Significance

The implementation of TSMO initiatives in Mississippi has profound effects on the state's transportation landscape. By prioritizing efficiency and safety, TSMO fosters long-term economic growth, enhances safety, promotes environmental sustainability, and enriches the overall quality of life for residents.[15]

Economic Growth

Efficient transportation systems are critical to economic vitality. TSMO strategies help reduce congestion, minimizing travel delays for both commuters and commercial vehicles. As businesses rely on timely deliveries and access to markets, the enhanced traffic flow facilitated by TSMO directly supports Mississippi's economic development. Moreover, improved transportation efficiency attracts new businesses and industries to the state, further boosting economic opportunities.

Safety Enhancements

The integration of advanced technologies and traffic management strategies through TSMO initiatives significantly improves roadway safety. By utilizing data-driven approaches, such as real-time traffic monitoring and incident management, MDOT can facilitate prompt response to accidents and hazardous conditions. This proactive approach decreases the frequency and severity of crashes, contributing to a safer travel environment for all road users. Furthermore, traveler information systems play a crucial role in disseminating timely alerts and updates, empowering motorists to make informed decisions and navigate safely.

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[14] Mississippi Department of Transportation. (2023). *Mississippi Electric Vehicle Infrastructure Deployment Plan*. Retrieved October 2024 from https://mdot.ms.gov/documents/Planning/Transportation%20Asset%20Management%20/EV/MS%20EV%20Infrastructure%20Deployment%20Plan.pdf

[15] Federal Highway Administration (FHWA). (n.d.). *How Does TSMO Relate To…* Retrieved November 2024 from https://ops.fhwa.dot.gov/plan4ops/focus_areas/how_does_planning.htm

Environmental Sustainability

TSMO also plays a vital role in supporting environmental sustainability initiatives. By optimizing traffic flow, reducing idling time, and alleviating congestion, TSMO helps to lower vehicle emissions, which is essential for addressing air quality concerns. Mississippi's dedication to incorporating sustainable practices within its transportation network is further demonstrated through investments in EV infrastructure. These efforts reduce the environmental impact of transportation, support a healthier community, and contribute to long-term ecological goals.

Enhanced Quality of Life

The TSMO initiatives significantly enhance the quality of life for Mississippi residents. Improved traffic management reduces travel times, which allows individuals to spend more time with family, pursue leisure activities, or engage in community events, reducing stress and increasing community connections and interactions. By creating a more efficient and safer transportation environment, TSMO contributes to the overall well-being of individuals and communities across the state.

4.0 Existing Conditions

MDOT has established a robust inventory of transportation management systems that play a critical role in enhancing traffic operations and safety throughout the state.[16] This inventory encompasses various technologies and strategies essential for real-time monitoring, traveler information dissemination, and traffic safety management. These systems can be organized into three distinct categories:

- Traffic Operations and Safety Management
- Traveler Information Systems
- Emerging Technologies

Table 3 outlines the specific systems included within each category.

[16] Note: MDOT previously maintained systems supporting Commercial Vehicle Operations (CVO), including Weigh-In-Motion (WIM) systems and Electronic Clearance Systems. However, all truck weight systems and enforcement responsibilities have been transferred to the Department of Public Safety (DPS).

Table 3. Transportation Management Systems Inventory

Category	Systems
Traffic Operations and Safety Management	1. Transportation Management Centers 2. Communication Infrastructure 3. Traffic Signal Operations & Management 4. Closed-Circuit Television Cameras 5. Vehicle Detection Systems 6. Road Weather Information Systems 7. Smart Work Zones
Traveler Information Systems	1. Dynamic Message Signs 2. MDOT Traffic Website and Mobile Application
Emerging Technologies	1. Electric Vehicles 2. Connected Vehicles 3. Autonomous Vehicles

Sources: Central Mississippi ITS Architecture Plan[17], Memphis Urban Area Regional ITS Architecture and Deployment Plan[18], MDOT Documents Webpage[19]

4.1 Traffic Operations and Safety Management

Traffic operations and safety management are essential for ensuring the smooth functioning of the transportation network in Mississippi. This area focuses on utilizing various technologies and strategies to monitor traffic conditions, manage congestion, detect hazardous situations, and respond effectively to incidents. Traffic operations and safety management inventory in Mississippi includes the following categories.

Traffic Management Centers

TMCs are specialized facilities serving as central hubs for surface transportation systems. Their primary responsibility is to monitor and manage traffic through the ITS

[17] Central Mississippi Planning & Development District. (August 2024). *Central Mississippi ITS Architecture Plan*. Retrieved October 2024 from https://cmpdd.org/images/transportation/Intelligent-Transportation-Systems-Architecture/Central-Mississippi-ITS-Architecture-Plan-Update.pdf

[18] Memphis Metropolitan Planning Organization. (August 2024). *Memphis Urban Area Regional ITS Architecture and Deployment Plan*. Retrieved October 2024 from https://memphismpo.org/sites/default/files/documents/plans/safety-mobility/its/DRAFT%202024%20Memphis%20RITSA%20Deployment%20Plan.pdf

[19] MDOT. (n.d.) *MDOT Documents Webpage*. Retrieved October 2024 from https://mdot.ms.gov/portal/documents

devices. Within the state of Mississippi, there are six[20] such TMCs that oversee the entire statewide transportation network. These TMCs include Statewide TMC in Jackson, Regional TMCs in Hattiesburg, and Local TMCs in Southaven, Oxford, Natchez, and Ridgeland, as shown in Table 4. The primary mission of TMCs is to enhance roadway safety and alleviate congestion. They achieve this through the following activities:

- Monitoring traffic and road conditions through CCTV cameras, Vehicle Detection Systems (VDS), and web sources.
- Providing incident detection and verification and coordinating incident response activities.
- Disseminating information about traffic and road conditions, travel times, road closures, detours, incidents, emergency alerts, work zones, and other travel information to the public via DMSs, MDOT Traffic application, social media, and other platforms.
- Managing traffic through signal adjustments and implementing detour routes as needed using the Active Arterial Management (AAM) approach.

Table 4. TMC Locations

TMC Name	City	Managing Agency	Status
MDOT Statewide TMC	Jackson	MDOT	Existing
Hattiesburg Regional TMC/EOC	Hattiesburg	MDOT	Existing
Northwest Regional Combined TMC	Southaven	Local	Existing
City of Ridgeland TOC	Ridgeland	Local	Existing
Oxford Combined TMC	Oxford	Local	Existing
Natchez Combined TMC	Natchez	Local	Existing
Batesville Regional TMC/EOC	Batesville	MDOT	Planned
Gulf Regional TMC	Saucier	MDOT	Planned
Tupelo Regional TMC	Tupelo	MDOT	Planned

Sources: MDOT. *Special Provision No. 907-659-5*

Communication Infrastructure

Communication infrastructure is a critical component of TSMO in Mississippi, as it facilitates real-time data exchange between TMCs and ITS devices in the field. This connectivity enables efficient traffic monitoring, incident detection, information dissemination, and adaptive control of traffic signals and other roadside devices. The

[20] Mississippi Department of Transportation. (May 2021). *Special Provision No. 907-659-5.* Retrieved February 2025 from https://mdot.ms.gov/documents/LPA/PDM/Checklist/659-5.pdf

state relies on four primary communication methods: fiber optics,[21] third-party party leased lines, cellular modems,[22] and wireless radios.

Fiber optics is the backbone of Mississippi's communication infrastructure, providing high-speed data transmission known for its immunity to electromagnetic interference and resilience to data surges. This technology offers significantly higher bandwidth and faster data transmission rates than other communication options, making it more reliable for critical functions like streaming high-definition video for real-time traffic monitoring and transferring large volumes of data from VDS devices.

Where fiber optics are unavailable, leased lines from third-party providers are often utilized. These connections, often fiber-based, provide stable data transmission between ITS devices and TMCs without the need for state-owned infrastructure. While leased lines provide consistent performance, they depend on external providers and involve recurring costs.

In areas where deploying fiber or leased lines is not feasible or practical, cellular networks are used to bridge the gap and extend coverage. Many of Mississippi's ITS devices use cellular connections to transmit data from remote or rural locations to the TMCs. While cellular communication provides essential coverage, it offers lower bandwidth compared to fiber optics or leased lines and may occasionally face reliability issues, especially in areas with poor network signals.

Additionally, MDOT utilizes wireless radios for short- to medium-range data transmission where direct line-of-sight communication is available. These radios enable various ITS components to communicate and share information wirelessly, supporting applications such as traffic light priority, and automatic vehicle location. They offer advantages such as flexibility, ease of maintenance, and tolerance to adverse weather conditions.

Traffic Signal Operations & Management

Traffic signals are a fundamental component of TSMO in Mississippi. They play a critical role in ensuring the efficient movement of vehicles and pedestrians,

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[21] Mississippi Department of Transportation. (January 2019). *Intelligent Transportation Systems (ITS) Design Manual*. Retrieved October 2024 from https://mdot.ms.gov/documents/Traffic%20Engineering/Manuals/MDOT%20ITS%20Design%20Manual.pdf

[22] Mississippi Department of Transportation. (January 2019). *Intelligent Transportation Systems (ITS) Design Manual*. Retrieved October 2024 from https://mdot.ms.gov/documents/Traffic%20Engineering/Manuals/MDOT%20ITS%20Design%20Manual.pdf

enhancing road safety, and managing congestion on Mississippi's roadways. The responsibility for these signals is divided among various agencies based on their location:

- MDOT manages traffic signals located on state roads. As of 2025, MDOT manages approximately 1,200[23] signals.
- County Agencies manage traffic signals located on county roads within their jurisdiction.
- City Agencies manage traffic signals within their limits that are not situated on state or county roads, with one exception – cities with populations exceeding 20,000 are required by state law to maintain MDOT's signals within their jurisdiction, while MDOT retains operational authority.

Mississippi has taken significant steps in modernizing its traffic signal management, moving beyond conventional approaches to implement sophisticated systems that enhance overall traffic operations. These systems include:[24]

- Real-Time Signal Control: Many traffic signals are connected to a centralized TMC, allowing for real-time signal timing adjustments. With the help of ITS devices, such as CCTV cameras, VDS, and advanced signal controllers, TMC operators can monitor traffic patterns and modify signal timings to alleviate congestion and respond swiftly to incidents.
- Emergency Vehicle Priority Systems: To facilitate faster emergency response, certain intersections are equipped with signal preemption systems. These systems automatically adjust the signal phase to grant priority to ambulances, fire trucks, and other emergency vehicles, clearing a safe path and reducing delays in critical situations.
- Active Traffic Signal Management and Operations: MDOT has implemented Active Traffic Signal Management and Operations on three corridors in the Jackson Metro area. This system uses real-time traffic data to optimize signal timing and improve traffic flow.
- Automated Traffic Signal Performance Measures (ATSPM): MDOT has implemented ATSPM to continuously collect and analyze traffic signal performance data. ATSPM provides real-time and historical insights into factors like signal timing effectiveness, and vehicle delays. The goal of ATSPM is to

[23] Mississippi Department of Transportation. (January 2025). Email.

[24] Central Mississippi Planning & Development District. (August 2024). *Central Mississippi ITS Architecture Plan*. Retrieved October 2024 from https://cmpdd.org/images/transportation/Intelligent-Transportation-Systems-Architecture/Central-Mississippi-ITS-Architecture-Plan-Update.pdf

improve efficiency, optimize operations, and enhance safety by identifying issues such as excessive wait times or unbalanced signal phasing.

- Signal Analytical Software Using Probe Data: To further enhance signal performance evaluation, MDOT is exploring the analytical software that utilizes probe data – data collected from vehicles equipped with GNSS (Global Navigation Satellite System) or GPS (Global Positioning System), which continuously and anonymously transmit precise location, speed, and direction data. This technology has the potential to allow MDOT to assess traffic signal operations by analyzing vehicle movements, delays, and travel times without relying solely on roadside detection infrastructure.

Additionally, effective traffic signal management in Mississippi depends significantly on close collaboration between various agencies. Many jurisdictions have established agreements[25] to coordinate traffic signal timing, allowing for the sharing of timing plans and joint operation of signals. This collaborative approach helps optimize traffic flow across jurisdictional boundaries, reducing delays and enhancing safety for all road users.

Closed-Circuit Television Cameras

CCTVs are a major component of the ITS system providing real-time surveillance of the Mississippi roadway network. As of 2024, MDOT's traffic management system consists of 1,138 CCTV cameras[26] strategically placed along interstates, other state roads, and intersections across the state. Table 5 provides a breakdown of CCTV camera deployment by area.

These cameras[27] are used to:

- Detect incident and verify location and type of incident.
- Determine appropriate responses to an unplanned event or incident.
- Monitor incident response and clearance.

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[25] Memphis Metropolitan Planning Organization. (August 2024). *Memphis Urban Area Regional ITS Architecture and Deployment Plan*. Retrieved October 2024 from https://memphismpo.org/sites/default/files/documents/plans/safety-mobility/its/DRAFT%202024%20Memphis%20RITSA%20Deployment%20Plan.pdf

[26] MDOT. (2024). *MDOTtraffic.com*. Retrieved October 2024 from https://www.mdottraffic.com/default.aspx?showMain=true

[27] Mississippi Department of Transportation. (January 2019). *Intelligent Transportation Systems (ITS) Design Manual*. Retrieved October 2024 from https://mdot.ms.gov/documents/Traffic%20Engineering/Manuals/MDOT%20ITS%20Design%20Manual.pdf

- Monitor traffic conditions and congestion on mainlines and ramps.
- Monitor and operate traffic signals.
- Detect vehicle breakdowns, debris on the road, and unauthorized vehicles in restricted areas.
- Verify DMS message and readability.
- Observe localized weather and other hazardous conditions along the roadway.
- Monitor assets.

The widespread installation of these cameras provides extensive coverage, playing a significant role in alleviating congestion and enhancing safety on Mississippi's roadways.

Table 5. CCTV Camera Deployment by Area

Area	Number
Collins	2
DeSoto/Marshall	301
Forest	3
Golden Triangle	38
Greenville	27
Gulf Coast	222
Hattiesburg	122
Jackson	289
Lucedale	3
Lula - Helena	10
McComb	4
Natchez	8
Oxford	20
Tupelo	84
Vicksburg	5

Source: MDOT, MDOTtraffic, 2024

Vehicle Detection Systems

MDOT maintains a robust network of VDSs, predominantly located on arterial roads and interstates in and around the state. The four primary types of VDSs[28] utilized in the state include:

[28] Mississippi Department of Transportation. (January 2019). *Intelligent Transportation Systems (ITS) Design Manual*. Retrieved October 2024 from

- Radar Detection Systems (RDS): Utilizing microwave technology, RDS detect vehicles and measure key traffic parameters such as speed, volume, and vehicle classification across multiple lanes. RDS provides continuous, real-time data on traffic conditions, making it well-suited for incident detection, traffic flow monitoring, and planning initiatives.
- Bluetooth Detection Systems (BDS): BDS gather travel time and origin-destination information by detecting Bluetooth-enabled devices within passing vehicles. As vehicles equipped with detectable devices pass through two consecutive Bluetooth reader locations, the system logs their unique identifiers and detection times. This data enables the estimation of travel times between points, offering valuable insights for traffic monitoring and analysis. Although not all vehicles are detected, BDS provides reliable travel time estimates, supporting applications such as corridor management and future connected vehicle (CV) technologies.
- Video Vehicle Detection Systems (VVDS): VVDS utilize cameras mounted above or beside the roadway to monitor specific zones within travel lanes. The system processes video images to identify vehicle presence, speed, volume, and classification. Video detection is particularly effective for real-time traffic management, including detecting wrong-way drivers and monitoring intersections for turning and lane-changing activities.
- Loop Detection Systems (LDS): Loop detectors are installed beneath the roadway surface and use electromagnetic fields to detect vehicles passing over them. These detectors capture information on vehicle presence, count, and speed, making them ideal for lane-by-lane traffic monitoring.

As of 2025, MDOT maintains approximately 250[29] VDS systems. This count includes Radar, Bluetooth, and Video Vehicle Detection Systems, but excludes loop detectors. Together, these VDS technologies deliver numerous benefits, including:

- Providing real-time data for traffic and incident management.
- Supporting traveler information systems and corridor monitoring.
- Facilitating origin-destination studies and planning analysis.
- Enhancing multi-lane intersection control and queue detection.
- Assisting with ramp metering and evaluating road capacity.
- Contributing to historical data analysis and performance measurement.

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https://mdot.ms.gov/documents/Traffic%20Engineering/Manuals/MDOT%20ITS%20Design%20Manual.pdf

[29] Mississippi Department of Transportation. (February 2025). Email.

- Detecting lane changes, wrong-way driving, and turning patterns.
- Supporting future CV applications.

Additionally, MDOT is exploring third-party probe data as an alternative to VDS technologies for traffic monitoring and analysis. Probe data provides real-time, detailed traffic information without requiring roadside detection infrastructure, offering a more flexible and scalable solution for monitoring and managing roadway conditions.

Road Weather Information Systems

A Roadway Weather Information System (RWIS) is a network of sensors that collects and transmits essential weather data, including pavement and sub-surface temperatures, wind speed and direction, air temperature, visibility, precipitation, and humidity. As of 2025, MDOT has deployed two[30] RWIS stations across the state. These stations enable MDOT to:

- Provide real-time weather-related data.
- Support weather advisories and warnings.
- Support hurricane evacuations.
- Measure air and surface temperature.
- Measure humidity and visibility.
- Measure precipitation and surface water level.

Smart Work Zones

The MDOT employs Smart Work Zone systems[31] to enhance traffic safety and efficiency in work zone areas. These systems feature a variety of applications, including queue detection, speed monitoring, travel time information, and alerts for construction equipment. By strategically deploying portable CCTV, VDSs, DMSs, and other ITS technologies around work zones, MDOT collects and analyzes real-time traffic data. This data is used for disseminating important travel information to drivers, such as updates on lane closures, delays, speed advisories, and alternate routes. As a result, these systems empower drivers to plan their routes effectively, avoid delays, and navigate safely through and around work zones.

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[30] Mississippi Department of Transportation. (February 2025). Email.

[31] Central Mississippi Planning & Development District. (August 2024). *Central Mississippi ITS Architecture Plan*. Retrieved October 2024 from https://cmpdd.org/images/transportation/Intelligent-Transportation-Systems-Architecture/Central-Mississippi-ITS-Architecture-Plan-Update.pdf

4.2 Traveler Information Systems

Traveler Information Systems play a vital role in providing real-time information to motorists, enhancing their ability to make informed travel decisions. By keeping travelers informed, MDOT helps improve safety and reduce delays on the state's highways. Three primary traveler information systems in Mississippi are the following.

Dynamic Message Signs

DMSs are roadway signs equipped with electronic displays that allow dynamic adjustment of messages or graphics to be presented to roadway users. These devices are primarily implemented at key decision points along major corridors such as interstates and arterial roadways. As of 2024, there are 76 DMSs deployed across the state[32] of Mississippi, primarily on interstate and state roads in areas of Jackson, Gulf Coast, DeSoto, Marshall, and Hattiesburg, as shown in Table 6. They are used to display crucial transportation information[33] including:

- Real-time traffic information to drivers, such as travel times, incident warnings, lane closures, reduced speed limits, road closures, detour routes, upcoming road constructions, and active work zones.
- Weather-related information, such as warnings about fog, ice, snow, heavy rain, tornadoes, or hurricanes.
- Safety-related messages, such as amber alerts, evacuation notices, emergency alerts, and other alerts about potentially dangerous situations.
- Traveler information, such as directions to airports, rest areas, and tourist attractions.
- Public safe driving campaigns, such as messages about seatbelt use, not texting while driving, and not drinking and driving.

The timely information provided by DMS significantly enhances traffic flow and safety in areas where they are implemented.

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[32] MDOT. (2024). *MDOTtraffic.com*. Retrieved October 2024 from https://www.mdottraffic.com/default.aspx?showMain=true

[33] Mississippi Department of Transportation. (January 2019). *Intelligent Transportation Systems (ITS) Design Manual*. Retrieved October 2024 from https://mdot.ms.gov/documents/Traffic%20Engineering/Manuals/MDOT%20ITS%20Design%20Manual.pdf

Table 6. DMS Deployment by Area

Area	Number
Jackson	15
Gulf Coast	17
DeSoto/Marshall	26
Hattiesburg	11
Natchez	2
Vicksburg	2
Lula - Helena	1
Greenville	2

Source: MDOT, MDOTtraffic, 2024

MDOT Traffic Website and Mobile Application

The MDOT Traffic application[34] is an integral part of Mississippi's Traveler Information Systems, serving as a crucial resource for drivers by delivering comprehensive, real-time insights into traffic conditions and road safety. This application consolidates critical information into a single, user-friendly platform, empowering users to make informed choices about their travel routes. With its detailed map interface, the app allows users to access a variety of essential elements, including:

- Alerts;
- Cancelled alerts;
- Road closures;
- Road work locations;
- Cameras;
- Message signs;
- Rest areas;
- Welcome centers;
- Posted bridges; and
- Traffic Congestion Map.

[34] MDOT. (2024). *MDOTtraffic.com*. Retrieved October 2024 from https://www.mdottraffic.com/default.aspx?showMain=true

4.3 Emerging Technologies

Emerging Technologies represent the forefront of innovation in transportation management, providing new solutions to enhance the efficiency and safety of the transportation network. MDOT is exploring advancements in Electric Vehicles, Connected Vehicles, and Autonomous Vehicles to support a more sustainable and responsive transportation system.

Electric Vehicles

EVs have gained significant attention in recent years. However, many potential buyers remain hesitant to purchase EVs due to concerns about range anxiety – the fear of running out of battery power without access to a charging station. To address these concerns, Mississippi is actively developing a comprehensive network of charging stations across the state.

As part of this effort, the MDOT has applied for federal funding through the Bipartisan Infrastructure Law's NEVI Formula Program. The state is set to receive $50.5 million to expand its charging network,[35] which may ease range anxiety for EV users by making charging more accessible.

As of 2024, Mississippi has 164 public charging stations,[36] including:

- 113 stations with 274 Level 2 charging ports. Level 2 chargers operate at 240 volts AC and typically deliver between 10 to 20 miles of range per hour of charging.
- 46 stations with 134 Direct Current Fast Chargers (DCFC) charging ports. DCFC, also known as Level 3 chargers, are the fastest and most powerful chargers available. DC fast chargers are often found along highways and in urban areas, offering a crucial service for drivers needing a quick battery boost during longer trips. They can deliver between 180 and 240 miles of range per hour of charging.
- 5 combined stations with 14 Level 2 charging ports and 7 DCFC charging ports.

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[35] Mississippi Department of Transportation. (2023). *Mississippi Electric Vehicle Infrastructure Deployment Plan*. Retrieved October 2024 from https://mdot.ms.gov/documents/Planning/Transportation%20Asset%20Management%20/EV/MS%20EV%20Infrastructure%20Deployment%20Plan.pdf

[36] US Department of Energy. (October 2024). *Alternative Fueling Station Locator*. Retrieved October 2024 from https://afdc.energy.gov/stations#/analyze?region=US-MS&tab=fuel&fuel=ELEC&ev_levels=dc_fast

Connected Vehicles

Connected Vehicles (CVs) are vehicles equipped with communication devices that enable them to exchange messages with infrastructure and road users. Key types of communication[37] involved in CV technology are:

- Vehicle-to-Infrastructure (V2I). V2I communication involves vehicles interacting with roadside infrastructure, such as traffic lights, signs, and roadway sensors. It enhances traffic flow by providing real-time traffic information and signal prioritization, reducing congestion.
- Vehicle-to-Vehicle (V2V). V2V communication allows vehicles to exchange information about speed, location, acceleration, and direction with nearby vehicles. It enhances safety by providing warnings or assistance in situations like sudden braking or lane changes.
- Vehicle-to-Device (V2D). V2D communication enables vehicles to interact with personal devices, such as smartphones. This technology improves pedestrian and bicyclist safety by providing timely information about hazardous road conditions.

While each of these types of communication has individually shown its ability to improve safety, prevent crashes, and optimize system performance, the full potential of CV technology emerges when they work together. This type of communication is commonly known as Vehicle-to-Everything (V2X). Three main elements[38] that enable V2X communication are:

- On-Board Units (OBU): wireless radios installed on vehicles and other moving travelers, which send and receive V2X messages.
- Roadside Units (RSU): wireless radios that are typically installed on roadside infrastructure to send and receive V2X messages.
- Smartphone Applications: Mobile applications that support V2X communication by receiving real-time alerts and safety information from nearby infrastructure, CVs, and vulnerable road users such as pedestrians and

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[37] RGBSI. (n.d.). *7 Types of Vehicle Connectivity*. Retrieved October 2024, from https://blog.rgbsi.com/7-types-of-vehicle-connectivity#:~:text=7%20Types%20of%20Vehicle%20Connectivity%201%201.%20Vehicle,%28V2D%29%20...%207%207.%20Vehicle%20to%20Grid%20%28V2G%29

[38] US Department of Transportation. (August 2024). *Saving Lives with Connectivity: A Plan to Accelerate V2X Deployment*. Retrieved October 2024, from https://www.its.dot.gov/research_areas/emerging_tech/pdf/Accelerate_V2X_Deployment_final.pdf

bicyclists.

MDOT recognizes the potential safety and mobility enhancements that CVs offer. The department actively monitors industry developments, formulates relevant policies, and identifies CV applications for implementation within the state. This proactive approach enables MDOT to make informed decisions and strategic investments for the future.

Autonomous Vehicles

Mississippi is actively working to meet the foundational requirements necessary for the safe and effective integration of Autonomous Vehicles (AVs) into its transportation system. By passing the Mississippi Fully Autonomous Vehicle Enabling Act of 2023,[39] the state has taken a significant step toward establishing a regulatory framework that authorizes the operation of fully autonomous vehicles—defined as those capable of driving without human intervention—on public roads. This legislation not only sets the legal groundwork but also addresses essential safety protocols, including the need for a law enforcement interaction plan, which ensures that AVs can communicate effectively with public safety officials and operate in compliance with state regulations.

4.4 Performance

The implementation of TSMO in Mississippi has resulted in significant advancements in traffic management, enhancing both safety and efficiency on the state's roadways. By utilizing advanced strategies and cutting-edge technologies, the MDOT has been able to optimize traffic flow, reduce crash rates, manage congestion, and improve overall driver behavior. The following bullet points outline some of the measurable benefits observed from TSMO[40] initiatives:

- Advanced arterial signal systems have been found to reduce motorist delays by up to 42%, reduce stops by up to 35%, increase average travel speeds by up to 22%, and reduce fuel consumption by up to 18%.
- Freeway management systems have resulted in increased travel speeds of 16-62%, travel time decreases of 20-48%, capacity increases of 17-25%, and

[39] Mississippi State Legislature. (March 2023). *Mississippi House Bill 1003*. Retrieved October 2024, from https://legiscan.com/MS/bill/HB1003/2023

[40] Drive Smart MDOT. (n.d.). *Intelligent Transportation Systems*. Retrieved October 2024, from https://drivesmart.mdot.ms.gov/intelligent-transportation-systems/#:~:text=The%20ITS%20system%20consists%20of%20a%20network%20of,phone%20apps%20and%20postings%20at%20the%20mdottraffic.com%20website

accident reductions up to 50%.

- Roadway weather management systems have been found to reduce weather-related accidents by over 70% through enhanced detection and motorist warning or guidance.
- Surveys of drivers found that 18% of respondents changed travel routes more than five times per month based on traveler information posted on DMS.

The ongoing commitment to TSMO is essential for addressing the evolving needs of Mississippi and its residents in the years ahead. As the state continues to embrace technological innovations, the continuous evaluation and enhancement of these systems will be crucial in addressing emerging traffic challenges and improving road safety for all users.

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