

Finding a Win-Win: Planning and Data-Sharing Partnerships between Governments and Public Land Management Agencies

[DRAFT Memorandum 1: Background and Literature Review](#)

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Introduction

This memorandum summarizes a review of the literature about planning and data-sharing partnerships between transportation agencies and Public Land Management Agencies (PLMAs). This literature review supports the Federal Highway Administration's (FHWA) *Finding a Win-Win: Planning and Data-Sharing Partnerships between Governments and Public Land Management Agencies* research study. The objectives of this research project are to:

1. Identify examples of cross-agency coordination between PLMAs and transportation agencies that results in process efficiencies, cost savings, and better transportation system delivery and/or management. These examples are intended to focus on corridor-scale collaboration.
2. Develop a suite of tools and contexts to aide PLMAs and State Departments of Transportation (DOTs) in sharing data and improving coordination for better transportation systems.

To conduct this literature review, the U.S. Department of Transportation's Volpe National Transportation Systems Center (Volpe Center) conducted a scan of Federal laws, regulations, and guidance that pertain to planning and data-sharing partnerships between transportation agencies and PLMAs; research documents; and other Federal, State, and local documentation (e.g., case studies, guides, reports). Appendix A: Bibliography lists each resource referenced in this document. *Memorandum 1* also identifies gaps in the existing literature that will inform the content of *Memorandum 2: Study Methodology*.

This memorandum will be updated throughout the course of the Study as the project team identifies additional relevant literature. The final literature review will be included as part of the Study's final report.

Definition of Key Terms

The research team provides the following definitions as applied to this Study.

Transportation Agency/Organization

For the purposes of this Study, "transportation agency" or "transportation organization" refers to agencies with jurisdiction, planning, funding, ownership, or management responsibility for transportation systems (e.g., roads, trails, transit, marine, or aviation systems). These could include system owners or operators. Typical transportation agencies or organizations include:

- State Departments of Transportation (DOT)
- Metropolitan Planning Organizations (MPO)
- Regional transportation planning organizations (RTPOs, rural counterpart to MPOs)
- Local Public Agencies (LPA), such as city or county governments
- Tribal governments¹
- Transit agencies
- Marine or aviation management agencies

¹ For more information on tribal transportation planning, see FHWA's research project on Transportation Planning in Tribal Communities (in progress). <https://highways.dot.gov/federal-lands/ott/study>

- U.S. Department of Transportation agencies: Federal Highway Administration (FHWA), Federal Transit Administration (FTA), and other modal administrations

Public Land Management Agency

A Public Land Management Agency (PLMA) is any public agency that manages land for public access and use. These uses can include recreation, resource protection, and economic uses, such as resource extraction or energy production. PLMAs include federal land management agencies, and parks and conservation agencies managed by states, regional governments, counties, or municipalities. PLMAs may own and manage transportation systems within their boundaries. Typical PLMAs include:

- U.S. Department of the Interior Agencies:
 - Bureau of Land Management (BLM)
 - National Park Service (NPS)
 - U.S. Bureau of Reclamation (BOR)
 - U.S. Fish and Wildlife Service (FWS)
- U.S. Army Corps of Engineers (USACE)
- U.S. Department of Agriculture, U.S. Forest Service (USFS)
- Independent Federal Agencies (IFA) that manage public lands (e.g., Presidio Trust, Tennessee Valley Authority)
- State parks, forests, and other state land management agencies
- Regional, county, and municipal parks and land management agencies

Public Lands Transportation Stakeholders

There are organizations that are not captured by transportation agency/organization and PLMA above that are invested in the successful management of transportation systems to access public lands. These can include:

- Nonprofit advocacy organizations
- Private companies doing business within the transportation planning or engineering sectors
- Academic institutions conducting transportation research
- National Oceanic and Atmospheric Administration (NOAA)²

Planning and Data-Sharing Partnerships in Planning and Decision-making Processes

This research project focuses on how transportation agencies and PLMAs share and use data to inform transportation planning and decision-making processes. Transportation agencies and PLMAs may have different data sharing needs for different phases. These partnerships may inform any stage of the transportation project lifecycle, including:

- System and project planning
- Project selection and programming
- Design and environmental review
- Construction

² NOAA is a member of the Interagency Visitor Use Management Council in addition to the Bureau of Land Management, Forest Service, National Park Service, U.S. Army Corps of Engineers, and U.S. Fish and Wildlife Service. The council serves to raise awareness of and commit to proactive, professional, and science-based visitor use management on federally managed lands and waters. <https://visitorusemanagement.nps.gov/>

- Operations and maintenance
- Performance management and reporting

The types of data that agencies may share includes a wide range of data related to agency goals at each stage of the project lifecycle. These data types may include:

- Traffic volume (current traffic patterns, historic trends, and forecasted)
- Visitation and usage (including trail use and transit ridership)
- Traffic and parking congestion
- Transportation safety and incident data
- Asset condition, ownership, and maintenance
- Environmental data (resources, resilience)
- Demographic and economic data

Background and Context

The primary purpose of transportation is to connect goods and people with destinations – whether to support recreational, commercial, or industrial trips. Transportation systems of all modes create connections across the landscape, connecting origins and destinations across land ownership boundaries. As such, transportation agencies – whether landowners, road owners, or transportation planning and funding organizations – manage different aspects of transportation networks. Transportation organizations, PLMAs, and other stakeholders need to coordinate on decision-making to successfully operate seamless connections across jurisdictions. Because transportation management decisions are increasingly data-driven to maximize the impact of limited funds, data sharing among partners becomes an important part of successful collaboration.

In general, recreational travel to the country’s Federal public lands has been increasing for the past several years,^{3,4} and this trend is expected to continue for public lands in both urban and rural areas in the coming decades. Increasing visitation means increased use of the transportation system infrastructure that gets visitors both *to* our national parks, forests, refuges; state parks; and other recreational sites and lets them travel *within* these public lands. Transportation agencies and PLMAs share a common interest in ensuring the public enjoys safe, efficient access to and through public lands. Visitation to and resource management activities on these lands also generate local, regional and state economic benefits. At the same time, the traveling public is not concerned with the jurisdictional boundaries, and instead wants to get from their residence to their desired outdoor recreation site by the mode of their choosing as quickly and easily as possible. As a result, transportation agencies and PLMAs are exposed to the impacts of congestion and crowding, which can adversely affect efficient access, economic activity, safe travel, and the visitor experience.

Planning collaboration can help transportation agencies and PLMAs identify travel trends, needs, and projects of mutual benefit to improve transportation access for the traveling public. Sharing data is an

³ US Bureau of Land Management. “Table 4-1: Estimated Recreational Use of Public Lands Administered by the BLM.” Public Land Statistics, 2010-2019. Last retrieved 3/31/2021. <https://www.blm.gov/about/data/public-land-statistics>

⁴ US National Park Service. Annual Visitation Summary Reports 2010-2019. Last retrieved 3/31/2021. <https://irma.nps.gov/STATS/Reports/National>

important part of transportation collaborations, as it helps organizations identify problems, make data-driven cases for funding and other decisions, and evaluate the effectiveness of plans, projects, and management practices, as well as potential impacts. Data sharing partnerships can also help PLMAs and transportation agencies improve conditions related to common goals, such as transportation safety, congestion management, visitor experience and mobility, resource protection, and sensitive environmental features.

Legislative Context

There are several laws, regulations, and executive orders pertaining to PLMA and transportation agency planning and decision-making processes. The primary legislation governing transportation decision-making for PLMAs and transportation agencies is the surface transportation authorization under Title 23 of the U.S. Code (USC). The most recent authorizations were the Moving Ahead for Progress in the 21st Century (MAP-21) Act of 2012 and the Fixing America's Surface Transportation (FAST) Act of 2015, which authorized several programs and requirements regarding transportation planning, programming, and performance management, and other decision-making. These provisions are summarized in this section.

Metropolitan, Rural and Statewide Transportation Planning and Programming

Metropolitan and Statewide Transportation Planning are governed by 23 USC Section § 134 (Metropolitan transportation planning) and § 135 (Statewide transportation planning).⁵ 23 USC § 134 and § 135 require MPOs and State DOTs to develop the following:

- **Long-Range Transportation Plans (LRTPs):** 23 USC § 134 and § 135 require MPOs and State DOTs to develop long-range transportation plans (LRTPs) that cover their respective planning areas. 23 USC § 135 requires State DOTs to develop LRTPs with a minimum 20-year forecast period for all areas of the State that provides for the development and implementation of the intermodal transportation system of the State. 23 USC § 134 requires MPOs to develop LRTPs, often referred to as Metropolitan Transportation Plans (MTPs), for their planning areas. State DOTs and MPOs typically update their LRTPs every 4 to 5 years, depending on applicable requirements. LRTPs are multimodal planning documents, covering all transportation modes and require both public involvement and consultation with other transportation organizations within the planning area, including State DOTs, MPOs, nonmetropolitan planning organizations, transit agencies, tribal governments, and federal land management agencies (FLMAs). RTPOs are designated to develop transportation improvement programs and long-range plans for non-metropolitan areas. Federal transit law (49 USC. § 5301 et seq) and the final rule on Statewide and Nonmetropolitan Transportation Planning and Metropolitan Transportation Planning spell out provisions for the organizations.
- **Transportation Improvement Programs (TIPs) and Statewide Transportation Improvement Programs (STIPs):** 23 USC § 134 and § 135 require MPOs and State DOTs to develop Transportation Improvement Programs (TIPs) and Statewide Transportation Improvement Programs (STIPs), respectively. TIPs and STIPs are documents containing lists of projects programmed for funding that are consistent with the MPO's or State DOT's current LRTP and contribute to achieving the LRTP's goals. TIPs and STIPs have 4-year time horizons and are updated every 4 to 5 years. During TIP and STIP development, MPOs and State DOTs must

⁵ 23 USC Section 134, 135.

conduct public involvement and consult with other transportation organizations within the planning area, including State DOTs, MPOs, nonmetropolitan planning organizations, transit agencies, tribal governments, and FLMAs. In non-metropolitan rural areas, Federal planning law (49 USC § 5304) requires each state to cooperate with local officials to develop a long-range statewide transportation plan and STIPs.

FAST Act Planning Factors

The FAST Act established several national planning factors, or issues for State DOTs and MPOs to consider in their LRTPs and TIPs. These planning factors are summarized below:⁶

- A. Economic vitality;
- B. Transportation Safety (motorized and non-motorized);
- C. Transportation Security (motorized and non-motorized);
- D. Accessibility and mobility of people and freight;
- E. Environment;
- F. Integration and connectivity (across jurisdictions and modes);
- G. System management and operation;
- H. Preservation of the existing transportation system;
- I. Resiliency and reliability; and
- J. Travel and tourism.

Items (I) and (J) above are new planning factors in the FAST Act. Although many of these planning factors are also relevant to PLMAs, factor J – travel and tourism – places a new emphasis on understanding recreational travel demand in the planning process and is an area best addressed through coordination between transportation agencies and PLMAs. Because this is a relatively new planning factor, guidance on how to address it in LRTPs and TIPs is still being developed.

Transportation Performance Management

FHWA defines Transportation Performance Management (TPM) as a strategic approach that uses system information to make investment and policy decisions to achieve national performance goals.⁷ In 2012, MAP-21 created new requirements for the U.S. Department of Transportation (USDOT) to generate a series of rulemakings establishing performance measures and targets for seven national goals:⁸

1. **Safety** - To achieve a significant reduction in traffic fatalities and serious injuries on all public roads
2. **Infrastructure Condition** - To maintain the highway infrastructure asset system in a state of good repair
3. **Congestion Reduction** - To achieve a significant reduction in congestion on the National Highway System
4. **System Reliability** - To improve the efficiency of the surface transportation system

⁶ 23 USC Section 134(h)(1), 135(d)(1).

⁷ FHWA. 2019. Transportation Performance Management website:
<https://www.fhwa.dot.gov/tpm/about/tpm.cfm>

⁸ 23 USC 150(b)

5. **Freight Movement and Economic Vitality** - To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development
6. **Environmental Sustainability** - To enhance the performance of the transportation system while protecting and enhancing the natural environment
7. **Reduce Project Delivery Delays** - To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices

The USDOT published rulemakings for national performance measures and targets for the national goals in 2016. These rules require State DOTs and MPOs to submit the specified performance management data for national reporting, with the first performance period beginning January 1, 2018, and ending December 31, 2021. The TPM statutes and regulations are available on the FHWA TPM webpage.⁹

TPM creates a data sharing framework for a set of nationally consistent performance measures. For many transportation agencies, TPM has created a need for agencies to increase their capacity to collect, analyze, and share data. TPM has also created opportunities for increased collaboration as agencies collect and share comparable data. FHWA's [TPM Toolbox](#) includes capacity building resources to help agencies develop their TPM programs, including chapters on "External Collaboration and Coordination" and "Data Management."¹⁰

Performance-Based Planning and Programming

In 2012, MAP-21 also placed new emphasis on performance-based planning and programming (PBPP) by requiring the use of performance management elements in planning and programming documents including L RTPs and TIPs/STIPs.¹¹ The FAST Act built upon these requirements in 2015. PBPP refers to the application of performance management elements within transportation planning and programming processes to achieve desired performance outcomes for the multimodal transportation system. This includes a range of activities undertaken by a transportation agency with other agencies, stakeholders, and the public. PBPP attempts to ensure that transportation agencies make decisions based on their ability to meet desired goals.¹² PBPP is how transportation agencies implement TPM.¹³

As shown in Figure 1, PBPP links each phase of the project life cycle – including planning, programming, implementation, and evaluation – with performance data to articulate an agency's goals, objectives, performance measures, and targets; analyze how investment decisions will achieve the agency's objectives; and evaluate outcomes during and after implementation.

⁹ FHWA. 2019. TPM Statutes and Regulations website: <https://www.fhwa.dot.gov/tpm/about/how.cfm>.

¹⁰ FHWA. 2020. TPB Toolbox. <https://www.tpmtools.org/>

¹¹ 23 USC Section 134, 135.

¹² Federal Highway Administration. 2013. *Performance Based Planning and Programming Guidebook*. Washington, DC. https://www.fhwa.dot.gov/planning/performance_based_planning/pbpp_guidebook/

¹³ FHWA. 2020. Transportation Performance Management / Performance-Based Planning and Programming Implementation Workshop Series. https://www.fhwa.dot.gov/planning/performance_based_planning/workshops/tpm_interim_report/

Figure 1: PBPP Framework (Source: FHWA, 2013, Performance Based Planning and Programming Guidebook)



One benefit of PBPP is that it allows transportation agencies to communicate their goals and evaluate decisions based on data with other agencies, stakeholders, and the public. FHWA’s *Performance Based Planning and Programming Guidebook* provides the following lessons for effective implementation of PBPP related to data sharing and collaboration:¹⁴

- **Use measures that matter.** Rather than identifying hundreds of measures, it is often preferable to identify a limited set of key measures to best support goals and objectives, guide investment decisions, and evaluate progress.
- **Engage the public and stakeholders.** Public engagement is critical to identify the issues that residents care about most. In addition, keep the public and stakeholders in mind when developing measures to ensure that they are easy to understand and resonate.
- **Coordinate and collaborate broadly.** Effective PBPP involves coordination within agencies and across agencies so the State DOTs, MPOs, nonmetropolitan planning organizations, and transit agencies are coordinated in the development of goals, objectives, performance measures, and targets. It also involves coordination with a wide range of partners, including local governments, the business community, freight communities, law enforcement, economic development, and others.

¹⁴ Federal Highway Administration. 2013. *Performance Based Planning and Programming Guidebook*. Washington, DC. https://www.fhwa.dot.gov/planning/performance_based_planning/pbpp_guidebook/

- **Provide context for performance results.** A recent trend in performance management has been to develop dashboards and other data visualization techniques. These tools are helpful for communicating data; however, using a simplified approach to reporting data could create a risk for misinterpretation. It is important to tell a story and combine data with an explanation of performance results.

Although FHWA’s PBPP Guidebook does not discuss collaboration with PLMAs specifically, the adoption of PBPP by agencies throughout the U.S. provides new opportunities for data sharing and collaboration between transportation agencies and PLMAs. FHWA has developed a wide range of resources related to, summarized in Table 1.

Table 1: Summary of USDOT PBPP Resources

Title	Date	Description
Performance-Based Planning and Programming Guidebook ¹⁵	2013	The Guidebook has been designed to help transportation agencies and partner organizations understand: the key elements of a PBPP process and the relationship of these elements within existing planning and programming processes. The Guidebook highlights effective practices to help transportation agencies in moving toward a performance-based approach to planning and programming.
Model Long-Range Transportation Plans: A Guide for Incorporating Performance-Based Planning ¹⁶	2014	This Guidebook informs transportation agencies and their planning partners about effective practices for incorporating performance-based planning into the development of a long range transportation plan.
Performance-Based Planning for Small Metropolitan Areas ¹⁷	2014	This report provides insights on effective practices in performance based planning by MPOs that plan for Urbanized Areas with populations less than 200,000. It presents key themes from interviews with small MPOs and DOT partners across the country and includes two case studies of small MPOs that are currently leaders in implementing performance based planning: Chittenden County Regional Planning Commission (Vermont) and Thomas Jefferson Planning District Commission (Virginia).

¹⁵ FHWA. 2013. *Performance Based Planning and Programming Guidebook*. Washington, DC. https://www.fhwa.dot.gov/planning/performance_based_planning/pbpp_guidebook/

¹⁶ FHWA. 2014. *Model Long-Range Transportation Plans: A Guide for Incorporating Performance-Based Planning*. Washington, DC. https://www.fhwa.dot.gov/planning/performance_based_planning/mlrtp_guidebook/

¹⁷ FHWA. 2014. *Performance-Based Planning for Small Metropolitan Areas*. Washington, DC. https://www.fhwa.dot.gov/planning/performance_based_planning/small_mpo_report/

Title	Date	Description
Performance-Based Planning and Programming: A Report to Congress ¹⁸	2017	This Report to Congress covers the overall effectiveness of PBPP as a tool for guiding transportation investments and the effectiveness of the PBPP processes of State DOTs and MPOs.
PBPP Case Studies ¹⁹	2011, 2015, 2019	This collection of case studies represents varied approaches to PBPP by transportation agencies. Agencies featured include: Florida DOT, Minnesota DOT, Utah DOT, Washington State DOT, Delaware Valley Regional Planning Commission, Lewis Clark Valley MPO, Maricopa Association of Governments, Metropolitan Transportation Commission, Portland Metro Council, Rockingham MPO, San Diego Association of Governments, and Wasatch Front Regional Council.
Example Practices for Performance-Based Planning and Programming ²⁰	2020	This report shares how transportation agencies are using their LRTPs and STIPs/TIPs to implement PBPP.

Federal Land Management Agency Transportation Planning and Programming

23 USC § 201 requires FHWA’s Office of Federal Lands Highway, in consultation FLMAs, to implement transportation planning procedures for Federal lands “that are consistent with the planning processes” required for MPOs and State DOTs under 23 USC § 134 and 135.

For long-range planning documents, FLMAs typically develop LRTPs at the national level. NPS and FWS have also developed regional LRTPs and, in some cases, unit-level LRTPs. FLMAs also develop other unit-level or site plans and planning studies that have transportation components, such as a portfolio planning approach (NPS)²¹, Comprehensive Conservation Plans (FWS), Forest Plans (USFS), and Travel and Transportation Management Plans (BLM). Although FLMA LRTPs consider unique public lands contexts, many of the common FLMA goals overlap with common State DOT and MPO goals. Common goals include safety, resource protection/environmental sustainability, mobility/congestion management, asset management, visitor/user experience, and economic opportunity.²²

For programming, each FLMA has a process to develop its program of projects for inclusion into its TIP in collaboration with FHWA Office of Federal Lands. FHWA Office of Federal Lands also develops a TIP that

¹⁸ FHWA and FTA. 2017. *Performance-Based Planning and Programming: A Report to Congress*. Washington, DC. https://www.fhwa.dot.gov/planning/performance_based_planning/resources/report_to_congress_2018/

¹⁹ FHWA. 2019. Performance-Based Planning and Programming Case Studies: https://www.fhwa.dot.gov/planning/performance_based_planning/case_studies/

²⁰ FHWA. 2020. *Example Practices for Performance-Based Planning and Programming*. Washington, DC. https://www.fhwa.dot.gov/planning/performance_based_planning/resources/example_practices/.

²¹ NPS may still complete General Management Plans (GMPs), but only when needed. <https://parkplanning.nps.gov/planningProgram.cfm>

²² Published FLMA LRTPs are available on the FHWA Federal Lands Planning Program website: <https://highways.dot.gov/federal-lands/programs-planning/lrtps>.

includes all federal projects it has stewardship and oversight responsibility for, including FLMA projects. State DOT's then incorporate the FHWA Office of Federal Lands TIP into their respective STIPs.

Although FHWA's TPM requirements do not apply to FLMAs, 23 USC § 201 states that FLMAs shall, to the extent appropriate, implement safety, bridge, pavement, and congestion management systems.²³ The performance measures that State DOTs and MPOs are required to report under TPM requirements are not required for FLMAs, and in many cases they would not be feasible for FLMAs or meaningfully characterize their transportation systems. (For example, a performance measure focused on pavement condition is less useful for a PLMA with mostly unpaved roads.) However, TPM may provide opportunities for FLMAs to better understand transportation agencies' data, as well as opportunities for FLMAs to provide similar data for cross-jurisdictional planning and collaboration with PLMAs.

State and Local Public Lands Transportation Planning and Programming

There is limited literature on transportation planning and programming for state and local PLMAs, and outside of Federal funding programs there are no nationwide requirements for PLMA and transportation agency coordination. However, many states have laws and regulations pertaining to non-federal PLMAs. These include land use and transportation planning requirements. In addition, PLMAs may work with State DOTs and MPOs to provide inputs into their travel demand modeling.

Common Motivations for Data Sharing

Possible Outcomes of Data Sharing

Public agencies collect data to understand the function of their services and potential areas of improvement. When transportation agencies and organizations share data, their partners and other users of the data all benefit. The following section is an overview of the possible benefits of data sharing in transportation planning.

In the case of TPM, regulations require data collection to quantify final performance measures.²⁴ It is imperative to use specific standards for data sharing to meet established national performance goals because the data collected is shared and compared across different agencies. This establishes a motivation for involved agencies to cooperate and abide by established requirements for data collection and sharing.

According to *Data Sharing Guidance for Public Transit Agencies*, sharing data among public agencies provides the following benefits to agencies and their partners:²⁵

- **Improving efficiency.** Sharing data can spark innovation and supporting research, allowing for better overall service.
- **Promoting cost effectiveness.** By sharing and utilizing third party or private sector assistance for data analysis, agencies can operate more efficiently.

²³ 23 USC § 201.

²⁴ TPM Regulations Webpage: <https://www.fhwa.dot.gov/tpm/about/regulations.cfm>

²⁵ National Academies of Sciences, Engineering, and Medicine. 2020. *Data Sharing Guidance for Public Transit Agencies – Now and in the Future*. Washington, DC: The National Academies Press.

<https://doi.org/10.17226/25696>.

- **Supporting improved customer information.** Understanding the general usage patterns and needs of customers can optimize services.
- **Establishing greater transparency of agency services.** By increasing awareness of services, agencies can foster improved engagement with customers.
- **Supporting performance management.** Benchmarking assists agencies to review and improve their overall performance.

When public organizations engage in data sharing partnerships, they must consider several factors such as whether they want to share their data, with whom, and if they decide to share, the best model to utilize. Benefits such as increased transparency and potential for innovation are primary motivators for engaging in data partnerships. When agencies engage in such partnerships, inter-agency cooperation and understanding, public perceptions, and civic engagement are enhanced.²⁶

Data Sharing Benefits to Transportation Decision-Making Processes

Data sharing can also support transportation agencies, PLMAs, and other stakeholders to improve transportation decision-making throughout the project lifecycle. For example, data sharing can help agencies better understand the needs and priorities of partner organizations, which can help identify opportunities for collaboration during planning, programming, design and environmental review, project implementation, and evaluation. This, in turn, can lead to project funding opportunities or project delivery efficiency improvements, and ultimately to a more seamless transportation network for the traveling public.

Recognizing that data needs vary from phase to phase and between users, this Study could examine how the desired outcomes outlined above can be achieved in each of the following transportation phases:

- System and project planning
- Project selection and programming
- Design and environmental review
- Construction
- Operations and maintenance
- Performance management and reporting

The Eco-Logical approach is an example of how such motivations influence desired outcomes. In the approach, both “Region System Framework” (REF) and the “Regional Ecosystem Infrastructure Development Framework” (REIDF) describe the outcome of integrating conservation priorities, data, and plans with transportation and infrastructure data and plans.²⁷

Common Data Sharing Challenges

The literature surrounding data sharing identifies a number of challenges collaborating organizations may face. While the literature does not address data sharing challenges in the context of public lands management, the information from other transportation and related disciplines may be applicable.

²⁶ Ibid.

²⁷ National Academies of Sciences, Engineering, and Medicine. 2014. Manager’s Guide to the Integrated Ecological Framework. Washington, DC: The National Academies Press. <https://doi.org/10.17226/22423>; 1/12/21

These relate to processes from collecting data through keeping shared data updated. One report established that data challenges are simultaneously technical and institutional in nature.²⁸ This section identifies what the literature says about the different types of challenges.

Staff Capacity

Successful data collection and management is contingent on staff resources, capacity, and coordination. One Transit Cooperative Research Program (TCRP) report notes that when individual groups collect and manage data they may inadvertently withhold this information from teams even within the same organization. A lack of communication may leave teams unaware of how their collected and managed data could hold utility for similar or separate teams.²⁹ Different parts of the same organization may not be aware that relevant data they need already exists within their own organization or partner organizations. A centralized data repository or catalog provides a more effective way to manage data collection, management, and distribution processes. The efficiency carries through to responding to public requests for information relevant to public agencies.

Despite the efficiencies to be gained, only one transit agency surveyed by the TCRP research team responded that it has an information management and governance group established to handle outside data requests.³⁰ The lack of a dedicated data management group in transit agencies is indicative of a larger problem – agencies do not have the staff capacity and related resources to put dedicated teams in place. Part of this can be attributed to leadership not recognizing the importance of data management,³¹ which will be discussed further below.

Additionally, staff turnover impacts the continuity of data sharing capacity and partner relationships, especially when there is no overlap between the outgoing and incoming staff. Ensuring the continuity of knowledge regarding data management is critical for data governance and data management sustainability.³² A recent report reviewing data management practices in Midwestern DOTs assessed the participating agencies on the maturity level of their data strategy and governance, including a question on whether their staff transition processes maintain data management knowledge and expertise. On a scale of one to five, with five being the most mature, the highest score for staff transition processes was a three.

²⁸ National Academies of Sciences, Engineering, and Medicine 2019. *Developing National Performance Management Data Strategies to Address Data Gaps, Standards and Quality*. Washington, DC: The National Academies Press. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_920NPM.pdf 12/18/2020

²⁹ National Academies of Sciences, Engineering, and Medicine, *Data Sharing Guidance for Public Transit Agencies Now and in the Future*, 11-14.

³⁰ National Academies of Sciences, Engineering, and Medicine 2020. *Data Sharing Guidance for Public Transit Agencies Now and in the Future*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25696> 12/17/2021

³¹ BMC Public Health. 2014; 14:1144. <https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-14-1144> 12/17/2021

³² Nextrans USDOT Region V Regional University Transportation Center. 2017. *A Synthesis of Data Management Practices in the Midwestern DOTs*. Project No. 166UWY2.2. Last accessed 2/3/2021. https://www.purdue.edu/discoverypark/nextrans/assets/pdfs/166UWY2.2_Summary%20and%20Final%20Technical%20Report.pdf

Data Quality

Data quality control is essential to sharing reliable data between organizations. Databases and dashboards used to share information within an organization and externally are only as good as the data stored within them. Several reports identified data completeness as a challenge related to quality. Data completeness refers to whether the information collected contains all data points relevant to its application, including consideration of whether the collection method is inclusive of all users. For example, smart phone data is an emerging big data source; however, not every person has a smart phone, especially among low income populations. If portions of the population are not represented in the data, they may not be accounted for in decision-making that impacts them. Checking for data completeness requires staffing, processes, and tools that can identify potential issues.³³

The data collected needs to be relevant to the planning and decision-making at hand. The data collected may be a by-product of a different project rather than a dedicated effort. In this situation, the data may not capture valuable details that would be covered by a targeted collection. For instance, weekday commuter data is not useful to understanding weekend visitation to public lands. Additionally, limited data coverage could result from using old collection methods that could include biases. The NCHRP report on performance management data found that organizations tend to rely on available data instead of finding new types of data that is better fit for decision-making.³⁴ If the older data includes biases that may not be immediately apparent, it continues to impact results until the method is corrected and new data is collected.

Finally, poor data quality may lead an organization not to trust it and, therefore, unwilling to share it, further challenging data collaboration.

Data Compatibility and Comparability

Organizations collect transportation data across a variety of metrics and methods. Documentation of the data is also varied, which impacts the ability to cross reference data sets. A group of researchers looking at barriers to sharing data related to public health identified several technical challenges that are listed in the table below.³⁵

³³ National Academies of Sciences, Engineering, and Medicine 2019. *Leveraging Big Data to Improve Traffic Incident Management*. Washington, DC: The National Academies Press.

http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_920NPM.pdf 12/18/2020

³⁴ Ibid. Page 5

³⁵ van Panhuis, WG, Paul, P, Emerson, C, Grefenstette, J, Wilder, R, Herbst, AJ, et al. *A systematic review of barriers to data sharing in public health*. BMC Public Health. 2014; 14: 1144.

<https://bmcpublikealth.biomedcentral.com/articles/10.1186/1471-2458-14-1144>

Table 2: Technical challenges that inhibit data sharing

Technical Issue	Example
Data collection not accessible/retrievable	Data stored on individual computers instead of a common network
Data terminology differences	Nomenclature and coding differences do not align
Limited formatting	Data collected and maintained in hard copy form and not digitized
Lack of metadata and standards	Without metadata to describe data within the set, other organizations may not be able to identify what data they need.

Source: BMC Public Health. 2014; 14: 1144

According to several reports, some transportation sectors have taken steps to standardize data collection and analysis processes. A recent example of standardized data sharing is the use of a general transit feed specification (GTFS). GTFS establishes a common data framework for transit agencies to share route and schedule information that external parties can use to develop web applications and other uses. The Federal Transit Administration (FTA) established the National Transit Database (NTD) to collect various data points from operators based on their size. A significant challenge to establish standards across a broad range of transportation organization is that adoption is not uniform. A strong coalition with champions is needed to get enough buy-in for a substantial shift in process.

Looking at the emergence of big data sets from a range of sources, NCHRP researchers referenced a need to improve data collection and communication infrastructure. When referring to the ability of Traffic Management Centers (TMC) the report stated: “New capabilities will be needed for data acquisition, communications bandwidth from the roadside to the TMC, computing hardware, software, data storage and management systems, decision support subsystems, and data sharing and dissemination systems.”³⁶

Effort and Cost

Establishing proper data collection and management efforts in an organization takes substantial effort and funding. Staff need to establish goals and objectives for data use and management and be empowered to implement a plan that attains them. The investment in data collection and management should be a long term commitment that continues beyond staff changes. The TCRP report states, “[S]taff turnover can make it difficult to ensure that progress in data management is sustainable. Establishing a staff member or team that is dedicated to data management is an important step in addressing these challenges.”³⁷ The relationships between sharing partners should also withstand staff turnover.

Data collection is labor intensive, and organizations may not have the staff capacity to collect enough data. As an alternative to data collection, public organizations purchase private datasets from companies that collect data on transportation systems, but these datasets can also be costly. These agreements require negotiating data sharing agreements, which can be complicated. The agreements

³⁶ National Academies of Sciences, Engineering, and Medicine 2020. *Framework for Managing Data from Emerging Transportation Technologies to Support Decision-Making*. Washington, DC: The National Academies Press. Pg 39. <http://www.trb.org/Publications/Blurbs/181365.aspx> 12/18/2021

³⁷ National Academies of Sciences, Engineering, and Medicine, *Data Sharing Guidance for Public Transit Agencies Now and in the Future*, 11-14. Page 50.

can include provisions about accuracy and use. When there is shared interest in purchasing the same data set, state and local agencies can coordinate efforts for cost sharing.

Data Governance

Data is constantly being updated and refined. Even if a road segment location data remains the same, data related to its condition may be updated by the operating agency. An organization can maintain its datasets with regular updates; however, once a data set is shared, later updates may not transmit and the partner's information remains the same.

The literature reviewed did not discuss the need for data partnerships to establish agreed upon update protocols and commitments. While it was not mentioned directly, organizations sharing data must be able to understand the data opportunities and limitations they receive. They should also keep each other informed on scheduled updates, roles and responsibilities, and the contact for when questions or errors arise.

New data from new sources are also a challenge. NCHRP Report 282 establishes that new big data sets from emerging sources cannot be well managed using traditional data handling approaches that most organizations have now.³⁸ Traffic Management Centers need improved capabilities for “data acquisition, communications bandwidth from the roadside to the TMC, computing hardware, software, data storage and management systems, decision support subsystems, and data sharing and dissemination systems.”

Challenges also exist when there are discrepancies in data collection standards between agencies. If there are divergent standards, or inconsistencies in data collection practices, the data may not be compatible and no longer provide value for respective agencies.

Data Privacy and Security

Data privacy is an enormous issues in an increasingly connected world. Most transit agency representatives interviewed for the TCRP Report 213 identified privacy protection as a major concern. It requires effort to remove the Personal Identifiable Information (PII) from data sets; however, it is integral to insuring public trust with the public. Research on data sharing in public health indicated two categories of barriers to data sharing are political and legal. Distrust of the government may make people resistant to having data collected about them. In response, elected officials may ask for restrictive policies to address their constituents' concerns. An agency may also be wary of allowing other organizations that it doesn't fully trust the ability to link to its data or system. Legally, transportation organizations that collect or use data must be careful regarding data ownership and privacy controls.

Data sharing between organizations must address privacy issues. The partner organizations must assess the risk of specific data and identify methods for protecting PII when data is transferred between them. Partners should work together to establish a balance between the need and benefits of open data sharing and the risks of data containing PII.

³⁸ National Academies of Sciences, Engineering, and Medicine 2020. *Framework for Managing Data from Emerging Transportation Technologies to Support Decision-Making*. Washington, DC: The National Academies Press. <http://www.trb.org/Publications/Blurbs/181365.aspx> 12/18/2021

Some data sets can include information that can be compiled to establish details on where specific infrastructure lacks security or the location of people in an area, making them susceptible to physical or cyberattack.

Leadership Buy-in

The leader of an organization directs its priorities and investment. Leadership support of data collection, management, and sharing is critical given the resources it requires to operate effectively. However, “Leadership often does not fully understand the value of big data, modern data management, or the eminent need to ready for it.”³⁹ Without a data sharing champion at the top of an organization, it can be very hard for staff to obtain the resources they need for their planning and decision making. The literature identified some specific reasons that leadership does not embrace data and data sharing.^{40, 41, 42}

- Lack of trust in the data, especially from external sources
- Operational focus does not allow for collection and analysis of emerging mobility technologies
- Limited funding to distribute and choose to keep data and data sharing efforts to just meet the federal standards
- Lack of understanding about how good data can support transportation planning and informed decision making, coupled with limited time to learn more about the possibilities.

Data Management and Sharing

There is a significant body of literature on the internal management and external sharing of data across industries, including the transportation industry. However, little has been written about these processes as they pertain to data sharing between PLMAs and other transportation organizations. This section summarizes some of the key findings from other industries or transportation entities that are relevant to the focus of this research.

Managing Data Internally

A recent NCHRP study defined data management as “the practice of organizing and maintaining data and data processes to meet ongoing information lifecycle needs.”⁴³ Data management practices have evolved as technological advancements enabled a dramatic increase in the volume of data available to

³⁹ National Academies of Sciences, Engineering, and Medicine 2020. *Framework for Managing Data from Emerging Transportation Technologies to Support Decision-Making*. Washington, DC: The National Academies Press. <http://www.trb.org/Publications/Blurbs/181365.aspx> 12/18/2021

⁴⁰ Ibid. page 61

⁴¹ National Academies of Sciences, Engineering, and Medicine, *Data Sharing Guidance for Public Transit Agencies Now and in the Future*, 27.

⁴² van Panhuis, WG, Paul, P, Emerson, C, Grefenstette, J, Wilder, R, Herbst, AJ, et al. *A systematic review of barriers to data sharing in public health*. BMC Public Health. 2014; 14: 1144. <https://bmcpublikealth.biomedcentral.com/articles/10.1186/1471-2458-14-1144>

⁴³ National Academies of Sciences, Engineering, and Medicine 2020. *Framework for Managing Data from Emerging Transportation Technologies to Support Decision-Making*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25965> <http://www.trb.org/Publications/Blurbs/181365.aspx>

and used by organizations. Some organizations use a data management plan to ensure these practices maximize funding, time, resources, and meeting the organization’s goals and requirements.⁴⁴

The body of literature includes several different ways of defining the activities that fall under data management. In a synthesis of data management practices in Midwestern DOT’s, the management practices most relevant to this Study include:

- **Data Strategy and Governance**—the planning, policies, and principles that determine how data is used at the organization, as well as those responsible for managing and making decisions about the data.
- **Data Life-cycle Management**—managing data from collection to archiving. This includes creating data catalogs or dictionaries to track available data, as well as managing regular update cycles to ensure the data is current.
- **Data Architecture and Integration**—standardizing data referencing methods and other key linkages across datasets, including for geospatial data.
- **Data Collaboration**—coordinating within and outside of the organization to maximize utility and avoid duplication.
- **Data Value**—ensuring the quality and availability of the organization’s data.⁴⁵

The following maturity model prescribing ratings for data management practices at a DOT is applicable more broadly to other organizations that collect and manage transportation data:⁴⁶

Table 3: Data Management Maturity Model (Source: Teresa Adams et al, Capability Maturity Levels for Data Management Assessment, (NEXTRANS Center and University of Wisconsin-Madison, 2017), 11, table 3)

Maturity Level	Rating Score	Description
Initial	1	Ad hoc and event driven, success due to heroic efforts of individuals
Developing	2	Recognized need for improvement, pilot initiatives underway
Defined	3	Defined and documented processes not yet stabilized or widely socialized
Functioning	4	Implemented processes – operating and adding value
Sustained	5	Evaluated and improved processes, sustained over time

An organization that has clear procedures for collecting, processing, and documenting its own data will more easily be able to develop data sharing partnerships. One of the most common reasons PLMAs initially form data sharing partnerships is to partner on a specific project for which a non-park entity has or can apply for funding. PLMAs often partner with local organizations to apply for mutually beneficial transportation improvements, such as to a road connecting to a park or a shuttle system that serves a

⁴⁴ Backlund Jarquín, P., MPH. (n.d.). Data Sharing: Creating Agreements In support of community-academic partnerships. Retrieved January 8, 2021, from http://trailhead.institute/wp-content/uploads/2017/04/tips_for_creating_data_sharing_agreements_for_partnerships.pdf, 7.

⁴⁵ Adams, T. (n.d.). A Synthesis of Data Management Practices in the Midwestern DOTs. Retrieved January 8, 2021, from https://www.purdue.edu/discoverypark/nextrans/assets/pdfs/166UWY2.2_Summary%20and%20Final%20Technical%20Report.pdf, 11-13.

⁴⁶ Ibid.

park and a surrounding community. PLMAs and partners may start with an “initial” maturity level, as they share information ad hoc related to a project. These projects can be leveraged to develop a more consistent sharing partnership.

Preparing for a Data Sharing Partnership

While the scope of this literature review does not include detailed discussion of each of these data management tasks, they help ensure that any data shared is authoritative, and has sufficient context to ensure it is used and communicated properly.⁴⁷

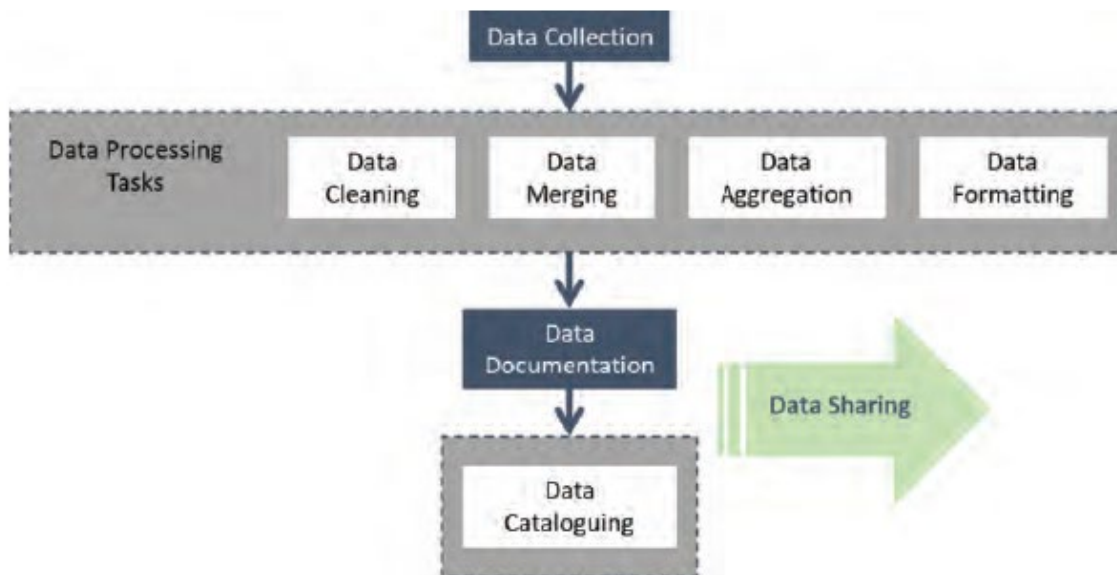


Figure 2: Data Sharing Process (Source: National Academies of Sciences, Engineering, and Medicine, *Process of Preparing Data for Sharing*, (Washington, DC: The National Academies Press, 2020), 25, figure 4).

Beyond these general best practices for data management, there are specific steps an agency can take to prepare staff and data for a data sharing partnership:

Identify dedicated, data-focused staff

As with many organizational functions, it is important to have dedicated staff with the responsibility and resources to manage data. Such staff may include IT specialists, whose role involves guiding data management efforts along with agency processes. GIS staff also may serve to benefit data management, as much data requires geospatial interpretation. Based on the size of the organization, this could be a full-time staff member, or a division with several people. For particularly small organizations, such as a small transit agency, these roles may be filled by staff at partner organizations. These individuals should have skills in database administration, maintenance, analytics, and data privacy.

The organization should also include a legal staff person or division that is equipped to interpret legislation related to data storage and sharing. This staff person or division should understand data

⁴⁷ National Academies of Sciences, Engineering, and Medicine. 2020. *Data Sharing Guidance for Public Transit Agencies – Now and in the Future*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25696>; 27.

security laws, data breach notification laws, information disclosure (public records) laws, exemptions, and tort laws regarding mishandling of data.

It is also important that data management staff coordinate closely with other staff at the partner organization who collect and work with data. The staff responsible for data management should establish clear processes for standardizing, sharing, and communicating about data across the organization. While there are specific staff focused on data management, everyone at the organization should understand their role.⁴⁸

Establish goals and objectives to be achieved through data sharing partnerships.

An agency considering a data sharing partnership should clearly define the data and analysis needs it is trying to achieve through a data sharing partnership.

Data management staff at the organization should work with other staff and leadership to establish the goals for the data analysis and what data is needed to meet those goals. From there, they need to determine how much of the goal can be met with data the organization already has, as well as the data gaps. The organization should evaluate whether a data sharing partnership could fill the gaps more efficiently and effectively than collecting the data itself. Some aspects to consider when choosing which path to pursue are the decisions that will be made based on the data and analysis, the frequency with which the data needs to be updated, whether the organization has the capacity to meet these needs, and whether a partner organization already collects the data. An organization might begin by inventorying its existing data management and sharing processes, and assess any necessary changes to data collection and governance. A review of the decisions the data informs and any outcomes of not sharing the data will also set parameters of a data sharing partnership.

The organization should develop protocols for cataloging data, data sharing, privacy protection, public records requests, and other protocols. This can also include ensuring the organization's own data quality, coverage, processing, and documentation.⁴⁹

Select data tools

Organizations need to consider what capabilities a data reporting tool needs to meet their goals. Does it integrate data from multiple sources? Does it simply allow users to input and view the data, or does it allow for analysis? Does it output data reports? Organizations may have to use multiple tools to reach all of their needs. Organizations also need to determine whether they purchase these tools or build them in-house.⁵⁰

Establish data standards

There are a number of existing data standards for transportation data, such as those for reporting congestion, safety, and pavement condition. Organizations may also adopt their own data formats that they document in a data dictionary or catalog. In developing a data sharing agreement, partners may

⁴⁸ Ibid, 11-14.

⁴⁹ Ibid, 11-14.

⁵⁰ National Academies of Sciences, Engineering, and Medicine. 2019. Management and Use of Data for Transportation Performance Management: Guide for Practitioners. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25462>; 38-42.

agree to a common format or standard to facilitate sharing. In other cases, partners may derive more use from working with raw, non-standardized data.⁵¹

Publish data

The type of data sharing model and audience will determine how an organization publishes its data, what data is shared, and to what degree it is aggregated. Agencies may have different formats for data sharing for internal staff, external partners, and the general public, based on its intended use for each audience. For example, the agency may have a data tool that all internal staff can access, upload select data from that tool to a shared server with a partner, and share that information to the public via reports or dashboards.⁵²

Evaluate and select data sharing models

Organizations should select data sharing models based on the benefits an organization hopes to achieve from data sharing and the costs and risks the organization is trying to minimize.⁵³

TCRP Research Report 213 provides an overview of two major categories of data sharing models:⁵⁴

1. **Public data sharing (open data)** includes online data repositories, dashboards, or public reports. It may also include developing publicly available standard data feeds. An example might be a State DOT publishing public dashboards with transportation safety or congestion data that PLMAs can use to identify safety and congestion issues in gateway communities.
2. **Private data sharing** includes sharing data between partners by a private agreement, which may include purchasing the data. This could also include developing shared repositories, standard data feeds, or Application Programming Interface (API), which allows organizations to share content and data across different software platforms. An example could be a nearby transit agency sharing its more granular ridership data with a PLMA than it publishes publicly.

Building Data Sharing Partnerships

Building data-sharing partnerships does not subscribe to a set formula. These steps may happen concurrently and iteratively, and thus follow no prescribed order. The following section reviews common steps involved in the process of building these partnerships.

Identify a potential data-sharing partner

Before any partnerships are established, an organization will first establish the needs that any applicable data sharing could address. When an organization identifies an effort or project that would benefit from data sharing, it is best to identify partners early in order to define the goals and approach collectively. Building a strong partnership can help ad hoc data sharing become a longer-term partnership with multiple mutually beneficial projects.

⁵¹ Ibid, 43-45.

⁵² Ibid, 46-49.

⁵³ Ibid, 11-14.

⁵⁴ Ibid, 15.

Engage with a partner's organizational leadership

Before engaging with a potential partner's leadership to establish a partnership, it is important to learn as much as possible in advance about the organization. This includes, as available, their history of data sharing, past data sharing partnerships, barriers identified, and the organization's data use guidelines.

In initial discussions with leadership, it is important to clearly understand the priorities of each organization, and what apprehensions they have about sharing data. The conversation should determine the resources each organization might be able to provide to support the data sharing partnership, particularly where there may be opportunities to overcome barriers. For example, the organization sharing the data might not have the resources to clean the data, but the recipient organization might be able to do this on their own time.

Having identified the key elements of a data sharing partnership, the organizations can develop a memorandum of understanding (MOU) or other agreement for data sharing.⁵⁵

The following list includes examples of the type of content that might be included in a data sharing agreement:⁵⁶

- Description of the information
- Scale of the data
- Funding and resource requirements
- Privacy, security, copyright, and other legal requirements
- Ownership of the data
- Storage of the data (short- and long-term)
- Access of the data by other parties, partners, or the public
- Approval process
- Roles and responsibilities for data management and analysis
- Training needs and requirements
- Release of the data or findings
- Timeline for agreement

Engage with a partner's data management team

Once a data sharing agreement is established, or as it is being drafted, the organizations should coordinate between their respective data management teams to identify available data, expertise at each organization, roles and responsibilities, potential technical issues (e.g., inadequate servers, obsolete data sources, quality or limitations of data). Ideally, the teams should identify opportunities to reduce the burden on the organization sharing the data. For example, an organization could request full data tables rather than asking them to extract specific fields.

If possible, it may be useful to review a sample of the data to more definitively identify what data will be valuable to share and what barriers exist to data completeness, usability, etc.

⁵⁵ Wiehe, et al. (2018). *A Solutions-Based Approach to Building Data-Sharing Partnerships*. EGEMS (Washington, DC), 6(1), 20. <https://doi.org/10.5334/egems.236>; 4-7.

⁵⁶ Backlund Jarquín, P., MPH. (n.d.). Data Sharing: Creating Agreements In support of community-academic partnerships. Retrieved January 8, 2021, from http://trailhead.institute/wp-content/uploads/2017/04/tips_for_creating_data_sharing_agreements_for_partnerships.pdf, 12-14.

As the data management teams define the process for and barriers to data sharing, it may be necessary to adjust the approach and amend the data sharing agreement.

Engage with a partner's legal team

Prior to the step of meeting with the partner organization's leadership, an organization may work with its own internal legal team to identify templates for data use agreements and anticipate potential barriers.

Depending on the anticipated complexity of the agreement or significant barriers, the organization may choose to include its internal legal team in conversations with the partner's legal team. The legal team can bring a sample data use agreement to initial meetings with partner's legal team to articulate scope of the data sharing effort and potential risks. This includes a discussion of specific data use guidelines, particularly those that protect individual privacy and where data may need to be aggregated before sharing.⁵⁷

Summary of Previous Transportation Agency and PLMA Planning and Data Sharing Efforts

Since 2010, there have been several examples of transportation agencies and PLMAs collaborating and sharing data to support transportation decision-making that could inform this Study. These include:

- FLMA Collaborative LRTPs
- Transportation Working Groups for ongoing collaboration
- Transportation agency / PLMA joint studies and plans
- TIP/STIP collaboration
- Collaborative project implementation

This section summarizes examples of these collaborative efforts.

Federal Lands Collaborative Long-Range Transportation Plans

FLMAs develop LRTPs that are similar to those developed by State DOTs and MPOs. Federal lands LRTPs establish a vision with goals, objectives, and strategies for managing FLMA transportation systems. They typically have a planning horizon of 20 years or more and may be developed at the national, regional, or unit-level.⁵⁸ These plans should include outreach and consultation with other agencies and stakeholders, including other FLMAs, FHWA, state and local transportation agencies, tribal governments, and the public. In two regions of the U.S., FLMAs have enhanced this outreach by developing the plans collaboratively, including a range of FLMAs, FHWA, State DOTs, and other local partners in the development of the plan. These plans span jurisdictional boundaries, considering the network of transportation systems that provide access *to* and *within* public lands.

⁵⁷ Wiehe, et al. 2018. *A Solutions-Based Approach to Building Data-Sharing Partnerships*. EGEMS (Washington, DC), 6(1), 20. <https://doi.org/10.5334/egems.236>; 4-7.

⁵⁸ FHWA, Office of Federal Lands Highway. 2020. Long Range Transportation Plans (LRTPs) website. <https://highways.dot.gov/federal-lands/programs-planning/lrtps>

Alaska Federal Lands Collaborative LRTPs

In Alaska, FHWA's Western Federal Lands Highway Division Office (WFL) convened the FLMAs in Alaska to develop a regional Collaborative LRTP.⁵⁹ This plan – the first Collaborative LRTP in the U.S. and one of the first Federal lands LRTPs – was developed through the active involvement of the BLM, NPS, USFS, FWS, FHWA, Alaska Department of Transportation and Public Facilities (DOT&PF), Alaska Municipal League, and WFL. Through this collaboration, the project team developed a common set of goals, objectives, and strategies, and they shared data to develop a common analysis of baseline conditions and trends.

Through the process of developing the Alaska CLRTP, the FLMAs, FHWA, and their partners identified data gaps and developed implementation actions to address them. For example, the group conducted a Collaborative Visitor Transportation Survey (CVTS) to fill data gaps regarding visitation; conducted a multimodal transportation safety study to enhance their baseline understanding of traveler safety in and to Federal lands in Alaska; and worked to develop a common understanding of asset management data from each agency. They also developed mechanisms for sharing project data, such as a shared GIS platform to provide updated data on each agency's program of projects.⁶⁰

In 2020, the Alaska partners published an update to their Collaborative LRTP.⁶¹ This plan developed an updated set of baseline conditions, based partly on the progress in developing and sharing data the group had accomplished in implementing the 2012 plan. The 2020 plan also reflected new legislation and agency guidance to provide an updated vision, goals, objectives, strategies, and potential performance measures to guide the FLMAs and their local transportation partners in Alaska for the next 20 years.

Pacific Northwest Collaborative LRTP

In 2019, a collaborative team of FLMAs, FHWA, and State and local transportation agencies published the *Pacific Northwest Federal Lands Collaborative Long-Range Transportation Plan*.⁶² This plan was the product of a similar collaborative planning effort in Oregon and Washington. The agencies who developed the plan included: BLM, USFS, FWS, USACE, FHWA, Oregon Department of Transportation (ODOT), Washington State Department of Transportation (WSDOT), Oregon Association of Counties, and the Washington County Road Administration Board. Similar to the Alaska Federal Lands Collaborative LRTP, the Pacific Northwest Federal Lands Collaborative LRTP aggregated data from each FLMA and State and local partners to develop baseline conditions for transportation systems across jurisdictions that provide access to and within Federal lands in Oregon and Washington. The plan also developed a

⁵⁹ Bureau of Land Management, National Park Service, U.S. Forest Service, U.S. Fish and Wildlife Service, Alaska Department of Transportation and Public Facilities, and Federal Highway Administration. 2012. *Alaska Federal Lands Long Range Transportation Plan*. <https://highways.dot.gov/federal-lands/programs-planning/lrtps/alaska-collaborative-lrtp>.

⁶⁰ Fix, et al. 2018. *Collaborative Visitor Transportation Survey: Results from Summer 2016 Alaska Survey*. http://volpe-public-lands.s3-website-us-east-1.amazonaws.com/flma_lrtp_cvts/documents/AK%20CVTS%20FINAL%20REPORT.pdf.

⁶¹ Bureau of Land Management, National Park Service, U.S. Forest Service, U.S. Fish and Wildlife Service, Alaska Department of Transportation and Public Facilities, and Federal Highway Administration. 2020. *Alaska Federal Lands Long Range Transportation Plan: 2020-2040*.

⁶² Bureau of Land Management, National Park Service, U.S. Forest Service, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers. 2019. *Pacific Northwest Federal Land Management Agency Long-Range Transportation Plan*. <https://highways.dot.gov/federal-lands/programs-planning/lrtps/pac-nw-collaborative-lrtp>

common set of goals, objectives, strategies, and potential performance measures to guide future planning collaboration, data collection, and data sharing partnerships to support plan implementation.

Transportation Working Groups

In both Alaska and the Pacific Northwest, the multiagency planning teams that developed Federal Lands Collaborative LRTPs continue to collaborate as Transportation Working Groups (TWGs). These TWGs focus on implementing the Collaborative LRTPs, sharing data and conducting joint studies, and coordinating on project programming. They also work to identify projects of mutual benefit and opportunities to leverage multiple funding sources to achieve project efficiencies. These TWGs arose to continue long-term collaborative efforts between the partners, including data needs and shared system information.

In Alaska, the TWG meets monthly via teleconference and holds an annual project coordination meeting, which is typically in person. During these project coordination meetings, participating agencies provide updates on their upcoming TIPs and STIPs and discuss opportunities for coordination on project programming as well as planning. The annual project coordination meetings encourage information-sharing by using the STIP as the basis for the FLMA-related projects discussed and potential future opportunities for coordination. Alaska DOT&PF presentations on statewide LRTP activities have also helped the FLMAs better understand the State's transportation planning process.⁶³

In the Pacific Northwest, the Collaborative LRTP planning team has also continued to meet to collaborate on LRTP implementation, data initiatives, and programming.

In Arizona and New Mexico, similar multi-agency groups have been meeting regularly for several years to coordinate on long-range planning, project selection, and design along highway corridors through Federal lands. Although they are not formalized as TWGs, these multi-agency collaborative relationships can help PLMAs and transportation agencies share data to inform transportation decisions.⁶⁴

Other Examples of Transportation Agency and PLMA Joint Studies and Collaboration

In addition to the Collaborative LRTPs and TWGs above, PLMAs and transportation agencies around the country have developed partnerships for data sharing. Some examples include:

FLMA Membership on MPO Policy Boards and Technical Committees

Relationships among FLMAs and MPOs can take many forms, depending on the presence of FLMA lands in a particular region. The Lake Tahoe region in California and Nevada and the National Capital Region in the District of Columbia, Maryland, and Virginia both have large FLMA presences; the U.S. Forest Service manages a large portion of the land near Lake Tahoe, and the National Park Service manages land and facilities in the National Capital Region. Both of the MPOs serving these regions have formalized the

⁶³ FHWA. 2018. "Implementation of Alaska's Long-Range Transportation Plan through Annual Project Coordination Meetings." Memorandum, part of "Federal Lands Highway-Federal-Aid Division Planning Coordination: Examples of Coordination in Action" series.

⁶⁴ FHWA. 2018. "State Department of Transportation Annual Coordination Meetings with Federal Land Management Agencies." Memorandum, part of "Federal Lands Highway-Federal-Aid Division Planning Coordination: Examples of Coordination in Action" series.

relationships with their corresponding FLMA by inviting them to serve as members of their policy boards and technical committees.⁶⁵

In the case of the Tahoe Regional Planning Agency, the U.S. Forest Service’s Tahoe Basin Management Unit serves as a voting member to the Tahoe MPO. The FS’s membership on the Tahoe MPO has helped to improve coordination between the FS and the other non-FLMA MPO members. In its 2017 [Regional Transportation Plan](#), the MPO describes how a “bundled” approach to corridor planning, which requires significant coordination among a host of partners, results in cost savings by grouping projects by geographic area. In particular, the State Route 89 Recreation Corridor Improvement Project, which the U.S. Forest Service is leading in close coordination with several other MPO member agencies, will improve access to Federal lands as well as within the region.

In the Washington, DC, area, the Metropolitan Washington Council of Governments’ (MWCOC’s) Transportation Planning Board serves as the MPO. The National Park Service’s National Capital Area manages many parks, parkways, and facilities in the region, and therefore is an important partner for many topics, including transportation. The National Capital Regional Office is an ex officio (non-voting) member of the Transportation Planning Board. The National Capital Region is complex, as it involves two States plus the District of Columbia. The MPO and the NPS National Capital Area have used this relationship to identify opportunities for collaboration both at the long-range planning level and at the project level. This is particularly important since several NPS units, specifically the Baltimore-Washington Parkway and the George Washington Memorial Parkway, are themselves major elements of the regional transportation network.

Colorado: Planning and Programming Data Sharing Pilot

In Colorado, transportation agencies and PLMAs recently completed a pilot to share planning and programming data to better inform existing plans and funding programs. The goal of the pilot was to better collect multi-agency data to feed into existing planning efforts – such as Colorado DOT’s LRTP update – and funding programs related to Federal lands transportation, such as the Federal Lands Transportation Program and the Federal Lands Access Program. FHWA’s Central Federal Lands (CFL) Division Office facilitated this pilot study and created standardized templates for each partner to assess and communicate their transportation infrastructure needs along multi-agency planning corridors.⁶⁶

Conclusion and Research Gaps

Based on the literature reviewed, data sharing research applications can be split into two possible groups:

1. **Governance:** The body of literature, applications, and case studies focused on establishing and maintaining data-sharing relationships. These are the institutional mechanisms that support data sharing between organizations.

⁶⁵ FHWA. 2018. “Federal Land Management Agency Membership on Metropolitan Planning Organization Policy Boards and Technical Committees.” Memorandum, part of “Federal Lands Highway-Federal-Aid Division Planning Coordination: Examples of Coordination in Action” series.

⁶⁶ FHWA. 2020. *Colorado Planning Pilot Close-out Report (DRAFT)*. Washington, D.C.: US Department of Transportation.

2. **Data-driven Decision-making:** The body of literature, applications, and case studies focused on data needs, inputs, outputs, tools, and decisions by lifecycle phase. These are the actual data and tools needed to inform specific decisions.

The research team identified a wide body of literature addressing both data governance and data-driven decision-making. However, there are limited resources addressing both data governance and decision-making in the context of transportation systems and PLMAs. In addition, the project team identified the following research gaps:

- The USDOT has developed a wide range of guidance and research regarding data sharing and decision-making in the context of State DOTs and MPOs, particularly regarding legislative requirements for Transportation Performance Management and Performance-Based Planning and Programming. However, there are limited resources specific to PLMAs or collaboration between transportation agencies and PLMAs.
- There is substantial literature on PLMA transportation planning and programming, but there is very limited literature on data sharing between transportation agencies and PLMAs.
- Almost all of the literature reviewed on PLMAs pertain to FLMAs. There is very limited literature on how state and local PLMAs conduct transportation planning, collaborate with transportation agencies, or share data.