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

Final Report

June 30, 2023

U.S. Department of Transportation
Federal Highway Administration

Executive Summary/Preface

Transportation data sharing partnerships are becoming increasingly important as transportation systems continue to evolve and become more complex. As the demand for transportation services grows, the need for accurate and timely data becomes paramount for staff and the public to make informed decisions. This report is a culmination of research and analysis conducted by the U.S. Department of Transportation (USDOT) Volpe Center on the topic of transportation data sharing partnerships between transportation and public land agencies.

Funded by the Federal Lands Highway Division (FLH) of the Federal Highway Administration (FHWA), the purpose of this research project is to document and evaluate the integration of project planning and data sharing into transportation planning practices and processes within public land settings. The report highlights the importance of collaboration between transportation system owners and the need to establish clear roles, responsibilities, and feedback mechanisms to ensure effective implementation of these partnerships.

While the benefits of data sharing are clear and numerous, there are several barriers to coordination and little information or guidance on how to partner across public lands and transportation agencies. The deliverables from this research have begun to address the lack of guidance and provide information on how to overcome the barriers. The case studies in Appendix 1 provide examples of successful planning and data sharing partnerships for others to learn from. The case studies and Technical Research Panel helped the project team identify information gaps that were developed into functional tools, listed in the table below. The final toolkit contains these 11 tools that cover data governance, data types, and implementation work plans to support long-lasting partnerships.

Governance Tools
Tracking of Best Management Practices
Templates for Developing Data Sharing Agreements
Synopsis of Laws and Regulations
Challenges Regarding Personally Identifiable Information
Data Tools
Existing Data Resources
User-Friendly Data Visualization Tools
Traveler Information Systems to Distribute Data
Big Data and Crowdsourced Data
Work Plans for Future Activities
Supporting Data User Groups
Communicating Funding Opportunities
Ongoing Technical Support

The critical final step in the research project is to publish and market the Planning and Data Sharing Partnership Toolkit widely. The most likely stakeholders for distributing the Planning and Data Sharing Partnerships toolkit are federal offices, state DOTs, academic institutions, non-profits, and public lands advocacy groups. However, other groups may become apparent as the toolkit becomes more widely known.

As transportation systems continue to evolve, it is critical to stay up to date on the latest developments in transportation data sharing partnerships. This report serves as a resource for transportation professionals and stakeholders looking to improve their understanding of the benefits and challenges of these partnerships, and to develop effective strategies for successful implementation.

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Abbreviations

The abbreviations for the following terms appear in this report:

AASHTO   American Association of State Highway Transportation Officials
DOT   Department of Transportation
FHWA   Federal Highway Administration
FLH   Federal Lands Highway Division
IT   Information Technology
MOU   Memorandum of Understanding
MPO   Municipal Planning Organization
PLMA   Public Land Management Agencies
TRP   Technical Research Panel
USDOT   United States Department of Transportation

Introduction

Recreational travel to public lands is becoming increasingly popular and is expected to continue to rise in the coming decades. This trend has caused, and will continue to cause, a surge in the use of transportation infrastructure accessing and navigating these lands, which raises concerns about congestion, crowding, and the impact on natural resources and safe travel. It is essential that agencies such as the Federal Highway Administration's (FHWA) Federal Lands Highway (FLH) Office, state Departments of Transportation (DOTs), local governments, and Public Land Management Agencies (PLMAs), work together to ensure the public has safe and efficient access to public lands, which generate significant economic benefits at the local, regional, and state levels. It is critical for these stakeholders to establish effective data sharing partnerships to avoid duplication of collection efforts and find opportunities to align schedules when appropriate. Partnerships that establish successful exchanges of data provide valuable insight into addressing the challenges of increased visitation to public lands. Agencies can use robust data to make informed decisions about infrastructure improvements, traffic management strategies, and resource protection measures. The cultivation of these processes ensure that public lands remain accessible and enjoyable for generations to come. Unfortunately, several barriers to coordination—such as staff capacity, incongruent agency missions, and incompatible data platforms—prove difficult to overcome.

The specific goals of this research were to:

- Identify examples of information coordination between PLMAs and transportation partners that result in process efficiencies, cost savings, and more effective transportation system delivery and/or management.
- Develop a suite of tools, resources, and usage guidelines to aid PLMAs and their partners in improving data coordination for better transportation systems.

This final report documents the culmination of research conducted from September 2020 through June 2023.

Study Approach

The primary objective of the research project was to identify examples of cross-agency coordination between PLMAs and transportation agencies that result in process efficiencies, cost savings, and better transportation system delivery and/or management. The project focused on partnerships that collaborated at the corridor-scale. Out of these observations, the project aimed to develop a suite of tools, resources, and usage guidelines to aid PLMAs and transportation agencies in sharing data and improving coordination for better transportation systems.

Process

In order to focus this research on planning and data sharing partnerships, the project team developed high-level research questions:

- Why do PLMAs and transportation agencies share data?
- How do PLMAs and transportation agencies share and use data?
- What are the challenges to data sharing?

These high-level questions served as the basis for the literature review and other tasks in the project. To address these questions, the project team then developed more specific research questions:

- What types of data do PLMAs and transportation agencies use to support planning on public lands?
- How do PLMAs and transportation agencies use data to inform decision-making?
- What are the characteristics of successful PLMA and transportation agency data sharing examples?
- What are the barriers to effective data sharing between PLMAs and transportation agencies?
- What do PLMAs and transportation agencies need to share data more effectively?

The study began answering these questions by conducting a literature review of state and federal publications, academic journals, and related documents; analyzing existing data and tools; as well as engaging in conversations with planning staff and technical experts. To conduct the literature review, the USDOT's Volpe National Transportation Systems Center (Volpe Center) reviewed 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). The team identified gaps in the existing literature that informed the content of the study methodology. The final literature review is included as an appendix in this final report.

In addition to the literature review, the Volpe Center also sought answers by engaging with a diverse selection of PLMAs and government agencies involved in some form of a data sharing partnership. The Volpe Center held discussions with these groups and developed a selection of case studies to document their experiences and lessons learned during their partnerships. The process of holding these discussions and developing case studies was nationally focused and not limited to any single location.

Technical Research Panel

As part of the overall project plan, a Technical Research Panel (TRP) was established to provide guidance and input to the project team. The TRP was comprised of representatives from various stakeholder groups, including federal and state agencies, local planning departments, nonprofit organizations, and private practitioners. TRP membership included at least one representative from each of the following groups: Bureau of Land Management, Bureau of Reclamation, city planning and/or department of transportation, county planning, economic development agency/organization, Federal-aid Division Office representation, National Park Service, nonprofit parks advocacy or research representation, private planning or engineering practitioner, state DOT, regional planning, state or local parks and/or other land management departments, United States Forest Service, university research representation, and US Army Corps of Engineers (Table 1). The TRP also had the flexibility to invite additional technical staff from other federal agencies as needed to provide expertise and advice to the TRP and project management team. Table 2 summarizes the objectives and findings of the panel meetings over the duration of the study.

Table 1: Technical Research Panel by Agency

Name	Agency	Role
1. Cassie Bhat	ICF International	Senior Management Consultant
2. Meredith Bridgers	US Army Corps of Engineers	Outdoor Recreation Planner
3. Kayla Carter	Northeast Tennessee Regional Economic Partnership	Manager, Outdoor Development
4. Randy Chatterton	Bureau of Land Management	Colorado Office Staff
5. Hanna Cockburn	City of Greensboro	Transportation Planner
6. Erica Cole	National Park Service	Transportation Planner
7. Stacy Corless	Mono County, California	Board of Supervisors
8. Emily Douce	National Parks Conservation Association	Director of Operations and Park Funding
9. Rob Gillespie	United States Forest Service	National Program Manager
10. Michael Gray	Virginia Department of Transportation	Salem District Planning Manager
11. Maureen Gresham	FHWA Pennsylvania Division Office	Community Planner
12. Matt Johns	Rapides Area Planning Commission	Executive Director
13. Marlene Kelley	Bureau of Indian Affairs	Supervisory Highway Engineer
14. Tom Lamar	Latah County Idaho	Commissioner
15. Daniel Pietkowski	University of Nebraska	Assistant Professor
16. Dan Staton	Bureau of Reclamation	Operations and Maintenance Structures Program Manager
17. Jaime Sullivan	Western Transportation Institute	Senior Research Engineer
18. Peter Tomczik	US Fish and Wildlife Service	Transportation Asset Management Coordinator
19. Rick Williams	Oregon Department of Transportation	Principal Planner

Table 2: Summary of Research Panel Meetings

Meeting Date	Meeting Objective	Meeting Outcome
January 11, 2021	Identify examples of cross-agency information coordination between PLMAs and transportation partners that result in process efficiencies, cost savings, and a development of tools and resources.	Initial establishing of criterion for case studies and context for research.
March 17, 2021	Introduce two-week window for methodology review.	Further established a criterion for selecting case studies and the contexts that should be included in the research.
March 4, 2022	Project team presents data collection process including evaluation of 24 case study candidates, discussions with 14 project groups, and documentation of case study interviews. Four common themes for project motivations include: analyzing travel, understanding partner priorities, overcoming institutional barriers, and collaboration on specific tasks.	The results of data sharing partnerships included coordinated plans and projects, enhanced awareness of partner goals and projects, identifying common priorities and objectives, and coordinated project delivery.
June 21, 2022	Project team requests TRP participants to review and comment on 12 drafted case studies. As a part of the toolkit development process, the group reviews what tools already exist and where gaps exist to inform what tools are necessary.	The session helped establish a comprehensive understanding of existing resources and where gaps exist in data sharing tools. The creation of new tools was determined to include governance tools, data tools, and work plans to aid with project implementation.
September 7, 2022	Identify several actions, including creating a summary of current data sharing processes and obstacles, creating a format for sharing best practices, including laws and regulations related to data sharing, providing resources outside of the federal realm, and identifying an IT-focused user group.	Initiated training sessions and working groups, reached out to Municipal Planning Organizations (MPOs) and attending conferences, and created a monitoring phase to determine the effectiveness of the guide.
January 11, 2023	A presentation of the toolkit, designed to provide governance and data tools for transportation professionals. The governance tools include best management practices, data sharing agreement templates, synopsis of laws and regulations, and challenges stemming from personally identifiable information (PII).	Discussed work plans for future activities, including supporting data user groups, communicating funding opportunities, and ongoing technical support.
May 26, 2023	A presentation of the final toolkit formatting and overview of remaining research project deliverables. This was the final meeting for the research panel.	Limited comments and discussion of final toolkit in advance of panel review. The participants noted that they have been engaged along the process and are familiar with the outcomes.

Findings

The project team answered the overarching and specific research questions as the study progressed from literature review to case studies and eventually toolkit development with consistent input from the TRP along the way. The findings are intended to justify and promote planning and data sharing

partnerships, define a path to form those partnerships and initiate data sharing, and help stakeholders overcome challenges that others have faced when establishing lasting data sharing partnerships.

Why do PLMAs and transportation agencies share data?

Part of the answer to why data is shared relates to legislative requirements in the transportation planning process that must be followed by state DOTs. The literature review highlighted important legislative context for the transportation planning process. Title 23 of the U.S. Code (USC) is the primary legislation governing transportation decision-making for PLMAs and transportation agencies. Additionally, 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 authorized several programs and requirements regarding transportation planning, programming, performance management, and other decision-making. There are no nationwide requirements for state and local PLMAs, but many states have laws and regulations pertaining to non-federal PLMAs. With these requirements in mind, transportation agencies and PLMAs can identify opportunities for collaboration, such as a long-range transportation plan.

The case studies revealed motivations beyond the legislative requirements for sharing data. Among them are:

- Identifying shared priorities, missions, goals, and objectives
- Developing a common understanding of how projects from each agency interact with other agencies' existing or planned efforts
- Leveraging additional data to make project planning and analysis more robust
- Analyzing travel patterns, transportation networks, and gaps at a regional scale
- Addressing challenges that cross jurisdictional boundaries, such as congestion and environmental protection
- Overcoming institutional barriers to data sharing, such as firewalls, incompatible technologies, and inefficient one-off data transfers
- Working together on a particular task, such as a project of mutual benefit

How do PLMAs and transportation agencies share and use data?

There are seemingly endless ways to share and use data between PLMAs and state transportation agencies; however, there are critical activities that should happen before any data files are transferred. The study's findings show that building relationships and trust between the involved parties was critical and having a designated champion or representative in a leadership role was important. Related to the role of a champion, the study found communication of the importance of data sharing partnerships to agency leadership and the public led to greater support.

The mechanisms used for data sharing varied depending on the situation, including formal and informal methods. Formal data sharing partnerships use agreements, such as a Memorandum of Understanding (MOU), to establish roles and responsibilities as well as what data partners share, data management protocols, privacy and access limitations, and other considerations. An informal data sharing partnership may become formalized over time.

The research team did not define a specific set of data that should be shared across different partnerships, as the context of transportation planning varies by location and other circumstances. Rather, the team found it is important for all partners in a data sharing partnership to have access to the

same technologies and platforms. In some cases, partners achieved this with commonly available platforms, such as online mapping software. In other cases, partners use more complex platforms developed and maintained by third-party vendors. In either case, it is important for partners to have access to the data platforms and the training and resources needed to analyze the data.

The results of data sharing partnerships included coordinated plans and projects, enhanced awareness of partner goals and projects, identifying common priorities and objectives, and coordinated project delivery. These results, in turn, helped the PLMAs and transportation agencies with transportation decision making. Additionally, while the study focused on transportation access to public lands, the high-level findings are universal across sectors and stakeholders.

What are the challenges to data sharing?

Challenges to planning and data sharing include:

- **Limited leadership support** – Leadership in an organization directs priorities and where to invest limited funding and staff resources.
- **Staff turnover across agencies** – People change jobs and often do not overlap with their successor. The result can be that cross-agency relationships do not last when they are tied to an individual instead of a designated staff role or position.
- **Unfamiliar organizational structures** – Other agencies can seem opaque to outsiders who do not know the right person to contact for data sharing.
- **Limitations due to agency policies** – Agencies may have specific rules about what data can be shared externally and how new data can be brought into their systems. While these limitations are intended to protect the organization from sharing sensitive data or cyberattacks, there may be ways to work with information technology (IT) staff to allow data sharing under certain conditions.
- **Other work taking priority** – This challenge relates to leadership support but also points to issues that stem from many demands on individual staff.

Planning and Data Sharing Partnership Toolkit

There is no single solution to address all these challenges; however, there are actions that can reduce these barriers. The TRP and case studies helped identify a set of 11 tools (Table 3) to help reduce barriers to planning and data sharing partnerships that the project team organized into three categories. These tools together form the Planning and Data Sharing Partnership Toolkit.

- **Governance Tools** – These are tools that provide support and resources related to different agencies working together successfully to achieve their common goals. They touch on formal agreements, legal requirements, and best practices.
- **Data Tools** – These are tools that focus on the types of data that agencies typically share for transportation planning across jurisdiction boundaries. The tools include existing data clearinghouses and the application of different types of data.
- **Work Plans for Future Activities** – The work plans are intended to be action items for different stakeholders to expand and support planning and data sharing partnerships. They relate to funding and ongoing support for stakeholders to pursue partnerships for coordinated transportation planning, including regular updates of the toolkit itself.

Table 3: List of Planning and Data Sharing Tools by Category

Governance Tools
Tracking of Best Management Practices
Templates for Developing Data Sharing Agreements
Synopsis of Laws and Regulations
Challenges Regarding Personally Identifiable Information

Data Tools
Existing Data Resources
User-Friendly Data Visualization Tools
Traveler Information Systems to Distribute Data
Big Data and Crowdsourced Data

Work Plans for Future Activities
Supporting Data User Groups
Communicating Funding Opportunities
Ongoing Technical Support

Overall, the research project emphasized the importance of data sharing partnerships between PLMAs and transportation agencies for better transportation systems. The project's findings and toolkit will serve as a valuable resource to aid PLMAs and transportation agencies in sharing data and improving coordination for better transportation systems.

Planning and Data Sharing Partnerships Implementation Work Plan

The research findings justify and encourage planning and data sharing partnerships, which is a long-term effort. The scope of this research project does not include ongoing support for disseminating the Planning and Data Sharing Partnership Toolkit or technical assistance to help stakeholders establish planning and data sharing partnerships. Rather, it provides a high-level implementation work plan for FHWA and other stakeholders to share the toolkit and establish a process for ongoing support for such partnerships.

A comprehensive work plan is crucial for successfully implementing any project or initiative. It is an active guide that requires regular updating to address changes in resources, new challenges, and priorities. A work plan provides a clear roadmap of what needs to be done, who is responsible for each task, and when each task should be completed. It helps to identify the next steps and limitations that must be addressed to move a project forward. FHWA and transportation planning stakeholders must justify agency spending and a well-developed work plan can establish a strong business case for investing in project implementation. By outlining the specific benefits of planning and data sharing partnerships and the resources required to support them, a work plan can demonstrate the need for investment, as well as a clear understanding of the FHWA resources required to achieve project objectives.

Work Plan Audience

When developing an implementation work plan, it is important to consider what is being implemented and the target audiences for each potential task. This project can be viewed as having two implementation work plan audiences: the stakeholders that engaged in the research and have interest

in seeing it progress beyond the toolkit being created and the stakeholders wanting to create partnerships (toolkit users).

The target audience for the Planning and Data Sharing Partnerships work plan to implement the findings of this research project and their likely roles are in Table 4, which is also part of the Ongoing Technical Support tool in the toolkit. The federal agencies in the table include FHWA who invested in the research, other federal agencies that participated in development of the research needs statement that led to the research being funded, and others that create or compile datasets for public use. It is also important that the work plan conveys to groups that financially support the specific partnership being established that their investment will result in tangible transportation improvements by highlighting the potential benefits of implementing the plan, such as increased efficiency, reduced costs, and improved safety.

Work plan task owners and tool developers are also champions of the Planning and Data Sharing research. They are involved in the development of the final, more detailed, work plan and committed to its success. Their involvement and commitment help ensure that the plan is implemented effectively and efficiently.

Table 4: Planning and Data Sharing Partnership Implementation Roles and Responsibilities

Entity	Contribute to keeping tools updated	Outreach and marketing to inform audience of TA*	Provide TA Services as needed	Funding support to provide TA services
Federal Agencies	✓	✓		✓
State Agencies	✓	✓		
Local Agencies + Technical Assistance Programs[1]	✓		✓	
Academic Institutions, Non-Profits	✓	✓	✓	
Public Land Advocates	✓	✓		
Software + Database Companies	✓			

*TA = technical assistance

Work Plan Components

A valuable work plan is a comprehensive document that outlines the objectives, activities, roles and responsibilities, time frame, and measurable outcomes of a project. The objectives should be clear, specific, and achievable within the defined time frame. The activities needed to achieve these objectives are included along with how the work plan will be shared with stakeholders and how feedback will be gathered. The Planning and Data Sharing work plan described in this document is a high-level version of an implementation work plan to move the research forward. FHWA and other stakeholders will need to create a more detailed work plan that also includes a time frame that clearly identifies when each task will be completed, measurable outcomes to evaluate the project's success, and feedback mechanisms to

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[1] Technical assistance programs include Local Technical Assistance Programs (LTAPs, https://www.fhwa.dot.gov/clas/ltap/) and Tribal Technical Assistance Programs (TTAPs, https://www.fhwa.dot.gov/clas/ttap/).

gather feedback on the project's progress. Finally, to help ensure the successful implementation of the work plan, potential Planning and Data Sharing pilots should be defined, along with identifying possible funding sources.

Conclusion

Transportation planning in and around public lands is important, especially given the rising amount of recreational travel. The congestion from this visitation crosses boundaries between public lands and multiple transportation agencies. It is essential that agencies work together to ensure the public has safe and efficient access to public lands. These agencies can benefit from sharing data and coordinating transportation planning by avoiding duplication of data collection efforts and identifying opportunities to align capital construction projects or operational changes. The agencies involved can leverage robust data collection to make informed decisions about infrastructure improvements, traffic management strategies, and resource protection measures.

While the benefits of data sharing are clear and numerous, there are several barriers to coordination and little information or guidance on how to partner across public lands and transportation agencies. The deliverables from this research have begun to address the lack of guidance and provide information on how to overcome the barriers. The case studies in Appendix 1 provide examples of successful planning and data sharing partnerships for others to learn from. The tools in the Planning and Data Sharing Partnership Toolkit were identified through a combination of gap analysis from a literature review and case studies, and input from the Technical Research Panel. The final toolkit contains 11 tools that cover data governance, data types, and implementation work plans to support long-lasting partnerships. The next steps in supporting Planning and Data Sharing Partnerships are to make the toolkit available to a wide audience of stakeholders and provide support to transportation agencies and public lands management agencies in their efforts to coordinate data and planning.

Appendix 1: Case Studies
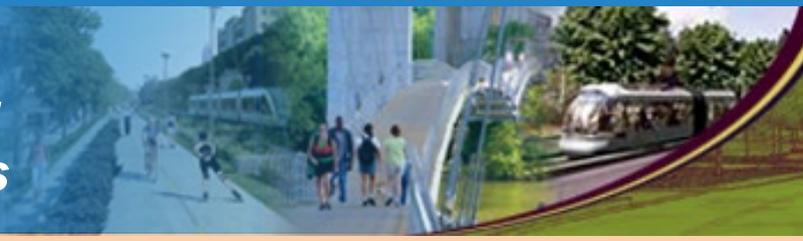
Alaska Transportation Working Group
Interviewed Organization(s): Federal Highway Administration, Alaska Department of Transportation & Public Facilities, U.S. Forest Service, National Park Service)

Forming a Data Sharing Partnership

The Alaska Transportation Working Group (TWG) formed in 2008 and consists of the following members:

- Federal Highway Administration (FHWA), Western Federal Lands (WFL) Division and Alaska Division
- Bureau of Land Management (BLM)
- National Park Service (NPS)
- U.S. Fish and Wildlife Service (FWS)
- U.S. Forest Service (FS)
- Alaska Department of Transportation & Public Facilities (DOT&PF)
- Alaska Municipal League (AML)
- Denali Commission
- Fairbanks Area Surface Transportation (FAST) MPO (joined in 2022)
- Anchorage Metropolitan Area Transportation Solutions (AMATS) MPO (joined in 2022)

The TWG initially formed to develop a Collaborative Long-Range Transportation Plan (LRTP) for federal lands in Alaska. At that time, the national surface transportation authorization required that federal land management agencies develop LRTPs, and the partners in Alaska chose to work together to develop their first LRTPs in the state together. Through this process, they developed a forum for sharing data, collecting new data to support research, and planning efforts, and coordinating project programming and delivery. Since formation, the TWG completed its initial LRTP in 2012 and an update in 2020, conducted joint research on a range of transportation management topics, and has been a forum for members to identify and complete projects of mutual interest. The TWG continues to meet monthly via teleconference and holds annual project coordination meetings.

Lessons Learned

Lesson #1 – The project champion

One lesson of the Alaska TWG is the importance of a champion who can convene, organize, and support the group's activities. This champion is responsible for keeping the group moving forward and providing vision and institutional memory. WFL has assumed the facilitation lead for the Alaska TWG, and individual agency staff play the champion role for different TWG focus areas.

Lesson #2 – Set common goals

It is important to have established, common goals and objectives to drive a collaborative planning effort's success. This can take the form of a Collaborative LRTP like the Alaska TWG, or it could be another type of organizing vision and purpose.

Data Fields & Tools

Because the TWG was originally formed to develop the first Collaborative LRTP in the state, it was not initially obvious what data the group needed. The group worked together to identify the data needed to establish baselines, analyze trends, and develop performance measures for the LRTP's six goal areas: system management, user experience, safety and mobility, environment, climate change, and partnerships. Through this process, the TWG members shared existing data on their respective transportation systems. The TWG also identified data gaps and developed joint research projects to fill those gaps. These projects included the Collaborative Visitor Transportation

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Survey (CVTS), which conducted a survey of visitors to federal lands across Alaska; a safety performance baseline analysis that combined a wide range of multimodal transportation incident data; and case studies of climate change impacts on transportation infrastructure such as permafrost melting and coastal erosion.

Implementation Challenges

The TWG's first challenges were organizational in nature. It took substantial work to identify the correct contacts at each agency and to establish the working group. The initial TWG members also had to communicate the value of the group to their agencies' leadership to justify the time and resources required for participation. Maintaining agencies' management support for the TWG has been an ongoing challenge, yet critical to the group's success. To justify the TWG's effort, the TWG communicates its achievements in planning, programming, and project coordination. The TWG has particularly benefitted from the Federal Lands Access Program (FLAP) because they have demonstrated how the TWG's project coordination has led to projects of mutual benefit. As the TWG continues to collaborate, limited staff resources in member agencies presents an additional challenge to implementation, particularly for smaller agencies.

The TWG has also encountered data-related challenges in terms of both data sharing and compatibility. In terms of data sharing, TWG has struggled to overcome agency firewalls and access to data sharing platforms. Different agencies' IT departments support or block different data sharing platforms, which makes it difficult to transfer files between agencies. In terms of data compatibility, different agencies often collect or maintain data in different formats or with different attributes, which can make it difficult to conduct analyses across agencies. For example, the TWG has put substantial effort into developing a common understanding of transportation asset condition, which has required cross-walking between different agencies' asset management datasets.

Results/Main Takeaways

The Alaska TWG has achieved success in a wide range of joint projects, including the development of two Collaborative LRTPs, joint research projects, and ongoing project coordination. The TWG has provided a forum for identifying and developing FLAP projects and other projects of mutual benefit. Coordination on projects across jurisdictions has helped the TWG members achieve more efficient projects; for example, combining nearby projects can reduce contractor mobilization costs. TWG members also stress the value of relationship-building. Understanding the transportation system outside of agency borders and knowing the right staff at the TWG partner agencies to work with has been valuable for a range of planning and project needs. The TWG membership continues to grow as new agencies see the benefit of coordinating with the TWG.

Looking Forward

The Alaska TWG continues to work together after over 14 years of collaboration. The TWG currently focuses on implementation of its 2020 Collaborative LRTP update. The TWG also continues to work on improving data collection and standardizing as much data as possible to encourage better coordination across jurisdictions. The Alaska TWG's model of collaboration has been duplicated through a TWG in Oregon and Washington, and integrated planning efforts in Colorado and Nevada have also drawn on lessons from the Alaska TWG.

Quick-Reference Information

- **Project Phase:** System and Project Planning, Project Selection and Programming, Project Design and Environmental Review
- **Agencies/Partners Involved:** Federal Highway Administration, Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, U.S. Forest Service, Alaska Department of Transportation & Public Facilities, Alaska Municipal League, Denali Commission, Bureau of Indian Affairs, Fairbanks Area Surface Transportation MPO, Anchorage Metropolitan Area Transportation Solutions MPO
- Location: Alaska (statewide)
- **Type(s) of Data Shared:** Transportation systems geospatial data, asset condition, safety, visitation, environment, climate, and resilience
- **Method of Data Sharing:** Working group charter, collaborative planning efforts, annual project coordination meetings

Special Thanks

- Kevin Doniere, Alternative Transportation Program Manager, Alaska Region, NPS
- Amy Thomas, Deputy Director of Engineering, U.S. Forest Service
- Paul Escamilla, Project Engineer, U.S. Forest Service
- Eric Taylor, Transit Program Manager, Alaska Department of Transportation & Public Facilities
- Roxanne Bash, Transportation Planning Team Lead, FHWA WFL
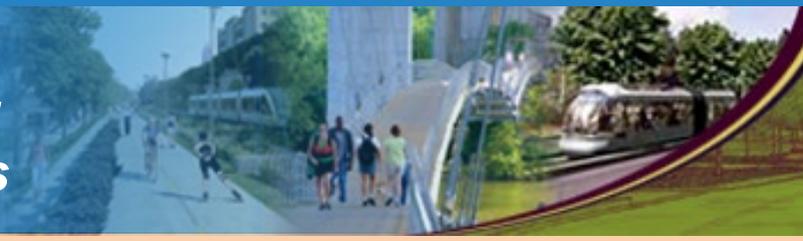
Collaborative Visitor Transportation Survey
Interviewed Organization(s): USDOT Western Federal Lands Highway Division, US Forest Service, USDOT Volpe Center

Forming a Data Sharing Partnership

The Alaska Transportation Working Group (TWG) – a group of federal land management and transportation agencies in Alaska – convened in 2008 to develop their first Collaborative Long-Range Transportation Plan (LRTP) and to coordinate on projects of mutual benefit. While developing their first LRTP, the TWG identified a need to collect better data on user experience. As such, they conducted a statewide, multi-agency survey of users of federal lands to better understand their transportation experiences to and within federal lands sites.

One barrier to collecting user survey data is the need to obtain Office of Management and Budget (OMB) clearance for survey questions in compliance with the Paperwork Reduction Act (PRA) of 1980. To address this challenge and to create a resource for other public lands and transportation agencies across the U.S., the TWG developed the Collaborative Visitor Transportation Survey (CVTS), which is a generic clearance with a range of public lands transportation-related questions. The Alaska TWG implemented the CVTS at several public lands sites across Alaska in 2016 and used the results of the survey in the 2020 Collaborative LRTP update.

The CVTS is a multi-agency collaboration with a range of specific roles, led by FHWA's Western Federal Lands (WFL) Highway Division with technical support from the U.S. Department of Transportation's Volpe National Transportation Systems Center. The U.S. Forest Service houses the CVTS Generic Clearance and submits use requests to OMB for final approval. Other CVTS users and contributors include the Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, U.S.

Lessons Learned

Lesson #1 - Identify a project champion

The CVTS demonstrates the need for a project champion to work with a range of project partners and move the tool forward. This project had a few key roles: project management (WFL), social science technical lead (USDOT Volpe Center), and tool host (U.S. Forest Service). The project champion is particularly important for maintaining institutional memory and bringing in new agency contacts as staff turnover.

Lesson #2 - Design for flexible application

One aspect of the CVTS that has made it successful is that its creators designed it to be applicable to a wide range of agencies and contexts. By designing the survey compendium with a range of questions that are generally useful for agencies who want to collect visitor transportation survey data, they have helped make the CVTS sustainable beyond their initial survey effort and created a tool that other agencies have used throughout the U.S.

Army Corps of Engineers, and the Alaska Department of Transportation and Public Facilities.

Data Fields & Tools

The CVTS is a tool for collecting social science survey data to understand the transportation experiences and perceptions of public lands users. The CVTS generic clearance includes an OMB-approved compendium of

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transportation survey questions and data collection methodologies. Public lands and transportation agencies can use the approved questions and data to measure user experience performance metrics related to transportation. They can also quantify users' transportation experiences to help target transportation improvements. By providing an OMB-approved compendium of questions, the CVTS streamlines the OMB approval process, reducing the time and expense required to conduct individual surveys. The CVTS allows for more uniform survey data responses across users by asking standard questions.

Implementation Challenges

The CVTS is a complex effort that requires staff input from several federal agencies. Identifying appropriate contacts from agencies and maintaining relationships despite staff turnover has been a challenge.

Having a consistent champion to maintain and promote the CVTS has been important to the tool's success. USDOT Federal Land Highways (FLH) has been the champion of the CVTS. Their role coordinating transportation investments across FLMAs gives them insight into the importance of user experience data when prioritizing projects. Additionally, FLH understands the OMB process as a federal agency that has engaged in the process and the value of having a shared streamlining tool.

The CVTS team emphasized communicating the value of the CVTS to potential users and to the OMB to ensure support for using the generic clearance approach for other topics of national and multi-agency interest.

Results/Main Takeaways

As CVTS is used consistently over time, agencies can monitor how patterns and perceptions shift. The CVTS streamlines survey collection by eliminating the need for separate agencies to go through the full OMB process each time, reducing administrative costs and timelines for

developing user surveys. Some examples of projects that have used the CVTS include:

- Alaska: The BLM, USFS, USFWS, and the NPS collaborated on a statewide survey to measure visitor experience performance metrics. The partners then incorporated the data into their 2020 LRTP update.
- White Mountain National Forest (WMNF): The USFS collected information across several sites to evaluate and improve visitor transportation and recreation management for the WMNF.
- Beaver Lake: U.S. Army Corps of Engineers used information gathered to update of the Beaver Lake Master Plan and Shoreline Management Plan.
- Millennial and Baby Boomer Mobility Preferences: U.S. Fish and Wildlife (FWS) administered a survey to understand Millennial and Baby Boomer interests and preferences regarding access and circulation within FWS units in three western states – California, Colorado, and Texas.

Looking Forward

The CVTS is a continuing effort. WFL, Volpe, and USFS continue to manage the CVTS generic clearance and support agencies interested in using it. Looking forward, the CVTS team would like to share more information on how agencies have used surveys through the CVTS to improve transportation plans and projects. The CVTS team would also like to provide a clearinghouse for CVTS survey data in the future.

Special thanks:

- Roxanne Bash, Transportation Planning Team Lead, FHWA WFL
- Kenli Kim, Landscape Restoration and Ecosystem Services Research National Program Leader, USFS
- Margaret Petrella, Social Scientist, USDOT Volpe Center

Quick-Reference Information

- **Project Phase:** System and Project Planning
- **Agencies/Partners Involved:** Federal Highway Administration, Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, U.S. Forest Service, Alaska Department of Transportation and Public Facilities
- **Location:** Alaska (statewide)
- **Type(s) of Data Shared:** Visitor transportation survey data
- **Method of Data Sharing:** OMB Generic Clearance, compendium of survey questions, coordinated survey data collection
- **Additional Resources:** Collaborative Visitor Transportation Survey (CVTS)

Cape Cod Commission Outer Cape Bike and Pedestrian Master Plan
Interviewed Organization(s): Cape Cod Commission

Forming a Data Sharing Partnership

In 2017, Cape Cod Commission (CCC) staff, in collaboration with the National Park Service Cape Cod National Seashore (NPS CCNS), completed the Outer Cape Bicycle and Pedestrian Master Plan (OCBPMP). This plan creates a framework for an interconnected bicycle and pedestrian network linking the towns of Wellfleet, Truro, and Provincetown with the Cape Cod Rail Trail (CCRT), CCNS, and other destinations within the three communities. There were numerous attempts over the years to initiate this project, but it did not formally begin until CCNS, the CCC, and representatives from the three regional towns received funding through the Federal Transit Agency Transit in Parks (FTA TRIP) program.

A partnership to share data was necessary as there were several gaps in data between the various stakeholders. For instance, NPS was able to provide cultural resource data within its boundaries, however for areas outside of these zones, the data was gathered from the Massachusetts Historical Commission's GIS database. NPS and towns did not have road data (such as geometries or traffic counts) for regional roads, so the CCC provided their own collected data on bike and pedestrian traffic and collaborated with MassDOT. Necessary data to accomplish the project were dispersed among many different agencies and stakeholders, requiring efforts for collaboration.

Data Fields & Tools

Data for the project included roadway data, GIS data of regional roads and paths, bike and pedestrian traffic data, as well as subjective information such as "roadway characteristics" collected from the general public at community meetings. CCC compiled data collected over the years of the project and provided GIS services,

Lessons Learned

Lesson #1 – Establish efficient data digitization processes

Digitizing data was found to be a time-consuming process. Some digitizing needed to be done by GIS staff, particularly converting raw data into usable data for GIS. Another form of data that required digitization was the input of public comments from community meetings. Sometimes this information was based on hand drawn maps and handwritten notes. There is a need to find means to modify qualitative data into quantitative data in a practical and time-efficient manner.

Lesson #2 – Establish mechanism for continued collaboration

A challenge that the partnership team encountered was that there was no mechanism to keep the team collaborating. In an ideal data sharing partnership, there would be an implementation plan to keep the partnership going. For instance, this could be an MOU incorporated as a part of the process to help determine when the plan is completed. After an initial plan is created, those involved are often exhausted and therefore the project lacks a champion to keep it going. The project team acknowledged that having some mechanism to help achieve an agreement among involved parties would have been beneficial earlier in the collaborative process. In addition, rotating the leads of meeting can help keep things fresh and allows smaller towns and collaborating stakeholders to have more buy-in in initiatives.

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including sharing GIS shape files, which were used to layer a shared web map.

Implementation Challenges

Developing the scope of this data sharing partnership was a lengthy process, requiring nearly a year and involved both park land and non-park land involvement. Determining the responsibilities of various partners was a challenging process. One of the initial relationships established was between CCC and CCNS, collaborating under a cooperative agreement related to data sharing and planning. The partnership helped streamline the process of navigating the CCNS protocol for requesting and receiving data. This relationship was integral when interacting with local towns, particularly when pertaining to sensitive subject matter such as delegating responsibilities between NPS managing federal land and nearby towns facilitating non-park lands.

The project team achieved success sharing data and garnering community buy-in when developing the Bike and Pedestrian Master Plan. Despite this, the team has noted challenges related to executing the concepts presented in the Master Plan, siting slow progress as far as implementation is concerned. CCC does not own any land for implementation. A primary difficulty in implementing the initiatives developed thanks to shared data resources is a lack of a "champion" to push initiatives forward toward successful implementation. The towns and their unique governance and predispositions have been the cause of slow progress.

Results/Main Takeaways

CCC was able to serve as a community liaison between CCNS and local towns connected along the bicycle and pedestrian network of the Cape Cod Rail Trail. This relationship underscores the benefit of having a partner in the community that has the trust of the public to gain their participation/buy-in. Establishing the relationship early helps the set up for sharing information. In the context of developing the OCBPMP, CCC facilitated discussions between CCNS and local partners, fostering improved trust and cooperation among the team.

Looking Forward

The data shared among the partnership established a good foundation of support for planning and decision making by the steering committee. Since the project, base data layers have been updated; however, there is not a regularly updated data set on the bike routes. This project was generally singular in approach, and there have been no major changes since.

Special thanks:

- Steven Tupper, Director of Transportation Program, Cape Cod Commission
- Sarah Korjeff, Planning staff, Cape Cod Commission
- Martha Hevenor, Planning Staff, Cape Cod Commission

Quick-Reference Information

- **Project Phase:** System and Project Planning
- **Agencies/Partners Involved:** Cape Cod Commission, National Park Service Cape Cod National Seashore
- **Location:** Cape Cod, MA
- **Type(s) of Data Shared:** Traffic volume data and cultural/environmental resource data
- **Method of Data Sharing:** GIS layers accessed via ArcGIS

FHWA Planning & Data Sharing Partnerships Case Study Series

Colorado Integrated Planning Project

Interviewed Organization(s): FHWA Central Federal Lands (CFL) Highway Division, Colorado Department of Transportation (CDOT), Grand Valley Metropolitan Planning Organization / Mesa County Regional Transportation Planning Office

Forming a Data Sharing Partnership

As part of the Colorado Integrated Planning Project, the Federal Highway Administration (FHWA) Central Federal Lands (CFL) Division convened a wide range of public land management agencies (PLMAs) and state and local transportation agencies to share information on project needs at regional and corridor scales. CFL established this partnership to determine where organizations had similar gaps in data and develop and create a communal platform to address these needs. Another goal of this data-sharing effort has been to support integrated planning to ensure state and local transportation agencies incorporate PLMA needs into their plans and programs, and vice versa. This can help agencies identify opportunities to collaborate on projects of mutual interest and can inform future funding and project prioritization. Through the Project, the CFL hosted a series of workshops and created an online GIS platform for local agencies to share standardized data on identified project needs.

Data Fields & Tools

Several agencies found that their primary gaps were qualitative data, particularly data demonstrating why travelers are going to a place. The CFL workshop series brought PLMAs and state and local transportation agencies together to share information on travel needs and to document qualitative data in a standardized way on a shared online GIS platform. Partnering agencies were then able to use this shared and standardized data to collaboratively build long term transportation plans and other building projects. Agencies were able to provide data and information they had available, allowing different agencies at the local, state, and federal level to work together towards common goals.

Lessons Learned

Lesson #1 – Create a standard platform for data sharing

CFL led workshops to review partner datasets and teach partner agencies how to access shared datasets, particularly HPMS data from CDOT. CFL invited participating agencies to incorporate their data into a shared online GIS platform and provided training on how to use the GIS platform. Agencies then added their transportation network and project needs datasets. As a result, the partners shared data on 170 projects throughout the state, strengthening the network writ large.

Lesson #2 – Link data sharing to future planning, projects, and funding opportunities

The Colorado Integrated Planning Project provided an opportunity for agencies to align their long-range transportation plans and programs of projects. The partners also used the findings to identify projects of mutual benefit and develop strategies to pursue funding through grant programs and other funding sources. This is especially important for programs like the Federal Lands Access Program (FLAP), for which PLMAs are not eligible applicants. Nevertheless, working with state, local, and tribal partners to support their application process is imperative.

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The Colorado Department of Transportation (CDOT) and CFL entered into a data sharing agreement at the start of the project. CDOT shared Highway Performance Monitoring System (HPMS) data from their road dataset, and the partners used this data, along with PLMA road data, to supplement gaps in agency datasets, as well as to refine existing programmed projects.

By sharing data sets and working together, the agencies also developed a greater understanding of their respective planning processes. For example, local MPOs learned about the priorities of federal partners and were thus able to adapt their long-range transportation priorities to better position themselves as competitive applicants for federal funding.

Implementation Challenges

There were no barriers regarding the direct exchange of data. The primary implementation challenge was determining where data gaps existed.

Results/Main Takeaways

Sharing and comparing datasets across agencies highlighted overlapping data needs. Partner agencies incorporated the shared data into statewide long-range transportation and MPO plans to better position themselves as competitive applicants for federal funding.

Looking Forward

Partner agencies integrated data and findings from the Colorado Integrated Planning Project into their respective long-range transportation plans and programs of projects. CFL is establishing a similar integrated planning project in Nevada.

Special thanks:

- Aaron Bustow, Statewide and Metropolitan Transportation Planner, FHWA – Colorado Division
- William Haas, Metropolitan Transportation Planner, FHWA – Colorado Division
- Elijah Henley, Planning Team Lead, FHWA CFL
- Jeff Sanders, Transportation Planner, FHWA CFL
- Erica Cole, Transportation Planner, National Park Service
- Dean Bressler, Senior Engineer, Transportation Planning, Grand Valley Metropolitan Planning Organization / Mesa County Regional Transportation Planning Office
- Ross Mittelman, Mesa County Public Health Trails Coordinator
- Matt Muraro, Environmental Specialist/Regional Planner, Colorado DOT

Quick-Reference Information

- **Project Phase:** Planning, Programming
- **Agencies/Partners Involved:** FHWA Central Federal Lands (CFL) Highway Division, Colorado Department of Transportation (CDOT), Bureau of Land Management (BLM), National Park Service (NPS), U.S. Fish and Wildlife Service (FWS), and Colorado Metropolitan Planning Organizations (MPOs).
- **Location:** Colorado
- **Type(s) of Data Shared:** HPMS Data
- **Method of Data Sharing:** Online GIS Platform
- **Additional Resources:** https://www.codot.gov/programs/your-transportation-priorities/regional-transportation-plans
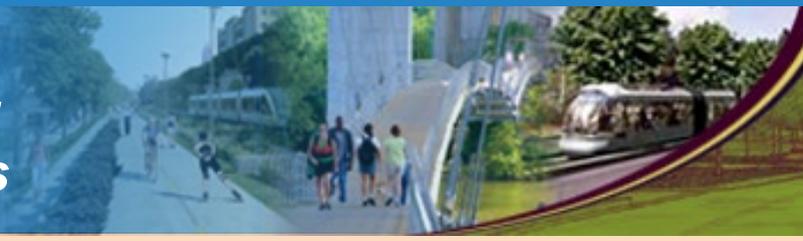
Bi-State Planning: Tahoe Regional Planning Agency
Interviewed Organization(s): Tahoe Regional Planning Agency

Forming a Data Sharing Partnership

California and Nevada established the Tahoe Regional Planning Agency (TRPA) in 1969 to protect harmony between ecology and transportation with the consent of Congress through a bi-state compact. The compact enables the formalized coordination of efforts for corridor level planning by identifying common goals for Federal, state, and local planning, as well as resource protection agencies and tribes in Lake Tahoe. The compact charges TRPA with establishing a regional plan to achieve environmental standards that emphasize the intersection of ecology, land use authority, and transportation, with a specific focus on access, recreation, and land use. TRPA's approach to transportation planning includes making their transportation demand model pairs with their travel demand model to build a recreational model.

Partner agencies within the compact share datasets and together determine data gaps that will address common goals. They regularly coordinate to understand each other's challenges and work to find solutions via agreements, charters, and other compact activities. This supportive problem solving, and ongoing support helps the partners realize the long-term value of participation and managing the corridor.

Data Fields & Tools

As an increasingly popular tourist destination, there is an overarching need for visitation data for the Lake Tahoe area, such as trip origin data, to understand travel behavior and how it impacts transportation and land use planning in the region. The partner agencies provide their data to TRPA who then pull it into the clearinghouse. Topline data showing the travel connections between the jurisdictions is a starting point for sharing. Data cleaning by TRPA staff is

Lessons Learned

Lesson #1 – Focus on the question

Given the amount of data available across the transportation and resource protection sectors, it is critical to focus on the question at hand and the data that will answer it. Collecting and analyzing data beyond what is needed can become overwhelming and waste critical time and resources without addressing the original need.

Lesson #2 – Regular coordination

Partner agencies and the TRPA are in regular communication with one another to understand each agency's needs work to ensure those needs are being met by the collaboration. In addition to regular meetings, TRPA hosts an annual summit to reaffirm their commitment to the compact.

often necessary once it is acquired and before it can be added to the clearinghouse. They recently outsourced the data cleaning and travel demand modeling so in-house staff can shift to data management and communications.

The TRPA conducts a travel mode survey to collect data on travel behaviors at different areas of the lake. The survey generates information on zip code of residency and income ranges to get an idea of who the traveler is, if they're a local or visitor, and where they're coming from and going. Bicycle counters are spread throughout the lake area and are now required for new trails. Parking data was recently added to the clearinghouse dataset; however, it isn't received regularly. Survey results are shared in the clearinghouse available to TRPA and its partners.[1]

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Implementation Challenges

TRPA has had difficulty determining which of hundreds of indicators and data sets will best address long-term needs. To keep the process manageable, TRPA works to identify the most critical needs long-term and then focuses efforts to obtain that data to power the dashboards for decision-making with planning level data. They have started to prioritize data that supports decision-making for climate change initiatives, such as forest fuel hazards, because climate impacts are a high-priority goal for many agencies in the area.

Another challenge is concisely communicating what the data says to the public. Partner agencies often use different data measures to describe similar things. If the message is not clear, the public doesn't understand what the agencies are trying to convey. TRPA convenes discussions to select a single data point to report on and not confuse the community. Ultimately, it helps the partners speak with one voice, especially when they are advocating for funding or legislative action.

Results/Main Takeaways

The TRPA's longevity and success is firmly rooted in the bi-state compact and having committed partner agencies that engage with each other frequently. TRPA's collaboration with partners maximizes efficiency, providing higher-quality results by identifying common data needs, gaps, and sources that are then pulled into a common location with joint access. Their work advances the region's transportation goals, protects the lake and its resources, and supports the economy by ensuring recreational travel is captured in the data and decision-making. It establishes a clear mission for transportation and resource protection for Lake Tahoe.

Looking Forward

TRPA is focusing on what data best addresses the compact partners' needs and provides the greatest support for decision-making in the most cost-effective way. This includes more focused datasets that TRPA can use repeatedly and power decision-making dashboards with planning level data. Data relevant to planning for climate change are resiliency are especially important to TRPA in this effort.

TRPA is also connecting with planning agencies in the broader California and Nevada area to understand recreational travel in the area to better plan for and support the future generations and resources at Lake Tahoe. TRPA is working to better correlate weather patterns, gas prices, and economic disposable income to model travel in a better way than a long-term model that glosses over those impacts.

Special thanks:

- Michelle Glickert, Principal Transportation Planner, Tahoe Regional Planning Agency
- Julie Regan, Chief, External Affairs/Deputy Director, Tahoe Regional Planning Agency
- Nick Haven, Division Manager, Long Range and Transportation Planning Division, Tahoe Regional Planning Agency

Quick-Reference Information

- **Project Phase:** Planning and Programming
- **Agencies/Partners Involved:** Tahoe Regional Planning Agency
- **Location:** Lake Tahoe Region, Nevada, and California
- **Type(s) of Data Shared:** Visitor survey results, air, soil, and water quality, land use, and transportation data
- **Method of Data Sharing:** Via email; building data clearinghouse for partnership
- **Additional Resources:** https://www.trpa.gov, https://www.trpa.gov/programs/maps, https://gis.trpa.org/mapmaker/
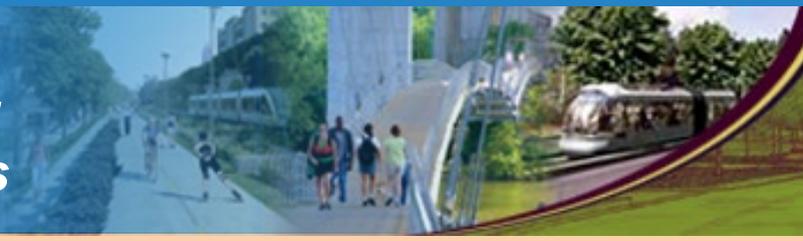
MARAD and University of Arkansas TransMAP

Interviewed Organization(s): U.S. DOT Maritime Administration, University of Arkansas, U.S. DOT University Transportation Center (UTC)

Forming a Data Sharing Partnership

University of Arkansas academics and industry specialists teamed up with the U.S. DOT Maritime Administration (MARAD) to form a data sharing partnership to address the challenges of sourcing maritime freight data, overcoming barriers to accessing this specific data, and improving accessibility to data portals. MARAD and the University of Arkansas established the Transportation and Maritime Analytics Partnerships (TransMAP) Hub project to create an open access online visualization platform to collect, analyze, and disseminate transactional and dynamic maritime freight data across multiple software platforms. The project team made the datasets available on a real-time basis to government agencies, industry, and citizens based on open-source data management software tools. TransMAP houses valuable interagency information and is an example of a project that successfully incorporated as a university research project as a mechanism for its upkeep and maintenance.

Data Fields & Tools

The online tool, TransMAP Hub, pulls together maritime freight systems data that would otherwise be widely dispersed and difficult to align for public users. The data are organized by categories, including vessel movement in and out of lochs, vessel type, as well as the frequency and types of commodities transported through a port. This data may be pertinent to researchers who seek to download and utilize data for assessment of local trade and maritime transportation. MPOs and other transportation decision makers at US ports can use TransMAP to understand freight systems and guide planning related to travel patterns.

Lessons Learned

Lesson #1 – Beta-test publicly available tools

The objective of TransMAP is to centralize public data into one place to improve data-informed maritime transportation planning. The partnership team benefited from initial "beta-testing" groups that sought out access to TransMAP for their own independent research and planning initiatives. The feedback from these groups was incorporated to improve Hub data collection and cleaning processes. Beta-testing the application ensured a high-quality tool for future users. future users.

Lesson #2 – Establish API standards

A significant problem with building data integration platforms is keeping them current. Many of the input data sources are formatted for human reading, but it is difficult and expensive to write and maintain software to integrate these documents (spreadsheets, pdfs, etc.) into the Hub. Websites like TransMAP rely on well-documented Application Programming Interfaces (API) to access these data sources as they update, use metadata to understand the data collection goals, make transformations to the data and data formats as they occur. While many of the sites use APIs to varying degrees, many do not, or the APIs are experimental and subject to change. Thus, established standards for APIs would allow for less expensive and more reliable data sharing.

To develop the platform, project collaborators from the University of Arkansas and U.S. DOT MARAD delegated roles among industry experts and academic specialists. Industrial engineers provided industry expertise by scoping and assessing relevant data sources. They also maintained access to integral industry contacts and stakeholders. On the technical development side of the project, university academics and graduate students assumed the responsibility of aggregating data and integrating it into interactive maps and dashboards.

Implementation Challenges

Implementation of the program was time intensive. The MARAD and University of Arkansas partnership was established as a three-year project, where the first two years were dedicated to developing the TransMAP Hub. The third year focused on testing and validation of the Hub. The TransMAP development team is developing a user guide to assist users to navigate and use the system. A challenge of creating this data sharing platform has been establishing necessary modifications to provide a publicly accessible resource without jeopardizing sensitive information. For instance, information specifying exact routes and schedules of commodities shipments could result in a breach of national security, and thus it was imperative to omit this type of information.

Results/Main Takeaways

The TransMAP Hub centralized diverse datasets into one location. Even though all the data included in the Hub are free and publicly available, it would otherwise be difficult for individuals to find because it is so dispersed. Creating the Hub required collaboration and input from all partners. The partnership brought together industry experts with academic specialists who each learned from each other in the process. Industry experts learned how to interact with the collected data and the academics learned from the specifics of maritime transportation data.

Looking Forward

The project is currently focused on the development and deployment of the TransMAP Hub, with the three-year partnership anticipated to culminate in September of 2022. However, there is interest to extend the project for a second phase to include enhanced data dashboards and analytics. An example of how to extend the project for a second phase could include increasing the scope of the TransMAP Hub to include other modes of transportation data, which would enhance its applicability. This would require partnerships with other modal agencies who could provide usable data access.

Special thanks:

- Jackson Cothren, Director, Center for Advanced Spatial Technologies, University of Arkansas
- Heather Nachtmann, Ph.D., Associate Dean for Research, College of Engineering, Director, Maritime Transportation Research and Education Center, University of Arkansas
- Travis Black, Acting Director for the Office of Ports and Waterways and lead for Port Infrastructure Development Planning Program of the US Department of Transportation, Maritime Administration (MARAD)

Quick-Reference Information

- **Project Phase:** Project Design and Environmental Review
- **Agencies/Partners Involved:** U.S. DOT Maritime Administration, University of Arkansas, U.S. DOT University Transportation Center
- **Location:** National
- **Type(s) of Data Shared:** Physical and socioeconomic data related to multimodal transportation for visualizing human geography, area-value data, and travel times
- **Method of Data Sharing:** TransMap, a centralized online tool
- **Additional Resources:** https://castuofa.github.io/transmap/

Mississippi National River Recreation Area Paddle Share Program
Interviewed Organization(s): Mississippi Park Connection, National Park Service, Volpe Center

Forming a Data Sharing Partnership

Mississippi National River Recreation Area (Mississippi NRRA) was created in 1988 to help facilitate recreational access to the Mississippi River; however, the National Park Service (NPS) did not have a formal program to support nonmotorized boating access to the river until 2016. The Mississippi Park Connection (MPC), a 501c3 non-profit partner of the Mississippi NRRA, has a common interest in river education and recreational use with the Mississippi NRRA (along with share office space). Beginning in 2014, MPC established relationships between NPS and other organizations interested in supporting a paddle share program. In addition to establishing the locations for paddle share stations, the partnership provided a mechanism for engaging with vendors to supply kayaks and lockers and operate the service. MPC manages the vendors and, together with the municipal and park district partners, owns the equipment, which NPS is unable to do because of limitations around maintenance costs and liability. Mississippi NRRA collects the use data and analyzes it for trends to help the partners manage the system's performance, inform schedule and route changes, and demonstrate how paddle share meets the program goals. For instance, the Minneapolis Park and Recreation Board uses the shared data to learn whether people with a Minneapolis zip code use the paddle share system, which helps validate the Park Board's involvement in the program. MPC is also able to use the data to advocate for funding subsidies based on the results.

Data Fields & Tools

The data includes information about when paddle share users reserve kayaks, where and when they pick the boats up, where the boats are returned, and approximately how long they were out. The data is shared through a portal

Lessons Learned

Lesson #1 – Good working relationships

Relationships between staff are vital to creating and establishing planning and data sharing partnerships between organizations. Good staff communication and coordination across agencies combined with positive data demonstrating the success of the partnership program fosters trust and confidence in the outcomes and continued collaboration.

Lesson #2 – Details in contracting

When working with a partner organization or vendor through an agreement or contract, it is critical from the outset to articulate the data points to be shared, the frequency of data reporting, the points of contact for sending and receiving data, and how they will be used, as well as the responsibilities of each signatory group. Mississippi NRRA and MPC realized that they should have been more explicit about their data needs and reporting requirements after the contract with the vendor was signed.

(called Checkfront) set up by the operating vendor. Data from the portal can be downloaded to a spreadsheet and requires little data cleaning. MPC, NPS, and the vendor can look at the number of reservations for upcoming days, right-size on-duty staff, and communicate to user groups when there are reservations available to encourage more use. NPS analyzes the data and provides the results to MPC. During the off-season, data from the previous year of operation is reviewed to inform decisions about modifying

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operations, such as adding more boats or reservation opportunities to the busiest stations. Nice Ride, the local bike share that is operated by Lyft, co-locates bike share stations next to paddle share stations wherever possible and shares its use data from these stations. The Nice Ride data helps MPC and NPS understand the multimodal nature of paddle share trips.

Implementation Challenges

Initially, there were challenges with the amount of data that the vendor would share with MPC and NPS. The initial agreement did not specify data reporting outside of monthly invoices. The parties were able to come to an agreement on data sharing by repeatedly asking the vendor to provide back-end access to the reservation system software. Since paddle share is the vendor's top customer, the vendor eventually provided this access.

NPS is constrained in its data collection through visitor surveys by the Paperwork Reduction Act and rules about collecting any data that contains personally identifiable information. When possible, it is better for NPS to leave the collection of data that contains this information to its partners. Surveys are an important tool in gauging the satisfaction of paddle share users. A subsidiary of MPC, Mississippi River Paddle Share LLC, was able to collect annual post-trip survey data to share with the partnership.

The remaining challenge is consistent funding revenue. The paddle share program partners are all non-profit organizations or local governments. Modest annual subsidies from each of the partners helped cover any gap between expenses and revenue from paddle share user fees. Operating costs have been increasing, especially as the kayaks and other equipment age. At the same time, grants have been shrinking. The partners are taking a strategic look at how to balance funding and costs.

Results/Main Takeaways

The paddle share system has expanded over the years and the partnership has been successful due to continued collaboration and support amongst the partner organizations. The paddle share uses data to inform cost-effective changes that sustain the program year after year. The data demonstrate high system usage and sufficient revenues to justify the program's continuation. Mississippi NRRA benefits from the partnership by fulfilling its mission to increase recreational access to the river; MPC benefits from higher visibility and a greater ability to gain support for its other programs.

Looking Forward

For improving the data sharing and planning aspect of the partnership, Mississippi NRRA and MPC would like the vendor to improve its reservation interface, enable more customizable reports, and allow for real-time weather-related and emergency shutdowns, as well as information on invoicing.

As the paddle share program continues, partnering with local institutions, such as the University of Minnesota Twin Cities, to spread the word about the program may attract more users and make the program more financially resilient. Many people who engage with the University and even metro area residents do not realize the Mississippi River is close by, it is part of the National Park Service, nor that there is paddle share nearby to enjoy.

Special thanks:

- Katie Nyberg, Executive Director, Mississippi Park Connection
- Karen Katz, Outdoor Recreation Planner, Mississippi NRRA
- Ben Rasmussen, Public Lands Team Lead, U.S. DOT Volpe Center

Quick-Reference Information

- **Project Phase:** Operations and Maintenance
- **Agencies/Partners Involved:** Mississippi Park Connection, National Park Service; secondary: Three Rivers Park District, City of Brooklyn Park, City of St. Paul, Minneapolis Park and Recreation Board, Mississippi Watershed Management Organization, Nice Ride/Lyft
- **Location:** Minneapolis and St. Paul metro area, Minnesota
- **Type(s) of Data Shared:** User data
- **Method of Data Sharing:** Data portal, regular in-person, and virtual meetings
- **Additional Resources:** https://www.nps.gov/miss, https://parkconnection.org, https://www.paddleshare.org

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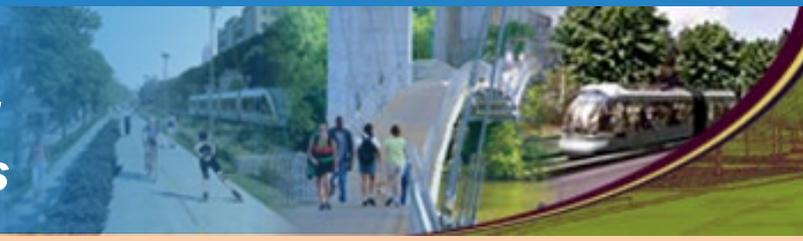
National Park Service National Capital Area Regional Count Program
Interviewed Organization(s): National Park Service, National Capital Region

Forming a Data Sharing Partnership

The National Park Service National Capital Area (NPS NCA) engages with multiple partners on planning and data sharing. NPS NCA is part of the National Capital Planning Commission (NCPC), the regional Metropolitan Planning Organization (MPO), which meets monthly to discuss the current and upcoming projects, as well as any issues related to them. The Commission members also include representatives from other Federal agencies, District of Columbia DOT (DDOT), Virginia DOT (VDOT), Maryland DOT (MDOT), and some presidential appointees.

NPS NCA established a cooperative agreement to conduct a coordinated count program throughout the region. The goal is to install more counters, collect better data, and store it in a database available to participants. The partner agencies benefit from the economies of scale in trail counters, the technical support for maintaining them, and the resulting processed data. NPS NCA has a partnership with DDOT focused on traffic counts and has also proactively engaged with the NCPC to coordinate trail data collection and analysis. DDOT places temporary traffic counters on federal roads and shares the data with NPS. NPS shares any traffic data it collects with DDOT, as well. The two agencies also coordinate on projects that entail road closures and other construction phases that impact traffic flows. Regarding trails, NPS has more than 50 miles of trails that connect to other trails within the region. The centralized approach to trail count data facilitates continued data collection despite regular staff turnover at public lands agencies, especially for staff with specialized skills in data counting technology and analysis.

Lessons Learned

Lesson #1 – **Cross-agency relationships**

Relationships across agencies are critical to establish sustainable, long-term collaboration. Inter-agency relationships must be maintained with regular communication and coordination of projects impacting each partner.

Lesson #2 – **Collaborate on data collection and management**

Maintaining data counters in good working order requires consistent monitoring and a specific skill set to troubleshoot problems. Data management and processing are also required to apply the information in decision-making. These tasks pose funding and bandwidth challenges for many agencies. Collaborating on collection and access to data can distribute the costs over multiple agencies and allow all to benefit from economies of scale.

Data Fields & Tools

DDOT and NPS share traffic counts and related data through the Highway Capacity Software (HCS), which applies the methodologies documented in the Highway Capacity Manual (HCM). The Federal Lands Highway Field Operations Technical Support Center (FOTSC) collects traffic data for NPS that can be used for traffic studies upon request, and then shared through the HCS. The transfer of traffic data is usually a single transaction based on individual project need rather than a consistent schedule.

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The regional trail count data is pulled directly from the counters into a database that is managed through a contract with the University of North Carolina (UNC), which manages technical work done by Virginia Tech and Portland State University Transportation Research and Education Center (TREC). While TREC is responsible for maintaining the counters in addition to processing the data in the database, NPS first established the counters and has access to the database.

Implementation Challenges

Maintaining good relationships is a challenge as staff change across agencies. In the scope of the National Capital Region, the NCPC must work with the Federal Government which owns much of the land in Washington, DC. There are many actors involved, including the NPS regional office, NPS units, DDOT, and other members of the NCPC.

Another challenge is maintaining the funding to collect data. DDOT and other smaller agencies have funding and staff constraints limiting their ability to maintain their own counter program, let alone bear the cost of increasingly advanced counter technology. NPS has worked to establish a 5-year agreement with UNC, funded through FHWA for research, for UNC to conduct research and manage the regional trail count data collection efforts by Virginia Tech and TREC.

Looking Forward

The longer-term goal for NCA is to issue an annual report with information beyond raw counts about the number of trail users. The goal is to translate raw collected data into performance measures, such as crash reduction and emissions reductions, to communicate regional data trends across several sectors, such as public health, environment, and safety.

Special thanks:

- David Daddio, National Capital Area Regional Transportation Manager

Quick-Reference Information

- **Project Phase:** System and Project Planning
- **Agencies/Partners Involved:** National Park Service (NPS), District of Columbia Department of Transportation (DDOT), National Capital Planning Commission (NCPC), Metropolitan Washington Council of Governments (MWCOG)
- **Location:** Transportation networks and recreation trails in the greater DC metro area
- **Type(s) of Data Shared:** Traffic count data, trail count data, project plans and schedules
- **Method of Data Sharing:** Database downloads, digital file transfers, Regional Transportation Data Clearinghouse (RTDC), coordination meetings
- **Additional Resources:** https://www.ncpc.gov/; https://www.mwcog.org; https://rtdcmwcog.opendata.arcgis.com; https://www.mwcog.org/file.aspx?&A=X1FahAYWSbbzUZJeicVZ7SznncgkG4CQ0pQ9QDUYRNw%3D
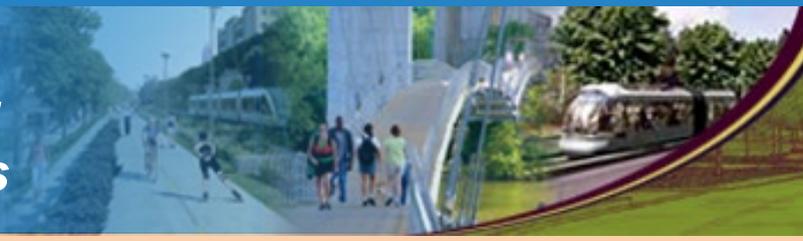
Oregon Coast Trail Action Plan
Interviewed Organization(s): Oregon Parks and Recreation Department, Association of Oregon Counties, Oregon Solutions, Federal Highway Administration (FHWA)

Forming a Data Sharing Partnership

The Oregon Coast Trail Action Plan is a regional collaborative planning effort to identify and inventory existing conditions, plan for improvements and realignments, and plan for long-term maintenance and governance of the Oregon Coast Trail. The Action Plan partnership includes the Association of Oregon Counties, Oregon Parks and Recreation Department, and Oregon Solutions. Partners compiled existing geospatial trail data with existing facilities and ownership data to determine baseline conditions. They also regularly engage with the public, tribes, and local elected officials to identify areas where the trail needs safety improvements. Qualitative information from the public engagement is regularly converted to geospatial data and added to the existing database, which is then used for long-term decision making and governance.

Once existing conditions are inventoried, several products will be developed: Declarations of Cooperation between trail segment owners for the North, Central, and South Segments and a Declaration of Cooperation for the overall trail's long-term governance. The Declarations of Cooperation will be incorporated into a final planning document that will include, to the degree possible, conceptual drawings and cost estimates to advance future design and construction to address trail gaps.

Data Fields & Tools

The Oregon Coast Trail Action Plan has a wide range of data inputs. The majority is geospatial data followed by natural and cultural resource data. There is also qualitative through-hikes data from other land management agencies,

information from public engagement, and hiking books. The team is establishing a framework to accurately capture word-of-mouth data in a format that is meaningful to the Action Plan.

Lessons Learned

Lesson #1 – Establish data storage and access plan

The Oregon Coast Trail Action Plan partnership recommends establishing a protocol for how to store data, who can access the data, and how they will access it. After several staffing changes over the course of the project, partners have learned that it is imperative to establish a development framework to ensure the project moves forward regardless of staff turnover.

Lesson #2 – Identify tasks based on individual skillsets

It is helpful to identify and complement other partners' strengths and regularly communicate with partners. Team members can identify who will complete each task based on their skillset. Individual agencies may be best positioned to assume tasks based on a specific data focus or audience. This ensures everyone is on the same page while maximizing the team's efficiency without repeating work.

Creating more livable communities through transportation choices

The Action Plan team has a contract with Parametrix, an environmental planning and engineering firm, to collect, clean, house, and disseminate data through ArcGIS Online. Parametrix cleaned historical data where trail alignments differ from existing conditions, as well as gathered additional data for trail segments without existing data. Once clean, Parametrix added the data to ArcGIS Online. The ArcGIS online dataset is then used by Action Plan members to explore different alignments and layers and make governance and maintenance decisions. Following the Action Plan's completion, the ArcGIS data will be migrated to Oregon Parks and Recreation Department (OPRD) systems.

Implementation Challenges

In many cases, acquiring the most up-to-date data requires going to specific locations on the trail to "ground-truth" it, or walk the trail and validate the exact route and condition. This requires more time and resources to collect that data.

Results/Main Takeaways

Currently, the team is still collecting data that will be used for all aspects of the project lifecycle. The data collection and analysis from the Oregon Coast Trail partnership has been critical to developing the Action Plan and has also provided baseline information for other projects. The Action Plan will be used to set goals and priorities for the groups involved, identify gaps and funding opportunities for the trail, and prioritize gaps based on usership and cost.

Looking Forward

The Oregon Coast Trail Action Plan hopes to identify types of users of the trail, what they are using it for, the length of hikes, and other measures to better understand how the trail is used. This will allow the team to better support facilities and focus those efforts on the most used areas. The Action Plan will set the path for a complete, sustainable long-term Oregon Coast Trail.

Special thanks:

- Cole Grisham, FHWA, Transportation Planner
- Peter Dalke, Oregon Solutions, Project Manager
- Paul Reilly, Oregon State Parks, Program Coordinator
- Andy Smith, Association of Oregon Counties, County Solutions Director

Quick-Reference Information

- **Project Phase:** System and Project Planning
- **Agencies/Partners Involved:** Oregon State Parks, Association of Oregon Counties, Oregon Solutions, and FHWA
- **Location:** Oregon Coastal Counties
- **Type(s) of Data Shared:** Geospatial, natural and cultural resources
- **Method of Data Sharing:** ArcGIS Online
- **Additional Resources:** https://highways.dot.gov/federal-lands/projects/or/dot-2018-3; https://orsolutions.org/osproject/oregon-coast-trail
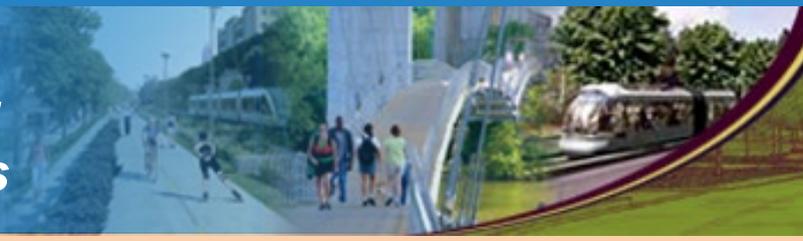
Oregon Department of Transportation Regional Integrated Transportation Information System
Interviewed Organization(s): Oregon Department of Transportation

Forming a Data Sharing Partnership

Oregon Department of Transportation (ODOT) purchased a Regional Integrated Transportation Information System (RITIS) enterprise license to collect and house data on traffic speeds and recreational routes for planning needs. RITIS is a data aggregation and dissemination platform for solving transportation problems, from the Center for Advanced Transportation Technology Laboratory at the University of Maryland.

Data on ODOT's RITIS platform is available to everyone in the state working in public transportation. RITIS serves as a data sharing platform, where ODOT inputs data in RITIS and becomes accessible to all ODOT users on the platform. It supports a broad range of tools and features and allows agencies to easily collaborate and share data. This enables better decision making and higher quality projects across the state.

Data Fields & Tools

ODOT'S RITIS platform houses a wide range of data across the state. Examples include state highway traffic volume data, incident and weather data, traffic signal locations, and congestion data and associated calculations, such as hours of delay, cost of delay, and contributions to delay. RITIS performs its own calculations from inputted data, eliminating any possible inconsistencies or errors from people completing their own calculations.

The RITIS enterprise platform has data format requirements, which requires ODOT to clean some data to have it added to the platform. There are no barriers for users to access and download data once it is on the

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Lessons Learned

Lesson #1 – Learn from peers

RITIS has been available for many years longer than ODOT's use of the system, which has enabled ODOT staff to learn from other state that have a more mature working knowledge of the platform. ODOT's access to RITIS serves as an example of how a state agency can make transportation data available to its partners, which includes land managers. As the primary contract holder to RITIS, ODOT allowed for other agencies, particularly those that are smaller or less resourced, to utilize data under ODOT's contract without the burden of high start-up costs.

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platform. ODOT has training resources from RITIS available on their website for users, and plan on visiting agencies throughout the state to increase awareness of the tool and its benefits.

Implementation Challenges

ODOT has faced challenges determining how users are using the data in RITIS. RITIS is available to all ODOT employees, State of Oregon public agencies, and consultant or university staff performing work for a public agency in the State of Oregon. Non-ODOT RITIS accounts require an organization to sign an INRIX data use agreement to establish a new account for that organization. Users must fill out a login application and be approved by ODOT staff to gain access to RITIS.

While staff in various agencies in Oregon can use RITIS, it is their consultants accessing the data, which makes it difficult for ODOT to gauge who the "real" users are, identify what future data inputs would best serve its users, and which additional groups to include.

Results/Main Takeaways

RITIS has saved time and resources by having all the data ODOT and other agencies need in one easy-to-find location with many calculations already completed. ODOT has used RITIS to plan transit programs, especially in recreational districts that have experienced recent surges in population growth and tourism. The data has helped ODOT determine who is travelling on Oregon roads and their trip start and end points. This information and RITIS' calculations allow ODOT to tell road users the best time to visit destinations to avoid congestion and manage parking.

Additionally, RITIS has dramatically increased data access to users across the state, allowing them to answer questions they were unable to with only their agency's data. Furthermore, it ensures consistency across projects from various agencies because all calculations and necessary indices are preloaded into the tool.

Looking Forward

ODOT has a license for RITIS until 2030. They plan to visit agencies throughout the state to increase awareness of RITIS and its benefits. Project efficiency, quality, and decision making will increase statewide as more agencies use the tool, and reduce costs associated with making individual data purchases.

Quick-Reference Information

- **Project Phase:** Evaluation and Reporting
- **Agencies/Partners Involved:** University of Maryland (RITIS owner), Oregon Department of Transportation, various State of Oregon public agencies
- **Location:** Oregon
- **Type(s) of Data Shared:** Traffic volumes and speeds, incident data, recreational routes
- **Method of Data Sharing:** Enterprise license to database
- **Additional Resources:** https://ritis.org; https://www.oregon.gov/odot/Data/Pages/RITIS.aspx

FHWA Planning & Data Sharing Partnerships Case Study Series

Collecting Multi-Jurisdictional Road Stream Crossing Data in Maine

Interviewed Organization(s): U.S. Fish and Wildlife Service Forming a Data Sharing Partnership

The Maine Stream Crossing Survey partnership formed in 2006 to collect and disseminate statewide data on stream barriers and barriers to fish passage throughout the state. The reason this group formed in Maine was to focus on improving habitat for the Atlantic salmon, an endangered species whose remaining habitat in the United States is almost entirely within the state of Maine. The partnership included the following partners:

• U.S. Fish and Wildlife Service (FWS)

• Maine Department of Transportation

• Maine Department of Marine Resources, Inland Fisheries, and Wildlife

• Maine Department of Environmental Protection

• Maine Forest Service

• Atlantic Salmon Federation

• The Nature Conservancy (TNC)

The partnership began in 2006 with a pilot study on fish passage in the Lower Penobscot River area. They developed their own data collection protocols and conducted a survey of stream crossing data to prioritize improvements at crossings. The team then expanded data collection to all public roads and some private roads[1] throughout the state, which it maintains in a database and disseminates through the Maine Stream Habitat online viewer. This dataset includes asset management and ecological information on road stream crossing structures, such as culverts and aquatic organism passage structures.

Lessons Learned

Lesson #1 – Develop common goals among partners

When creating a partnership with a myriad of groups with differing goals and capacity, it is important to focus first on the areas where the most parties have a shared interest. For example, the Maine Stream Crossing Survey partners found success by first working together on shared interests, like improving data on road conditions and aquatic habitat quality.

Lesson #2 – Identify realistic goals for the partnership

To be successful, partnerships should be conscious of their capacity and careful to set realistic goals.

Data Fields & Tools

TNC manages the partnership, including directing data collection, managing staff and volunteers, coordinating with private landowners, land managers, and public entities.

Additionally, TNC created a data use agreement for private landowners to increase their level of comfort with the data collection process. USFWS hosts and populates the stream crossing database. The database has 26,000 records that represent road stream crossings and includes associated resource and asset data attributes.

The stream crossing database feeds into the Maine Stream Habitat online viewer, which presents stream crossing data

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and a network analysis tool. The viewer has layers such as stream crossings, fish passage barriers, priority habitats for various species, water features, and watersheds. The data available for each stream crossing includes potential impacts on aquatic species, watershed information, and other detailed crossing information. The viewer highlights the data that is most relevant and beneficial to the public users, but additional information is available to partners in the database.

Implementation Challenges

This partnership has encountered several challenges and Partner engagement was a significant reoccurrence. This project requires the participation of a wide range of agencies and private entities, including some whose primary mission is not environmental protection. It has been important to communicate the value of this dataset to a wide range of partners so that they support the project. The partnership has also had to build trust with private landowners and show them the value of this data for their land management.

Additive to the partner engagement aspect, it has been difficult to maintain consistent funding for this partnership, which is necessary to keep the dataset current and to maintain the data-sharing site.

With regards to developing data protocols, the partnership needed to establish an agreed-upon data dictionary and data collection methodology that would meet the partners' specific needs related to ecology and asset management. The project developed a data collection protocol that has since become a model for other ecology data collection efforts in New England and other locations in the U.S.

Results/Main Takeaways

The stream crossing database and online viewer combines infrastructure and habitat information to identify high priority crossing sites for repair or replacement and areas at risk of flooding. This partnership benefits private and public users, such as municipalities, road owners, and other stakeholders. The database has also resulted in the development of a bond fund from the Maine Department of Environmental Protection to competitively fund crossing replacements. The Maine Department of Marine Resources has also used the results of this partnership to help set restoration and recovery goals. The Maine Stream Connectivity Work Group convenes to coordinate with partners on data collection, updates, and general work progress.

Looking Forward

The project partners would like to make the stream crossing database as accurate and up to date as possible and have a consistent host for the online viewer, as multiple partners have hosted the online viewer over the years. The partnership is also interested in incorporating LiDAR data in the database, as more imagery becomes available. Additionally, the project would significantly benefit from funding to support local rural road data collection.

Special thanks:

- Alex Abbott, GIS Analyst and Stream Restoration Specialist, U.S. Fish and Wildlife Service

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Quick-Reference Information

- **Project Phase:** System and Project Planning; Maintenance and Operations
- **Agencies/Partners Involved:** U.S. Fish and Wildlife Service, Maine Department of Transportation, Maine Department of Marine Resources, Maine Department of Environmental Protection, Maine Forest Service, Atlantic Salmon Federation
- **Location:** Maine (statewide)
- **Type(s) of Data Shared:** Culvert and stream crossing data
- **Method of Data Sharing:** Data dictionary, database, and online web viewer
- **Additional Resources:** Maine Stream Habitat Viewer; Maine Road-Stream Crossing Survey Manual

Wasatch Front Regional Council Active Transportation and Congestion Management Programs

Interviewed Organization(s): Wasatch Front Regional Council, Utah Geospatial Resource Center, Utah Department of Transportation

Forming a Data Sharing Partnership

Utah has a strong network of public organizations sharing geospatial information system (GIS) mapping data that is coordinated by the Utah Geospatial Resource Center (UGRC). The UGRC is the map technology coordination office for the state of Utah. It is a common hub for the Utah Department of Transportation (UDOT) Planning Department, the Wasatch Front Regional Commission Metropolitan Planning Organization (WFRC MPO), and other local and state-level partners public agencies to share and access updated GIS data. UGRC serves as the coordinator among the agencies using the data and have the responsibility to improve the quality of collected and shared data and ensure consistency across projects. UGRC created a linear referencing system for projects across the state. All planned projects involving Utah Department of Transportation (UDOT) are based on this linear referencing system, which is regularly updated if roadway geometry changes. Federal land management agencies (FLMAs) have not been engaged in coordination outside one-off data requests.

Data Fields & Tools

State- and local-level GIS layers represent most data shared in the hub. State-level GIS layers include roads, address points, and boundaries. The local-level roadway centerline data has been especially useful for many projects because it has detailed information on roadway lanes, bike infrastructure, sidewalks, signal counts, pedestrian delay, and collisions. Other data sets include public lands boundaries, which are maintained by the Trust for Public Land, and aerial imagery that are available on the Wasatch Front Regional Council website.

Lessons Learned

Lesson #1 – The project champion

UGRC has established a strong statewide network of partners for sharing high quality geospatial data. The office provides a consistent, reliable centerline dataset that is used at all levels of government in the state. Strong partners, such as WFRC and UDOT, provide support to UGRC by being stewards of data relevant to their constituents.

Lesson #2 – Efficiency in common baselines

The linear referencing system that UGRC developed and distributed is used statewide. As new data is incorporated into the system, UGRC has quality control to ensure it references the correct geometry and imports into maps correctly. Until there is an active trusted exchange of accurate info, agencies are going to use their own datasets. Combining data from disparate sources often leads to compatibility issues that can be difficult to been resolve.

UGRC previously housed all the data; however, they have shifted to a distributed system. WFRC stewards data for their area and shares the data with other groups to further disseminate it. They also house state-level data on their website and index it with UGRC to maximize its audience. UGRC conducts quality control on data they receive, cleaning the data as needed. There are also some datasets where UGRC collects public input to crowdsource existing conditions. UGRC has an internal central multi-user database for the centerline data. Several years ago,

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the agencies worked together to expand the data to include existing and planned bike facilities. UDOT updated linear referencing system and WFRC can log in and update data. UGRC ensures data from all the counties is accurate and reliable before publishing it.

Implementation Challenges

An authoritative and correct data source is key to efficient and effective transportation planning. If there is no coordination to bring the databases closer together, project staff first must validate the information, which is very time consuming. Eventually, the people who pick up the data later must determine which database is correct with little information on where to start. UDOT referenced an experience regarding active transportation plans in which planners had to retain and refer to multiple datasets throughout the project. It reduces efficiency and can lead to recurring issues.

Federal agencies have been minimally involved in the data sharing process, which has led to data gaps resulting in challenges with implementation on projects that intersect or border federal land. Federal agencies in the state aren't using this referencing system, so when they do share data with UDOT or others in the state there are some inconsistencies in the geometry.

It has been challenging to find the right person within the FLMA to engage. UGRC and UDOT have been trying to put together a federal user group to foster better communication with those other agencies. It's currently most active with U.S. Forest Service, Natural Resources Conservation Service, and the Farm Service Agency. Some agencies are more willing to participate than others.

The project team achieved success sharing data and garnering community buy-in when developing the Bike and Pedestrian Master Plan. Despite this, the team has noted challenges related to executing the concepts presented in the Master Plan, siting slow progress as far as

implementation is concerned. CCC does not own any land for implementation. A primary difficulty in implementing the initiatives developed thanks to shared data resources is a lack of a "champion" to push initiatives forward toward successful implementation. The towns and their unique governance and predispositions have been the cause of slow progress.

Results/Main Takeaways

The partnership has ensured consistent high-quality data across the state. Organizations across the state, like planning agencies and police departments, rely on these data sets, which increases overall data efficiency and consistency. Local agencies can streamline project development because Wasatch Front Regional Council ensures high-quality and comprehensive input data.

Looking Forward

This is an enduring data sharing effort. UGRC is continuing to identify data stewards to ensure the data is maintained in the long term while continually working to improve datasets to ensure its high quality. As the data sharing network in Utah has matured, many data consumers became data contributors under the guidance of UGRC. It will be important for UGRC, WFRC, UDOT, and other proponents to communicate the benefits of data sharing in effort to institutionalize contributions to a common database. In the future, they would like to increase coordination with Federal agencies to determine data accuracy and ensure data exchanges moving forward.

Special thanks:

- Bert Granberg, Analytics Director, Wasatch Front Regional Council
- Matt Peters, Director, Utah Geospatial Resource Center
- Stephanie Tomlin, Central Planning Modeling, Data, and GIS Program Manager, Utah Department of Transportation

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Quick-Reference Information

- **Project Phase:** System and Project Planning
- **Agencies/Partners Involved:** Utah Geospatial Resource Center, Utah Department of Transportation, Wasatch Front Regional Council
- **Location:** Wasatch Front Region, UT
- **Type(s) of Data Shared:** Roadway lanes, bike and pedestrian infrastructure, signal counts, pedestrian delay, collisions
- **Method of Data Sharing:** Housed on Utah Geospatial Resource Center website
- **Additional Resources:** **https://wfrc.org**; **https://gis.utah.gov**; **https://www.udot.utah.gov/connect**;

Appendix 2: Memo 1 - Background and Literature Review

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

Memorandum 1: Background and Literature Review

March 24, 2021

U.S. Department of Transportation
Federal Highway Administration

Table of Contents

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 governments[1]
- Transit agencies
- Marine or aviation management agencies

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[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

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[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

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[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

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[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

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[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 LRTPs 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.

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[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).

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[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

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[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.

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[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.

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[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]

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[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://bmcpublichealth.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

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[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.

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[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

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[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://bmcpublichealth.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

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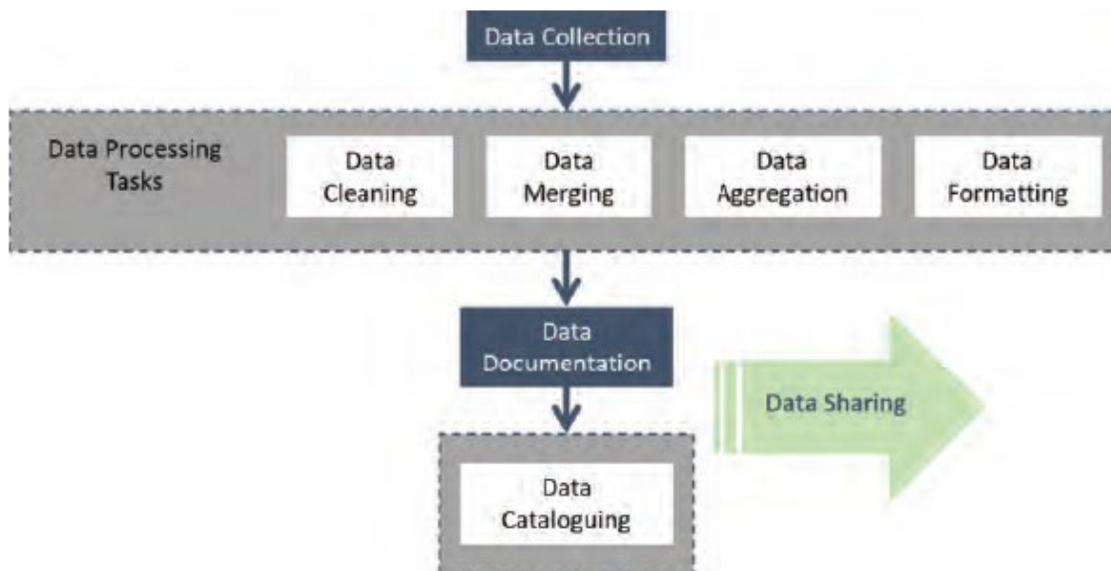
Figure 2: Data Sharing Process (Source: National Academies of Sciences, Engineering, and Medicine, Process of Preparing Data for Sharing, (Washington, DC: The National Academies Press, 2020), 25, figure 4).

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

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[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

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[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.

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[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.

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[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.

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[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

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[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

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[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] FWHA. 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 FLMAs 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' (MWCOG'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.

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[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 a 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.

Appendix 3: Memo 2 - Methodology

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

Memorandum 2: Methodology

May 4, 2021

U.S. Department of Transportation
Federal Highway Administration

Table of Contents

Introduction

This memorandum summarizes the proposed methodology for collecting and analyzing data and information in support of an applied research study titled, *Finding a Win-Win: Planning and Data-Sharing Partnerships between Governments and Public Land Management Agencies*.

The specific goals of this project are to:

- Identify examples of information coordination between Public Land Management Agencies (PLMAs) and transportation partners that result in process efficiencies, cost savings, and more effective transportation system delivery and/or management.
- Develop a suite of tools, resources, and usage guidelines to aid PLMAs and their partners in improving data coordination for better transportation systems.

This memorandum describes:

- The research questions to be addressed;
- The information and data needed;
- The stakeholder entities and individuals from whom to gather the information and data;
- The proposed methods to collect the information and data;
- Assumptions that will inform the methodology; and
- The general timeframe for the Data Collection and Analysis task (Task C).

This methodology is based in part on the information documented in *Memorandum 1: Background and Literature Review (March 2021).*[1]

Definition of Key Terms

The research team provides the following definitions as applied to this Study. These terms are defined in additional detail in *Memorandum 1: Background and Literature Review*.[2]

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). Examples may include State Departments of Transportation (DOT), Metropolitan Planning Organizations (MPO) ,and other local or agency related divisions focusing on transportation issues.

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, as well as parks and conservation agencies managed by states, regional governments, counties, or municipalities. PLMAs may own and manage transportation systems within their boundaries.

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[1] Federal Highway Administration. 2021. "Finding a Win-Win: Planning and Data-Sharing Partnerships between Governments and Public Land Management Agencies. Memorandum 1: Background and Literature Review." https://highways.dot.gov/federal-lands/programs-planning/studies/pads.
[2] Ibid.

Research Questions

Accurate and up-to-date data is critical for transportation planning; however, the types of data available and the process for accessing them are not always clear, especially when applied to transportation systems that provide access to or within public lands. This research project aims to fill some of these gaps, and considers both the data and the process of sharing data.

In order to focus this research on planning and data sharing partnerships, the study team developed high-level research questions:

- Why do PLMAs and transportation agencies share data?
- How do PLMAs and transportation agencies share and use data?
- What are the challenges to data sharing?

These high-level questions served as the basis for the literature review, and the project team will further explore them in later phases of this project. To address these questions, the project team has developed the following, more specific research questions:

- What types of data do PLMAs and transportation agencies use to support planning on public lands?
- How do PLMAs and transportation agencies use data to inform decision-making?
- What are the characteristics of successful PLMA and transportation agency data sharing examples?
- What are the barriers to effective data sharing between PLMAs and transportation agencies?
- What do PLMAs and transportation agencies need to share data more effectively?

This memo expands upon each of these high-level research questions below.

What types of data do PLMAs and transportation agencies use to support planning on public lands?

Establishing data sharing partnerships requires determining which data must be, could be, or may not need to be shared for transportation planning on public lands. Once planners identify the data sets, they are better positioned to determine whether they exist, who has them, and the quality of the data.

This research project will explore:

- The primary types of transportation data for transportation planning in a public lands context; and
- Additional types of transportation data or transportation-related data that could be beneficial when applied to this process.

How do PLMAs and state/local transportation partners use data to inform decision-making?

For this study, the team will review how PLMAs and their federal, state, and local agency partners approach transportation decisions across the entirety of the transportation project lifecycle (e.g., planning, project selection, design, operations, maintenance, etc.). Although this research project focuses primarily on using data sharing to support transportation planning, agencies' decision-making

processes typically apply across project phases. As a result, the project team will also consider data sharing throughout the transportation project lifecycle.

The research project will explore:

- State and local planning processes relevant to PLMAs;
- PLMA planning processes relevant to state and local transportation agencies;
- Differences and similarities in the goals for transportation data sharing between PLMAs and transportation agencies;
- Differences and similarities in transportation data access and analysis between these groups;
- Stage of the planning process or lifecycle process that data is shared; and
- Additional stakeholders relevant to PLMA, state, and local transportation planning processes.

What are the characteristics of successful public lands information/data sharing examples?

The literature review informed common practices for establishing data sharing partnerships. This research study builds on that background by identifying practices specific to successful examples of sharing transportation data between PLMAs and partners.

The research project will explore:

- Motivations for data sharing partnerships;
- The communication and coordination efforts to initiate and build data sharing partnerships;
- The mechanisms, methods, or platforms agencies use to share transportation data; and
- Outcomes of data sharing partnerships, such as expected benefits, realized benefits, and unanticipated failures.

What are the barriers to effective data sharing between PLMAs and transportation agencies?

This part of the research will focus on what barriers exist to effective data sharing between PLMAs and transportation agencies. This will build on existing literature on barriers to effective data sharing partnerships, and use information from case studies to identify barriers specific to a public lands context.

The research project will explore:

- At what stage in the data sharing process agencies face challenges;
- Challenges associated with sharing particular types of data;
- Challenges experienced by particular types of agencies in sharing data;
- Differences in IT infrastructure or data storage between agencies;
- How agencies overcame or attempted to overcome any identified barriers; and
- What resources agencies think would be helpful to overcome barriers.

What do PLMAs and transportation agencies need to share data more effectively?

This part of the research will focus on what resources and support PLMAs and transportation agencies need to engage in more successful data sharing partnerships. It will explore best practices and lessons learned from case studies, as well as feedback from the research panel and other sources.

The research project will explore:

- How to establish and maintain the mechanisms for data sharing (working groups, agreements, shared platforms, etc.);
- Existing opportunities to standardize transportation data to better share across agencies;
- Resources (e.g., funding, staff training, shared platforms) needed for data sharing partnerships; and
- The role regional and national agencies could play in facilitating data sharing.

Proposed Collection Methods

This study requires strategic and targeted use of literature (including PLMA and transportation agency publications, academic journals, and related documents), conversations with planning staff and technical experts, and analysis of existing data and tools.

Literature Review

The study began by investigating the why, how, and what high-level questions identified in the research statement and introduction section above. Using those questions as a framework, the study team conducted a literature review. The review process included key word searches in various databases and websites, including the Transportation Research Information Database (TRID), Western Transportation Institute resources, Federal Geographic Data Committee (FGDC), Transportation Research Board publications, U.S. Department of Transportation publications, FHWA plans and studies, State DOT and local agency research related to transportation on public lands, university research reports, and academic journals.

Through the literature review, the project team gathered information on data sharing partnerships with other types of organizations and the available tools to support these processes. The final literature review includes sections on the purpose and benefits of data sharing; challenges to data sharing; data management sharing processes; and a summary of previous PLMA and transportation agency planning and data sharing efforts.

Technical Research Panel (TRP)

The research team assembled a technical research panel (TRP) to ensure the study purpose, approach, findings, and deliverables align with project goals and public land management needs at key project milestones. The research team will facilitate up to eight TRP meetings throughout the research process. The TRP consists of participants from the following organizations or types of organizations:

- Bureau of Land Management
- Bureau of Reclamation
- City planning and/or department of transportation
- County planning
- Economic development agencies or organization
- FHWA Federal-Aid Division Office
- FHWA Office of Tribal Transportation and/or Bureau of Indian Affairs
- National Park Service
- Nonprofit parks advocacy or research organization

- Private planning or engineering practitioner
- State Department of Transportation
- Regional planning organization
- State or local parks and/or other land management department
- United States Forest Service
- University researchers
- United States Army Corps of Engineers
- United States Fish and Wildlife Service

The TRP is integral to the study, as participants have direct experience in the planning and data sharing processes that are the subject of this study. The TRP's primary purpose is to help guide the research process, and provide input and insight on the research team's progress.

The TRP will also be involving in identifying and selecting case studies. Members will help connect the research team to resources or contacts for case studies.

Database Research and Scan for Additional Data Sharing Examples

Beyond the literature review and recommendations from the TRP, the research team will scan for additional examples of data sharing between PLMAs and partners in various databases and transportation groups. Examples include:
- FHWA Road Safety Audits
- FHWA Transportation Management Area (TMA) Certification Reviews
- Relevant TRB committees
- Relevant research conducted by University Transportation Centers

Case Studies

The research team will also reach out to stakeholders to gather the information and data for case studies. These case studies will highlight how public lands management agencies and transportation agencies are using data sharing partnerships to achieve shared goals. These case studies will help examine best practices for partnerships to coordinate information/data sharing for planning, delivering, and managing transportation systems on and near public lands.

The methodology for conducting the case studies is as follows:

1. Establish case study selection criteria
2. Identify candidate case studies through database scans, TRP workshop, and broad "Call for Case Studies"
3. Develop final case study list per selection criteria
4. Develop case study method, format, and evaluation
5. Conduct outreach to case study subjects
6. Conduct case study discussions
   a. Conduct interviews and workshops, including up to 10 site visits (as possible)
   b. Review background materials
   c. Map planning and data sharing processes
   d. Conduct up to 10 site visits (as possible)
7. Synthesize cross-case study findings for Research Panel review

The information gathered from case studies may include, but is not limited to:

- Identification of common challenges that initiate data coordination efforts;
- Formation and maintenance of agency relationships;
- Data needs and innovations;
- Agencies involved;
- Tools and data platforms used;
- Application of data to project planning, selection, design, implementation, lifecycle management, and evaluation;
- Application of data to agency and user needs and travel patterns, including adaptive management of travel demand and public lands use;
- Lessons learned; and
- Results of collaborative data sharing efforts.

Case Study Selection Criteria

The TRP helped identify and define criteria for selecting case studies that cover the full range of examples discussed below.

Multi-Agency Involvement

The case studies should include a variety of types of agency involvement, such as:

- One-to-one data sharing examples;
- Data sharing that include three or more agencies;
- Open data sharing with an unspecified number of agencies; and
- Publicly-shared data.

These data-sharing relationships primarily include traditional transportation and public lands stakeholders, but they also may include other agencies, such as state-level environmental agencies, universities/research entities, non-profits, and private data providers. The research will cover the different data sharing policies and processes each of these types of agencies have, and how that influences their data sharing efforts.

Variety of Types of Data

The case studies should include a range of types of data, including not only traditional transportation data related to safety, traffic volume, transportation assets, or road ownership and maintenance, but also on cross-cutting topics like environment, resiliency, and equity. The examples should include multiple modes of travel. The case studies should include examples of sharing data that is easy to collect, as well as data that is less common or needs to be collected by innovative methods. The case studies should include both public and proprietary data. Finally, the case studies should include data in different forms, such as tabular, geospatial, longitudinal, and historic data.

Replicability

In order for case studies to be useful, they need to be replicable by other agencies. Case studies should provide an easy-to-follow roadmap for other agencies to implement similar data sharing efforts, with consideration given to agency policies, mechanisms for partnering, governance, project context, and costs. Case studies should highlight how agencies overcame similar challenges, and how identified gaps could be filled to better facilitate data sharing.

Diversity of Circumstances and Contexts

Case studies should apply across public lands with a variety of circumstances and contexts, such as:

- Examples in rural, suburban, and urban areas;
- Examples that are local and regional in scale;
- Examples with limited staff capacity and with trained staff;
- Examples that span a range of costs, including consideration of cost effectiveness;
- Examples that consider the range of transportation needs to and within public lands, including recreation, economic development, and community connectivity; and
- Examples with different agency goals for data sharing.

Different Project Phases

The case studies should include examples across different project phases, including those identified in Figure 1, which shows a generalized version of the transportation planning process. This process will be used as a starting point in case study discussions to understand agencies' transportation decision-making processes. Case study examples will include a focus on how data-driven decision making feeds into all elements of this process.
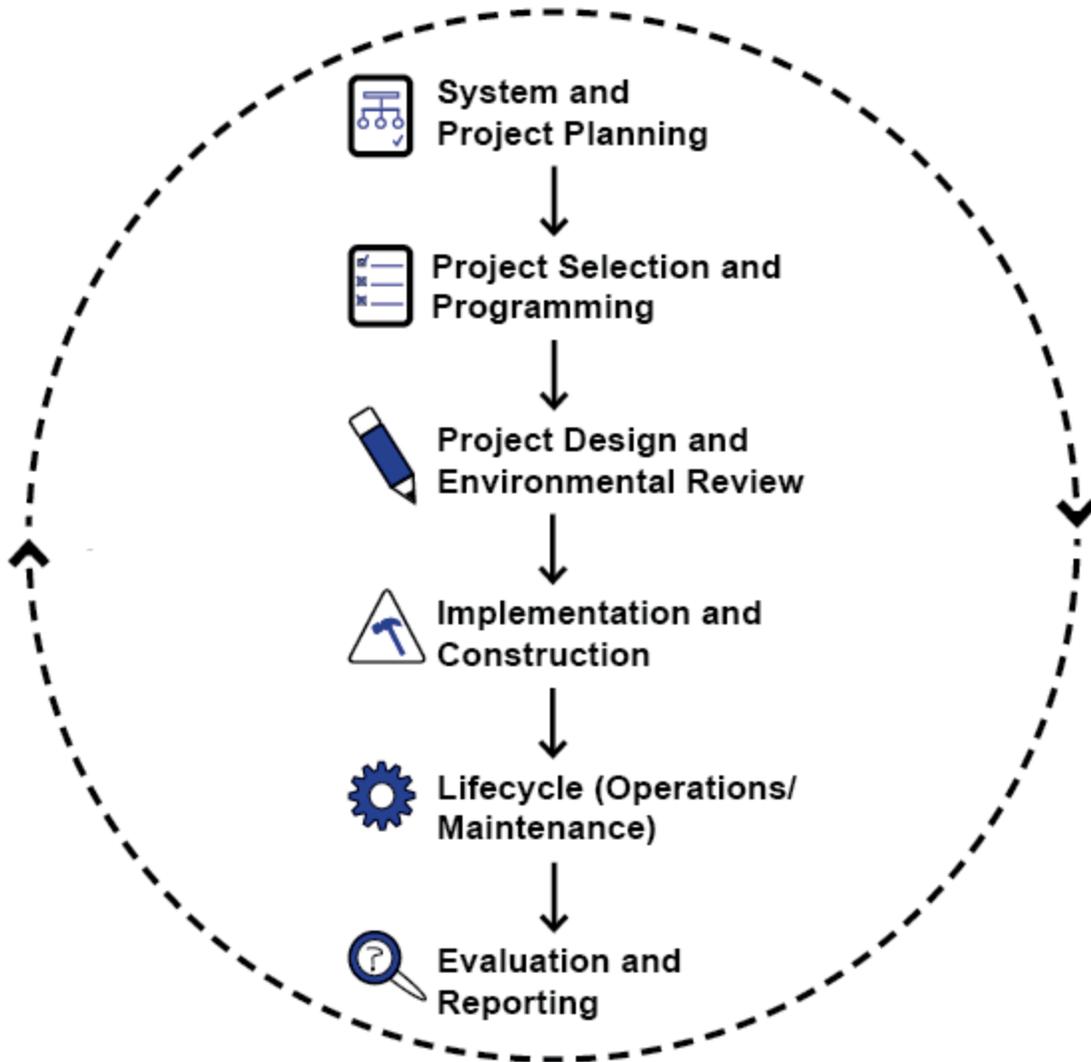
Figure 1: Generalized Transportation Planning Process

Case Study Assumptions

The project team makes the following assumptions related to the case study methodology.

Compliance with the Paperwork Reduction Act

The Paperwork Reduction Act (PRA) is a law that governs how the Federal government collects information from the public. This research is subject to the PRA, and the Volpe Center may need to seek Office of Management and Budget (OMB) approval for any survey or structured interviews of non-federal PLMAs and transportation partners. The PRA does not apply to collecting information from staff at Federal agencies.

Travel Restrictions

Due to restrictions on travel related to the Covid-19 pandemic, there will be limited opportunities for representatives of the research team to conduct site visits or attend in-person meetings. The project team will only travel if and when USDOT travel guidance allows travel and it is safe for both the project team and meeting participants. If necessary, the project team will hold meetings virtually in lieu of travel.

Recent Changes to Planning Processes

PLMAs and transportation partners may have recently modified their planning processes or their use of tools and resources due to impacts from recent events, including the Covid-19 pandemic and climate disasters. The Volpe Center will seek to understand how the planning processes and use of tools/resources have changed based on these impacts, and what additional tools/resources might help PLMAs and transportation partners in times of transition.

Transportation Planning Process as a Starting Point

This research focuses on data sharing partnerships between PLMAs and partners. The research assumes a "one-to-many" relationship, discussing how PLMAs can connect with various partners to achieve shared transportation goals. Within the PLMA context, the research primarily focuses on transportation planning but also considers data sharing to inform decisions throughout the transportation project lifecycle. Agencies have different flow charts to illustrate the transportation project lifecycle, or the transportation planning process. Figure 1 includes a generalized version of this process that is used as a basis for this research.

Schedule and Next Steps

The research study's Data Collection and Analysis task includes three subtasks. The subtasks are listed below with their respective proposed timeframes and the initial next steps within each subtask.

- Data Collection: March 2021 to September 2021
  - Conduct case studies, with the following interim deliverables:
    - List of case study criteria and call for case studies
    - Matrix for case study selection
    - List of selected case studies
    - Case study key questions and approach
    - Field reports from each case study (including any resources shared by participants)
    - Draft case study chapter, including case study write-ups and preliminary findings/themes
- Data Coordination and Data Sharing Toolbox: July 2021 to October 2021
  - Develop a toolbox with the following information:
    - Data sharing forums, platforms, and practices;
    - Partnership structures and governance;
    - Plans, studies, or project delivery tools;
    - Existing tools, benefits and barriers, and how to use them in different settings, such as the Congestion Management Toolkit (NPS) and INSTEP (NPS);

- Emerging data sources, such as mobile location data and Bluetooth traffic and visitor trip data collection;
- Data sharing platform tools, which may be used primarily outside of PLMA context currently or perhaps outside of transportation altogether;
- Gap analysis for tools that do not currently exist and the context for their use; and
- Application and context of tools identified, including clarifying contexts for tools and resources needed to operate tools.
- Findings: September 2021 to December 2021
  - Summarize key findings and other recommendations based on the data collection and data coordination/data sharing toolbox tasks.
  - Identify data coordination and sharing approaches that are most successful, how data coordination can be more effective, what steps can be taken to further advance mutually-beneficial coordination, and a best practices framework for state PLMAs and partners to adapt into their existing planning and project delivery processes.

Appendix A: Transportation Planning Data

Data that is critical to the transportation planning process are captured in Table 1. This list will be updated to reflect additional information gathered during the research process.

Table 1: Data Use by Type

Data	Type(s)[3]	Example of Uses	Source(s)
Road network	Spatial	Origin-destination pairs	Departments of transportation (all levels)
Intersection nodes	Spatial	Modeling	
Crash data	Spatial, Tabular	Road Safety Audits	Law enforcement agencies
Demographic	Spatial, Tabular	Population density,	Census, state and local agencies
Bus stop nodes	Spatial	Transit Network analysis	Transit agencies, DOTs
Traffic volumes	Tabular	Measure congestion	FHWA, state and local DOTs
Train station nodes (all rail)	Spatial	Transit network analysis	Transit agencies, DOTs

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[3] Integrated Land and Water Information System
(http://ilwis.itc.utwente.nl/wiki/index.php/Basic_concepts:_Spatial_and_tabular_data)

Data	Type(s)[4]	Example of Uses	Source(s)
Watershed	Spatial	Geometric design	Environmental management agencies
Floodplain	Spatial	Infrastructure resiliency	Natural resource or environmental management agencies
Bridges	Spatial	Modeling	Departments of transportation (all levels)
Culverts	Spatial, Tabular	Infrastructure resiliency	Departments of transportation (all levels)
Trails	Spatial, Tabular	Non-vehicle networks	Natural resource or environmental management agencies
Bicycle Routes	Spatial, Tabular	Non-motorized vehicle networks	DOT (All Levels)
Pavement condition	Spatial, tabular	Long range planning	Departments of transportation (all levels)
Asset location	Spatial	Long range planning	Managing agencies
Deferred Maintenance	Tabular	Long range planning	Managing agencies

[4] Integrated Land and Water Information System
(http://ilwis.itc.utwente.nl/wiki/index.php/Basic_concepts:_Spatial_and_tabular_data)

Appendix 4: Memo 3 - Data Collection

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

Memorandum 3: Data Collection

February 28, 2022

U.S. Department of Transportation
Federal Highway Administration

Table of Contents

Abbreviations

The abbreviations for the following terms appear in this report:

CVTS	Collaborative Visitor Transportation Survey
LTRPA	Lake Tahoe Regional Planning Authority
MARAD	United States Maritime Administration
MOU	Memorandum of Understanding
NPS	National Park Service
OCBPMP	Outer Cape Bike and Ped Master Plan
ODOT	Oregon Department of Transportation
PLMA	Public Land Management Agencies
RITIS	Regional Integrated Transportation Information System (RITIS)
TRB	Transportation Research Board
TRP	Technical Research Panel
USFS	United States Forest Service
UTC	University Transportation Center

Introduction

This memorandum summarizes the data collection methodology, findings, and next steps in support of an applied research study titled, *Finding a Win-Win: Planning and Data-Sharing Partnerships between Governments and Public Land Management Agencies*.

The specific goals of this project are to:

- Identify examples of information coordination between Public Land Management Agencies (PLMAs) and transportation partners that result in process efficiencies, cost savings, and more effective transportation system delivery and/or management.
- Develop a suite of tools, resources, and usage guidelines to aid PLMAs and their partners in improving data coordination for better transportation systems.

This memorandum describes:

- How the study team selected case studies were selected;
- How case studies discussions were conducted;
- The motivations for planning and data-sharing partnerships in the case studies;
- The mechanisms the partnerships used;
- The results of the partnerships; and
- The general timeframe for finalizing the case study documents and developing tools for the toolkit.

Case Study Process

As outlined in Technical Memo 2,[1] the planned approach for the data collection task in the research project involved a literature review (documented in Technical Memo 1), a review of technical report databases, and a set of case studies. While the database search did not yield much information, the result itself is an indication of why data sharing partnerships was identified as a research need.

The study team followed the planned approach for developing case studies to highlight how public lands management agencies and transportation agencies are using data sharing partnerships to achieve shared goals. The study team developed a set of criteria for evaluating and selecting the nominated examples, which were documented in Technical Memo 2. They included:

- Multi-agency involvement,
- Variety of data types,
- Diversity of contexts,
- Project phase,
- Replicability, and
- Readiness.

The team requested case study suggestions from the Technical Research Panel (TRP) and released a "Call for Case Studies," which was distributed through Transportation Research Board (TRB) committees,

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[1] Federal Highway Administration. 2021. "Finding a Win-Win: Planning and Data-Sharing Partnerships between Governments and Public Land Management Agencies. Memorandum 2: Methodology." https://highways.dot.gov/federal-lands/programs-planning/studies/pads.

relevant newsletters, the University Transportation Centers (UTC), the project website, and the research team's professional networks. The call was sent on May 3, 2021, with a response requested by June 4, 2021. The effort resulted in 24 nominations. The study team applied the selection criteria and sorted the case studies into the following groups:

1. **Highly recommended**: Cases that meet the selection criteria well, including stage of transportation lifecycle, geographic diversity, and general applicability.
2. **Potential**: Cases that meet many of the "highly recommended" criteria but did not make the cut.
3. **Not recommended**: Cases that do not appear to meet selection criteria as well as cases in the other two categories.

The TRP provided input on the rankings, leading to the final tally of 16 highly recommended, four potential, and four not recommended. The study team began reaching out to the case study points of contact to gauge interest in participation and schedule discussions. The discussions were scheduled between September 20, 2021, and January 7, 2022.

Discussion Questions

The study team developed a set of 23 questions to guide each discussion. The team designed these questions to answer the high-level research questions presented in Technical Memo 2, which were:

- What types of data do PLMAs and transportation agencies use to support planning on public lands?
- How do PLMAs and transportation agencies use data to inform decision-making?
- What are the characteristics of successful PLMA and transportation agency data sharing examples?
- What are the barriers to effective data sharing between PLMAs and transportation agencies?
- What do PLMAs and transportation agencies need to share data more effectively?

The questions were grouped into four sections:
1. Data sharing partnership formation,
2. Data fields and tools,
3. Results, and
4. Looking forward.

The questions were not shared with the meeting participants in advance of the meeting, which were conducted virtually using Microsoft Teams. The full set of questions are in Appendix A.

Interest and Discussions

All but one of the case study candidate points of contact were willing to participate in the case study discussion process, presented as one to two one-hour calls. The River Network did not participate; they felt their position as peer group organizers was not a good example of a data sharing partnership between transportation and public lands agencies. Two other discussions were unable to be scheduled. The study team facilitated discussions for the following case studies (see Appendix B for the list of meeting dates and times):

1. Alaska Collaborative Visitor Transportation Survey (CVTS)

2. Alaska Transportation Working Group
3. Colorado Integrated Planning Project
4. Lake Tahoe Regional Coordination
5. Maine Stream Crossing Survey
6. United States Maritime Administration (MARAD) and University of Arkansas TransMAP Hub
7. Mississippi National River and Recreation Area Paddle Share program
8. Mount Rainier Visitor Use Management Planning
9. National Park Service (NPS) Pilot Data Collection Partnerships
10. NPS National Capital Area Data Collection Partnership (originally grouped with the NPS partnerships above but separated due to unique aspects)
11. Oregon Coast Trail Action Plan
12. Oregon Department of Transportation (ODOT) Regional Integrated Transportation Information System (RITIS)
13. Outer Cape Cod Bike and Ped Master Plan
14. Wasatch Front Regional Council Regional Data Sharing Partnerships

The study team initially scheduled discussion meetings for one hour; however, the team quickly realized it was not enough time for the full discussion of topics. The team extended the remaining initial calls to 90 minutes and scheduled follow up calls with participants that had shorter initial meetings.

The study team sent the meeting notes to the participants for review and confirmation after the meetings were completed. The notes will be used to develop the final case study documents.

Summary of Findings

The study identified the following common themes from the case studies. The study team will document each case study in more depth in the Final Report.

Motivations for Data Sharing

The public lands and transportation agencies in the case studies expressed some common motivations for planning and data sharing partnerships. These included:

- Identifying shared priorities, missions, goals, and objectives;
- Developing a common understanding of how projects from each agency interact with other agencies' existing or planned efforts;
- Leveraging additional data to make project planning and analysis more robust;
- Analyzing travel patterns, transportation networks, and gaps at a regional scale;
- Addressing challenges that cross jurisdictional boundaries, such as congestion and environmental protection;
- Overcoming institutional barriers to data sharing, such as firewalls, incompatible technologies, and inefficient one-off data transfers; and
- Working together on a particular task, such as a project of mutual benefit.

Mechanisms for Data Sharing

The case studies illustrate a variety of types of data sharing partnerships and mechanisms for data sharing. These include:

- **Informal data sharing partnerships:** These partnerships typically arise out of a shared desire to share data for particular plans or projects, but they are not governed by any formal agreements, such as Memoranda of Understanding (MOUs) or formal data sharing protocols. The benefit of informal partnerships is that they require less effort to establish. However, they may be best suited to simple data sharing partnerships.
- **Formal data sharing partnerships:** These are partnerships that are formalized through agreements, such as MOUs, between partner entities. These MOUs may establish what data partners share, data management protocols, privacy and access, and other considerations. An informal data sharing partnership may become formalized over time.
- **Different geographic scales:** The case study examples were at a variety of scales, including local (e.g., in the vicinity of a public lands unit and local community), regional, state-wide, or national.

The case study entities identified the importance of the following factors for success:

- **Building relationships and trust among partners:** Case study participants described relationship-building among partners as a means of achieving effective partnerships and as a result of those partnerships. The case study agencies also stressed the importance of establishing a partner as a "first-among-equals" who is the lead point of contact in coordinating and implementing the partnership.
- **Explaining the value of data sharing partnerships:** The case study participants described the importance of communicating the importance of data sharing partnerships to agency leadership and the public.
- **Using common technologies or platforms for processing and accessing the data:** It is important for all partners in a data sharing partnership to have access to the same technologies and platforms. In some cases – including the Oregon Coast Trail Action Plan and the Colorado Integrated Planning Pilot – partners achieved this with commonly available platforms, such as online mapping software. In other cases, such as the ODOT Regional Integrated Transportation Information Systems, partners use more complex platforms developed and maintained by third-party vendors. In either case, it is important for partners to have access to the data platforms and the training and resources needed to analyze the data.

Results from Planning and Data Sharing Partnerships

It is important to communicate the impacts of good data sharing partnerships in transportation planning engaging public lands. Positive results garner continued support within the participating agencies and provides an example for others to follow. Based on the case study discussions, the study team identified four outcomes of data sharing partnerships that demonstrate the benefits of these partnerships.

1. **Coordinated plans and projects:** Partnering and sharing data with other agencies that have planned studies and projects enables the partners to see where there is possible overlap. By working together on the Outer Cape Pedestrian and Bicycle Master Plan (OCPBMP), NPS and the local towns had a better understanding of where each other's projects are happening and how they intersect. The Oregon Coast Trail Action Plan had a similar outcome.
2. **Enhanced awareness of partner goals and projects**: The Colorado Integrated Planning Project brought together representatives from local stakeholders, metropolitan planning organizations (MPOs), state agencies, and Federal agencies when each was undergoing, or about to start, long range transportation plans. The development of an integrated map helped visualize where

different projects were planned, the proximity of projects to each other's, and spurred discussion about the purpose of each project. The communication made the agencies and groups aware of where and why the various projects are occurring and has the potential to facilitate coordination for project implementation.

3. **Identified common priorities and objectives**: The Lake Tahoe Regional Planning Authority (LTRPA) has established a compact with the United States Forest Service (USFS, owns 78 percent of land in basin), six local jurisdictions, Tahoe city, private agencies, and other stakeholders. The LTRPA works on corridor planning with their partners by identifying common goals. They try to understand what each partner has to deal with in order manage their facilities and incorporate the understanding into via agreements and chartering exercises that work for everyone.

4. **Coordinated project delivery:** Time and financial efficiencies are possible when agencies share information and schedules to coordinate their planning transportation projects. For example, the Alaska Transportation Working Group described project efficiencies through regular project coordination to identify projects of mutual interest and opportunities to coordinate construction projects along similar timeframes.

Suggested Tools for Supporting Data Sharing Partnerships

The discussions concluded by asking participants what, if any, tools would help facilitate the creation and longevity of data sharing partnerships. The responses ranged from universal but adaptable templates to information sharing on legal requirements and best practices.

- Templates for developing data sharing agreements,
- User-friendly data visualization tools,
- Tracking of best management practices,
- High-level overview of how to prioritize key data points,
- Synopsis of laws and regulations governing data/ownership/controls Such as privacy regulations, cloud-based storage.
- Supporting data user groups (geographic or topic) to discuss best practices and new developments, and
- Communication of funding opportunities for piloting data collection collaboration.

The study team will incorporate these suggestions into the tool development in the next phase of the project.

Schedule and Next Steps

The research study's Data Collection and Analysis task includes three subtasks. The subtasks are listed below with their respective proposed timeframes and the initial next steps within each subtask. The remaining subtask for the data collection task is to draft and finalize the case study write-ups.

- Data Collection: August 2021 to March 2022
  - Conduct case studies, with the following interim deliverables:
    - Draft case study chapter, including case study write-ups and preliminary findings/themes
- Data Coordination and Data Sharing Toolbox: March to July 2022
  - Develop a toolbox with the following information:
    - Data sharing forums, platforms, and practices;

- Partnership structures and governance;
- Plans, studies, or project delivery tools;
- Existing tools, benefits and barriers, and how to use them in different settings, such as the Congestion Management Toolkit (NPS) and INSTEP (NPS);
- Emerging data sources, such as mobile location data and Bluetooth traffic and visitor trip data collection;
- Data sharing platform tools, which may be used primarily outside of PLMA context currently or perhaps outside of transportation altogether;
- Gap analysis for tools that do not currently exist and the context for their use; and
- Application and context of tools identified, including clarifying contexts for tools and resources needed to operate tools.
- Findings and Final Report: July to September 2022
  - Summarize key findings and other recommendations based on the data collection and data coordination/data sharing toolbox tasks.
  - Identify data coordination and sharing approaches that are most successful, how data coordination can be more effective, what steps can be taken to further advance mutually-beneficial coordination, and a best practices framework for state PLMAs and partners to adapt into their existing planning and project delivery processes.

Appendix A: Case Study Questions

Data Sharing Partnership Formation

1. Could you provide a brief overview of the project (or partnerships, etc.), including how it formed, for what purpose, and who is involved?
2. What data did you need and how did you determine who had that data?
3. What are the designated roles of the parties involved?
4. How did you govern your data sharing relationship(s) (policy board, intergovernmental agreement, project team, etc.)?
5. What have been the main benefits to the data sharing partnership?
6. Did you come across any organizational barriers in sharing data? If so, how did you overcome them?

Data Fields and Tools

7. What types of data were shared and how was it used? Is there a regular exchange of data or was it a single time transaction?
8. Was the data already in a form that could be used, or did you have to do additional cleaning and analysis to use it?
9. How did you determine which parties were responsible for cleaning and analyzing the data?
10. What specific tools or platforms are used to share data?
11. Was additional training, funding, or other resources needed to implement the data sharing partnership?

Results

12. Did receiving this data allow you to do anything you could not have done without the data?
13. How is the data used to achieve goals, support the planning process, or advance specific projects? Consider all aspects of a project lifecycle, from project planning, selection, design, implementation, lifecycle management, and evaluation.
14. How is the data used to address agency and user needs and travel patterns, including adaptive management of travel demand and public lands use?
15. How would you recommend other public lands with similar goals establish data sharing partnerships?
16. Once established, have there been challenges or barriers in maintaining the data sharing partnership?
17. Are there any other results and lessons learned of the data sharing efforts that haven't already been mentioned?
18. In your experience, are there any unique challenges that public land agencies face regarding partnerships and data sharing that are different than the typical transportation planning and management processes?
19. Do you believe the goals and methods for transportation within public lands are different from those of transportation agencies? If so, how?

Looking Forward

20. Did the data sharing partnership achieve its goals (short-term and long-term)? Is there anything you would change or like to be able to do moving forward?
21. What other groups might you like to partner with to share transportation data, or what other types of transportation data would you like to access?
22. What tools would you like to see as a result of this study to support you in developing and maintaining data sharing partnerships?
23. Do you have any recommendations for other public lands or transportation partners we should reach out to about data sharing efforts?

Appendix B: Meeting Schedule

Case Study	Interviewees	Date (and follow-up discussion dates if applicable)
Cape Cod Commission (Outer Cape Bike and Ped Master Plan OCBPMP)	Steven Tupper, Sarah Korjeff, Martha Hevenor	9/28/21 (12/3/21)
MARAD and University of Arkansas TransMAP	Heather Nachtmann, Travis Black, Jackson David	10/1/21
NPS Pilot Data Collection Partnerships	Rachel Collins, Joe Regula, Erica Cole, David Daddio	10/7/21 (12/2/21 discussion with David Daddio regarding DC National Mall projects)
Wasatch Front Regional Council	Bert Granberg, Matt Peters, Stephanie Tomlin	10/13/21 (12/20/21)
Oregon Coast Trail Action Plan	Andy Smith, Paul Reilly, Peter Dalke	10/14/21 (1/5/22)
Collaborative Visitor Transportation Survey	Roxanne Bash, Kenli Kim, Margaret Petrella	10/19/21 (12/16/21)
Regional Integrated Transportation Information System (RITIS)	Thanh Nguyen, Chi Mai	10/20/21
Maine Stream Crossing Survey	Alex Abbott	10/22/21
Tahoe Regional Planning Agency	Michelle Glickert, Julie Regan, Nick Haven	10/29/21
Mississippi National River and Recreation Area Paddle Share Program	Katie Nyberg, Karen Katz, Ben Rasmussen	11/8/21
Colorado Integrated Planning Project	Aaron Bustow, Erica Cole, Dean Bressler, Bill Haas, Elijah Henley, Matt Muraro, Ross Mittelman, Jeff Sanders, Rachel Peterson	12/17/21 (2/15/22)
Alaska Transportation Working Group	Amy Thomas, Paul Escamilla, Eric Taylor, Roxanne Bash, Kevin Doniere, Troy Civitillo, Curt Fortenberry	1/7/22 (2/4/22)

Appendix 5: Memo 4 - Data Coordination and Sharing Toolbox