



Synthesis Report: Bilateral Exchanges between the Federal Highway Administration and the Netherlands' Rijkswaterstaat

Synthesis Report Documenting the Collaborative Activities, Outputs, and Impacts of the Office of International Programs' Bilateral Relations Program between the Federal Highway Administration and the Netherlands' Rijkswaterstaat from 2009 to the Present Day

Report No. FHWA-HPL-25-001

Final – October 11, 2024

Submitted by: ICF Incorporated, L.L.C.

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Technical Report Documentation Page

1. Report No. FHWA-HPL-25-001	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Synthesis Report: Bilateral Exchanges between the Federal Highway Administration and the Netherlands' Rijkswaterstaat Synthesis Report Documenting the Collaborative Activities, Outputs, and Impacts of the Office of International Programs' Bilateral Relations Program between the Federal Highway Administration and the Netherlands' Rijkswaterstaat from 2009 to the Present Day		5. Report Date October 11, 2024	
		6. Performing Organization Code:	
7. Author(s) Laurence O'Rourke (ICF), Marcel Ham (Rebel), Remco Derksen (Rebel), Christine Shepherd (Rebel), Saunders Ruffin (Rebel), and Jihan Noizet (FHWA)		8. Performing Organization Report No.	
9. Performing Organization Name and Address ICF 1902 Reston Metro Plaza Reston, VA 20190		10. Work Unit No.	
		11. Contract or Grant No. 693JJ322A000013	
12. Sponsoring Agency Name and Address United States Department of Transportation 1200 New Jersey Ave., SE Washington, DC 20590		13. Type of Report and Period Synthesis Report	
		14. Sponsoring Agency Code	
15. Supplementary Notes FHWA Task Monitor: Jihan Noizet FHWA Contract Administrator: Amalia Rodezno			
16. Abstract This synthesis report documents the Binational Relations Program (BRP) between the Federal Highway Administration (FHWA) and Rijkswaterstaat (RWS), the executive arm of the Netherlands Ministry of Infrastructure and Water Management, detailing the activities, outputs, challenges, benefits, and opportunities for improvement of the 15-year-old collaboration. The report is organized around seven distinct topics that have defined the program to-date: 1) Road Safety; 2) Performance Measures; 3) Project Acceleration; 4) Emergency and Crisis Management; 5) Cycling; 6) Connected and Automated Vehicles; 7) Infrastructure Resilience and Adaptation. The report culminates in a vision for sustaining the partnership into the future with concrete recommendations for future scope and administrative methodologies.			
17. Key Words Office of International Programs, OIP, Lessons Learned, International Collaboration, Netherlands		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161	
19. Security Classif. (of this report) None	20. Security Classif. (of this page) None	21. No. of Pages 71	22. Price N/A

Form DOT F 1700.7 (8-72). Reproduction of completed page authorized.

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Abbreviations

Name	Abbreviation
American Association of State Highway and Transportation Officials	AASHTO
Binational Relations Program	BRP
Conference of European Directors of Roads	CEDR
Connected and Automated Vehicles	CAV
Department of Transportation	DOT
Design-Build-Finance-Operate-Maintain	DBFOM
FHWA's Office of International Programs	OIP
FHWA's Office of Planning, Environment, and Realty	HEP
Global Benchmarking Program	GBP
Highway Safety Model	HSM
Implementing Arrangement	IA
Infrastructure-to-vehicle technology	I2V
Knowledge and Innovation Office	KIO
Memorandum of Cooperation	MOC
Memorandum of Understanding	MOU
Multinational Relations Program	MRP
North Carolina State Department of Transportation	NCDOT
Point of Contact	POC
Public-private Partnership	P3
Rijkswaterstaat	RWS
Transit Asset Management	TAM
Transportation Research Board	TRB
U.S. Federal Highway Administration	FHWA
Vehicle-to-infrastructure technology	V2I
Washington State Department of Transportation	WSDOT
World Road Association	PIARC

1 Executive Summary

1.1 Overview

The United States Federal Highway Administration's (FHWA) Office of International Programs (OIP) leads the effort to provide access to international sources of information and best practices with respect to road-related technologies and innovations. There are three main international programs that the OIP oversees to meet these objectives: the Global Benchmarking Program (GBP), Binational Relations Program (BRP), and Multinational Relations Program (MRP). These programs work in a complementary fashion to address different aspects of FHWA's international efforts, all while focusing on U.S. priorities and FHWA objectives.

The BRP between the FHWA and the Netherlands' Rijkswaterstaat (RWS), the executive arm of the Netherlands Ministry of Infrastructure and Water Management, has focused on government-to-government exchanges on high-priority transportation topics since 2009. The program is structured around one to two collaboration topics reflecting a salient and topical road transportation theme that are addressed in two-year intervals. Seven collaboration topics have been addressed by the FHWA-RWS BRP to-date, which include road safety, performance measures, project acceleration, emergency and crisis management, cycling, connected and automated vehicles, and infrastructure resilience and adaptation.

Cumulatively, the longstanding FHWA-RWS BRP collaboration has successfully facilitated the development of professional networks at the coordinator and expert levels as well as information exchanges on crucial transportation topics, fostering a sense of collegiality and professionalism between the two agencies, while simultaneously demonstrating resiliency in the face of administrative changes in the U.S. This trusted partnership, built over a decade and a half, continues to generate tangible and intangible benefits for both agencies to this day via in-person and virtual engagement modalities, as well as periodic meetings among senior management parties representing both agencies.

This established network has made mutual knowledge requests much more efficient for both agencies and improved the ability to benchmark progress on transportation research topics of importance to both nations.

1.2 Recommendations

To ensure the ongoing success and resiliency of the FHWA-RWS exchange, this report identifies numerous recommendations with respect to potential areas of future collaboration, strategies for selecting engagement modalities, and improving the quality of those engagements.

1.2.1 Future Collaboration Topics

Given both nations grapple with many of the same road transportation challenges, the FHWA-RWS BRP can serve as a unique vessel to transmit each agency's unique approaches to these challenges. This provides a vital source of innovation for both agencies. Therefore, when considering future topics, it is practical to consider a topic of mutual salience in which a delta in agency approach exists to maximize the amount of value the exchange can deliver.

The topic of “smart mobility”, which synergizes technological advancements with mobility solutions, emerged as a recurrent topic of interest for future exchange among officials from both agencies. Because of the far-reaching and transformative implications of innovative technology on both agencies’ transportation systems, the momentum behind the short-lived “connected and automated vehicles” (CAVs) BRP collaboration topic between 2019 and 2021, and each nations’ differing regulatory approaches to smart mobility subtopics, “smart mobility” represents a ripe concept for future collaboration. Key subtopics mentioned included vehicle-to-infrastructure (V2I) and infrastructure-to-vehicle (I2V) technologies, advanced driver assistance systems (ADAS), "geofencing" for CAVs, real-time traffic information dissemination, the digitization of road safety protocols and governance structures, the integration of artificial intelligence (AI), the utilization of "digital twins" for virtual modeling, and the cascading effects of CAVs on civil service operations, licensing frameworks, and insurance paradigms. Additionally, the imperative for strategic alignment with "IT Giants" regarding transportation data ecosystems was highlighted.

In addition to smart mobility-centric themes, the critical challenge of aging infrastructure emerged as a key concern among stakeholders from both agencies. This issue has been elevated to strategic prominence, as evidenced by its prioritization on the agenda of the newly appointed Director-General of RWS to optimize the lifecycle management of legacy infrastructure assets. Additional areas of mutual interest – including sustainability initiatives, (embodied carbon in construction services and circular economy principles), climate adaptation strategies, and data and information services – could also be explored.

1.2.2 Selecting an Engagement Modality

To operationalize the adoption of new collaboration topics and select the most appropriate engagement modality, RWS and FHWA officials can consider utilizing a strategic framework which contemplates the comparative expertise level each agency brings to the table about the topic. By understanding the level of expertise each agency has in relation to a topic, “low hanging fruit” may become more apparent, which delivers high value in exchange for low resources. For example, there are three core forms of engagement: information exchange, joint research, and pilot projects. Information exchange, conducted through meetings, webinars, and conferences, offers high value at low cost and fosters mutual learning and strong networks. This can serve as the “gateway” into joint research and/or pilot projects and is most relevant when there is a mismatch in expertise level. Joint research involves co-creating new, additive information useful to both parties, ideally resulting in implementable opportunities. This is most relevant when there is an alignment in expertise level. Finally, pilot projects (e.g., tool swapping) focus on implementing information and are most effective when both agencies have equal expertise on a specific topic - regardless of whether the topic is nascent or mature. Importantly, both agencies need to also balance this strategic framework with the actual resource availability that both agencies can expend towards a particular topic, including the time availability of each agency’s subject matter experts, to fully understand a topic’s priority as well as its associated activities.

1.2.3 Programmatic Improvements

Several suggestions are put forth to unlock the full potential of future collaborative opportunities. This includes leveraging face-to-face information exchange at least once per year, per topic, to help build trust and facilitate information flow. While tools for virtual connection have dramatically enhanced the capabilities and logistics for international collaboration, they should not replace in-

person connections, which were identified by program participants as a crucial success factor in the effectiveness of the FHWA-RWS BRP – especially at the beginning of a collaboration. These initial in-person meetings lay the groundwork for determining appropriate engagement types aligned with exchange goals. Additionally, identifying and securing time and resources for the exchange is essential, albeit challenging. Therefore, it is recommended to creatively leverage existing conferences and event fora for topic ideation and follow-up. Furthermore, involving the right stakeholders is vital. This includes bringing in external expertise and administrative support for more intensive exchanges, recognizing the crucial role of U.S. State DOTs in providing additional resources to knowledge exchange and development, pilot testing, and contracting joint research, and potentially expanding partnerships to include EU counterparts and additional U.S. research organizations. Finally, consideration should be made to incorporate and facilitate reporting standards to streamline data collection for internal record-keeping.

1.3 Collaboration Topics

The following tables provide an overview of each of the seven collaboration topics conducted between the beginning of the BRP and the present day, along with their high-level benefits, challenges, and takeaways.

1. Road Safety Collaboration
2. Performance Measures Collaboration
3. Project Acceleration Collaboration
4. Emergency and Crisis Management Collaboration
5. Cycling Collaboration
6. Connected and Automated Vehicles Collaboration
7. Infrastructure Resilience and Adaptation Collaboration

Table 1: Road Safety Collaboration


 Road Safety (Conducted 2010 – 2011)
Overview of Exchange
Emphasis on crash prediction models, the Highway Safety Model (HSM), Dutch investment scenarios for safety, rumble bars, barriers, and billboard distraction, among other topics. Collaboration methods included conferences, meetings, and in-person technical visits.
Key Benefits
For RWS, the American Association of State Highway and Transportation Officials (AASHTO) Highway Safety Manual served as a source of inspiration. For FHWA, learning about RWS's more systemic approach to roadway improvements for safety was of value. As part of the exchange, the RWS gave the FHWA a report called "Building Blocks for Safety". This gave the FHWA another perspective on systemic project selection approaches, which has been implemented in various states.
Key Challenges
Neither RWS nor FHWA cited any key challenges associated with this exchange topic except that the topic occurred more than a decade prior to this synthesis report, making it difficult for interviewees to remember with accuracy.
Key Takeaways
A formal extension of an exchange topic is not necessary once the bilateral relationship among relevant experts has matured to a level where the exchange will naturally occur.

Table 2: Performance Measures Collaboration


 Performance Measures (Conducted 2010 – 2013)
Overview of Exchange
Emphasis on surveying the performance management practices in European states, and several states in the U.S. with a goal of developing better performance management systems in both the U.S. and the Netherlands. Collaboration methods included in-person technical visits, joint research, and webinars.
Key Benefits
Provided insights for the U.S. and Netherlands at a time when both countries were establishing performance and outcome-based transportation programs. For RWS, the research helped them better understand how to improve alignment of government/ministerial goals with road authority performance measures. For FHWA, the research helped them understand the varied application of transit asset management systems across U.S. State Departments of Transportations.
Key Challenges
Neither RWS nor FHWA cited any key challenges associated with this exchange topic.
Key Takeaways
Joint research as a collaboration activity works well when both countries have an equivalent knowledge level on a topic.

Table 3: Project Acceleration Collaboration


 Project Acceleration (Conducted 2012 – 2013)
Overview of Exchange
Emphasis on efforts to expedite project delivery through initiatives like FHWA's "Every Day Counts" program and RWS's "Sneller en Beter" (Faster and Better) program and focused on innovative contracting approaches, e.g. public-private partnerships (P3s). Collaboration methods included in-person executive meetings, webinars, and in-person technical visits.
Key Benefits
FHWA noted that it benefited from RWS's experience with innovative contracting mechanisms at a time when the U.S. was examining these mechanisms in more detail.
Key Challenges
The FHWA was concerned that the flow of knowledge was not bidirectional and that RWS was contributing more.
Key Takeaways
The FHWA witnessed firsthand how a project manager-first approach can "grease the wheels" of a project. Additionally, given the rapid advancement of this topic in the United States, there might be a more robust opportunity for exchange on this topic.

Table 4: Emergency and Crisis Management Collaboration


 Emergency and Crisis Management (Conducted 2014 – 2016)
Overview of Exchange
Emphasis on best practices with respect to responding to emergencies, with RWS seeking to learn from the U.S. experience. Collaboration methods included in-person visits.
Key Benefits
In September 2014, RWS visited FHWA, receiving presentations on climate change impacts on evacuation planning and national response frameworks. The RWS liaison reported a productive visit, resulting in an internal Dutch-language report with numerous recommendations. This report was not accessible for review in this assessment.
Key Challenges
There are no documented challenges for FHWA. However, according to RWS, while there were intentions to further explore potential collaboration after an in-person visit, a key personnel change within RWS hindered this momentum, stifling future activities for exchange.
Key Takeaways
Due to a lack of information available, no key takeaways were derived.

Table 5: Cycling Collaboration


 Cycling (Conducted 2016 – 2018)
Overview of Exchange
<p>Emphasis on increasing knowledge sharing on planning, designing, monitoring, and improving bicycle transportation networks based on the shared belief that effective cycling infrastructure enhances safety, accessibility, and the overall transportation system. Collaboration methods included web meetings, webinars, in-person workshops, and joint in-person conference sessions.</p>
Key Benefits
<p>For FHWA, learning about Dutch approaches on bikeway selection methods, integration of public transport and cycling, channelization of traffic, observed raised crosswalks, protected intersections, and Leading Pedestrian Interval (LPI) and Leading Bicycle Interval (LBI) influenced the application of these cycling components in the U.S. For RWS, benefitted from networking and research framework as well as gaining insights into the relation between self-driving vehicles and bicycles.</p>
Key Challenges
<p>Neither RWS nor FHWA cited any key challenges associated with this exchange topic.</p>
Key Takeaways
<p>Cycling is a crucial component of “smart and green mobility” and could be considered a valuable subtopic for future collaboration.</p>

Table 6: Connected and Automated Vehicles Collaboration



 Connected and Automated Vehicles (Conducted 2019 – 2021)
Overview of Exchange
Emphasis on insights into the two agencies' respective CAV initiatives and practical implementation challenges. Collaboration methods included webinars, and a joint research proposal creation.
Key Benefits
RWS and FHWA co-developed a timely research proposal and benefited from an informative and valuable set of webinars on relevant CAV topics.
Key Challenges
The COVID-19 pandemic stymied the collaboration.
Key Takeaways
Connected and automated vehicles – especially the larger genus of “smart mobility” – is still a fruitful topic for further collaboration.

Table 7: Infrastructure Resilience and Adaptation Collaboration

 Infrastructure Resilience and Adaptation (Conducted 2014 – Present)
<p>Overview of Exchange</p>
<p>Ongoing exchange over the past decade has included several phases: 2014–2016 (strategies, methods, and best practices to increase infrastructure resilience), 2016–2018 (comparing climate resilience tools for transportation projects), 2019–2021 (nature-based solutions to reduce flood hazards to highways and provide environmental benefits), and 2022–present (reviewing new climate and resilience topics for further exchange). Collaboration methods included web meetings, webinars, in-person technical visits, conferences, and pilot projects.</p>
<p>Key Benefits</p>
<p>For both agencies, information sharing has resulted in updated guidance materials, such as the FHWA's Vulnerability Assessment and Adaptation Framework (third edition) and the International Guidelines on Natural and Nature-Based Features for Flood Risk Management.</p>
<p>Key Challenges</p>
<p>In-person visits and face-to-face interactions proved to be very valuable, but they can also be very costly from an administrative standpoint. Additionally, FHWA and RWS have different capabilities based on their mandates (e.g., RWS has implementation power and the FHWA does not, making it difficult to explore testing through pilot projects).</p>
<p>Key Takeaways</p>
<p>Early and sustained face-to-face connection is pivotal in securing a solid basis for communication. Additionally, a longer period to exchange on the topic can lead to more organic collaborative relationships. Furthermore, senior topic champions from each agency and outside administrative support as needed can help enhance the exchange outcomes. Finally, because RWS serves in both administrative and road managing roles, while the FHWA is largely focused on oversight and policy, the presence of a State DOT can be indispensable.</p>

2 Introduction

2.1 Overview of Effort

ICF International and IMG Rebel Advisory, Inc. (Rebel), jointly referred to as the “Project Team,” were contracted to develop an official record of the exchanges between the United States Department of Transportation’s Federal Highway Administration (FHWA) and Rijkswaterstaat (RWS), the executive arm of the Netherlands Ministry of Infrastructure and Water Management. Since 2009, the FHWA and RWS have been engaged in a bilateral information exchange, facilitated by the FHWA’s Office of International Programs (OIP) and the RWS’s Office of Knowledge and Innovation Management (WVL BNKI, or “KIO”), and continue to host collaborative exchanges.

The goal of the Project Team’s work was to summarize past road transportation technical interactions between the United States and the Netherlands, along with a description of the benefits derived from them, challenges faced by the collaboration, and recommendations to surmount those challenges to ensure the program continues to flourish. Additionally, the team looked for additional methods, subjects, and opportunities for future collaboration.

2.2 Methodology

The Project Team utilized two data collection methods to provide the informational basis for this Synthesis Report: desk research and semi-structured interviews.

- 1. Desk Research** – The foundation for this report is based on a literature review that documents and summarizes the exchange of information between the FHWA and RWS in their binational collaborations to date, including the dates and details of binational collaboration topics and documents associated with them. To prepare the literature review, the Project Team inspected three main categories of information: 1) documents provided by the OIP, including other documents referenced within these documents, 2) the OIP’s website, including the “Technologies and Best Practices” landing page¹ and the “Publications” landing page,² and the links found therein, and 3) other relevant, publicly available documents found via internet search. The information collected as part of the literature review informed the questions for discussion with selected representatives from the FHWA and RWS and served as background for the Synthesis Report.
- 2. Semi-Structured Interviews** – Between February 22, 2024, and March 24, 2024, the Project Team conducted 9 interviews with 11 officials representing the FHWA and RWS that previously were or are currently involved in the FHWA-RWS BRP. The information from these discussions provided an additional layer of detail and depth to substantiate the desk research, which together form the basis of this Synthesis Report. The Appendix contains a list of interviewees.

After collecting these two sources of information, the Project Team overlaid the findings from the semi-structured interviews with the desk research to identify points of corroboration and

¹ See: <https://international.fhwa.dot.gov/programs/tbp/>

² See: <https://international.fhwa.dot.gov/links/pubs.cfm>

contradiction to concretize a final literature review and “source of truth”. Subsequently, the Project Team analyzed the responses of the interviews for signs of weakness and strength in the collaboration between the FHWA and RWS, which led to collating a prioritized list of recommendations for the program.

2.3 Limitations

2.3.1 Lack of Interviews

The Project Team was unable to contact several FHWA officials who served as the respective points of contact (POCs) for Performance Measures, Emergency and Crisis Management, Cycling, and Infrastructure Resilience & Adaptation due to the individual either being retired, at a new agency, or otherwise unreachable. Fortunately, all RWS POCs were able to be interviewed, therefore all collaboration topics received reflection.

2.3.2 Length of Time Since Topic Closed

15 years have passed since the signing of the initial Memorandum of Cooperation in 2009, which signaled the beginning of the formal bilateral exchanges between FHWA and RWS. As a result, interviewees' memory of these earliest topics was vaguer than recent ones, and access to associated documentation was more difficult to achieve. This was especially the case for the collaborative activities related to Road Safety, Performance Measures, Project Acceleration, and Emergency and Crisis Management.

2.3.3 Lack of Documentation

The Project Team was unable to access documentation for several collaboration topics, most notably for Emergency and Crisis Management. This is due to the lack of access to officials associated with the collaboration topic (read: Lack of Interviews), a lack of publicly available documentation, archived, non-public and non-accessible documents, as well as documents internal to RWS that remain in the Dutch language and therefore inaccessible to the research team.

2.4 Flow of Paper

First, this paper will provide a historical overview of the bilateral exchange, including descriptions of key administrative milestones that have shaped the exchange. Second, this paper will provide a summary of past road transportation technical interactions between the United States and the Netherlands, specifically the seven “collaboration topics” around which the exchange organizes itself. Third, this paper will provide a description of the key benefits, challenges, and takeaways from the exchange disaggregated by each collaboration topic. Fourth, the paper will conclude with a series of recommendations to surmount cited challenges to ensure the program continues to flourish, as well as a list of insightful methods, subjects, and opportunities to enrich future collaboration. Fifth, a concluding section will examine the entire information exchange holistically, providing high-level takeaways. Finally, the Appendix contains an archive of all known documentation of the program, which contains all documents referenced in this report.

3 Background

3.1 Office of International Programs

The Office of International Programs (OIP) works to access, promote, and disseminate global best practices and technical innovations to ensure a safe and efficient U.S. highway transportation infrastructure.

OIP's activities are designed to support FHWA in shaping the future of highway transportation in the United States by incorporating the agency's strategic goals into a broad range of interactions with foreign counterparts, including the Netherlands.

The FHWA and the RWS interact via two collaboration programs facilitated by OIP: the Binational Relations Program (BRP) and the Multinational Relations Program (MRP). This Synthesis Report focuses on the BRP collaborations, though where it makes sense for context, mention of the MRP is made.

The OIP's counterpart in RWS is the Office of Knowledge and Innovation Management (WVL BNKI, or "KIO"), which focuses on sourcing global knowledge for RWS strategic plans. Like the OIP, the KIO facilitates bilateral relationships with the RWS's "sister organizations" across the world, including Belgium, Germany, the United Kingdom, and France, countries with similar approaches to road transportation like Sweden, larger industrialized countries like China and the United States, and other specific countries depending on the collaboration topic (such as South Korea and Japan for CAVs). KIO also partners with large technological institutes and universities in the Netherlands, such as Delft University of Technology (TU Delft). The KIO also relies on international working groups and committees, like the Conference of European Directors of Roads (CEDR) and the World Road Association (PIARC), for international information exchanges and knowledge development. Additionally, the KIO and OIP are both members of the Forum of European National Highway Research Laboratories (FEHRL).

3.2 Binational Relations Program

The BRP is the hallmark exchange activity between the FHWA and RWS. The BRP focuses on government-to-government relations and activities designed to exchange information regarding best practices and technologies related to high-priority topics. Endeavors focus on DOT and FHWA priorities, with a goal of facilitating exchanges that are practical and implementable. There is an emphasis on the interchange element of the relationships, aiming to provide benefits to all participants.³

The BRP between FHWA and RWS was formalized under the Memorandum of Cooperation (MOC) signed in 2009. There have been seven "collaboration topics" that have served as the basis for BRP information exchanges to date with the RWS and are discussed in Section 4. Administratively, senior management parties representing both agencies meet formally once every two years, with less formal meetings occurring annually.

³ "Binational Relations Programs", Office of International Programs website. See: <https://international.fhwa.dot.gov/programs/brp/>

3.3 Multinational Relations Program

Apart from engaging in the BRP activities, the FHWA and RWS have worked through the OIP's MRP, particularly through PIARC. This collaboration extends to the Global Benchmarking Program (GBP), where the FHWA takes a leadership role in "identifying, evaluating, documenting, and implementing proven foreign innovations" to enhance highways and highway transportation services in the United States, aligning with strategic priorities.⁴

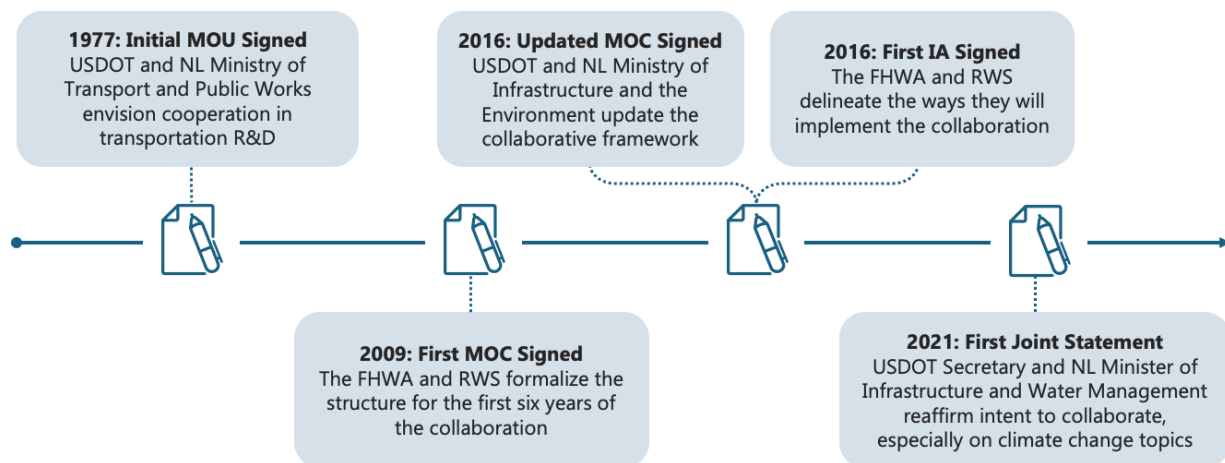
The Netherlands has hosted and shared information with the FHWA's GBP delegations. Of the 88 studies conducted since 1991, 45 visited the Netherlands.⁵ The Netherlands is the third most visited country in the GBP. In addition, the FHWA has also accrued several technology, policy, and practice innovations from GBP studies that have visited the Netherlands. These have yielded significant benefits for the U.S. highway system in the areas of road safety, bridge construction, pavements, traffic management, risk management, and policy advances, among others. One example is the implementation of accelerated bridge construction and self-propelled modular transporter technology identified through a GBP study to the Netherlands and other European countries; this has resulted in major cost savings, time savings, safety advantages, and convenience for travelers, such as the \$55.16 million saved on six Utah DOT projects.⁶

Furthermore, both agencies' membership in FEHRL, the European umbrella organization of national road research institutes, also provides an international forum for collaboration.

3.4 History of the FHWA-RWS Information Exchange

The following section provides an overview of the emergence of the FHWA-RWS information exchange through the lens of major governance documents that shaped the contours of their collaboration. Figure 1 provides an overview of these documents.

Figure 1: Timeline of Major BRP Milestones



⁴ "Office of International Programs, Multinational Relations Programs, Global Benchmarking Program" June 7, 2024. See: <https://international.fhwa.dot.gov/programs/mrp/gbp.cfm>

⁵ "Netherlands FHWA Binational Program Anchor Briefing", October 2023. [Not publicly available]

⁶ "Netherlands FHWA Binational Program Anchor Briefing", October 2023. [Not publicly available]

- **1977 Memorandum of Understanding between the U.S. Department of Transportation (USDOT) and the Ministry of Transport and Public Works of the Netherlands** – The relationship between the USDOT and the Ministry of Transport and Public Works of the Netherlands can be traced back to October 6, 1977, when members of both parties signed a Memorandum of Understanding (MOU), which “envisaged a program to achieve mutually advantageous cooperation in transportation research and development”.⁷ The specific signatories to the agreement are illegible on the original document.
- **2009 Memorandum of Cooperation between FHWA and RWS** – The 2009 MOC formalized a six-year information exchange “in furtherance of that [1977] MOU and to enhance cooperation in finding solutions to problems of mutual concern and to improve transportation systems and techniques without the costly and wasteful duplication of parallel national efforts.”⁸ Signed by the FHWA's Deputy Administrator Gregory G. Nadeau and RWS's Director-General Bert Keijts, it outlined two cooperation forms: annual working meetings of technical experts and a system for professionals to develop contacts and exchange information. Initial cooperation areas outlined in the MOC included transportation performance and accountability and roadway safety. Future topics mentioned were climate change and congestion management.
- **2016 Memorandum of Cooperation between the USDOT and Ministry of Infrastructure and the Environment of the Netherlands** – The 2016 MOC between the USDOT and the Ministry of Infrastructure and the Environment of the Netherlands, signed by USDOT Secretary of Transportation Anthony R. Foxx of the former agency and Minister Melanie Schultz van Haegen-Maas Geesteranus of the latter, updated the collaborative framework established in previous agreements. This MOC emphasized the importance of efficient transportation systems for trade and travel and outlined nearly a dozen potential cooperation areas, including innovation in mobility, safety and consumer protection, multimodal transportation, emerging technologies, energy efficiency, and disaster preparedness, as well as infrastructure financing, smart cities, regulatory practices, and freight planning.⁹
- **2016 Implementing Arrangement between FHWA and RWS** – In June 2016, the FHWA's Deputy Administrator at the time, Gregory G. Nadeau, and the Director-General of RWS, Jan Hendrik Dronkers, signed the “Implementing Arrangement between FHWA and RWS” to formalize the continuation of the partnership under the overarching 2016 MOC. The Implementing Arrangement (IA) listed two objectives relevant to the BRP, as identified in the 2016 MOC: “encouraging, fostering, and facilitating collaboration and exchange of information” and “improving the quality of each Participant's research on transportation-related issues”.¹⁰ The IA also outlined the two agencies' intention to

⁷ “Memorandum of Cooperation”, November 2009. [Not publicly available]

⁸ “Memorandum of Cooperation”, November 2009. [Not publicly available]

⁹ “Memorandum of Cooperation”, April 2016. [Not publicly available]

¹⁰ “Implementing Arrangement”, June 2016. [Not publicly available]

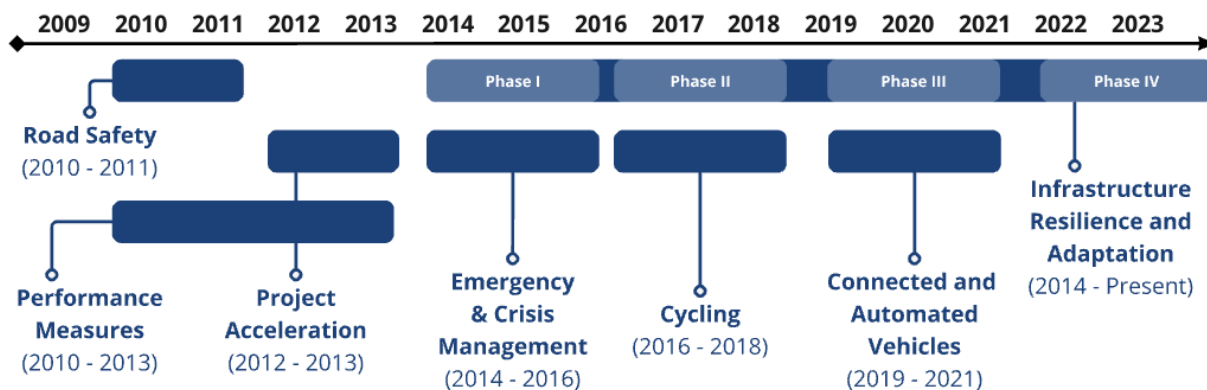
organize annual working meetings of technical experts and partners as well as develop a system of connecting professionals, as were both laid out in the 2009 MOC.

- 2021 Joint Statement on Transportation and Climate Change** – Released in April 2021, the “Joint Statement on Transportation and Climate Change” highlights the takeaways from a meeting between the Secretary of Transportation of the United States, Pete Buttigieg, and the Minister of Infrastructure and Water Management of the Netherlands, Cora van Nieuwenhuizen. The document articulates each party’s reaffirmed intent to collaborate on “climate action in transport in areas such as resilience and adaptation, electrification, alternative fuels, including bio-derived and hydrogen-derived fuels, and technological advancements for greater efficiency” and explicitly calls to “reinvigorate bilateral cooperation” under the 2016 MOC.¹¹ This press release clearly encourages the continuation of the enduring BRP between the FHWA and RWS, which at the time of the Joint Statement was engaging in information exchanges on infrastructure resilience and adaptation, including topics related to climate change resilience, sustainability, and nature-based solutions.

3.5 Summary of Overarching Collaboration and Topics

For over a decade and a half, a structured approach for this collaboration effort has emerged in which one to two collaboration topics are addressed in two-year intervals. Since 2009, seven collaboration topics have been addressed by the FHWA-RWS collaboration, each reflecting a salient and topical road transportation subtopics to both the United States and the Netherlands at the time (see Figure 2).

Figure 2: Timeline of FHWA-RWS Collaboration Topics










While the 2009 MOC and 2016 MOC memorialize areas of potential cooperation, there is no prescriptive methodology for deciding on a topic. Instead, both agencies collaboratively determine the topic. An RWS official involved in the BRP illustrated this approach, sharing “once a potential project topic pops up, you start to have meetings and discussions with your own [RWS] experts, and eventually host meetings with experts from the FHWA. Once you have experts in the room, they talk about interesting things. Then you ask – what would be the way forward? What further

¹¹ “Joint Statement on Transportation and Climate Change”, April 2021. See: <https://www.transportation.gov/briefing-room/joint-statement-us-department-transportation-and-ministry-infrastructure-and-water>

discussion/exploration on collaboration (sub)topics would bring the most mutual value?"¹² Table 8: Summary of Exchange Topics provides an overview of each executed exchange topic, including a list of the primary collaboration methods utilized.

¹² Interview with Onno Tool, RWS, March 19, 2024.

Table 8: Summary of Exchange Topics

Collaboration Topic	Overview of Exchange	Collaboration Methods
 Road Safety	<p>Exchange centered on crash prediction models, the Highway Safety Model (HSM), Dutch investment scenarios for safety, rumble bars, barriers, and billboard distraction, among other topics.</p>	<p>Conferences, meetings, in-person technical visits</p>
 Performance Measures	<p>Exchange centered around surveying the performance management practices in European states, and several states in the U.S. with a goal of developing better performance management systems in both the U.S. and the Netherlands.</p>	<p>In-person technical visits, joint research, webinars</p>
 Project Acceleration	<p>Exchange centered on efforts to expedite project delivery through initiatives like FHWA's "Every Day Counts" program and RWS's "Sneller en Beter" (Faster and Better) program and focused on innovative contracting approaches (e.g., public-private partnerships).</p>	<p>In-person executive meetings, webinars, in-person technical visits</p>
 Emergency and Crisis Management	<p>Exchange focused on response to emergencies – i.e., emergency management best practices and experiences – with the RWS seeking to learn from the U.S. experience.</p>	<p>In-person visits</p>
 Cycling	<p>Exchange focused on increasing knowledge sharing on planning, designing, monitoring, and improving bicycle transportation networks based on the shared belief that effective cycling infrastructure enhances safety, accessibility, and the overall transportation system.</p>	<p>Web meetings, webinar, in-person workshops, joint in-person conference sessions</p>
 Connected and Automated Vehicles	<p>Exchange sought to share insights into the two agencies' respective CAV initiatives and practical implementation challenges.</p>	<p>Webinars, joint research proposal creation</p>
 Infrastructure Resilience and Adaptation	<p>Ongoing exchange over the past decade has included several phases: 2014–2016 (strategies, methods, and best practices to increase infrastructure resilience), 2016–2018 (comparing climate resilience tools for transportation projects), 2019–2021 (nature-based solutions to reduce flood hazards to highways and provide environmental benefits), and 2022–present (reviewing new climate and resilience topics for further exchange).</p>	<p>Web meetings, webinars, in-person technical visits, conferences, pilot projects</p>

4 Information Exchange Benefits, Challenges and Takeaways

The following section provides an overview of each collaboration topic that has transpired since the BRP between the FHWA and RWS began in 2009. Each overview will include a summary of key activities and outputs related to the respective topic, as well as a review of its most salient benefits, challenges, and takeaways. “Benefits” refer to the specific achievements or advancements of the particular topic in the respective jurisdictions. “Challenges” refer to the barriers and unexpected circumstances that hindered, disrupted, or limited the expected outcomes of a particular topic. “Takeaways” refer to findings of general applicability to the broader BRP, which may inform existing and future exchanges.

4.1 Road Safety

The topic of roadway safety was one of the foundational areas of cooperation in the information exchange between FHWA and RWS. Outlined in the 2009 MOC, the FHWA and RWS memorialized both agencies’ intent to explore “national safety trends, user acceptance and adaptation, development of countermeasures, and capacity development”.¹³ The FHWA’s Road Safety collaboration with RWS occurred from May 2010 – August 2011, opening the channel for the U.S. and the Netherlands to exchange on several road safety-related topics. During this time, FHWA and RWS counterparts exchanged information on crash prediction models, the Highway Safety Model (HSM), Dutch investment scenarios for safety, rumble bars, barriers, and billboard distraction, among other topics. This period also witnessed the only known official personnel exchange between the FHWA and RWS to date, in which Onno Tool of RWS worked in the U.S., at the TRB for six months as a part of the second Strategic Highway Research Program (SHRP2),¹⁴ where he worked on the reliability of travel times, after which point he divided his time between the FHWA and TRB. While at the FHWA, he helped work on support of guidance for State DOTs. The timing of this formal exchange also coincided with the United States’ effort to adopt a Safe System Approach to address roadway safety challenges.¹⁵ The Dutch “Sustainable Safety Program”, which resulted in “at least a 50-percent reduction in fatalities between 1994 and 2015” on Dutch roads has served to influence the U.S. efforts.¹⁶

4.1.1 Key Activities and Outputs

Table 9: Key Activities and Outputs, Road Safety

Title (Date)	Type	Description
Fact Finding Trip in the Netherlands (2010)	In-person technical visit	Three FHWA officials working on road safety traveled to the Netherlands, specifically visiting Rotterdam and TU Delft. ¹⁷

¹³ “Memorandum of Cooperation”, November 2009.

¹⁴ See: <https://www.fhwa.dot.gov/goshrp2/>

¹⁵ “Dissemination Tools and Strategies of the Federal Highway Administration’s Office of International Programs”, August 2021.

¹⁶ Doctor, Mark and Ngo, Chimai. “Making our Roads Safer through a Safe System Approach.” *Public Roads*. U.S. Department of Transportation. Winter 2022. Accessed via: <https://highways.dot.gov/public-roads/winter-2022/01>

¹⁷ Interview with Mike Griffith, former Director of Office of Safety Technologies at FHWA, March 14, 2024

Title (Date)	Type	Description
Transportation Research Board (TRB) Highway Safety Performance Committee Meeting (August 2011)	Conference / workshop	This was the first of two workshops under the NCHRP 17-50 project facilitated by the TRB which sought to provide technical assistance to implement the HSM at the state level. ¹⁸ The peer exchange took place on in Irvine, California, in which state representatives and other invited guests shared their HSM implementation experiences, including best practices, successes, and lessons learned. ¹⁹ The RWS team traveled from the Netherlands to participate. ²⁰
Meeting on Accident Prediction Models in California (August 2011)	Meeting	FHWA organized a sub-meeting with top-experts in Accident Prediction Models (APM): Douglas Harwood, Jim Bonneson, Ray Krammes, Mike Griffith and John Milton. ^{21,22}
Periodic Virtual/Phone Meetings (2010-2011)	Meeting	Over the course of the exchange, relevant stakeholders from FHWA and RWS convened via conference and web calls.

4.1.2 Key Benefits

RWS counterparts benefitted from public safety research and tools. The Dutch were very interested in the American Association of State Highway and Transportation Officials (AASHTO) HSM,²³ the FHWA’s crash prediction models, and a digital billboard study (which examined driver distractions).

FHWA counterparts noted they benefitted from learning about RWS’s more systemic approach to roadway improvements for safety. As part of the exchange, the RWS gave the FHWA a report called “Building Blocks for Safety”. This gave the FHWA another perspective on “systemic project selection approaches”, which essentially looks more across a system to identify certain features of the roadway that need improvement and not just focusing on what the FHWA calls “hotspot locations” based on crash data alone. This process has become very popular across U.S. states.

4.1.3 Key Challenges

Neither RWS nor FHWA cited any key challenges associated with this exchange topic except that the topic occurred more than a decade prior to this synthesis report, making it difficult for interviewees to remember with accuracy.

¹⁸ See: <https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=2974>

¹⁹ “Netherlands FHWA Binational Program Anchor Briefing”, October 2023 (Not publicly available)

²⁰ Interview with Mike Griffith, former Director of Office of Safety Technologies at FHWA, March 14, 2024

²¹ Interview with Mike Griffith, former Director of Office of Safety Technologies, March 14, 2024

²² Minutes Rijkswaterstaat visit TRB Highway Safety Performance Committee meeting, 2011

²³ See: <https://www.highwaysafetymanual.org/Pages/default.aspx>

4.1.4 Key Takeaways

A formal extension of an exchange topic is not necessary once the bilateral relationship among relevant experts has matured to a level where the exchange will naturally occur.

The RWS and FHWA experts associated with the Road Safety topic noted that while the formal exchange on this topic ended after two years, they had established a peer-to-peer network upon who they could call if they needed to understand or discuss safety best practices occurring in the other country (or for the FHWA, in Europe more broadly). In particular, the RWS experts noted that the evolution of the relationship beyond a formal exchange can be seen as a metric of success for the exchange.

Exchanges can benefit from parallel events and research, and this exchange on Road Safety was no different. During the formal exchange period on this topic, the RWS counterparts traveled to the U.S. to participate in an event related to the HSM implementation. The event was not specific to the bilateral exchange between RWS and the U.S.; though both RWS and FHWA managed to leverage it to enhance their exchange on the topic.

4.2 Performance Measures

The topic of performance measures was another foundational area of cooperation in the information exchange between FHWA and RWS. Outlined in the 2009 MOC, the FHWA and RWS memorialized both agencies' intent to explore "increasing transparency, accountability, and performance in delivering a transportation program".²⁴ More specifically, the goal was to identify best practices in transportation performance management that could inform the development of effective national performance targets. Completed between December 2010 and October 2013, the exchange on this topic centered around surveying the performance management practices in European states, and several states in the U.S. with a goal of developing better performance management systems in both the U.S. and the Netherlands. To undertake this effort, FHWA contracted SAIC, Inc. and Rijkswaterstaat contracted the University of Delft to conduct the necessary research. Both sides used the same questionnaire for their surveys to help ensure comparability of information. Most meetings, webinars, and presentations were related to this particular research effort.

4.2.1 Key Activities and Outputs

Table 10: Key Activities and Outputs, Performance Measures

Title (Date)	Type	Description
Kick-off Meeting (December 2010)	In-person technical visit	The FHWA and RWS were each in the early stages of developing their own performance management programs when this first meeting of the collaboration occurred in Delft, the Netherlands. Each agency identified national goal areas and defined a set of possible performance measures to be tracked over time, and they both established targets for some of the program elements. However, there was a need to better understand how to set performance targets to effectively manage a national performance program and set targets.
US-Netherlands Cooperative Project on Performance Management (March 2013)	Webinar	The webinar aimed to present the key findings of the joint research paper.
Procedures for Defining Management Strategies and Targets Associated with Transportation Goals (April 2013)	Paper ²⁵	Report authored by the FHWA that identifies current successful practices in the establishment of a performance-based transportation program and techniques for defining outcome performance measures and targets that represent the needs of the stakeholders. Conducted in tandem with an RWS-authored study examining European and Australian practices, with the aim of effectively and efficiently comparing and learning from both agencies' findings, respectively.

²⁴ "Memorandum of Cooperation", November 2009.

²⁵ Not available publicly.

Title (Date)	Type	Description
<p>Performance Management Practices in Europe and the USA (2014)</p>	<p>Joint research paper²⁶</p>	<p>This paper written by Telli Van Der Lei and Rob Schoenmaker (TU Delft), Thomas Van (FHWA), and Max Klok and Onno Tool (RWS) focused on learning from the experiences of the U.S., other European countries, and Australia, who have used performance management systems to manage their highway networks. This document is the follow-up to the “Procedures for Defining Management Strategies and Targets Associated with Transportation Goals” (2013) report.</p>

4.2.2 Key Benefits

This exchange resulted in needed insights for the U.S. and Netherlands at a time when both countries were establishing performance and outcome-based transportation programs. At the time this exchange topic was formalized, “recent legislation in both countries [sought] to establish accountability through systems that [emphasized] the establishment of standardized performance measures, opportunities for setting realistic targets, and plans that define how programs will be sustained well into the future.”²⁷ Through the research, both RWS and FHWA were able to document the current state of practice in their own respective countries as well as identify lessons learned from other countries, Scotland, Australia and England.

For RWS, the research helped them better understand how to improve alignment of government/ministerial goals with road authority performance measures. Concretely, the research resulted in RWS noting that strategic goals identified at the federal level connected to performance measures at the implementing level were not as well developed in the Netherlands. After this research effort, RWS noted that they improved their performance management system to better integrate a “line-of-sight” concept.²⁸ Further, RWS noted that their collaboration with FHWA and the U.S. on this topic underscored to them the importance of using cost-benefit analysis as a starting point when investigating traffic management measures.²⁹

For the FHWA, the research helped them understand the varied application of transit asset management (TAM) systems across U.S. State Departments of Transportations (DOT). As part of the joint research effort, the U.S. project team surveyed state transportation agencies actively involved in the development of TAM programs, specifically seeking to examine a diverse set of agencies experienced in development and use of performance measures for management decisions.³⁰ At the time of the survey, the agencies that were reviewed had established measures across safety, infrastructure conditions, congestion reduction and reduced project delivery delays whereas were less experienced in developing measures related to system reliability, freight

²⁶ Available online. See: <https://trid.trb.org/View/1288264>

²⁷ van der Lei, TTE., Schoenmaker, R., Van, T., & Klok, M. (2014). Performance management practices in Europe and the USA. In s.n. (Ed.), Proceedings of the Transportation Research Board 93rd annual meeting 2014 (pp. 1-19). Transportation Research Board (TRB).

²⁸ Interview with Onno Tool, RWS, March 19, 2024.

²⁹ Interview with Onno Tool, RWS, March 19, 2024.

³⁰ Agencies surveyed included: Washington State, Minnesota, Wyoming, Oregon, Utah, North Carolina, Georgia, New York, Connecticut.

movement and economic vitality and environmental sustainability. The researchers looking at the U.S. states recommended that where measures were established, there should be a movement towards greater consistency of measures with consideration for how this impacted data collection requirements and where measures were undeveloped there should be support to State DOTs on developing consistent and meaningful measures.³¹

4.2.3 Key Challenges

Neither RWS nor FHWA cited any key challenges associated with this exchange topic.

4.2.4 Key Takeaways

Joint research as a collaboration activity works well when both countries have an equivalent maturity level on a topic. It could also be argued that joint research works well when both countries are relatively less mature in a topic area. The joint research project that emanated from the Performance Measures exchange came at a time when both the U.S. and the Netherlands were examining how to create performance and outcome-based transportation programs. As a result, both the FHWA and RWS were interested in collaborating and dedicating resources to the research.

Exchanges can benefit from parallel events and research, and this exchange on Performance Measures was no different. During the formal exchange period on this topic, the RWS counterparts traveled to the U.S. to share the results of their research, which resulted from the formal exchange, at a TRB meeting.

³¹ U.S. – Netherlands Cooperative Project on Performance Management, webinar presentation on March 26, 2013, slides 53-62.

4.3 Project Acceleration

Prior to the formal beginning of this collaboration topic in 2011, ongoing efforts within the FHWA and the RWS were exploring ways to expedite road infrastructure project delivery via alternative means. For the FHWA, it was their “Every Day Counts” program, a model designed to be implemented at the state level that identifies and rapidly deploys proven, yet underutilized innovations to improve transportation systems nationwide.³² For RWS, it was their “Sneller en Beter” (“Faster and Better”) programs that had the same higher goal of shortening project delivery. “Sneller en Beter” has two tracks: “Immediate Acceleration (Faster)”, which is the acceleration of decision making in road construction projects, and “Consistent Acceleration (Better)”, which requires fundamental shifts in the way everyone involved in the road sector thinks and acts. The collaboration between FHWA and RWS on this topic would end up solidifying FHWA's “Every Day Counts” program and accelerating the adoption of innovative project delivery mechanisms at a state level.

4.3.1 Key Activities and Outputs

Table 11: Key Activities and Outputs, Project Acceleration

Title (Date)	Type	Description
Executive Meeting (March 2011)	In-person meeting	FHWA Administrator and Executive Director met with RWS Director General to agree upon topic for pursuit. ³³ Additional details have not been found.
Technical Webinar (August 2012)	Webinar	Experts from both agencies exchanged information on topics related to project acceleration, including innovative contracting (RWS), planning and environmental linkages (FHWA), mitigation banking (FHWA), and use of in-lieu fees (FHWA).
Technical Visit (September 2012)	In-person technical visit	Between September 25 and 26, 2012, FHWA officials Hari Kalla and Robert Griffith met with representatives of RWS to investigate opportunities to deliver transportation projects faster and better. The two days consisted of a number of discussions about process and procedures as well as a site visit to a highway reconstruction project that is being delivered by Design-Build-Finance procedures.

4.3.2 Key Benefits

The knowledge gained from this collaboration topic uncovered the benefits and challenges of innovative contracting mechanisms for the FHWA. This includes topics related to design-build contracting, design-build-finance-maintain contracting, performance-based maintenance contracting, and the use of warranties in contracting. The information from these exchanges was subsequently disseminated to State and local transportation agencies, and may have been well received.³⁴ Moreover, the keystone collaboration activity – a technical visit to the Netherlands in

³² See: <https://www.fhwa.dot.gov/innovation/everydaycounts/about-edc.cfm>

³³ See Anchor Briefing

³⁴ Taken from FHWA OIP's “Dashboard and Map” - <https://international.fhwa.dot.gov/programs/tbp/map.cfm>

2012 – proved to be successful for the FHWA. The RWS presenters were knowledgeable and engaging. They shared information that was innovative and beneficial to the FHWA.

FHWA witnessed firsthand how a project manager-first approach can “grease the wheels” of a project. On a more technical note, the FHWA liaison to this collaboration topic observed that RWS operates in a manner completely different from the FHWA: RWS does not hire engineers but project managers (PM) instead. This creates “PM expertise”, in which all the moving pieces of a project can be handled more easily.³⁵

4.3.3 Key Challenges

The FHWA was concerned that the flow of knowledge was not bidirectional. According to the FHWA liaison to this collaboration topic, the FHWA was in more of a learning mode, receiving information from the RWS. This was because alternative project delivery was “not yet a mature topic.”³⁶ At the onset of the collaboration, with the Netherlands recognized as leaders in alternative contracting and procurement methods (e.g., design-build and Design-Build-Finance-Operate-Maintain (DBFOM) public private partnerships), the U.S. was in an early exploration stage as the majority of states did not yet have enabling legislation for design-build let alone more complex public-private partnerships.

4.3.4 Key Takeaways

Given the rapid advancement of this topic in the United States, there might be a more robust opportunity for exchange on this topic. According to the FHWA project liaison, “now the use of design-build and other alternative contracting mechanisms are a common practice in most states”.³⁷ Indeed the vast majority of U.S. states have legislation that authorizes the design-build approach for transportation projects fully or with certain limitations, as of 2022.³⁸ Therefore, because both agencies have achieved a level of “maturity” on themes related to project acceleration since the previous discussion of the formal collaboration topic, the FHWA-RWS collaboration could potentially pursue a more advanced form of engagement, like the implementation of a pilot project.

³⁵ Interview with Hari Kalla. Conducted on March 21, 2024.

³⁶ Interview with Hari Kalla. Conducted on March 21, 2024.

³⁷ Interview with Hari Kalla. Conducted on March 21, 2024.

³⁸ <https://dbia.org/advocacy/state/>

4.4 Emergency and Crisis Management

The "Emergency and Crisis Management" collaboration emerged from RWS's growing interest in the topic. By its own estimation, RWS proclaimed the Netherlands was good at preventing emergencies and dealing with its aftereffects but needed to improve its ability to respond to emergencies, which led to the official selection of the collaboration topic in 2014.³⁹ The 2016 MOC also memorialized this topic – “disaster preparedness and response” – as an area of mutual interest.⁴⁰ In full disclosure, the Project Team was unable to hold formal interviews with the FHWA point-of-contact associated with this collaboration topic, and because of a lack of publicly available documentation related to the topic, this section likely underrepresents the scope and impact of this collaboration topic.

4.4.1 Key Activities and Outputs

Table 12: Key Activities and Outputs, Emergency and Crisis Management

Title (Date)	Type	Description
Technical Visit (September 2014)	In-person technical visit	FHWA hosted a team of transportation experts from RWS in Washington, D.C. to discuss transportation and emergency management best practices. ⁴¹
Planning for Evacuations and Emergencies: Transportation Systems Management and Operations – Adaptation for Climate Change (September 2014)	Presentation	Delivered on behalf of the FHWA during RWS's September 2014 Technical Visit detailing how the FHWA is approaching evacuation protocol due to climate change's increasing impact on road transportation, including system maintenance needs, travel behavior, and freight transportation.
Traffic Incident & Events Planning, Operations & Tools: A U.S. Perspective (September 2014)	Presentation	Delivered on behalf of the FHWA during RWS's September 2014 Technical Visit detailing tools leveraged by the FHWA to operate traffic management centers and unified command onsite.

4.4.2 Key Benefits

There are no documented benefits for FHWA. During RWS's technical visit to the FHWA in September 2014, FHWA officials delivered two technical presentations on 1) the impact of climate change on the FHWA's evacuation planning and 2) national response and national technical integration matrix (TIM) frameworks. According to the RWS liaison to this collaboration topic, this was an informative and fruitful visit, culminating in a report “with a lot of recommendations” for RWS.⁴² This report has remained internal to RWS (written in Dutch) and was consequently not reviewed for this report.

³⁹ See Anchor Briefing.

⁴⁰ “Memorandum of Cooperation”, April 2016.

⁴¹ See Anchor Briefing.

⁴² Interview with Onno Tool. Conducted on March 19, 2024.

4.4.3 Key Challenges

There are no documented challenges for FHWA. However, according to the RWS liaison to this collaboration topic, while there were intentions to further explore potential collaboration after the in-person visit, a key personnel change within the RWS from the office associated with the RWS's information exchange with FHWA to another office in early 2015 hindered this momentum, stifling future activities for exchange.⁴³

4.4.4 Key Takeaways

Due to the lack of meaningful information available for analysis, there were no takeaways derived.

⁴³ Interview with Onno Tool. Conducted on March 19, 2024.

4.5 Cycling

The “Cycling” collaboration aimed to increase knowledge sharing on planning, designing, monitoring, and improving bicycle transportation networks. For RWS, the collaboration provided the opportunity to learn about integrating new cycling assets into replacement guidelines for large public infrastructure and the cycling safety measures (especially with respect to self-driving vehicles), enhancing quality management and inspections, and strengthening relationships with cycling-focused staff in provincial governments. For FHWA, the collaboration provided the opportunity to learn about effective cycling infrastructure that enhances safety, accessibility, and the overall transportation system. While cycling was never explicitly outlined in either the 2009 MOC or 2016 MOC, the 2016 MOC did reference “multimodal transportation and related infrastructure”, which cycling inherently relates to, as well as “safety and consumer protection”,⁴⁴ which was partially addressed via the collaboration’s subtopic of safe placement of cycling infrastructure. In full disclosure, the Project Team was unable to hold formal interviews with the FHWA point-of-contact associated with this collaboration topic, and therefore this section relies on publicly available documents to inform the key benefits to the U.S. jurisdiction, key challenges, and key takeaways, and may also underrepresent the scope of this collaboration topic.

4.5.1 Key Activities and Outputs

Table 13: Key Activities and Outputs, Cycling

Title (Date)	Type	Description
ThinkBike Workshop (April 2016)	Workshop	FHWA and the Royal Netherlands Embassy co-hosted a ThinkBike Workshop in Washington, DC, in which transportation planners, Dutch bicycle transportation experts, and cyclists gathered for a workshop on intersection conflicts, bike parking and “road diet” options. ⁴⁵
Regional Routes Webinar (May 2017)	Webinar	FHWA and RWS jointly held a webinar to discuss the measurement of the effectiveness of regional cycling routes.
Velo City Conference (June 2017)	Conference	RWS and FHWA staff presented at a joint session on national bike policy in Nijmegen, Netherlands. The RWS slide deck from that event, which focuses on the role of RWS in national cycling policy, mentions international cooperation with the FHWA. ⁴⁶

⁴⁴ “Memorandum of Cooperation”, April 2016.

⁴⁵ ThinkBike workshops are designed to help U.S. communities improve bicycle infrastructure. Information about this event was retrieved at the following link: https://safety.fhwa.dot.gov/road_diets/newsletter/spring/

⁴⁶ Dan Goodman, who was then working at the FHWA, also presented, but his materials could not be found. Information about this event was retrieved at the following link: https://ecf.com/sites/ecf.com/files/RickLindeman_RoleOfRWSInNationalCyclingPolicy_0.pdf.

Title (Date)	Type	Description
Dutch Approach to Bicycle Mobility: Retrofitting Street Design for Cycling (September 2017)	Report ⁴⁷	FHWA report highlighting techniques and strategies for retrofitting existing road infrastructures to improve safety, fix gaps and barriers in the pedestrian and bicycle network, improve transportation system efficiency, leverage investments, and meet local public demand. ⁴⁸ It draws from the experience and perspective of Dutch transportation practitioners. ⁴⁹
Cycling and Automated Vehicles Webinar (October 2017)	Webinar	FHWA and RWS discussed the safety implications of self-driving vehicles on cycling systems.
Cycling Safety Webinar (November 2017)	Webinar	RWS addressed how it was trying to address the high volume of cyclists and increasing levels of bicycle use by elderly, which in turn triggered an increase in serious and fatal crashes without motor vehicles. ⁵⁰
Walk Bike Places Conference (September 2018)	Conference	FHWA staff and RWS staff jointly conducted an interactive session in New Orleans, United States on a variety of topics including cycling's intersection with safety, automated vehicles, and data.
Cycling Data Briefing (September 2018)	Meeting	FHWA convened a meeting with Rick Lindeman from RWS to discuss how cyclist data resources are handled at FHWA (e.g., via the Traffic Monitoring Guide). ⁵¹
Dutch Multimodal Bike Planning Webinar	Webinar ⁵²	Organized by FHWA's OIP, it featured some of the highlights from the FHWA-RWS collaboration, both the BRP and the MRP to-date.

⁴⁷ Available online. See: <https://international.fhwa.dot.gov/pubs/pl18004/fhwapl18004.pdf>

⁴⁸ van Ommeren, Kees, Ruffino, Paolo, de Boer, Buis, Jeroen. "The Dutch Approach to Bicycle Mobility: Retrofitting Street Design for Cycling". Published September 10, 2017. See: <https://international.fhwa.dot.gov/pubs/pl18004/fhwapl18004.pdf>

⁴⁹ This information was catalogued in two FHWA reports ("Bicycle Network Planning & Facility Design Approaches in the Netherlands and the United States", 2016; "Delivering Safe, Comfortable, and Connected Pedestrian and Bicycle Networks: A Review of International Practices", 2015). Both reports were conducted under the Global Benchmarking Program, which is under the Multinational Relations Program scope. Information for this output was retrieved from the following link:

<https://international.fhwa.dot.gov/pubs/pl18004/>

⁵⁰ See Anchor Briefing.

⁵¹ Additional details from this event were not found.

⁵² To access this webinar, use the following link:

https://usdot.zoomgov.com/rec/play/cJUiSjhSEWnp4SMk2r5CoqyWlvd7kXLbumMG841jFiTLug2amt2JglFwa9P3P9ARoGclhq04c1aW-C8s.CMVePoFXoXSiYM7o?canPlayFromShare=true&from=share_recording_detail&startTime=1657645283000&componentName=rec-

Title (Date)	Type	Description
(July 2022)		
Web Meetings (Date unknown)	Virtual meeting	FHWA and RWS staff jointly held a series of web meetings in which staff from both agencies discussed how their countries have addressed issues such as e-bikes and cycling's relationship to automated vehicles. ⁵³

4.5.2 Key Benefits

This collaboration yielded significant accomplishments for the U.S. transportation system, including the following:

1. **Influencing bikeway selection methods.** Throughout this collaborative phase, FHWA had the opportunity to examine the Dutch approach to bikeway selection, which prioritizes simplification in the roadway design process. The Dutch retrofit roads and design bikeways considering target speeds and specific contexts, a practice that the U.S. has embraced. As of 2021, the U.S. incorporates elements such as curb extensions and dashed bike lanes, influenced by the Dutch approach.⁵⁴ FHWA's "Bikeway Selection Guide" (2019)⁵⁵ dedicates a section to the Netherlands' Sustainable Safety approach, a preventative method in road design integral to the Dutch bikeway selection process. Additionally, the FHWA's "Traffic Analysis and Intersection Considerations to Inform Bikeway Selection" (2021) report,⁵⁶ influenced by Dutch practices, continues to advocate for and promote these approaches.
2. **Influencing the integration of public transport and cycling.** The U.S. has integrated the Dutch methodology for planning multimodal networks into U.S. guidebooks. This approach, emphasizing the integration of public transport and cycling, is featured in FHWA's "Achieving Multimodal Networks" (2016) guide.⁵⁷ Notably, the guide includes a section that highlights Central Station in Utrecht, known for its bicycle parking facility accommodating 4,200 bikes. Furthermore, the influence of Dutch practices is evident in FHWA's "Small Town and Rural Multimodal Networks" (2016) guide.⁵⁸
3. **Influencing channelization of traffic, observed raised crosswalks, and protected intersections.** U.S. design guidebooks for active transportation now integrate Dutch practices to enhance safety for cyclists and pedestrians at intersections and other crossing points.⁵⁹ These practices encompass the use of channelization to separate traffic, observed raised crosswalks for traffic calming, and the implementation of protected

play&originRequestUrl=https%3A%2F%2Fusdot.zoomgov.com%2Frec%2Fshare%2FK2BN1aPNmgoFfITB9OvjHp9c4tGZUx9RQQAo0fUJeMK99IWj_KIb7Fn43LWLgUYp.nPGOqB2KbfXqajD8%3FstartTime%3D1657645283000 – Password to access the webinar is pNmy6L.4

⁵³ See Anchor Briefing.

⁵⁴ Taken from FHWA OIP's "Dashboard and Map" - <https://international.fhwa.dot.gov/programs/tbp/map.cfm>

⁵⁵ See: https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa18077.pdf

⁵⁶ See: https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/FHWA-SA-21-010_Traffic_Analysis_Intersection_Considerations.pdf

⁵⁷ See: https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/multimodal_networks/

⁵⁸ See: https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

⁵⁹ Taken from FHWA OIP's "Dashboard and Map" - <https://international.fhwa.dot.gov/programs/tbp/map.cfm>

intersections. Channelization establishes clear paths for vehicles through intersections, while raised crosswalks serve both as traffic-calming measures and pedestrian-friendly crossings. Protected intersections maintain separated bike lanes up to and through intersections. As of 2021, these methods are widely adopted in the U.S. The section on protected intersection design on page 96 of FHWA's "Achieving Multimodal Networks" (2016) guide⁶⁰ was influenced by Dutch practices. Additionally, FHWA's "Pedestrian and Bicyclist Road Safety Audit (RSA) Guide and Prompt List" (2020)⁶¹ incorporates protected intersections with reference to Dutch influence. Moreover, FHWA's "Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations" (2018)⁶² and "Traffic Analysis and Intersection Considerations to Inform Bikeway Selection" (2021)⁶³ were also shaped by Dutch insights.

4. **Influencing Leading Pedestrian Interval (LPI) and Leading Bicycle Interval (LBI).** Signalization methods from the Netherlands have left an impact on bicycle and pedestrian safety signalization strategies in the U.S.⁶⁴ Noteworthy among these methods are the Leading Pedestrian Interval (LPI) and Leading Bicycle Interval (LBI), providing pedestrians and cyclists with a head start upon entering intersections. The U.S. has also adopted the Dutch practice of using bike signal faces, specialized traffic signals for bicycles. Bike signal faces are now widespread in over a dozen U.S. cities, including Alexandria, Virginia; Salt Lake City, Utah; and Madison, Wisconsin, and a chapter on bicycle signals is available in the latest edition of the "Manual on Uniform Traffic Control Devices for Streets and Highways" (2023).⁶⁵ Design guides for each of these methods are available on the National Association of City Transportation Officials website.⁶⁶
5. **Influencing safe bikeways in roundabouts.** The Dutch have a tradition of extending bicycle facilities through and around roundabouts, a practice that has found its way into certain U.S. locations. For instance, the Massachusetts Department of Transportation (MassDOT) has integrated Dutch-style separated bike lanes through roundabouts as a design choice in their publications on "Roundabouts Guidelines" (2022).⁶⁷ A proposed peanut-shaped roundabout for the Inman Square intersection in Cambridge, Massachusetts, was considered to include bicycle facilities through and around the roundabout, drawing inspiration from Dutch design. Similarly, in California, the Presidio roundabout incorporates principles of Dutch bike lane design.

RWS fostered its network of cycling experts and refined its roadmap for its cycling safety agenda. From RWS's perspective, there were several "soft" benefits. On the whole, RWS felt "really appreciated by the FHWA" and found that the collaboration gave RWS 1) a valuable list of expert contacts which they believe will have "a good effect" on their work, especially cycling data, which is still not fully fleshed out, 2) a new perspective in smart mobility as it related to automated

⁶⁰ See: https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/multimodal_networks/

⁶¹ See: https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa20042.pdf

⁶² See: https://www.fhwa.dot.gov/innovation/everydaycounts/edc_5/docs/STEP-guide-improving-ped-safety.pdf

⁶³ See: https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/FHWA-SA-21-010_Traffic_Analysis_Intersection_Considerations.pdf

⁶⁴ Taken from FHWA OIP's "Dashboard and Map" - <https://international.fhwa.dot.gov/programs/tbp/map.cfm>

⁶⁵ See: https://mutcd.fhwa.dot.gov/kno_11th_Edition.htm

⁶⁶ See: <https://nacto.org/publication/urban-bikeway-design-guide/bicycle-signals/>

⁶⁷ See: <https://www.mass.gov/doc/massdot-guidelines-for-the-planning-and-design-of-roundabouts/download>

driving's effect on cycling (a "user point of view, not a system point of view"), and 3) a "far more structured" roadmap on what they needed for safety data due to the "taskforce on safety data" in the collaboration.⁶⁸

4.5.3 Key Challenges

There were no documented challenges.

4.5.4 Key Takeaways

Mutual information exchange on a topic with a perceived expertise mismatch can still yield fruitful results. Despite the renowned association of cycling with the Dutch road transportation network, the RWS liaison for this collaboration topic was frank about the capacity for RWS to benefit from this topic – "people think the Dutch have all the answers, but not always."⁶⁹ In this case, the collaboration topic gave RWS the "space to work on [these issues, and the] freedom to develop", which yielded a number of "soft" benefits that can be as valuable as more tangible outcomes, as was experienced by FHWA.

Cycling is a crucial component of "smart mobility" and could be considered a valuable "subtopic" for future collaboration. RWS emphasized cycling's inevitable convergence with another area of cooperation of increasing interest: smart mobility. Specifically, because a very significant amount of road infrastructure will need to be rebuilt to accommodate CAVs in metropolitan regions, this will have a serious impact on cycling infrastructure. Therefore, cycling may still be a fruitful topic for future collaboration, especially in tandem with collaboration related to smart mobility and CAVs.

⁶⁸ Interview with Rick Lindeman, RWS. Conducted on March 25, 2024.

⁶⁹ Interview with Rick Lindeman, RWS. Conducted on March 25, 2024.

4.6 Connected and Automated Vehicles

The "Connected and Automated Vehicles" (CAV) collaboration sought to share insights into the two agencies' respective CAV initiatives and practical implementation challenges, as well as promote a better understanding of the impacts of CAVs on the overall transportation system. For RWS, understanding FHWA's perspective as a national road authority on vehicle automation legislation and risk perceptions was valuable, given the potential road safety benefits but also risks of improper CAV introduction. For FHWA, RWS was viewed as a leader in CAV testing and deployment trials like vehicle platooning research, motivating FHWA's engagement. The momentum towards this collaboration phase was memorialized in the 2016 MOC, in which "innovation in mobility" and "emerging technologies and automation" were both cited as areas of potential cooperation.⁷⁰

4.6.1 Key Activities and Outputs

Table 14: Key Activities and Outputs, CAV

Title (Date)	Modality	Description
Herd Immunity for Traffic Safety (April 2021)	Joint research proposal ⁷¹	In concert with TU Delft, both agencies co-created a research proposal to explore the "tipping points" of sufficient vehicle connectivity and/or automation penetration at which points collective benefits of cooperative automation is achieved that improves safety and efficiency. ⁷² The report proposed desk research and a potential field-trial to demonstrate and validate the research's eventual findings.
Technical Webinar (May 2021)	Webinar	RWS and FHWA staff convened to discuss the contents of the "Herd Immunity" research proposal.
Grounding Presentations (Dates unknown)	Webinar/virtual meeting	RWS and FHWA staff jointly held multiple "grounding presentations" over several days where each agency demonstrated their tools and ongoing CAV research. ⁷³

⁷⁰ "Memorandum of Cooperation", April 2016.

⁷¹ This document is not publicly available.

⁷² Calvert, S.C., van Arem, B., Wang, M., Farah, H. "Herd Immunity for Traffic Safety: What if Cars Could Not Crash!?". Published by TU Delft on April 14, 2021.

⁷³ Projects referenced include: "Safe and Efficient Operation of Automated and Human Driven Vehicles in Mixed Traffic (SAMEN)", "InterCor (Harmonizing For interoperability; Making a Step from Theory to Practice; and Learning by Doing)", "C-ROADS: Harmonizing the deployment of C-ITS service through Europe", "The Dutch Study Report Board on Automated Vehicles and Advanced Driver Assistance Systems- safety investigations", and "MANTRA" (determining the influences of automation on the core business in relation to road safety, traffic efficiency, the environment, customer service, maintenance, and construction processes).

4.6.2 Key Benefits

Informative and valuable information exchange. During the initial exchange of webinars, one of the most important insights for RWS was how automation is handled by public authorities – not just on road testing, but how it's perceived as a larger movement (e.g. how risks in road traffic were perceived). RWS knew that if CAVs are introduced properly, there could be significant benefits to road safety, but if introduced improperly, there could be risks. Based on these initial presentations, both agencies would end up co-developing a research proposal entitled “Herd Immunity for Traffic Safety” that would serve as the key problem statement.

4.6.3 Key Challenges

Extenuating circumstances hindered and eventually discontinued the collaboration. RWS cited a lack of material resources as a limiting factor. Notably, funding was not approved by RWS for the “Herd Immunity” research proposal, despite FHWA approval, leading to the dormancy of the jointly prepared research proposal. Furthermore, the information exchange was effectively discontinued by the onset of the COVID-19 pandemic, diminished the CAV “hype cycle” and diverted RWS and FHWA resources away from the collaboration.

4.6.4 Key Takeaways

CAVs are still a fruitful topic for further collaboration. Even though CAVs have not proliferated to the extent that the industry believed would occur at the time of the collaboration, the CAV industry has rapidly evolved since the conclusion of the collaboration, and with CAV legislation implementation impacting operations, approvals, and infrastructure responsibilities, officials on both sides of the collaboration stressed the potential value of reinvigorating this exchange. FHWA believes that their “Herd Immunity” problem statement is still very relevant, saying “we think there is real value still to obtain even if we weren't able to really advance the work.”⁷⁴ RWS also still believes CAV is still a ripe collaboration topic, though much more practical than theoretical given the advancements since the collaboration ended in 2021. RWS is currently in the legislation implementation stage, meaning they are starting to change operations and think about their role in the approval and admission processes of CAVs. Because RWS oversees the operational domain for vehicles – roadways, there are consequently legal and organizational implications for public infrastructure, and thus the role for roadway authorities, like the RWS and FHWA, are crucial.

⁷⁴ Interview with Brian Cronin and Govindarajan Vadakpat, FHWA. Conducted on February 23, 2024.

4.7 Infrastructure Resilience and Adaptation

The FHWA and RWS have been working together on topics related to climate resilience since 2014. This has included three rounds of bilateral collaboration covering the following efforts:

- **Phase 1 (2014 – 2016):** FHWA and RWS shared information on strategies, methods, and best practices from both countries to help to increase infrastructure resilience.
- **Phase 2 (2016 – 2018):** FHWA and RWS implemented and compared climate resilience tools developed by each agency on one transportation project in each country (the InnovA58 in the Netherlands and the SR167 Completion Project in Washington State, USA).
- **Phase 3 (2019 – 2021):** FHWA and RWS explored nature-based solutions that reduce flood hazards to highways and provide environmental benefits, in partnership with Washington State DOT (WSDOT) and North Carolina DOT (NCDOT).

Building off this successful collaboration, FHWA and RWS agreed to continue to work together on topics related to infrastructure resilience and adaptation given their mutual interest in sharing approaches and lessons in mainstreaming climate change resilience.

- **Phase 4 (2022 – Present):** Currently FHWA and RWS are exploring climate change sustainability and resilience topics, which includes discussions about how climate change resilience is incorporated in planning, design and construction, asset management, and maintenance procedures.

This collaboration has led to numerous knowledge-sharing activities. These contributions aim to bolster the development and implementation of infrastructure resilience adaptation strategies in both the United States and the Netherlands. The outcomes of this endeavor continue to shape the transportation planning process, pavement and bridge design guidelines, asset management approaches, and various transportation system management strategies at different levels. Ultimately, the collaboration demonstrated the merit of sharing tools and knowledge between the agencies on the topic of infrastructure resilience in the face of climate change and extreme weather events.

4.7.1 Key Activities and Outputs

This exchange has spanned more than ten years and thus, there have been many activities and related outputs. The information is presented by phase of engagement on the topic.

The first phase of engagement between the RWS and FHWA on climate change focused on understanding the issues faced by each country as well as the various tools, strategies and methodologies deployed by each country to address climate risks and promote development of climate-resilient infrastructure. These activities and outputs are summarized in Table 15.

Table 15: Summary of Activities and Outputs, Phase 1 (2014-2016)

Title (Date)	Modality	Description
2014 TRB Annual Meeting (January 2014)	Conference	RWS expert Kees van Muiswinkel presented on Dutch approach to resilience
Resilience Theme Meeting (January 2024)	Meeting	FHWA, USDOT Volpe Center, and RWS convene in Washington, D.C. for a meeting focused on resilience.
Technical Visit (2015)	In-person technical visit	FHWA expert Michael Culp visited RWS and the Netherlands in 2015 as part of a benchmarking trip. ⁷⁵
Joint FHWA and Rijkswaterstaat Report 'Resilient Infrastructure' (January 2016)	Report	This report, written at the completion of phase 1, details the strategies, methods, reports, and best practices from the USA and the Netherlands (and, where relevant, other European countries) for building infrastructure resilient to climate change. ⁷⁶
Ongoing Meetings (2014 – 2016)	Meeting	During phase 1, each side learned about each other's tools and approaches. ⁷⁷

The second phase of engagement reflected a deepening of the technical collaboration and relationship between the FHWA, RWS as well as other relevant stakeholders (e.g., State DOTs and research entities) on various climate resilience topics. In particular, this phase of engagement centered on the piloting of resilience tools from one country in the other and related technical visits as well as general exchanges through seven webinars and joint conference presentations. A summary of the activities and outputs resulting from the phase of the exchange are found in Table 16 and Figure 3 provides an overview of the tools applied to the pilot projects selected in each country.

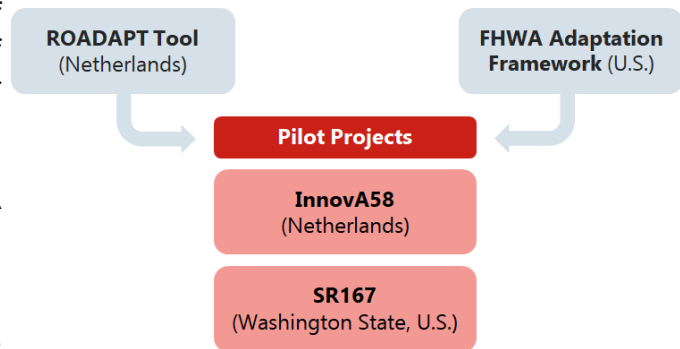


Figure 3: Structure of the Tools Comparison

⁷⁵ Interview with Katy Maher and Robert Kafalenos from FHWA, February 22, 2024

⁷⁶ van Ravesteijn, Maartje, Veld, Mark, Vijftigschild, Kevin. "Joint FHWA and Rijkswaterstaat Report 'Resilient Infrastructure'". Published January 2016. Accessed via

https://international.fhwa.dot.gov/pubs/joint_report_resilient_infrastructure_fhwa_rws_january_2016.pdf

⁷⁷ Interview with Katy Maher and Robert Kafalenos from FHWA, February 22, 2024

Table 16: Summary of Activities and Outputs, Phase 2 (2016-2018)

Title (Date)	Modality	Description
In-Person Technical visit of U.S. Counterparts to the Netherlands (April 2017)	In-person technical visit	WSDOT and FHWA participants visited the InnovA58 project site and met the team involved with the project to better understand how the resilience tools were applied. The site visit also allowed participants to learn more about transportation infrastructure resilience topics in the Netherlands, including: Climate projections and risks in the Netherlands; Dutch approach to coastal flood control; Including climate resilience requirements in contracting documents; Approaches to public engagement (“social design”); Smart mobility; Building With Nature/nature-based resilience strategies; Emergency preparedness; Sustainability-check self-assessment tool; and Porous asphalt. ⁷⁸
Resilient and Sustainable Transport – Dutch Style: An Interim Report on Bilateral Cooperation between FHWA and RWS (August 2017)	Report ⁷⁹	The paper describes how U.S. and Dutch colleagues collaboratively tested resilience tools on the A58 expansion project and the SR167 highway project in Washington State, U.S.A.
In-Person Technical Visit of U.S. Counterparts to the Netherlands (June 2018)	In-person technical visit	Another delegation from WSDOT and FHWA visited the Netherlands in 2018. This site visit focused on pavements and hydraulics. The delegation participated in a workshop on considering climate change on a project on the A20. The site visit also included presentations and discussion on: Porous pavement, pavement drainage, and incorporating climate into pavement design; Designing resilient water crossings, and co-benefits for fish passage; Road-weather operations and future precipitation projections; Asset management; Sustainability and resilience policy; and Nature-based adaptation strategies.
Resilience Innovations Summit and Exchange (RISE) –Denver, Colorado (October 2018)	Conference	The RISE conference had the goal of sharing emerging and state-of-the-practice information about how to include resilience practices in transportation system performance activities. In two conference sessions, FHWA, RWS, and Deltares delegates gave presentations on resilience strategies and the topics covered as part of this collaboration. ⁸⁰

⁷⁸ Hodges, Tina. Resilient and Sustainable Transport – Dutch Style: An interim report on bilateral cooperation between FHWA and Rijkswaterstaat. FHWA, 2017. https://www.fhwa.dot.gov/environment/sustainability/resilience/publications/dutch_style/index.cfm

⁷⁹ Available online. See: https://www.fhwa.dot.gov/environment/sustainability/resilience/publications/dutch_style/index.cfm

⁸⁰ Plovnik, Amy and Filosa, Gina. 2023, p54

Title (Date)	Modality	Description
<p>In-Person Technical Visit to Washington State, USA (October 2018)</p>	<p>In-person technical visit</p>	<p>In October 2018 the project team, including a delegation from the Netherlands, participated in a site visit to Tacoma, Washington to view the SR 167 Completion Project location and continue to explore approaches to climate resilience being employed in Washington State and the U.S.</p>
<p>In-Person Technical Visit to FHWA H.Q., Washington D.C. (October 2018)</p>	<p>In-person technical visit</p>	<p>The Rijkswaterstaat delegation visited the FHWA offices in Washington, DC on October 15-16, 2018, after the visit to WSDOT. The delegation met with the FHWA's sustainability team, and FHWA presented about the following topics: FHWA and Rijkswaterstaat sustainability and resilience efforts; Incorporating resilience into asset management plans; Dealing with uncertainty in climate projections and incorporating climate projections into design of bridges and culverts; Update on initiatives involving natural and nature-based features for flood risk mitigation; Sustainable pavements; and Alternative fuel corridors.</p>
<p>Series of Topical Webinars (2016 – 2018)</p>	<p>Webinar</p>	<p>Webinars typically included presenters from RWS and FHWA (and sometimes another agency), who would talk about their agency's approach to the topic and covered:</p> <ul style="list-style-type: none"> • Stormwater management (December 2016) • Precipitation projections and climate change (June 2017) • Porous asphalt and noise reduction (September 2017) • Habitat crossings (September 2017) • Green infrastructure and nature-based resilience solutions (January 2018) • Precipitation projections and project design, in support of a National Cooperative Highway Research Program (NCHRP) project (May 2018)⁸¹ <p>Integrating resilience in asset management and performance measurement (December 2018)</p>

The third phase of exchange between the RWS and FHWA focused primarily on the topic of nature-based solutions⁸² and their application in both countries. During this exchange, in addition to FHWA and RWS, NCDOT and WSDOT engaged, given their coastal geographic location and

⁸¹ NCHRP 15-61, Applying Climate Change Information to Hydrologic and Hydraulic Design of Transportation Infrastructure. <http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=4046>

⁸² Nature-based solutions – also referred to as natural infrastructure, green infrastructure, and engineering with nature – mimic characteristics of natural features and processes but are created by human design and engineering (FHWA).

commitment to enhancing the resilience of their transportation networks. A summary of the activities and outputs resulting from the phase of the exchange are found in Table 17.

Table 17: Summary of Activities and Outputs, Phase 3 (2019 – 2022)

Title (Date)	Modality	Description
International Guidelines on Natural and Nature-Based Features for Flood Risk Management (NNBF Guidelines) (2021)	Guidelines	Over the course of the FHWA/Rijkswaterstaat collaboration on nature-based solutions, representatives from Rijkswaterstaat provided updates on the development of the international guidelines and their relevance to project partners. ⁸³
Monthly Conference Calls and Webinars (2019-2021)	Meeting, webinars	Information sharing was an integral part of the collaboration between FHWA, Rijkswaterstaat, NCDOT, and WSDOT. Through monthly conference calls and webinars, the agencies exchanged information on nature-based resilience strategies and explored other topics related to resilience, including asset management, sea level rise, and sustainability/sustainable materials.
Transportation Resilience in the United States and the Netherlands: Summary of Collaboration on Nature-Based Solutions and Application of Infrastructure Resilience Tools, 2016-2022 (January 2023)	Report ⁸⁴	Report provides a summary of the technical exchange between the RWS and FHWA that occurred between 2016 and 2022, including an overview of the vulnerability tools from each country piloted on road projects in the other country as well as the Phase 3 engagement on Nature Based Solutions. The Phase 3 engagement on Nature-Based Solutions that involved exchange between FHWA, RWS as well as NCDOT and WSDOT.

Currently, FHWA and RWS are exploring climate change sustainability and resilience topics, including how climate change resilience is incorporated in planning, design and construction, asset management, and maintenance procedures via activities in Table 18.

Table 18: Summary of Activities and Outputs, Phase 4 (2022-present)

Title (Date)	Modality	Description
RWS Visit to the U.S. for the Transportation Research Board (TRB) Transportation Resilience 2023 Conference	Conference	Dutch participation in conjunction with FHWA on this collaboration topic during this conference. ⁸⁵ FHWA representatives Mike Culp, Robert Kafalenos, Heather Holsinger and RWS representative Kees van Muiswinkel were

⁸³ Bridges, T. S., J. K. King, J. D. Simm, M. W. Beck, G. Collins, Q. Lodder, and R. K. Mohan, eds. 2021. International Guidelines on Natural and Nature-Based Features for Flood Risk Management. Vicksburg, MS: U.S. Army Engineer Research and Development Center. Accessed via: <https://ewn.erd.c.dren.mil/international-guidelines-on-natural-and-nature-based-features-for-flood-risk-management/>

⁸⁴ Available online. See: <https://international.fhwa.dot.gov/pubs/pl23014/pl23014.pdf>

⁸⁵ See: <https://trb.secure-platform.com/a/page/TransportationResilience>

Title (Date)	Modality	Description
(November 2023)		involved in the planning committee for this conference since 2019.
In-Person Technical Visit from RWS to NCDOT (October/November 2023)	In-person technical visit	When RWS officials came to the U.S. for the TRB Transportation resilience Conference 2023 they traveled to North Carolina to meet with NCDOT officials. ⁸⁶
In-Person Visit to RWS for 225th Anniversary Meeting and Site Visits (November 2023)	In-person technical visit	Key FHWA counterpart, Katy Maher, traveled to the Netherlands in 2023 to meet with the RWS counterparts, conduct site visits, and celebrate the 225 th anniversary of RWS.
In-Person Programmatic Collaboration and Site Visits in the Netherlands (February 2024)	In-person technical visit	FHWA officials Jihan Noizet (Transportation Specialist of the Office for International Programs) and Keith Benjamin (Associate Administrator for the Highway Policy and External Affairs) met with their RWS counterparts for a high-level visit to discuss FHWA-RWS collaboration efforts and conduct several site visits.

4.7.2 Key Benefits

A key benefit of this exchange collaboration topic has been information sharing – not just between RWS and FHWA but with State DOTs as well. Despite the fact that both countries face different climate risks and have different policy approaches to the various climate resilience related topic, they were able to learn from each other on a variety of approaches related to integrating vulnerability and climate risk analysis into project design and examining the potential for nature-based solutions to help make infrastructure more resilient.⁸⁷ Information sharing was cited as being particularly beneficial around the following topics:

- Practices for improving resilience (e.g., the use of sand for beach nourishment)
- Approaches for optimizing where to make resilience investments
- Learning from tools that are being developed
- Integrating resilience into asset management
- Assessing vulnerability and considering a range of vulnerabilities in planning and project development
- Policy and funding allocation for resilience
- Sharing communication and outreach materials⁸⁸

RWS and FHWA information sharing on infrastructure resilience topics resulted in the following tangible benefits:

- **FHWA updated its guidance for ensuring the development of resilient infrastructure.** The second phase of the exchange centered on comparing climate

⁸⁶ Interview with Katy Maher and Robert Kafalenos from FHWA, February 22, 2024

⁸⁷ Filosa, Gina, Plovnick, Amy, Stahl, Leslie, Miller, Rawlings, Pickrell, Don. "Vulnerability Assessment and Adaptation Framework". Published December 2017. Accessed via

https://www.fhwa.dot.gov/environment/sustainability/resilience/adaptation_framework/index.cfm

⁸⁸ Ibid.

resilience tools developed by each agency on one transportation project in each country (the InnovA58 in the Netherlands and the SR167 Completion Project in Washington State, USA). FHWA gleaned lessons from the exercise which it incorporated into the third edition of its *Vulnerability Assessment and Adaptation Framework*, which provides a guide for transportation agencies interested in assessing their vulnerability to climate change and extreme weather events. Namely, FHWA used the Dutch experience applying their climate resilience tool on a large Dutch highway project (A58) to provide examples of different ways to assess a road asset's vulnerability to climate hazards as well as how to determine risk. FHWA also provided the Dutch example on how to integrate climate risk information into the road's engineering design.⁸⁹

- **Informed the International Guidelines on Natural and Nature-Based Features for Flood Risk Management (NNBF Guidelines).**⁹⁰ While not an explicit output of this collaboration, the NNBF Guidelines were under development and published during the third phase of exchange between FHWA and RWS. The NNBF Guidelines seek to inform the use of natural systems and functions to support flood risk management, meaning actions taken to reduce future damage to people and property caused by flooding and erosion in coastal and fluvial systems, including actions to address the myriad biophysical processes that contribute to flooding and erosion (e.g., processes contributing to shoreline erosion and loss of land elevation that can increase flood risks over time). "Over the course of the FHWA/RWS collaboration on nature-based solutions, representatives from RWS provided updates on the development of the international guidelines and their relevance to project partners."⁹¹
- **Informing how RWS mainstreams resilience in asset management.** RWS is currently updating and renewing its asset management methodologies, including how to mainstream resilience within it. RWS has cited the FHWA's approach and materials on this subject as an important input and inspiration.

Officials also noted that the exchange inspired them to think about how to approach climate resilience and transportation differently. U.S. officials noted that it was interesting to see how the Dutch and Europeans deal with current and expected future climate issues in a very technical and direct manner. FHWA was inspired by how the RWS collaborates well with the Royal Netherlands Meteorological Institute (KNMI), the Dutch national weather forecasting and climate projections service. The FHWA was also inspired by some of the large engineering projects along coastal areas to protect from storm surge and to deal with the combination of riverine and coastal flooding.⁹² RWS officials noted being impressed with the U.S.'s approach to integrating resilience into asset management specifically the U.S.'s ability to quickly repair and return to normal operations after an extreme weather event.

⁸⁹ Filosa, Gina et al. *Vulnerability Assessment and Adaptation Framework, Third Edition*. 2017

⁹⁰ Bridges, T. S., J. K. King, J. D. Simm, M. W. Beck, G. Collins, Q. Lodder, and R. K. Mohan, eds. 2021. *International Guidelines on Natural and Nature-Based Features for Flood Risk Management*. Vicksburg, MS: U.S. Army Engineer Research and Development Center. Accessed via: <https://ewn.erd.c.dren.mil/international-guidelines-on-natural-and-nature-based-features-for-flood-risk-management/>

⁹¹ Plovnik, Amy and Filosa, Gina. 2023, p14

⁹² Interview with Katy Maher and Robert Kafalenos from FHWA, February 22, 2024

4.7.3 Key Challenges

Arranging in-person exchanges requires coordination time and effort, which is not always available. While in-person technical visits are seen as vital to the success of the exchange, the interviewees from FHWA noted the staff time associated with coordinating international trips tends to be overlooked.

RWS has implementation power and the FHWA does not, which makes it difficult to explore testing through pilot projects. While the FHWA and RWS share similar tools, guidance, and policy, only RWS has implementing power. Therefore, when it comes to sharing information on implementing a particular project or idea in the United States, it meant recruiting state DOTs participate in the collaboration (like Washington State and North Carolina), but these state DOTs are also really busy with their own work, making it more challenging to engage.

4.7.4 Key Takeaways

Early and sustained face-to-face connection is pivotal in securing a solid basis for communication. Interviewees noted the value in virtual collaboration, but emphasized in-person visits as crucial for fully understanding climate adaptation projects. Seeing flood mitigation efforts and other climate-related interventions firsthand provides insights that can't be gained through remote interactions alone. Further, interviewees noted that presence at conferences was “crucial”, as well as the in-person events.⁹³

A longer period to exchange on the topic can lead to more organic collaborative relationships. Interviewees discussed the intangible takeaways from the climate resilience collaboration topic, which has continued for about a decade, noting length of this exchange has enabled the collaboration the time to grow facilitating strong, reliable connections and a broader cross-agency network, including the involvement of State DOTs. Also, as the resilience and sustainability work continues to evolve in both countries, both sides continue to have new lessons to share.

Senior topic champions from each agency and outside administrative and technical support as needed can help enhance the exchange outcomes. Both RWS and FHWA committed the resources of an extremely dedicated senior advisor on both sides, which helped promote commitment to the topic. Additionally, the involvement of the Volpe Center, who kept both agencies accountable by providing additional technical expertise and support, was an essential aspect too.

Because RWS serves in both administrative and road managing roles, while the FHWA is largely focused on oversight and policy, the presence of a state DOT can be indispensable. State DOTs can not only provide implementation opportunities, such as a pilot project, which the FHWA can help support, but they can also pull in their own expertise and relevant modeling too. They are also likely to be interested in learning from the Dutch.

Exchanges can benefit from parallel events and research, and this exchange on climate resilience and nature-based solutions was no different. During the formal exchange period on this topic, the RWS counterparts traveled to the U.S. to share the results of their research, which resulted from the formal exchange, at a Transportation Research Board meeting.

⁹³ Interview with Kees van Muiswinkel from RWS, March 25, 2024

Additionally, in 2019, representatives from both agencies participated in the planning of the 2023 TRB Transportation Resilience Conference, which provided a platform for further collaboration, leading to mutual and wider exchange of knowledge and experience during this period.

Both sides still seem very positive about exchanging on topics related to climate change. Interviewees noted the following as potential future topics:

- Resilience of asset management;
- Prioritization and evaluation of resilience projects and investments;
- Electric vehicles and carbon reduction;
- Circular economy;
- Storm surge protection;
- Governance of vulnerability implementation;
- Mainstreaming of vulnerability assessments in benefit-cost analyses;
- Incentivizing long-term versus short-term investments;
- Multi-modal resilience, incorporating AI technology into decision-making; and
- Requiring (climate-related) environment, social and governance requirements in tenders.

5 Recommendations

The following includes recommendations to support the future exchange between FHWA and RWS in the context of the BRP. Recommendations include potential future collaboration topics, how to think about structuring an engagement around a collaboration topic in the context of relative expertise and maturity in the topic area as well as recommendations on how to set an exchange up for success.

5.1 Potential Future Cooperation Topic

Leveraging the FHWA-RWS BRP as a strategic conduit for knowledge transfer presents a significant opportunity, given the shared transportation infrastructure hurdles faced by both entities. This platform facilitates the cross-pollination of distinctive methodologies, catalyzing innovation for all stakeholders involved. To optimize the exchange's value proposition, it is imperative to identify future focus areas that not only resonate bilaterally but also exhibit divergent approaches, thereby maximizing the potential for transformative insights and best practice adoption (see Figure 4).

The concept of "smart mobility," which synergizes technological advancements with mobility solutions, emerged as a recurrent theme among agency stakeholders engaged in the collaborative initiative. This overarching paradigm encompassed several key subtopics, including vehicle-to-infrastructure (V2I) and infrastructure-to-vehicle (I2V) technologies,⁹⁴ advanced driver assistance systems (ADAS),⁹⁵ "geofencing" for CAVs,⁹⁶ and real-time traffic information dissemination. The technological-mobility nexus further extended to the digitization of road safety protocols and governance structures, the integration of artificial intelligence (AI), the utilization of "digital twins" for virtual modeling,⁹⁷ and the cascading effects of CAVs on civil service operations, licensing frameworks, and insurance paradigms. Additionally, the imperative for strategic alignment with "IT Giants" regarding transportation data ecosystems was highlighted.

Given the pervasive and disruptive potential of these technological innovations on both agencies' transportation ecosystems, coupled with the residual momentum from the short-lived CAV

⁹⁴ V2I and I2V technologies enable real-time communication between vehicles and road infrastructure. V2I allows vehicles to send data to roadside units, traffic lights, and other infrastructure elements, providing information about traffic flow, road conditions, and vehicle status. Conversely, I2V enables infrastructure to transmit crucial information to vehicles, such as traffic signal timing, speed limits, road hazards, or weather alerts. This two-way communication can have implications for road safety, traffic management, and the development of autonomous driving systems.

⁹⁵ ADAS use sensors, cameras, and radar to enhance vehicle safety and improve driving. These technologies monitor surroundings and assist drivers through features like adaptive cruise control, lane departure warnings, and automatic emergency braking. ADAS helps reduce human error and mitigate accident risks by providing real-time feedback and sometimes taking corrective action.

⁹⁶ Using GPS or RFID (radio frequency identification), geofencing technology defines digital borders that provide location-specific instructions or restrictions to CAVs. Geofencing can limit speeds in school zones, restrict area access, or guide autonomous vehicles along set routes. It may also trigger functions like switching to electric-only mode in low-emission areas. By offering dynamic, location-based rules, geofencing can have implications for CAV safety, efficiency, and compliance.

⁹⁷ In a typical "digital twin" scenario, sensors are attached to a physical object to monitor key functional areas. These sensors gather performance data from various aspects of the object. This information is then fed into a processing system, which updates a digital replica accordingly. Once populated with relevant data, this digital model can run simulations, identify performance issues, and suggest improvements. The goal is to gain actionable insights that can enhance the original physical object. This approach has potential applications across numerous components of a road transportation system.

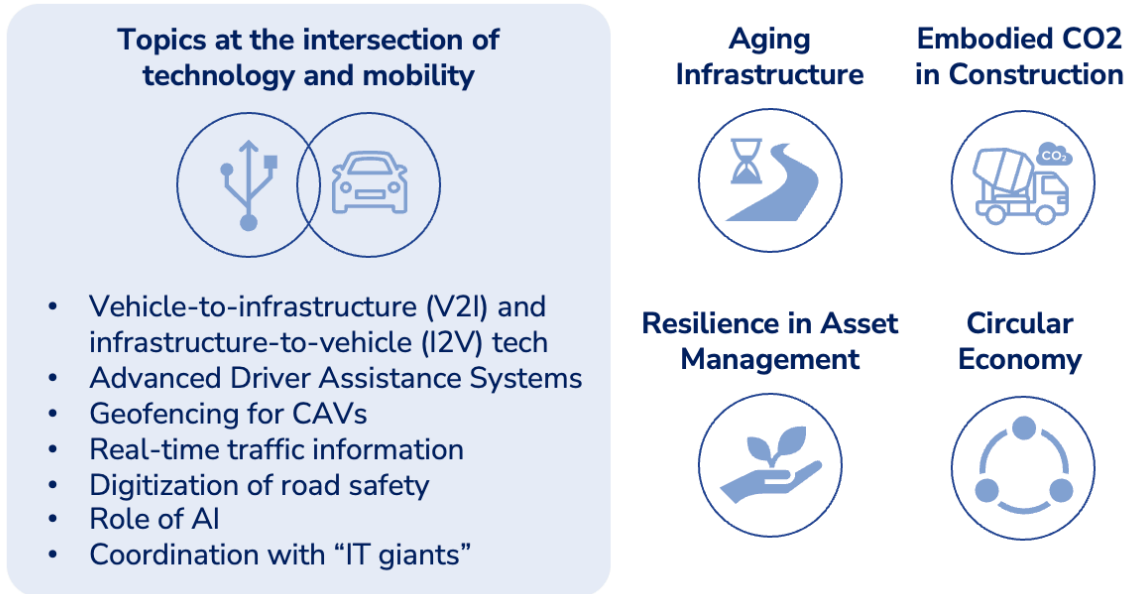
collaboration, and factoring in the divergent regulatory and implementation strategies across the FHWA and RWS, "smart mobility" presents itself as an optimal focal point for future collaborative endeavors.

Beyond smart mobility-centric themes, the topic of aging infrastructure was also cited by officials from both agencies as a crucial challenge. The issue has become a focal point for the new Director-General of RWS. In addition to prioritizing the maintenance, renewal, renovation, and management of each nations' aging infrastructure assets, topics for additional consideration could include sustainability topics (e.g., carbon emissions reduction and circular economy), climate adaptation, and data and information services.

In addition to smart mobility-centric themes, the critical challenge of aging infrastructure emerged as a key concern among stakeholders from both agencies. This issue has been elevated to strategic prominence, as evidenced by its prioritization on the agenda of the newly appointed Director-General of RWS. While the primary focus remains on optimizing the lifecycle management of legacy infrastructure assets—encompassing maintenance, renewal, renovation, and operational oversight—there exists a compelling opportunity to expand the collaborative scope.

Additional areas for BRP exploration include sustainability initiatives, such as reducing the embodied carbon in construction services⁹⁸ and circular economy principles, climate adaptation strategies, and data and information services.

Figure 4: Overview of Potential Collaboration Topics



⁹⁸ "Embodied carbon" refers to the carbon emissions that occur in the lifecycle of product or building material. For example, the embodied carbon of concrete for road construction would include the emissions from extraction, production, transportation, manufacturing, construction, and disposal of the material.

Furthermore, other topics cited in previous MOCs have not been explicitly addressed, which include “managing and reducing congestion through policy, pricing, technology, and multimodal solutions, and consideration of the role of reliability” (2009 MOC), infrastructure financing (2016 MOC), smart cities (2016 MOC), “good regulatory practices” (2016 MOC), and freight planning (2016 MOC). The 2021 Joint Statement also referred to topics that have not been explicitly addressed, including electrification, alternative fuels (including bio-derived and hydrogen-derived fuels), and technological advancements for greater efficiency.⁹⁹ Aspects of these topics may still be of interest for future cooperation and can be recontextualized to cater to current research and operational needs.

5.2 Strategy for Selecting Engagement Modality

Assuming there are resources and subject matter expertise available, to operationalize the adoption of a new collaboration topic, we advise adopting a framework that examines different types of engagement and their correlation with agency expertise (see Table 19).

We identified three core forms of engagement: information exchange, pilot projects, and joint research:

- Information exchange can deliver high value at potentially low cost. They can occur in-person or virtually, although in-person seems to deliver the greatest value. All collaboration exchanges involved information exchange as a form of engagement. Mutual learning and strong network on topic are ideal outcomes resulting from this type of engagement.
- “Pilot projects” refer to the instances where RWS and FHWA counterparts choose to apply guidance or methodologies on an actual project. This was done, for example, in Phase 2 of the Infrastructure Resilience and Adaptation exchange whereby the RWS / Netherlands tested the FHWA’s Adaptation Framework (as well as their own ROADAPT tool) on a the InnovA58 road project and FHWA / Washington State Department of Transportation likewise tested the two tools on their State Route 167 project
- “Joint research” is the co-creation of new information that is useful to each side. This type of exchange was successfully deployed within the Performance Measures and CAV collaboration topics. The ideal outcome for this type of engagement are executed research projects and the advancement of ideas that are then implemented in respective countries.

Ideally, information exchange can serve as the “gateway” into joint research and/or pilot projects. In the words of an RWS official, the “ideal collaboration topic” would start with a two-pronged information exchange: a webinar and then an “in-person exchange that focused on joint brainstorming and fact finding”, leading to both agencies “getting beyond just saying what each agency is doing and into building off of each other’s work and creating something new,” – i.e. culminating in a joint research product or a pilot project.¹⁰⁰

To maximize the impact of a type of engagement, consider the comparative “expertise level” each agency brings to the table about the topic. Because every engagement has the potential to foster relationship-building between experts at both agency, every form of

⁹⁹ “Joint Statement on Transportation and Climate Change”, April 2021.

¹⁰⁰ Interview with Serge van Dam, RWS. Conducted on March 21, 2024.

engagement is valuable in advancing the objectives of the FHWA-RWS BRP. However, by understanding the level of expertise each agency has in relation to a topic, “low hanging fruit” may become more apparent, which delivers high value in exchange for low resources. Information exchange is most appropriate when there is a mismatch in expertise level. For example, RWS has expertise about X topic and an interest in Y topic, while FHWA has expertise about Y topic and an interest in X topic, therefore each agency transmits their respective expertise to the other via webinar. Joint research is most appropriate when there is an alignment in expertise level. For example, if both agencies view a topic as nascent, there is mutual value for a joint research endeavor to uncover something that both agencies find as new and additive. Similarly, pilot projects are most viable when both agencies have an equal level of expertise on a topic, regardless of whether the topic is nascent or mature.

Finally, when determining how to exchange on a topic, parties should evaluate whether additional stakeholders beyond RWS and FHWA are needed, and appropriate resources are available. The Performance Measures exchange that resulted in a successful joint-research project involved hiring of outside consultants and research institutions. Further, the successful implementation of pilot projects in the context of the Infrastructure Resilience and Adaptation exchange required partnering with State DOTs, which, like RWS, have implementing power. Additionally, it is important to consider preexisting momentum inside either agency with respect to ongoing programs or initiatives that a collaboration topic can “piggy back” off of, which may provide the right acceleration and “authorizing authority” for staff to be able to give the exchange topics appropriate resources. Ultimately, the amount of time that SMEs from both agencies can commit to a particular topic is also a crucial determinant of a topic’s priority as well as its associated activities and should be assessed during topic planning deliberations.

Table 19: Strategic Engagement for Success

Type of Engagement	Ideal Expertise	Stakeholders	Required Enablers	Ideal Outcome
Information Exchange <ul style="list-style-type: none"> Meetings Webinars Conferences 	Agency mismatch or match (example: Project Acceleration)	FHWA, RWS	Time and Financial Resources	Mutual learning; strong network on topic
Joint Research <ul style="list-style-type: none"> Joint reports 	Agency match (example: CAVs and Performance Measures) Nascent topic area	FHWA, RWS, Other Research or Consulting Entities	Time and Financial Resources Approval of Parent Organizations	Executed research project; advancing ideas that are then implemented in respective countries
Pilot Projects <ul style="list-style-type: none"> Tool Swapping Other ways of applying information / 	Agency match (example: Nature-based Solutions). More mature topic area	FHWA, RWS, Other Research Entities, State DOTs	Time and Financial Resources Willingness and availability of State DOTs	Integrating best practices, new methodologies (e.g., turbo roundabout, NBS)

Type of Engagement	Ideal Expertise	Stakeholders	Required Enablers	Ideal Outcome
methodology to actual projects				

5.3 Setting up an Exchange for Success

Start with Face-to-face Information Exchange and Evolve from There

Exchanges benefit from early in-person meetings and information flow, followed by other types of engagement. Many stakeholders noted that face-to-face interaction, particularly early in an exchange lifecycle, facilitates a trust-based relationship and means for communication to flow, which makes exchanges later in the collaboration period significantly more productive. Ideally, in-person exchange occurs at least once per year, per exchange topic. Existing conferences and event fora (e.g., TRB) naturally provide these platforms.

To be sure, both agencies pointed out the resources to coordinate this international travel are not always available. Further, stakeholders noted that early exchanges work best if they can focus on information sharing—depending on the relative maturity of a topic in the respective country, this could take the entire two-year exchange period as was seen with the Infrastructure Resilience and Adaptation exchange topic or the information sharing can occur through a couple of webinars. After a suitable amount of information regarding a topic has been shared, parties can determine what type of further engagement works best for their respective goals around an exchange topic.

Identify Resources for Exchange

Finding resources – of both time and money – to dedicate to ensuring a successful exchange can be difficult. The following ideas stem from the various interviews and can be seen as recommendations for how to ensure that the exchange topics get the “most bang for their buck”.

Leveraging existing conferences and event fora (e.g., TRB / other events) for topic ideation, topic promotion, and following up on topics ex-post. Many interviewees cited convening around an exchange topic at a Transportation Research Board (TRB) conference (especially given the FHWA’s outsized role in organizing select TRB conferences) or other conference (e.g., Climate Resilience and Adaptation and Performance Measures). Leveraging existing fora seems to be an efficient and effective way to convene around a topic, deepen the network, and sustain connections.

Crowd in the Right Stakeholders

Where possible, consider leveraging outside expertise and administrative help to support the exchange. In certain exchanges that involved more than information exchange, i.e., they involved joint-research or pilot projects, the success of these exchanges seemed possible due to either the presence of an outside organization that provided technical expertise (e.g., Deltares, TU Delft, Volpe Center) and/or administrative support, to include planning events, taking notes, and calling both agencies about progress. The presence of these stakeholders seems to help provide the manpower needed to engage in a more intensive way; however, their presences is constrained by resource availability.

Further, for certain types of engagement involvement of U.S. State DOTs can be highly impactful under the right circumstances.¹⁰¹ The FHWA and RWS do not share the same roles and responsibilities. Almost all interviewees made it clear that RWS is a different agency than FHWA, because RWS is an executive agency with implementation power and a policy-advising role, an “advanced road authority akin to a Connecticut or Maryland [DOT]”,¹⁰² whereas the FHWA is an administrative, policy-setting office without implementation power. This difference was most salient when collaboration involved implementation, thus necessitating the intervention of one or more state DOTs, who have the capability to implement FHWA tools – a process that is “very informative and inspiring” to see transpire.¹⁰³ This does not, however, preclude the involvement of State DOTs from other types of engagement. In fact, their collaboration in knowledge exchange, knowledge development, and contracting joint research could be highly impactful.

Interviewees also recommended that the bilateral exchange consider expanding their exchange partners to European Union counterparts and more research organizations in the U.S. In line with the mismatch of roles and responsibilities between the RWS and FHWA, there may be a fruitful opportunity to coordinate with a European or international organization (e.g. Conference of European Directors of Roads, FEHRL, or PIARC) counterpart on a topic, not just a single country counterpart. Further, OIP could consider partnering with large technological institutes and universities in the United States, in the same way RWS's Knowledge and Innovation Office, the counterpart to the OIP, partners with TU Delft.

Incorporate Achievable Reporting Standards

FHWA and RWS program managers, with the assistance of SMEs, can consider requiring periodic progress reports. Not only will this standardize and streamline data collection from collaboration topics, but it can also ease future reporting and evaluation needs. This can be facilitated by creating a reporting template that can include inputs for collaboration progress, ongoing activity details, calendar of engagements, etc. Crucially, this effort should not impose a strong “reporting burden” but should instead encourage reflection at various intervals during a typical two-year collaboration topic (e.g., requiring an interim report after one year, and a close out report at the culmination of the term).

¹⁰¹ Interview with Onno Tool, RWS. Conducted on March 19, 2024.

¹⁰² Interview with Serge van Dam, RWS. Conducted on March 21, 2024.

¹⁰³ Interview with Kees van Muiswinkel, RWS. Conducted on March 25, 2024.

6 Conclusion

For more than fifteen years, the Binational Relations Program (BRP), facilitated by the FHWA's Office of International Programs (OIP), has provided a successful arena for agency officials and subject matter experts at the United States' Federal Highway Administration (FHWA) and the Netherlands' Rijkswaterstaat (RWS) to foster their professional networks and mutually exchange information on crucial road transportation topics in an enduring, efficient, inspiring, and resilient manner.

The exchange has created an enduring and efficient medium for expertise sharing.

In-person engagement has been a crucial value-add for exchange participants. Nearly all officials associated with the exchange interviewed for this report cited the in-person site visits, conferences, and workshops as a valuable means to bolstering the strength of their relationship with the opposite agency. This institutional trust, built over a decade and a half,

has created a strong sense of collegiality between the two agencies, as well as a sense of equality, which has made mutual knowledge requests much more efficient. In several instances, collaboration topics reached a point of maturity in which exchange began to occur naturally between officials without the facilitation of the OIP/BRP—a clear signal of success.

“The Dutch and Americans view each other as equals – [as though they were] in the same organization – as colleagues.”

“Sometimes you need to stick your head outside and say, ‘Hey! What’s happening there? What are the different approaches? What are the learnings? How can we put that into our own systems?’”

The exchange provides topical benchmarking and inspiration.

Oftentimes you cannot guarantee the outcomes at the onset of a new collaboration topic, as “it can take years for something to bear fruit”¹⁰⁴ However, “even if something concrete does not come out [of the collaboration], visibility into another country’s progress on a research topic can confirm if the other country is moving in a good direction”. In other words, collaboration can serve as “a good benchmarking exercise”.¹⁰⁵

The exchange has demonstrated resiliency. Several officials affiliated with the information exchange cited the resiliency of the exchange itself as a source of strength and longevity for the BRP. Since 2009, both agencies have maintained a consistent collaboration despite responding to changes in administration and the subsequent shifts in strategic priorities and new workloads for SMEs and program officials at both agencies.

For over a decade and a half, a multitude of collaboration methods— from workshops, in-person technical visits, and conferences—have brought together experts from both agencies to fulfill the OIP's goal of accessing and examining global best practices and technical innovations that improve the safety and efficiency of U.S. highway infrastructure. From roadway improvement, performance management systems, and innovative project delivery mechanisms to effective cycling infrastructure, handling CAV risks to road traffic, and shaping resilient transportation planning processes, the seven discrete collaboration topics to-date have allowed the FHWA to

Quotations in order of appearance: Onno Tool (RWS) and Serge van Dam (RWS).

¹⁰⁴ Interview with Onno Tool, RWS. Conducted on March 19, 2024.

¹⁰⁵ Interview with Onno Tool, RWS. Conducted on March 19, 2024.

examine myriad dimensions of a robust highway transportation network through the eyes of its high-performing counterpart across the Atlantic, RWS.

Ultimately, to ensure the ongoing success and resiliency of the BRP exchange between the FHWA and RWS for many more years to come, both agencies should continue to identify road transportation topics important to both countries while balancing a more deliberative approach to exchange activities, selecting additive partners, and appropriately resourcing activities.

7 Appendix

7.1 Compilation of Exchange Materials

Table 20: Compilation of Reference Materials

Document (Date)	BRP Relevance	Source	Description
2009 Memorandum of Cooperation (November 2009)	General	FHWA, not publicly available	Governance document that formalized the first phase of the binational relations program between FHWA and RWS.
2016 Memorandum of Cooperation (April 2016)	General	FHWA, not publicly available	Governance document that formalized the second phase of the binational relations program between FHWA and RWS.
2016 Implementing Arrangement (June 2016)	General	FHWA, not publicly available	Governance document that operationalized the second phase of the binational relations program between FHWA and RWS.
Progress Report FHWA-RWS Collaboration Q1-2018 (2018)	General	RWS, not publicly available	Internal RWS memo that reports on the overall progress of four collaboration topics through Q1 2018: cycling, freight, infrastructure climate resilience, and smart mobility.
Progress Report FHWA-RWS Collaboration Q3-2018 (2018)	General	RWS, not publicly available	Internal RWS memo that reports on the overall progress of four collaboration topics through Q3 2018: cycling, freight, infrastructure climate resilience, and smart mobility.
2021 Joint Statement on Transportation and Climate Change (April 2021)	General	Available online ¹⁰⁶	U.S. DOT press release that articulates FHWA's and RWS's reaffirmed intent to collaborate on climate action and reinvigorate their bilateral cooperation.
Dissemination Tools and Strategies of the Federal Highway Administration's Office of International Programs (August 2021)	General	Available online ¹⁰⁷	This synthesis report is part of an OIP project that seeks to identify and disseminate information on some of the most useful and effective best practices, technologies, and lessons learned through OIP's programs from the mid-1990s through the present.
Netherlands FHWA Binational Program Anchor Briefing (October 2023)	General	OIP, not publicly available.	A core source document created by the FHWA's OIP that provides an overview of the information exchange between FHWA and RWS, including high level summaries of the major collaboration topics completed to-date, as

¹⁰⁶ See: <https://www.transportation.gov/briefing-room/joint-statement-us-department-transportation-and-ministry-infrastructure-and-water>

¹⁰⁷ See: <https://international.fhwa.dot.gov/pubs/pl21025/pl21025.pdf>

Document (Date)	BRP Relevance	Source	Description
			well as their associated known collaboration activities and outputs.
FHWA OIP Dashboard and Map (Date unknown)	Road Safety, Performance Measures, Project Acceleration, Cycling	Available online ¹⁰⁸	Online spreadsheet listing technologies, best practices, and lessons learned from a limited number of international exchanges facilitated by the OIP.
FHWA Study Tour for Pedestrian and Bicyclist Safety in England, Germany, and The Netherlands (1994)	Road Safety	Available online ¹⁰⁹	This report documents the findings of a U.S. study team that visited England, The Netherlands, and Germany. The trip sponsored by the Federal Highway Administration was taken September 3-19, 1993. The purpose of the trip was to learn as much as possible about practices and policies for improving pedestrian and bicyclist safety and promoting the use of these modes.
Managing and Organizing Comprehensive Highway Safety in Europe (2003)	Road Safety	Available online ¹¹⁰	This report documents the FHWA study, conducted in March 2002, that included visits to Sweden, Germany, the Netherlands, and the United Kingdom. The objective of the scanning study was to investigate and review the supporting mechanisms used in planning, developing, and implementing highway safety programs.
Traffic Safety Information Systems in Europe and Australia (September 2004)	Road Safety	Available online ¹¹¹	Report documenting FHWA, American Association of State Highway and Transportation Officials, and National Cooperative Highway Research Program scanning study of how agencies in the Netherlands, Germany, and Australia develop and use traffic safety information systems.
Minutes for RWS TRB Highway Safety Performance Committee Meeting (August 2011)	Road Safety	RWS, not publicly available	Summary document describing RWS's experience at the TRB Highway Safety Performance Committee meeting in August 2011.
Highway Safety Manual Lead State Second Peer Exchange Baltimore, Maryland (November 2012)	Road Safety	Available online ¹¹²	This report summarizes the presentations and discussions for the Highway Safety Manual (HSM) Lead State Second Peer Exchange held through the National Cooperative Highway Research Program (NCHRP) 17-50, Lead State

¹⁰⁸ See: <https://international.fhwa.dot.gov/programs/tbp/map.cfm>

¹⁰⁹ See: <https://rosap.nhtl.bts.gov/view/dot/35366>

¹¹⁰ See: <https://international.fhwa.dot.gov/Pdfs/pl03006.pdf>

¹¹¹ See: https://international.fhwa.dot.gov/tsis_04010/

¹¹² See: https://onlinepubs.trb.org/onlinepubs/nchrp/docs/nchrp17-50_peerexchange2_report.pdf

Document (Date)	BRP Relevance	Source	Description
			Initiative for Implementing the Highway Safety Manual Project.
FHWA-RWS Update Call Presentation (February 2013)	Road Safety	RWS, not publicly available	PowerPoint deck for a meeting between FHWA and RWS that discussed the RWS Road Network, new research topics, and road safety policy topics.
Advancing Turbo Roundabouts in the United States: Synthesis Report (September 2019)	Road Safety	Available online ¹¹³	Report synthesizing existing published resources (e.g., reports, papers, presentations, videos, and tools) on the topic of turbo roundabouts from international and domestic sources.
Turbo Roundabouts Informational Primer (2020)	Road Safety	Available online ¹¹⁴	Informational primer seeks to describe the characteristics of turbo roundabouts, highlighting the design and traffic control features, operational capabilities, and potential safety benefits of these roundabout alternatives.
Making our Roads Safer through a Safe System Approach (2022)	Road Safety	Available online ¹¹⁵	Article in <i>Public Roads</i> magazine that discusses the United States' beginning adoption of a "Safe System Approach" to address roadway safety challenges.
Procedures for Defining Management Strategies and Targets Associated with Transportation Goals (April 2013)	Performance Measures	FHWA, not publicly available	Report authored by the FHWA that identifies current successful practices in the establishment of a performance-based transportation program and techniques for defining outcome performance measures and targets that represent the needs of the stakeholders. Conducted in tandem with an RWS-authored study examining European and Australian practices, with the aim of effectively and efficiently comparing and learning from both agencies' findings, respectively.
U.S. – Netherlands Cooperative Project on Performance Management Webinar (March 2014)	Performance Measures	RWS, not publicly available	The webinar aimed to present the key findings of the joint research paper.
Performance Management Practices in Europe and the USA Report	Performance Measures	Available online ¹¹⁶	This paper is a direct result of the FHWA-RWS exchange. In this study, government and road authority goals and objectives for performance management were evaluated for different States in the U.S. and different European

¹¹³ See: <https://safety.fhwa.dot.gov/intersection/roundabouts/fhwasa19027.pdf>

¹¹⁴ See: <https://safety.fhwa.dot.gov/intersection/roundabouts/fhwasa20019.pdf>

¹¹⁵ See: <https://highways.dot.gov/public-roads/winter-2022/01>

¹¹⁶ See: <https://trid.trb.org/View/1288264>

Document (Date)	BRP Relevance	Source	Description
(2014)			countries in the interest of advancing the development of the performance management programs in the U.S. and in the Netherlands.
Web Conference Agenda (August 2012)	Project Acceleration	RWS, not publicly available	Agenda detailing the itinerary for the first technical webinar between the FHWA and RWS.
Faster & Better Road Planning (August 2012)	Project Acceleration	RWS, not publicly available	Presentation prepared by RWS and presented to FHWA during the first technical webinar, detailing RWS's "Faster & Better" program and case studies on the RWS use of innovative contracting.
In-Person Technical Visit Agenda (Day 1 and 2) (September 2012)	Project Acceleration	RWS, not publicly available	Agendas detailing a series of in-person activities in which experts from the FHWA were hosted by RWS and presented on topics related to "Every Day Counts versus Sneller and Beter Approaches".
FHWA Visit: Programmatic Approach in Projects (Air Quality, Noise, Climate Change) (September 2012)	Project Acceleration	RWS, not publicly available	Presentation prepared by RWS and presented to visiting FHWA officials related to RWS's programmatic approaches to air quality, noise, and climate change, with a particular emphasis on the "Faster and Better" program.
Trip Report for FHWA-Rijkswaterstaat Meetings on September 25-26, 2012 (October 2012)	Project Acceleration	RWS, not publicly available	Debriefing document for George L. Bouza of the FHWA Office of International Programs from the FHWA officials who participated in the in-person technical visit to RWS in September 2012.
Every Day Counts (Date unknown)	Project Acceleration	Available online ¹¹⁷	Website that details Every Day Counts (EDC), the State-based model that identifies and rapidly deploys proven, yet underutilized innovations that make the U.S. transportation system adaptable, sustainable, equitable and safer for all.
Agenda for RWS Technical Visit to FHWA (September 2014)	Emergency and Crisis Management	RWS, not publicly available	Agenda provides a list of attendees and itinerary for a meeting between the FHWA and RWS, in which two presentations on emergency management topics were shared by the FHWA.
Planning for Evacuations and Emergencies: Transportation Systems Management and Operations – Adaptation for Climate Change	Emergency and Crisis Management	FHWA, not publicly available	Presentation delivered during RWS's September 2014 Technical Visit to FHWA detailing how the FHWA is approaching evacuation management and protocol due to climate change's multiplying impact on road transportation, including system maintenance needs, travel behavior, and freight transportation.

¹¹⁷See: <https://www.fhwa.dot.gov/innovation/everydaycounts/about-edc.cfm>

Document (Date)	BRP Relevance	Source	Description
(September 2014)			
Traffic Incident & Events Planning, Operations & Tools: A U.S. Perspective (September 2014)	Emergency and Crisis Management	FHWA, not publicly available	Delivered on behalf of the FHWA during RWS's September 2014 Technical Visit detailing tools leveraged by the FHWA to operate traffic management centers and unified command onsite.
FHWA Course on Bicycle and Pedestrian Transportation (2014)	Cycling	Available online ¹¹⁸	The FHWA course is intended for use at the university level as part of transportation planning and design curricula, providing information on pedestrian and bicycle planning techniques, as well as practical lessons on how to increase bicycling and walking through land-use practices and engineering design.
Delivering Safe, Comfortable, and Connected Pedestrian and Bicycle Networks: A Review of International Practices (May 2015)	Cycling	Available online ¹¹⁹	The purpose of this study was to identify noteworthy and innovative international designs, treatments, and other practices that have potential to improve bicycle and pedestrian safety and access and increase walking and bicycling in the United States.
Bicycle Network Planning & Facility Design Approaches in the Netherlands and the United States (April 2016)	Cycling	Available online ¹²⁰	This report explores similarities and differences in the approach to bicycle network planning and facility design in the Netherlands and the United States.
Decision Cycling Research Proposal (July 2016)	Cycling	RWS, not publicly available	Letter detailing a short proposal for a research project about the planning of Dutch cycling infrastructure, which would eventually be the "Dutch Approach to Bicycle Mobility" Report (2017).
Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts (August 2016)	Cycling	Available online ¹²¹	This publication is a resource for practitioners seeking to build multimodal transportation networks. The publication highlights ways that planners and designers can apply the design flexibility found in current national design guidance to address common roadway design challenges and barriers.
Small Town and Rural Multimodal Networks	Cycling	Available online ¹²²	A resource and idea book intended to help small towns and rural communities support

¹¹⁸ See: https://safety.fhwa.dot.gov/ped_bike/univcourse/instrtoc.cfm

¹¹⁹ See: <https://rosap.ntl.bts.gov/view/dot/50855>

¹²⁰ See: <https://rosap.ntl.bts.gov/view/dot/50775>

¹²¹ See: https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/multimodal_networks/

¹²² See: https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

Document (Date)	BRP Relevance	Source	Description
(December 2016)			safe, accessible, comfortable, and active travel for people of all ages and abilities.
Spring 2016: Road Diet Quarterly Update (2016)	Cycling	Available online ¹²³	Newsletter that provides background details on the ThinkBike Workshop in Washington, D.C.
Role of RWS in National Cycling Policy (June 2017)	Cycling	Available online ¹²⁴	RWS presentation for the Velo City Conference in June 2017 about Dutch cycling policy.
FHWA Thank-You Note (July 2017)	Cycling	RWS, not publicly available	Thank you note on behalf of the FHWA for RWS's hospitality in hosting FHWA officials Gabe Rousseau and Dan Goodman to learn how the Dutch create and improve safe and comfortable bicycle networks.
Dutch Approach to Bicycle Mobility: Retrofitting Street Design for Cycling (September 2017)	Cycling	Available online ¹²⁵	FHWA report highlighting techniques and strategies for retrofitting existing road infrastructures to improve safety, fix gaps and barriers in the pedestrian and bicycle network, improve transportation system efficiency, leverage investments, and meet local public demand.
Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations (July 2018)	Cycling	Available online ¹²⁶	This guide assists State or local transportation or traffic safety departments that are considering developing a policy or guide to support the installation of countermeasures at uncontrolled pedestrian crossing locations.
Walk Bike Places Conference Itinerary (September 2018)	Cycling	RWS, not publicly available	Itinerary for a joint session on governance at the Walk Bike Places Conference.
Bikeway Selection Guide (February 2019)	Cycling	Available online ¹²⁷	This document is a resource to help transportation practitioners consider and make informed decisions about tradeoffs relating to the selection of bikeway types. Dedicates a section to the Netherlands' Sustainable Safety approach, a preventative method in road design integral to the Dutch bikeway selection process.

¹²³ https://safety.fhwa.dot.gov/road_diets/newsletter/spring/

¹²⁴ See: https://ecf.com/sites/ecf.com/files/RickLindeman_RoleOfRWSInNationalCyclingPolicy_0.pdf

¹²⁵ See: <https://international.fhwa.dot.gov/pubs/pl18004/fhwapl18004.pdf>

¹²⁶ See: https://www.fhwa.dot.gov/innovation/everydaycounts/edc_5/docs/STEP-guide-improving-ped-safety.pdf

¹²⁷ https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa18077.pdf

Document (Date)	BRP Relevance	Source	Description
Pedestrian and Bicyclist Road Safety Audit (RSA) Guide and Prompt List (September 2020)	Cycling	Available online ¹²⁸	This guide is intended to support agencies that are interested in conducting pedestrian- and bicycle-focused RSAs and includes information on safety risks for both modes, the RSA process, necessary data, and the roles and responsibilities of the RSA Team.
Traffic Analysis and Intersection Considerations to Inform Bikeway Selection (February 2021)	Cycling	Available online ¹²⁹	This resource supplements FHWA's Bikeway Selection Guide and is intended to inform trade-off decisions associated with bikeway selection at intersections.
Guidelines for the Planning and Design of Roundabouts (March 2022)	Cycling	Available online ¹³⁰	Massachusetts Department of Transportation's publication detailing the various designs of roundabouts.
Dutch Multimodal Bike Planning Webinar (July 2022)	Cycling	Available online ¹³¹	Webinar was organized by the FHWA's OIP and featured some of the highlights from the FHWA-RWS collaboration, both the BRP and the MRP to-date.
Manual on Uniform Traffic Control Devices (December 2023)	Cycling	Available online ¹³²	The purpose of the MUTCD is to establish uniform national criteria for the use of traffic control devices that meet the needs and expectancy of road users on all streets, highways, pedestrian and bicycle facilities, and site roadways open to public travel.
Urban Bikeway Design Guide – Bicycle Signals (Date unknown)	Cycling	Available online ¹³³	Homepage for resources related to various specialized traffic signals for bicycles.
Herd Immunity for Traffic Safety	Connected and Automated Vehicles	RWS, not publicly available	Research proposal to explore the "tipping points" of sufficient vehicle connectivity and/or

¹²⁸ See: https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa20042.pdf

¹²⁹ https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/FHWA-SA-21-010_Traffic_Analysis_Intersection_Considerations.pdf

¹³⁰ See: <https://www.mass.gov/doc/massdot-guidelines-for-the-planning-and-design-of-roundabouts/download>

¹³¹ See:

https://usdot.zoomgov.com/rec/play/cJUiSjhSEWnp4SMk2r5CoqyWlvd7kXLbumMG841jFiTLug2amt2JgIFwa9P3P9ARoGclhq04c1aW-C8s.CMVePoFXoXSiYm7o?canPlayFromShare=true&from=share_recording_detail&startTime=1657645283000&componentName=rec-play&originRequestUrl=https%3A%2F%2Fusdot.zoomgov.com%2Frec%2Fshare%2FK2BN1aPNmgoFfiTB9OvjHp9c4tGZUx9RQQAo0fUJeMK99IWj_Kib7Fn43LWLgUYp.nPGOqB2KbfXqajD8%3FstartTime%3D1657645283000 – Password to access the webinar is pNmy6L.4

¹³² See: https://mutcd.fhwa.dot.gov/kno_11th_Edition.htm

¹³³ See: <https://nacto.org/publication/urban-bikeway-design-guide/bicycle-signals/>

Document (Date)	BRP Relevance	Source	Description
(April 2021)			automation penetration at which points collective fleet safety is achieved.
Herd Immunity Webinar Agenda (May 2021)	Connected and Automated Vehicles	RWS, not publicly available	Agenda for U.S. and Dutch technical counterparts to discuss aspects of herd Immunity as it relates to Connected and Automated Vehicles.
Safe and Efficient Operation of Automated and Human Driven Vehicles in Mixed Traffic (Date unknown)	Connected and Automated Vehicles	Available online ¹³⁴	TU Delft's "SAMEN" research homepage for the study of the interactions between human driven vehicles and automated vehicles.
Joint FHWA and RWS Report on Resilient Infrastructure Presentation (September 2015)	Infrastructure Resilience and Adaptation	RWS, not publicly available	PowerPoint deck for session at the International Conference on Surface Transportation System Resilience to Climate Change and Extreme Weather Events.
Joint FHWA and Rijkswaterstaat Report 'Resilient Infrastructure' (February 2016)	Infrastructure Resilience and Adaptation	Available online ¹³⁵	This report aims to enhance the processes of FHWA and RWS in building infrastructure resilience to climate change. It accomplishes this by detailing strategies, methods, reports, and best practices from the USA and the Netherlands (and, where relevant, other European countries).
Vulnerability Assessment and Adaptation Framework (December 2017)	Infrastructure Resilience and Adaptation	Available online ¹³⁶	A manual to help transportation agencies and their partners assess the vulnerability of transportation infrastructure and systems to extreme weather and climate effects.
Resilient and Sustainable Transport – Dutch Style: An Interim Report on Bilateral Cooperation between FHWA and Rijkswaterstaat (2017)	Infrastructure Resilience and Adaptation	Available online ¹³⁷	Synthesizes some of the information and perspectives gained during an in-person technical visit to the Netherlands that may be useful for application in the US context. It focuses on the climate vulnerability analysis of the Dutch InnovA58 project, the inclusion of climate resilience specifications in the design contract for the project, and innovations beyond resilience that are being integrated into the InnovA58 project in a complementary manner.

¹³⁴ See: <https://www.tudelft.nl/en/ceg/samen>

¹³⁵ See: https://international.fhwa.dot.gov/pubs/joint_report_resilient_infrastructure_fhwa_rws_january_2016.pdf

¹³⁶ See: https://www.fhwa.dot.gov/environment/sustainability/resilience/adaptation_framework/index.cfm

¹³⁷ See: https://www.fhwa.dot.gov/environment/sustainability/resilience/publications/dutch_style/index.cfm

Document (Date)	BRP Relevance	Source	Description
<p>Climate Adaptation of Road Infrastructure – A Comparison of the Implementation of the CEDR ROADAPT and the FHWA Framework for Vulnerability Assessment in The Netherlands and Washington State</p> <p>(April 2018)</p>	Infrastructure Resilience and Adaptation	Available online ¹³⁸	Joint publication of FHWA and RWS report that presents a discussion of the “ROADAPT” framework, the tools, the results of implementation, and shares perspectives the authors gained from using the tools to help future users understand the strengths and weaknesses of the tools.
<p>Collaborative Application of Transportation Infrastructure Tools in the United States and the Netherlands</p> <p>(March 2019)</p>	Infrastructure Resilience and Adaptation	FHWA, not publicly available	Report detailing the findings from a pilot project in which FHWA and RWS conducted an applied comparison of a suite of resilience tools developed and/or used by the respective agencies.
<p>International Guidelines On Natural And Nature-Based Features For Flood Risk Management</p> <p>(2021)</p>	Infrastructure Resilience and Adaptation	Available online ¹³⁹	Report that provides practitioners with the best available information concerning the conceptualization, planning, design, engineering, construction, and maintenance of NNBF to support resilience and flood risk reduction for coastlines, bays, and estuaries, as well as river and freshwater systems.
<p>Transportation Resilience in the United States and the Netherlands: Summary of Collaboration on Nature-Based Solutions and Application of Infrastructure Resilience Tools, 2016-2022</p> <p>(January 2023)</p>	Infrastructure Resilience and Adaptation	Available online ¹⁴⁰	Report summarizing the contributions between FHWA, RWS, Washington State DOT, and North Carolina DOT that explored nature-based solutions that reduce flood hazards to highways and provide environmental benefits.

¹³⁸ See:

https://www.academia.edu/114290385/Climate_Adaptation_of_Road_Infrastructure_A_comparison_of_the_implementation_of_the_CEDR_ROADAPT_and_the_FHWA_Framework_for_Vulnerability_Assessment_in_The_Netherlands_and_Washington_State?uc-sb-sw=18957448

¹³⁹ See: <https://ewn.ercd.dren.nl/international-guidelines-on-natural-and-nature-based-features-for-flood-risk-management/>

¹⁴⁰ See: <https://international.fhwa.dot.gov/pubs/pl23014/pl23014.pdf>

7.2 Interview List

Table 21: FHWA and RWS Officials Interviewed

Agency Official (Agency)	Date of Interview	Topic Association
Katy Maher (FHWA)	February 22, 2024	Infrastructure Resilience and Adaptation
Robert Kafalenos (FHWA)	February 22, 2024	Infrastructure Resilience and Adaptation
Brian Cronin (FHWA)	February 23, 2024	Connected and Automated Vehicles
Govindarajan Vadakpat (FHWA)	February 23, 2024	Connected and Automated Vehicles
Mike Griffith (FHWA)	March 14, 2024	Road Safety
Onno Tool (RWS)	March 19, 2024	General, Road Safety, Project Acceleration, Performance Measures, Emergency and Crisis Management
Hari Kalla (FHWA)	March 21, 2024	Project Acceleration
Serge van Dam (RWS)	March 21, 2024	Connected and Automated Vehicles
Kees van Muiswinkel (RWS)	March 25, 2024	Infrastructure Resilience and Adaptation
Rick Lindeman (RWS)	March 25, 2024	Cycling
Hans van Saan (RWS)	March 26, 2024	General, Infrastructure Resilience and Adaptation, Cycling, Connected and Automated Vehicles

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