

NATIONAL  
ACADEMIES

Sciences  
Engineering  
Medicine

**TRB** TRANSPORTATION RESEARCH BOARD

# TRB Webinar: Intermodal Passenger Facility Trends in Technology and User Experience

*November 20, 2024*

*2:00 – 3:30 PM*



# PDH Certification Information

1.5 Professional Development Hours (PDH) – see follow-up email

You must attend the entire webinar.

Questions? Contact Andie Pitchford at [TRBwebinar@nas.edu](mailto:TRBwebinar@nas.edu)

***The Transportation Research Board has met the standards and requirements of the Registered Continuing Education Program. Credit earned on completion of this program will be reported to RCEP at RCEP.net. A certificate of completion will be issued to each participant. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the RCEP.***



# AICP Credit Information

1.5 American Institute of Certified Planners Certification  
Maintenance Credits

You must attend the entire webinar

Log into the American Planning Association website to claim your  
credits

Contact AICP, not TRB, with questions

# American Association of Airport Executives (AAAE)

- 1.0 Continuing Education Units (CEUs)  
are available to Accredited Airport Executives  
(A.A.E.)

- Report your CEUs:
- [www.aaae.org/ceu](http://www.aaae.org/ceu)

# Purpose Statement

This webinar will present the key research findings in the pre-publication TCRP Research Report 250 / ACRP Research Report 275 / NCHRP Research Report 1129: Intermodal Passenger Facility Planning and Decision-Making for Seamless Travel. Presenters will summarize key trends and considerations for planning, constructing, operating and serving airports, rail and bus stations, transit centers, mobility hubs, and water transportation facilities.

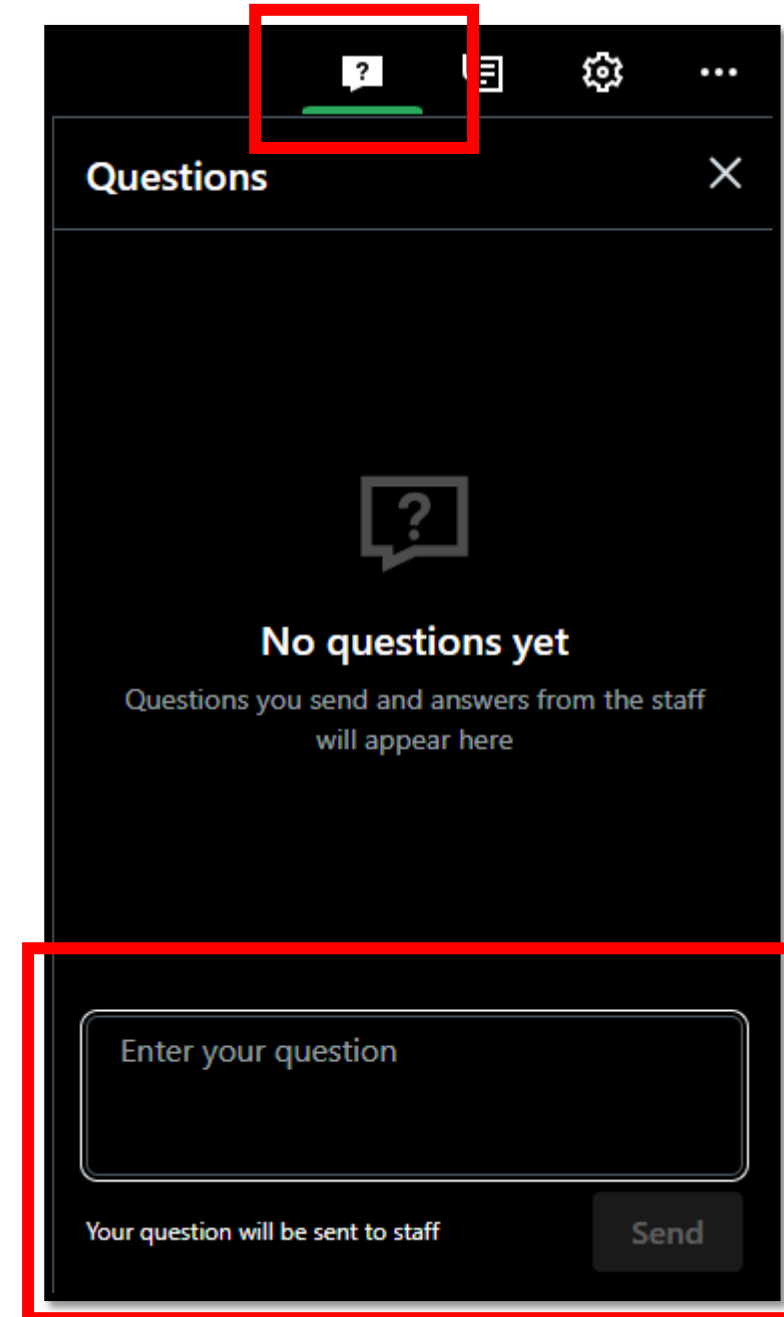
## Learning Objectives

At the end of this webinar, you will be able to:

- (1) Consider the implications of recent trends in intermodal facilities plans
- (2) Recognize the vital role of governance in planning, project delivery, and operations and the ways it changes throughout an intermodal passenger facility's life cycle
- (3) Apply complete trip principles and data to prioritize the user experience and support seamless travel

# Questions and Answers

- Please type your questions into your webinar control panel
- We will read your questions out loud, and answer as many as time allows

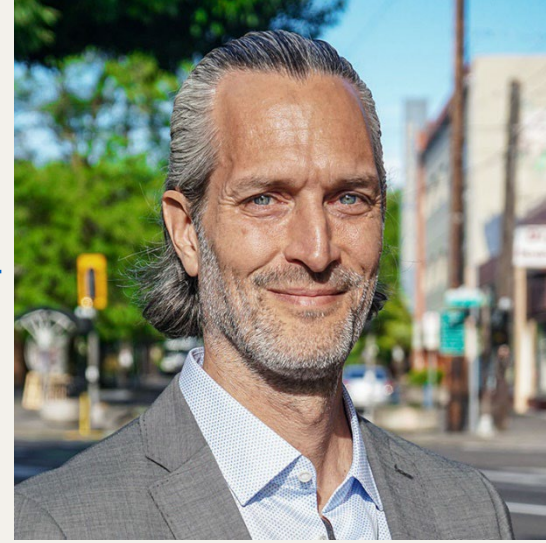


The screenshot shows a dark-themed mobile application interface for a webinar. At the top, a navigation bar contains several icons: a question mark icon (highlighted with a red box), a list icon, a settings gear icon, and a three-dot menu icon. Below the navigation bar is a header section with the word "Questions" and a close button (X). The main content area displays a large question mark icon and the text "No questions yet" followed by "Questions you send and answers from the staff will appear here". At the bottom, there is a text input field with the placeholder "Enter your question" (highlighted with a red box). Below the input field, the text "Your question will be sent to staff" is displayed next to a "Send" button (also highlighted with a red box).

# Today's presenters



Bill Schwartz  
[bschwartz@nelsonnygaard.com](mailto:bschwartz@nelsonnygaard.com)  
*Nelson\Nygaard, Consulting Associates, Inc.*



Nico Larco  
[nlarco@uoregon.edu](mailto:nlarco@uoregon.edu)  
*Urbanism Next and University of Oregon*



Sallye Perrin  
[sallye.perrin@wsp.com](mailto:sallye.perrin@wsp.com)  
*WSP*

# Introduction & Welcome

# What is an intermodal passenger facility?

- An intermodal passenger facility is a **transportation hub** served by at least two modes of travel with at least one travel mode by air, rail, bus, or passenger vessel. They include:
  - Multimodal centers or terminals
  - Airports
  - Transit centers or stations
  - Ferry or cruise ship terminals/docks
  - Mobility hubs
- All intermodal passenger facilities are mobility hubs, but not all mobility hubs are intermodal passenger facilities for the purposes of this research.

# **Main intermodal passenger facility themes we are discussing today**

**Continued evolution in facility use, new technology, and external forces of change require flexibility and adaptability.**

**Strong partnerships and good governance are foundational to a facility's success.**

**Seamless travel depends on a well-planned facility where the customer experience is prioritized.**

# How the report is organized

**Introduction**

**History  
Through 2020**

**Recent Trends  
and  
implications**

**Typology**

**Planning and  
Decision-  
making  
Framework**

**Data and  
Information  
Needs**

**Governance  
and  
Partnerships**

**Funding and  
Finance**

# Navigating the report

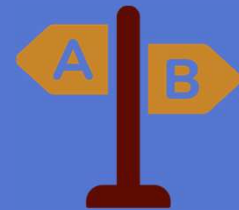
## Published resources



## Checklists



## Decision options



# Chapters 2 and 3: timeline of intermodal passenger facilities

## Report contents

### PRE-1970: RISE AND DECLINE OF INTERCITY TRAVEL BY TRAIN AND BUS

**1890s–1930s** Large-scale railroad terminal construction serving more passengers and more functions

**1927** First park-and-ride lot and first bus-rail transfer facility opens in Philadelphia

■ **1946** Baby boom and suburban migration begins

**Late 1955** Travel by air surpasses travel by rail

■ **1956** National Interstate and Defense Highways Act

**1969** First automated vehicle location (AVL) system introduced in Chicago

**1913** New Grand Central Terminal opens in New York

■ **1914–1918** World War I

■ **1939–1945** World War II

**1946** U.S. transit ridership at all-time high

**Late 1950s** Greyhound has nearly 5,000 stations and 10,000 employees

**1960s** Air and car travel grows; rail, bus, and transit travel declines

### 1970–1989: A CHANGING BUSINESS CLIMATE FOR RAIL, BUS, AND AIR TRAVEL

**1971** National Railroad Passenger Corporation (Amtrak) established

■ **1978** Airline Deregulation Act

■ **1970s** Energy crisis and gas shortages

■ **1982** Airport Improvement Program

■ **1970** Airport and Airway Development Act

**1975** Amtrak introduces intercity bus ticketing

**1980s** Urban rail transit investments for new systems and stations

**1983** Greyhound drivers' strike

### 1990–2009: TECHNOLOGY TRANSFORMS BUSINESS AND CONSUMER BEHAVIOR

**1990** Urban rail system expansion continues

■ **1991** Use of highway funds for transit permitted

■ **1991** Intermodal Surface Transportation Efficiency Act (ISTEA)

**Late 1990s** First "Chinatown" buses between New York and Boston

■ **2001** 9/11 terrorist attacks

**2006** Google transit offers real-time transit data in Portland, Oregon

■ **2007** First iPhone

■ **1990** Americans with Disabilities Act

**Early 1990** Air travel grows significantly

**1995** Amtrak launches first website

■ **Early 2000s** Growth of mobile computing

**2005** Milwaukee airport/Amtrak access project completed

■ **2006** Hurricane Katrina

**2007** 60% of Greyhound's market share in northeast U.S. taken by "Chinatown" buses.

# Chapters 2 and 3: timeline of intermodal passenger facilities

## 2010-2019: NEW MOBILITY ERA

■ **2012** Superstorm Sandy exposes NY subway system vulnerabilities

**2012** Transit app introduced

**2017** U.K.-based First Group acquires Greyhound and its real estate holdings

**2012** Ridehailing services via transportation network companies (TNCs) begin

**2014** Nashville Airport regulates TNCs; many airports soon follow

**2018** Waymo begins testing autonomous taxi service in Phoenix, AZ

## 2020 AND BEYOND: REMOTE/HYBRID WORK, CLIMATE ADAPTATION, AND AUTOMATION

■ **2020** Global pandemic leads to dramatic increase in hybrid and remote work

■ **2021** Infrastructure Investment and Jobs Act (IIJA)

■ **2022** Advanced Air Mobility Coordination and Leadership Act

**2023** Deployment of autonomous robotaxis in San Francisco generates ongoing controversy. Cruise ceases operations while Waymo continues operating.

**2020s** Significant growth in battery electric vehicle sales

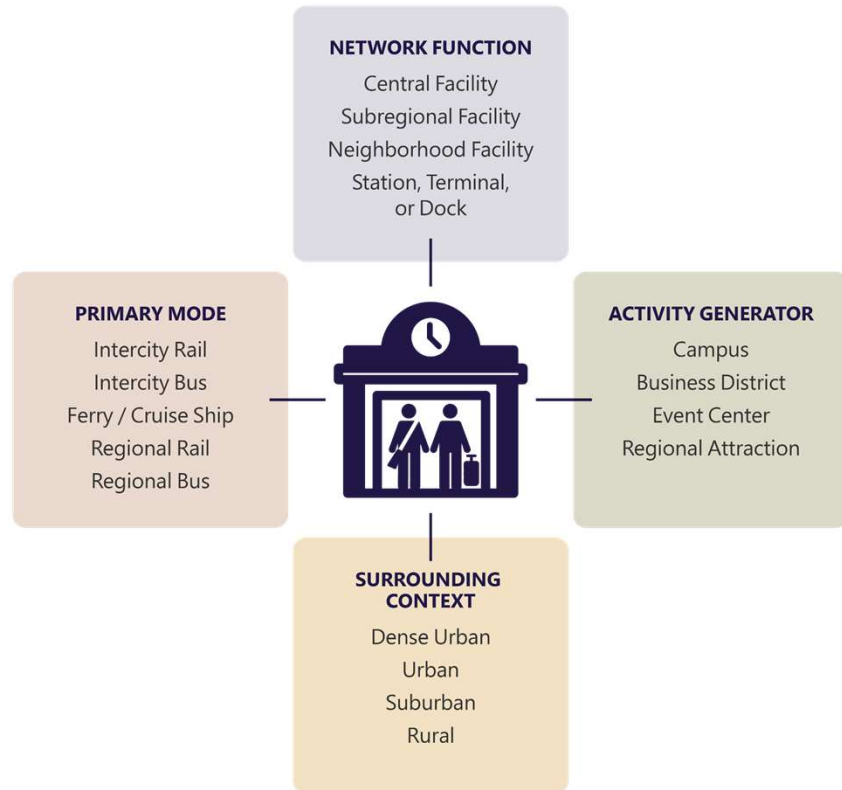
**2021** First Group sells Greyhound bus operations to FlixBus; continues to sell bus stations for redevelopment

■ **2022** Inflation Reduction Act

■ Federal Legislation / Policy  
■ External Events

Report contents

# Chapter 4: intermodal passenger facility typology and how to apply it



Report contents

# Chapter 5: a planning and decision-making framework

Report contents



# Chapter 6: data and information needs

Report contents



Nelson\Nygaard Consulting Associates

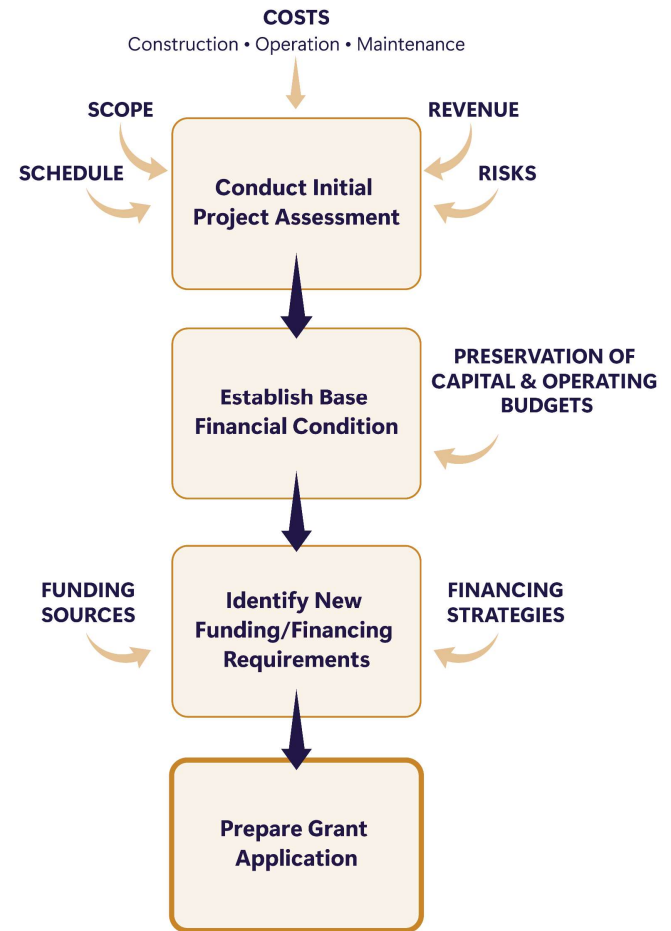
# Chapter 7: governance and partnerships

Report contents



[Governor Tom Wolf from Harrisburg, PA](#) via Flickr

# Chapter 8: funding and finance



Report contents

# **Recent and Emerging Trends**

## **Chapter 3**

# Forces of Change

- Telework
- Intercity bus station closures
- MaaS and digitalization
- Shared AVs
- Advanced air mobility
- Housing crisis
- Climate change and extreme weather
- Aging population
- Equity focus
- Growth in EV ownership

## 2020 AND BEYOND: REMOTE/HYBRID WORK, CLIMATE ADAPTATION, AND AUTOMATION

- **2020** Global pandemic leads to dramatic increase in hybrid and remote work
  - **2021** Infrastructure Investment and Jobs Act (IIJA)
  - **2022** Advanced Air Mobility Coordination and Leadership Act
  - **2023** Deployment of autonomous robotaxis in San Francisco generates ongoing controversy. Cruise ceases operations while Waymo continues operating.
  - **2020s** Significant growth in battery electric vehicle sales
  - **2021** First Group sells Greyhound bus operations to FlixBus; continues to sell bus stations for redevelopment
  - **2022** Inflation Reduction Act
- Federal Legislation / Policy  
■ External Events

# Telework

## Forces

- Changing commute patterns
- Varies by area, vocation
- Unknown long-term trend

## Implications

- Transit use
- Viability of retail / restaurants
- Future funding and financial viability of intermodal facilities

2023  
**30%**  
of US labor force working from home 2-3 days/week

**10%**  
of US labor force working remotely

Barrero, Evolution of Working from Home  
July 2023

# Intercity Bus Industry Disruptions

## INCREMENTAL STATION CLOSURES

### Implications

- Decrease in ease and comfort of bus travel (safety, amenities, weather protection)
- Largest implications on disadvantaged populations

# Zero-Emission Buses and Fleet Electrification

## Forces

- Growth of ZEB Use
- Vehicle maintenance has been an Issue

## Implications

- Implementation of charging stations (funding **and** space)

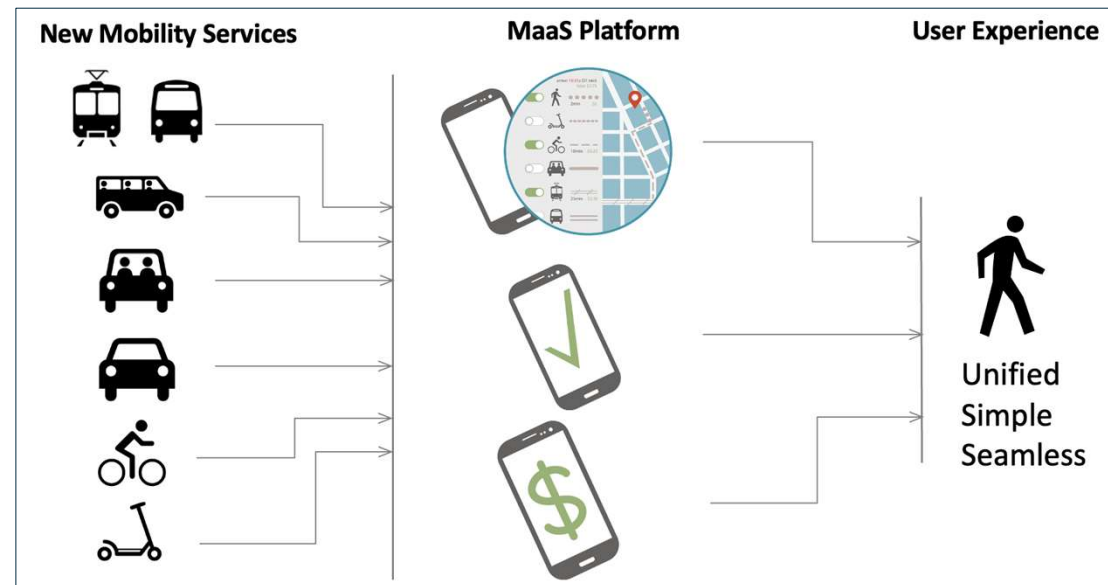
# Digitalization / Mobility as a Service (MaaS)

## Forces

- Integrated trip payment and digital trip planning
- Seeing renewed interest
- Scale/timing of deployment of MaaS?

## Implications

- First/last mile integration (space/wayfinding)
- Increased transit use (?)
- Transit agency role (as integrator?)
- Data sharing



Urbanism Next Center, University of Oregon

# Growth in Autonomous Mobility Options

## Forces

- Tech still in development with limited US deployments
  - GM Cruise issues in SF
- Model works best in dense areas
- Unclear if competing with or complementing transit

## Implications

- Similar to transportation network companies
  - Decreased parking demand
  - Increased need for pickup/drop-off (PUDO) space
  - Staging/maintenance areas
  - Potential increased transportation system efficiency
  - Provider/stakeholder management



Urbanism Next Center, University of Oregon

# Advanced Air Mobility (AAM)

## Forces

- VTOL aircraft
- Use cases: air taxis, airport feeder service, goods movement, humanitarian assistance
- Feasibility in urban environments?
- Price / affordability?
- Scale/timeframe of deployment?

## Implications

- Space
- Interference (at airports)
- Noise, privacy, visual pollution, energy use, land use compatibility



Urbanism Next Center, University of Oregon

# Broadening Housing Crisis

## Forces

- Ongoing housing and homelessness crisis
- 650,000+ people/night in US (in 2023)
- Large problem for existing facilities
- Some operators proactively working with homeless populations (LA Union Station, SEPTA, LA Metro)

## Implications

- Security and safety issues (fear/perception, staffing, etc.)
- Implications on ridership and retailers
- Facilities as places of shelter, safe spaces, and hygiene
- Implications on airports?
- Ethical dilemma

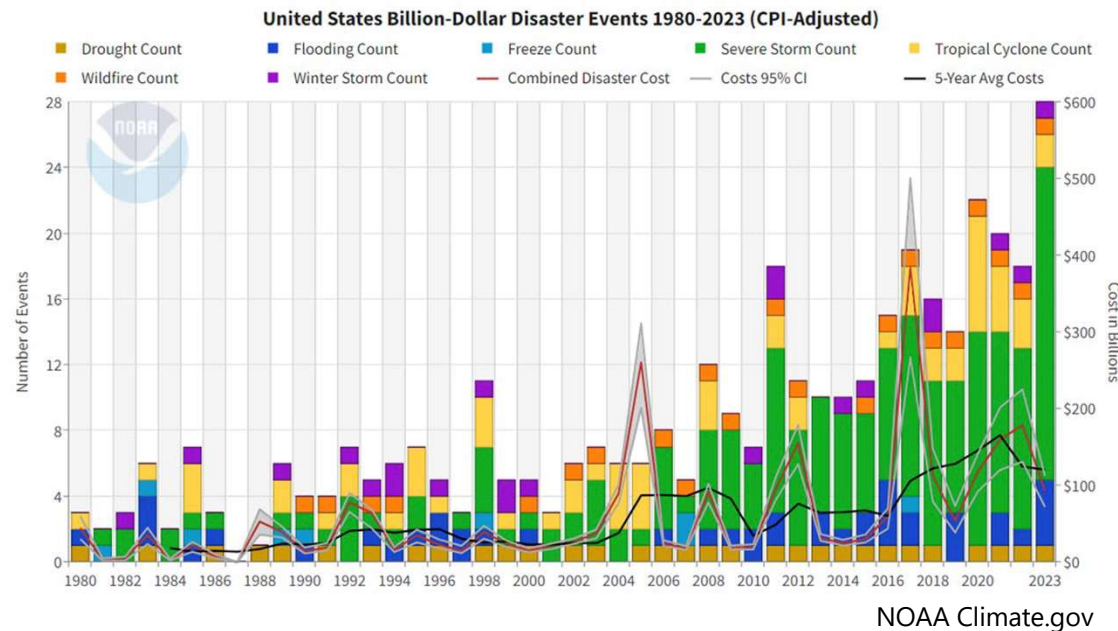
# Extreme Weather Events / Climate Adaptation

## Forces

- Increasing problem (flood, heat, wildfires, drought)
- 28 events in 2023 (>\$1B) with >\$600 billion total losses; nearly 500 lives lost

## Implications

- Service shutdown / delays
- Damage / maintenance
- Use of facilities as emergency shelters
- Resilience design needs / siting
- Comfort needs (heat/humidity)



# EV Ownership

**INCREASING (BUT STALLED) GROWTH**

## Implications

- Charging stations (space, payment, and maintenance)
- Grid capacity
- Partnerships

# Governance and Partnerships

Chapter 7

# What is Governance?

*...the act or process of governing or  
overseeing control and direction of an  
organization or facility....*



# Why is Governance Important?

- *Effective governance provides* flexibility through the project's lifecycle and addresses stakeholders' concerns.
- *Ineffective governance* can result in project overruns and delays, and legal disputes



# Governance Models

# Single Entity

## Seattle Ferry Terminal



[SounderBruce](#), via Wikimedia Commons

Cooperative  
Agreement

LAX APM/  
MTA Station



[Los Angeles County Metropolitan Transportation Authority](#) via Wikimedia Commons

Public and  
Joint Powers  
Authorities

Salesforce  
Transit Center



[Fullmetal2887](#) via Wikimedia Commons

Public Private  
Partnerships

DEN Airport  
Transit Center



[jDubman](#) at English Wikipedia

# What is the process for creating a governance model?

- Establish a clear project vision
- Identify partners and stakeholders
- Define stakeholder relationships and allocation of authority
- Establish management mechanisms including reporting and transparency.
- Plan for changes in roles and responsibilities over time
- Establish the legal framework and agreements.

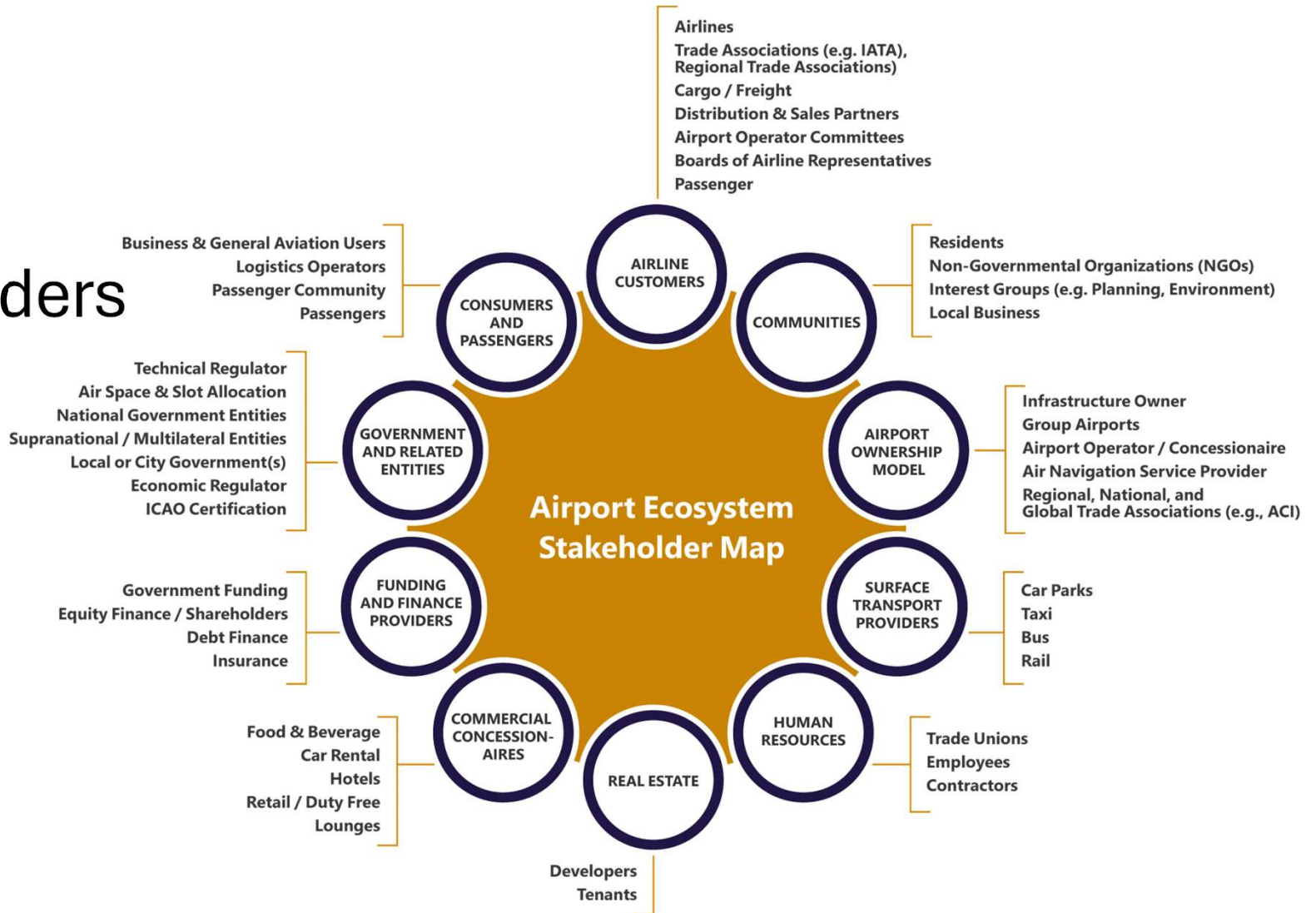


# What are the essential elements of a governance model?

- Establishing a shared vision
- Identifying partners and stakeholders
  - Direct participants
  - Consulting parties
  - External stakeholders



# Mapping Stakeholders



## Assigning Roles and Responsibilities

1. Who has the legal authority to participate in the project? Is a legislative change required to include the pertinent parties?
2. Who can provide funding for the project? Is financing available and by whom? Can equity/revenue flow to the project and if so, through what party?
3. Who has property rights, including land ownership, leases, and development rights?
4. Whose regulations and standards will apply and who has oversight?
5. Who will sustain and maintain the project through its lifecycle?
6. Who has responsibility for safety and security?

# Using a RACI Model

PROCESS	Planning		Design		Construction		Occupancy
ROLE OF PARTIES	ACTIVITY						
	Delivery	Financing	Communications	Ownership	Operations	Maintenance	Decision-Making
Facility Owner	R	C	R	R	C	C	R
Modal Provider 1			C	C	A	A	C
Modal Provider 2			C	C	A	A	C
Government Agency 1		R	C				R
Government Agency 2		C	C				R
Lead Developer	A	A	C	R	R	R	C
Permitting Authority	C	I	I				R
Community Association	I		I		I		I

R

 Responsible

A

 Accountable

C

 Consulted

I

 Informed

## What is included? A governance model checklist

- ✓ Relationship between internal and external partners and stakeholders
- ✓ Formal agreement with single point of authority for decisions
- ✓ Authority for representing the project in contracting and working with stakeholders
- ✓ Preliminary financing plan
- ✓ Considerations for future expansions

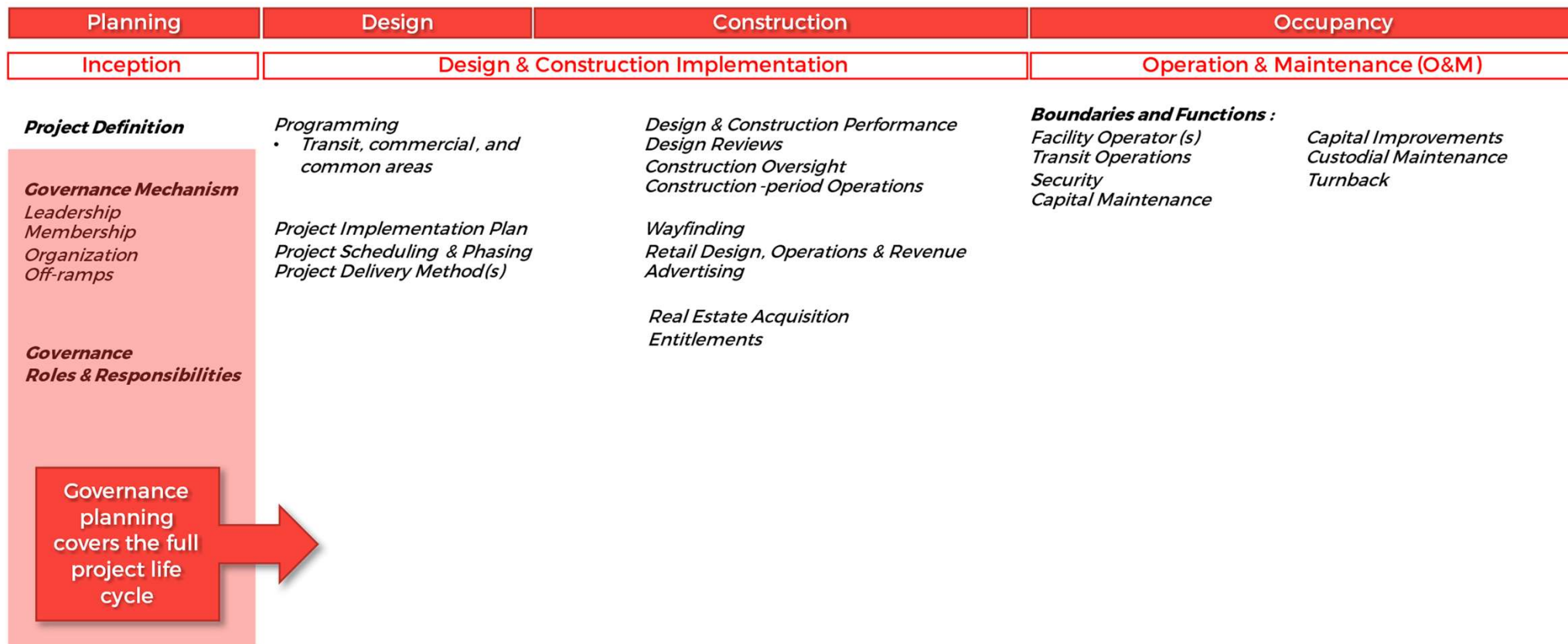


# What is included? A governance model checklist

- ✓ Management mechanisms for:
  - ✓ Processes and procedures
  - ✓ Independent reviews and oversight
  - ✓ Dispute resolution
  - ✓ Approving changes
  - ✓ Reporting and transparency



# Governance and the Project Life Cycle



# Denver Union Station: Flexible Governance Over Time



# The Complete Trip

**According to USDOT,  
a trip is complete  
when an individual  
traveler can execute  
every part of their  
trip from origin to  
destination  
regardless of  
location, income, or  
disability.**



**Intermodal  
passenger facilities  
can help achieve this  
optimum by  
emphasizing the user  
experience, which  
includes entering,  
using, and exiting  
the facility.**



[Takerlamar](#) via Wikimedia Commons

## Trip Planning

- Provide information on your facility website and elsewhere.
- Explain how to travel to/from and navigate within your facility.
- Regularly coordinate with modal partners.



## Outdoor Navigation

- Orient customers and others arriving at or leaving your facility.
- Provide ground transportation options and describe the adjacent community.
- Provide typical walking times.



## Boarding/Using Vehicles

- Offer clear directions to available parking, pickup and drop-off zones, or other ground transportation services.
- Prioritize pedestrian safety and navigation.
- Ensure adequate staffing available during surge periods.



## Vehicle & Mode Transfers & Payments

- Size passenger zones adequately, particularly for passengers with luggage.
- Incorporate all modes, including intercity bus.
- Ensure all customers have access to amenities and different fare payment options.



## Indoor/Outdoor Transition

- **Ensure horizontal circulation, vertical circulation, entrances, and exits are properly sized with clear wayfinding and with international symbols.**



## Indoor Navigation

- Provide attractive, comfortable, and well-illuminated spaces with inviting customer amenities and with clear wayfinding.



## Connecting & Completing Trip Segments

- Facilitate safe, smooth intermodal transfers minimizing travel distances, offering needed assistance, and providing clear wayfinding.



## **Good and inclusive design supports the complete trip**

- **Good design includes both the physical space and the placement of elements within it.**
- **Applying inclusive design principles means designing for all customers.**
  - Certain travelers may face challenges walking longer distances or lack the confidence to navigate large unfamiliar spaces.
  - Accessible does not mean barrier free.

## **The complete trip also depends on well-trained staff**

- **Plan for the unexpected.**
- **Build partnerships and invest in training.**
- **Adopt a continuous order of operations plan (COOP).**
- **Ensure everyone has ready access to instructions.**

# Final Thoughts

# Final thoughts

**Collaborate early  
and often**

**Identify ways to  
streamline new  
projects.**

**Plan with  
flexibility in mind  
and adapt  
accordingly.**

**Collect more data  
and share it more  
broadly.**

# Thank you

# Today's presenters



Bill Schwartz  
[bschwartz@nelsonnygaard.com](mailto:bschwartz@nelsonnygaard.com)  
*Nelson\Nygaard, Consulting Associates, Inc.*



Nico Larco  
[nlarco@uoregon.edu](mailto:nlarco@uoregon.edu)  
*Urbanism Next and University of Oregon*



Sallye Perrin  
[sallye.perrin@wsp.com](mailto:sallye.perrin@wsp.com)  
*WSP*

# Upcoming events for you

**December 3, 2024**

TRB Webinar: Airport Energy  
Resilience Roadmap

**December 12, 2024**

TRB Webinar: Recruitment &  
Retention to Support Transit Workers'  
Mental Health

[https://www.nationalacademies.org/trb/  
events](https://www.nationalacademies.org/trb/events)



# Register for the 2025 TRB Annual Meeting!

*January 5 – 9, 2025  
Washington, D.C.*

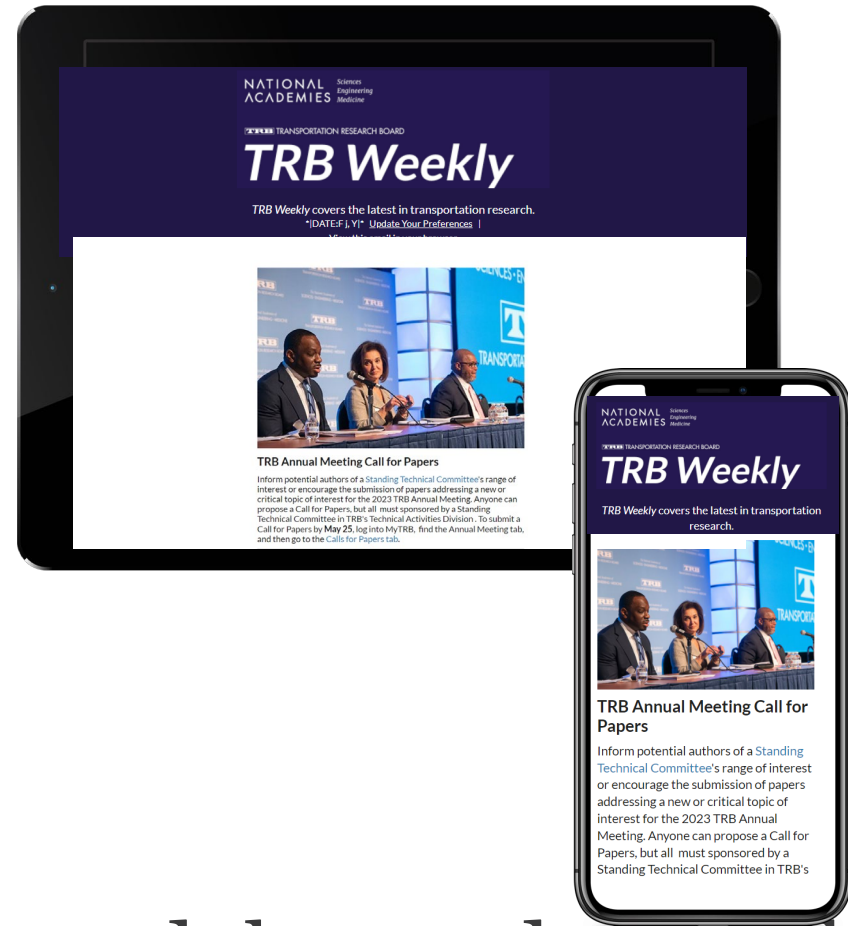


# Subscribe to *TRB Weekly*

If your agency, university, or organization perform transportation research, you and your colleagues need the *TRB Weekly* newsletter in your inboxes!

Each Tuesday, we announce the latest:

- RFPs
- TRB's many industry-focused webinars and events
- 3-5 new TRB reports each week
- Top research across the industry



Spread the word and subscribe!  
<https://bit.ly/ResubscribeTRBWeekly>

# Discover new TRB Webinars weekly

Set your preferred topics to get the latest listed webinars and those coming up soon every Wednesday, curated especially for you!

<https://mailchi.mp/nas.edu/trbwebinars>

And follow #TRBwebinar on social media

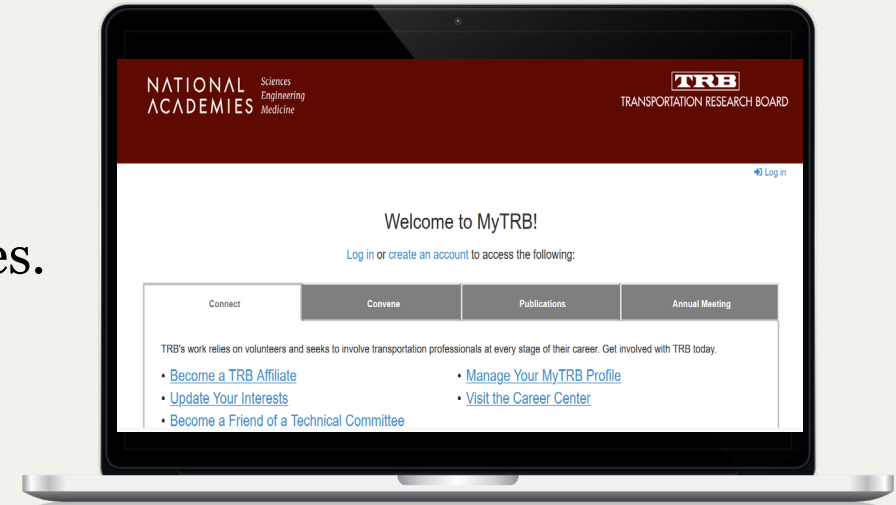


# Get involved

TRB mobilizes expertise, experience, and knowledge to anticipate and solve complex transportation-related challenges.

TRB's mission is accomplished through the hard work and dedication of more than **8,000 volunteers**.

<https://www.nationalacademies.org/trb/get-involved>



# We want to hear from you

- Take our survey
- Tell us how you use TRB Webinars in your work at [trbwebinar@nas.edu](mailto:trbwebinar@nas.edu)

