

2019 Spring AICP Exam Review

AREAS OF PRACTICE
TRANSPORTATION AND INFRASTRUCTURE

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Areas of Practice

- I. Introduction and Format of Review
 - A. Who Are the Players?
 - B. Planning and Engineering Principles
 - C. Planning Approach, Practices, and Tools
- II. Transportation Planning
 - A. Principles, Planning Approach, Practices, and Tools
 - B. Modal Areas
 - C. Integrated Planning
 - D. Equity of Access
- III. Infrastructure Planning
 - I. Principles, Planning Approach, Practices, and Tools
 - II. Range of Community Systems
 - III. Integrated Planning
- IV. Summary



Planning and Engineering Principles

- Much of the development of transportation infrastructure involves **BOTH planning and engineering disciplines.**
- Transportation is a **very data-driven** endeavor.
- The transportation planning framework is **based on the “scientific method”.**
- **Safety trumps every other consideration** in transportation.
- **No single entity is responsible for transportation systems.** It is a very distributed system of responsibilities and resources.
- Central principles include **“cost/benefit analysis”, multimodal level of service analysis, “performance metrics” and multi-year implementation timeframes**



Transportation - Modal Areas

- I. Roads and Bridges
- II. System Safety, Operations, and Intelligent Transportation Systems (ITS)
- III. Transit (Bus, Rail, Paratransit, and On-Demand Services)
- IV. Freight and Logistics (Truck, Rail, Pipeline, Aviation, Waterways)
- V. Active Transportation (Pedestrian, Bicycle, and Trail Systems)
- VI. Parking
- VII. Transportation Demand Management



Why Transportation Planning is Challenging

MULTIPLE SCALES

- Multi-State
- Statewide
- Regional
- Corridor
- Countywide
- Sector
- City-wide
- Neighborhood

MULTIPLE PLAN PURPOSES AND PLANNING HORIZONS

- Transportation Plan
- Land Use/Urban Design Plan
- Parking Plan
- Economic Development Plan

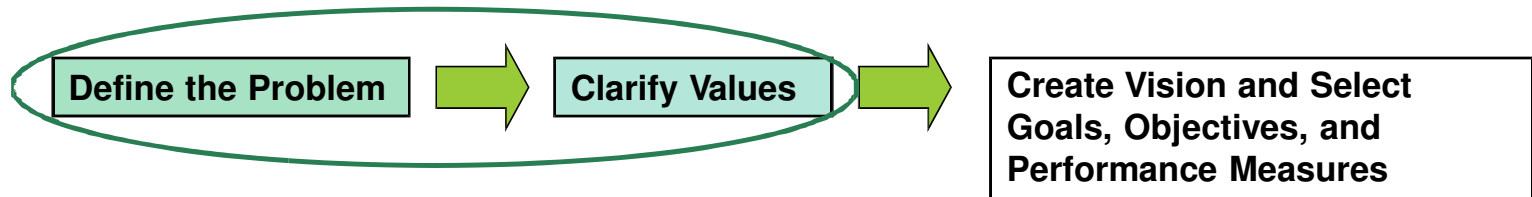
MULTIPLE PARTNERS

- Federal Agencies
- State Agencies
- Regional Entities
- Local Jurisdictions
- Business
- Environmental
- Social Justice
- Good Government
- Others

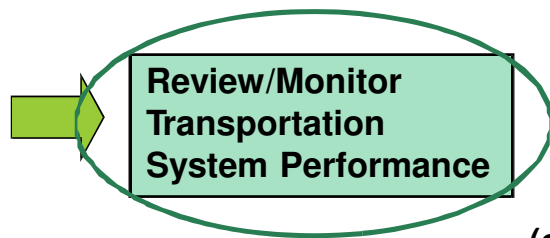
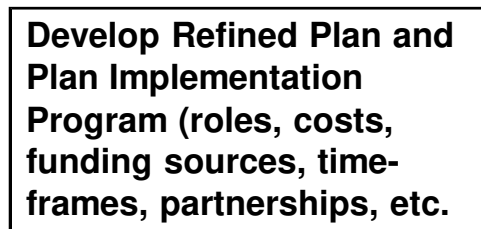
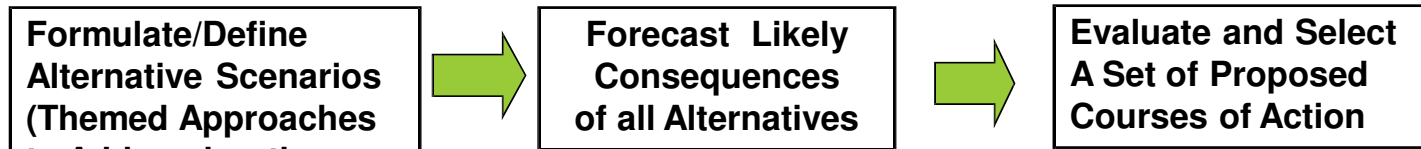
MULTIPLE POLICY AREAS

- Governance
- Mobility
- Economic Development
- Environment
- Finance
- Social Justice
- Sustainability
- Climate Change
- Resiliency/Emergency Management

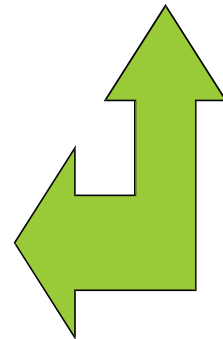
Typical Transportation Planning Approach



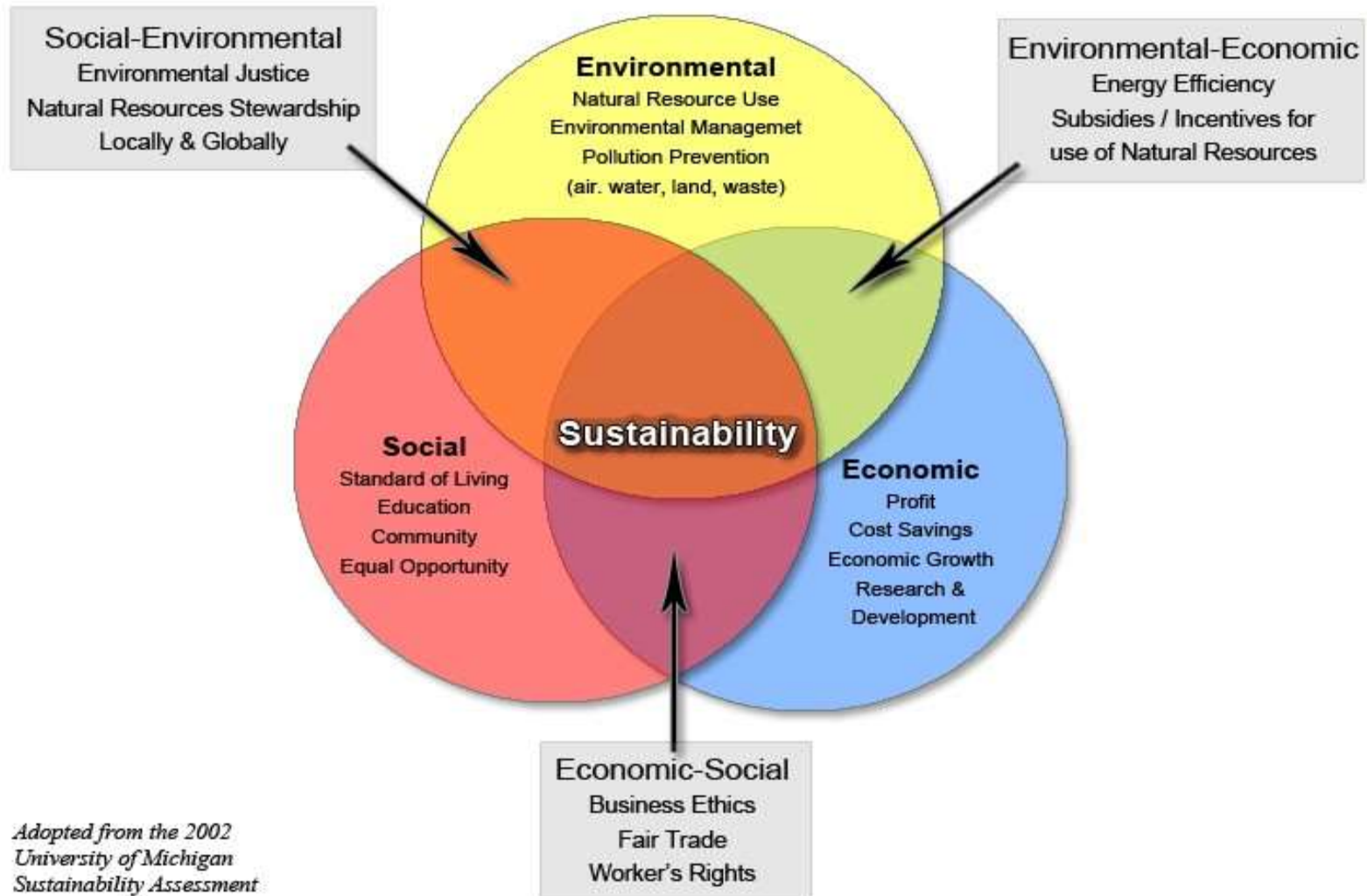
Public and stakeholder outreach activities carried out through the entire process



(critically important feedback loop)



Sustainability as a Guiding Principle



*Adopted from the 2002
University of Michigan
Sustainability Assessment*

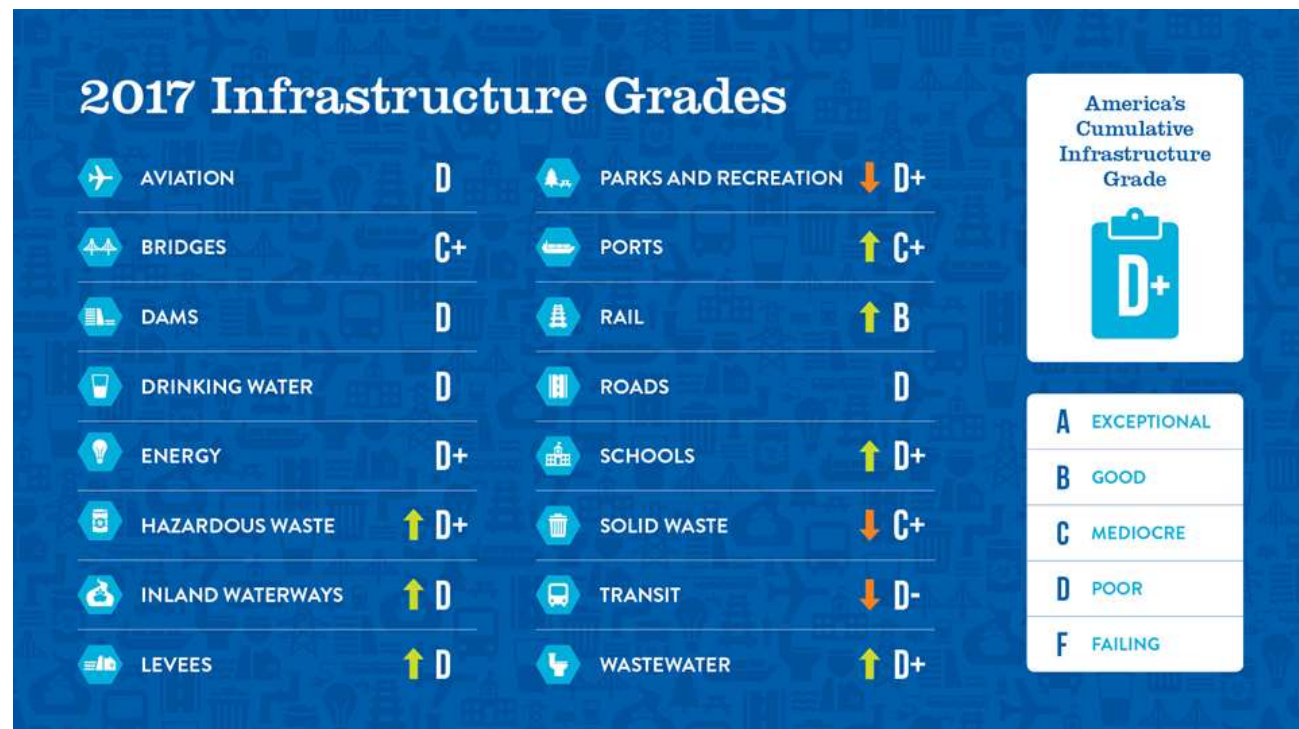
Huge Backlog in Unmet Mobility Needs

Biennial National and State Report Cards

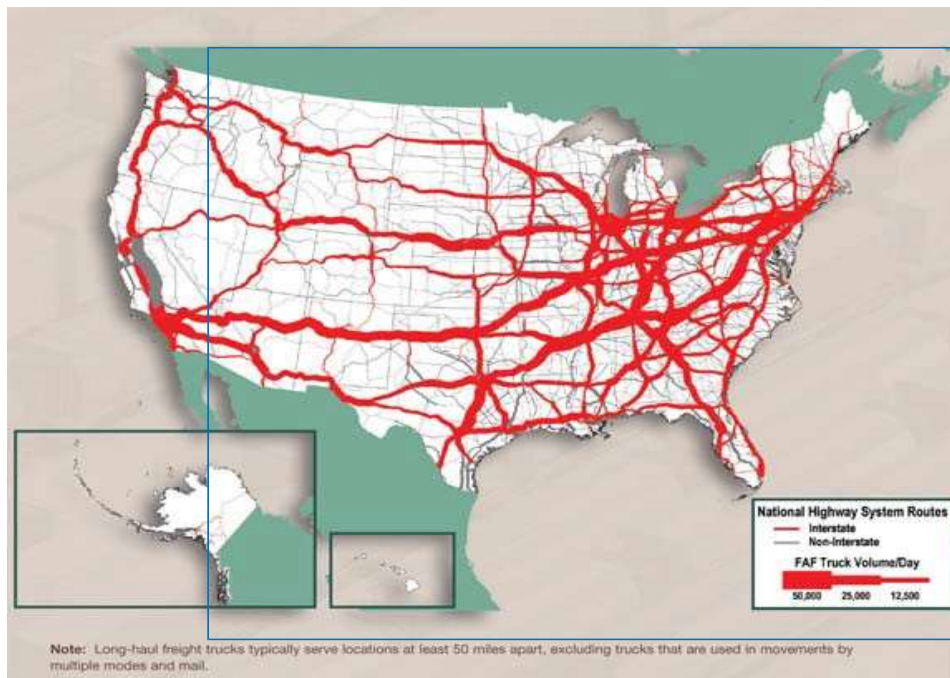
- Overall national assessment and ratings for each state
- Urges actions to deal with the backlog
- Impetus for new federal transportation asset management rules that require states, MPOs, and transportation agencies to comply

For more info:

www.infrastructurereportcard.org



System “Congestion” and Economic Prosperity



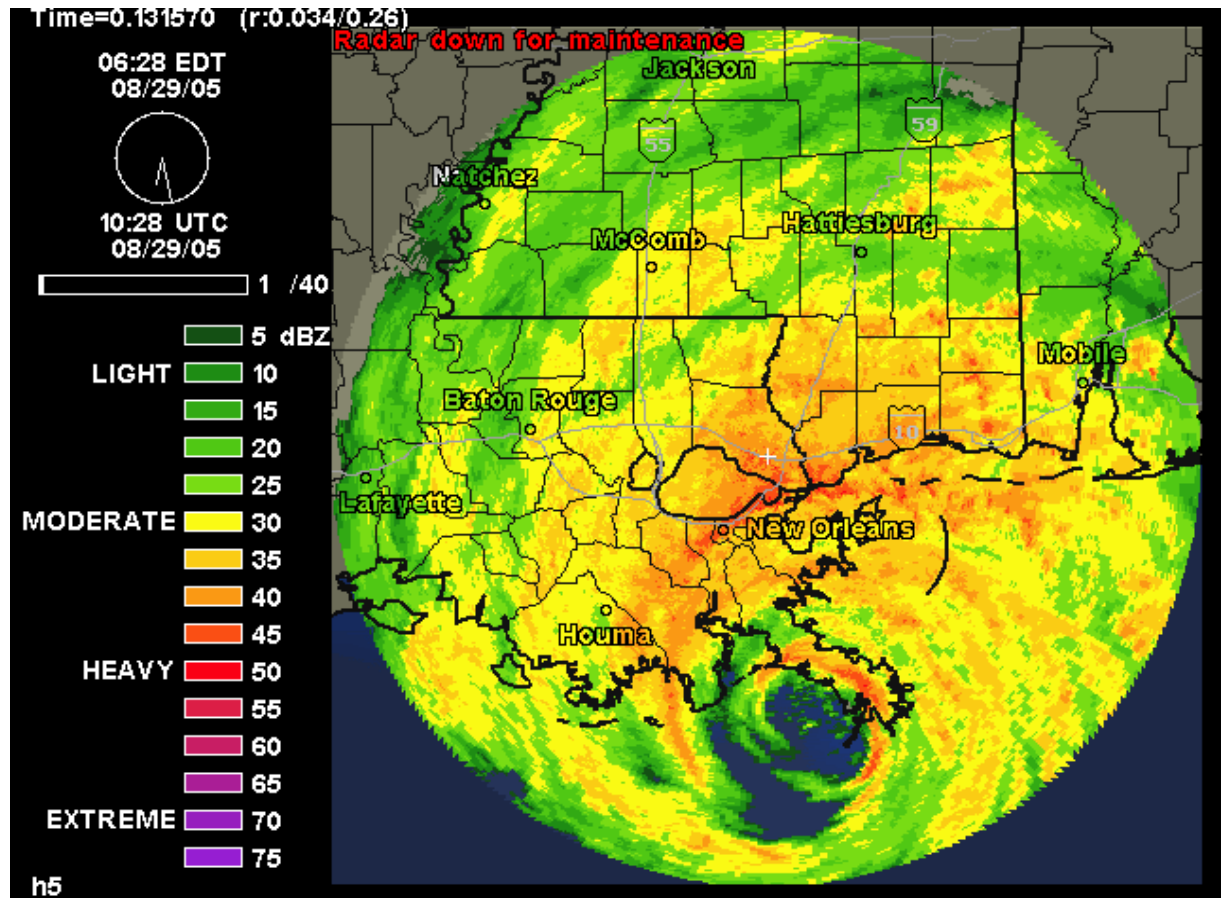
National Highway System Routes and Truck Volumes Per Day - 2040

Truck Traffic is Growing 2-3 Times Faster than Passenger Traffic



Resiliency, Climate Change, and GHG Reduction

How can we create better transportation systems that are resilient to natural and man-made disasters?



Road and Bridge Systems

Organizing Concepts: Roadway Functional Classification

- ◆ Expressways/Arterials/Collectors/Local Streets
- ◆ Each Functional Classification has “Owners” and Accepted Professional Standards for Planning, Design and Operations

Fundamental Concepts for Road and Bridge Systems

- ◆ “Level of Service” – measuring how well is the overall system and its subsystems (modes) working
- ◆ Creating “grid networks”, where possible
- ◆ Uniformity of design and operations – for safety reasons
- ◆ Practices are evolving toward “complete streets” (integrating multiple modes of transport) within local streets and some minor arterials



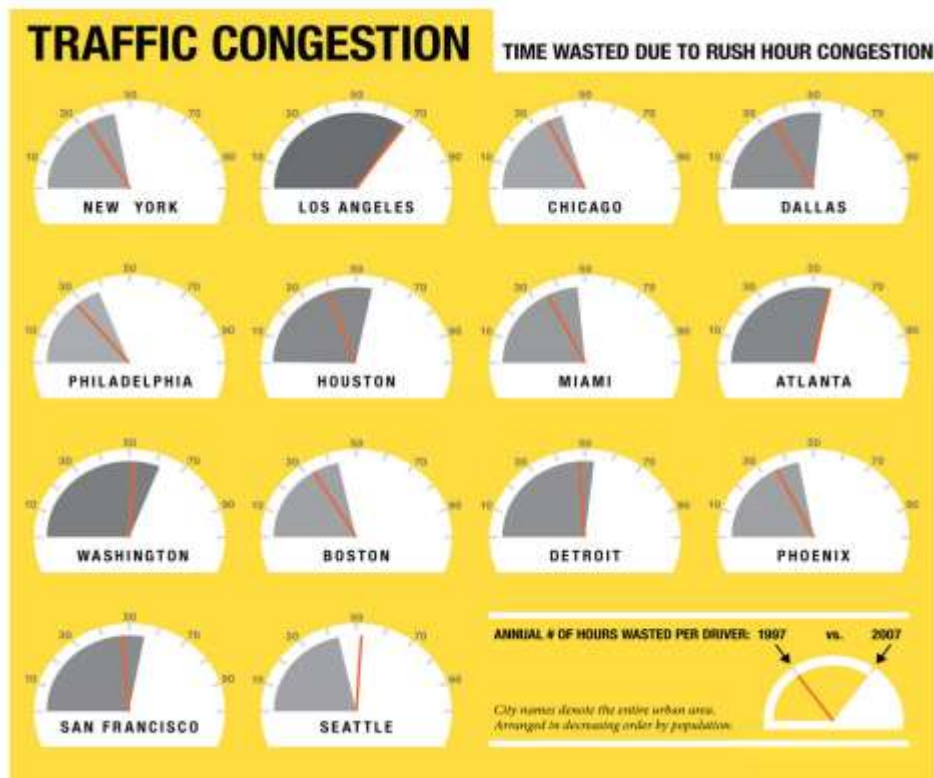
Concept of “Complete Streets”



Concept of “Multimodal Transportation”



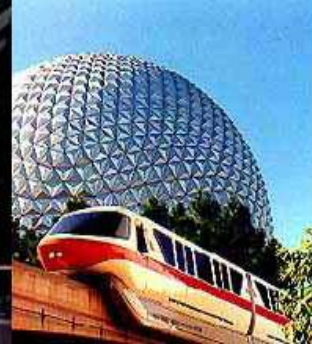
Transportation Systems Operations and Management (TSM&O) Intelligent Transportation Systems (ITS)



Maintaining **safe and reliable transportation systems**, especially for expressways and arterials, is one of the primary challenges for transportation planners. This is critical for:

- Attracting new and keeping existing businesses and firms
- Supporting freight transport, especially in major markets
- Supporting “quality of life” for people and companies

Bus and Rail Transit and On-Demand Services



Very High Interaction Between Transit and Land Use



Concept of Transit-Oriented Development – Phoenix, AZ



Distinguishing Characteristics of Transit Systems

- **Type of Technology** (i.e. heavy rail, light rail, express bus, local bus, etc.)
- **Type of Right-of-Way** (i.e. exclusive, such as fixed guideway for heavy rail; mixed (i.e. where light rail and cars interact in the same right-of-way, etc.)
- **Operating Characteristics** (i.e. express, local, or intercity service)



Rural Transit Planning

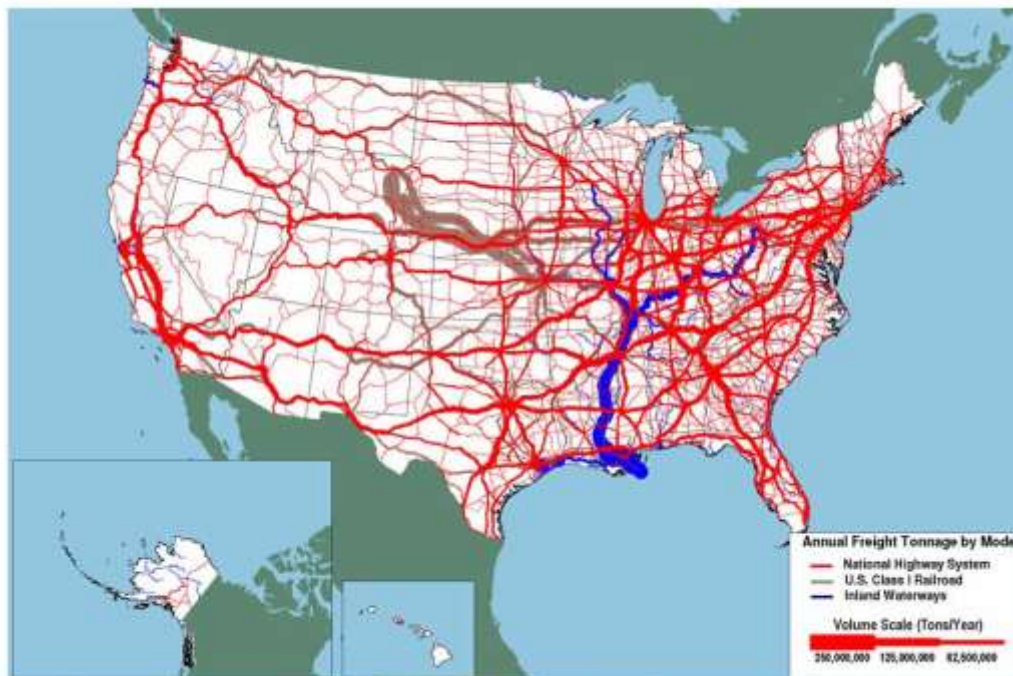
Rural transit systems operate across the U.S. in communities of less than 50K in population. They are crucial because they:

- Provide only option for citizens who cannot or should not drive
- Allow people to access educational opportunities and jobs
- Allows people to access health care, especially specialized services in larger communities



Freight and Logistics Planning

Tonnage on Highways, Railroads, and Inland Waterways: 2007



Sources: Highways: U.S. Department of Transportation, Federal Highway Administration, Freight Analysis Framework, Version 3.1, 2010. Rail: Based on Surface Transportation Board, Annual Carload Waybill Sample and rail freight flow assignments done by Oak Ridge National Laboratory. Inland Waterways: U.S. Army Corps of Engineers (USACE), Annual Vessel Operating Activity and Lock Performance Monitoring System data, as processed for USACE by the Tennessee Valley Authority; and USACE, Institute for Water Resources, Waterborne Foreign Trade Data, Water flow assignments done by Oak Ridge National Laboratory.

Freight System in US is comprised of:

- Interstate Highways
- Other National Highway System (NHS) Routes
- Other Non-NHS Routes
- Railroads
- Deepwater Ports
- Inland Waterways
- Pipelines
- Airports

National Trade Gateways



These gateways illustrate the importance of efficient intermodal transportation to support global markets.

Gateways include:

- 11 ports
- 5 land-border crossings
- 9 major airports

Freight Intermodal Facilities

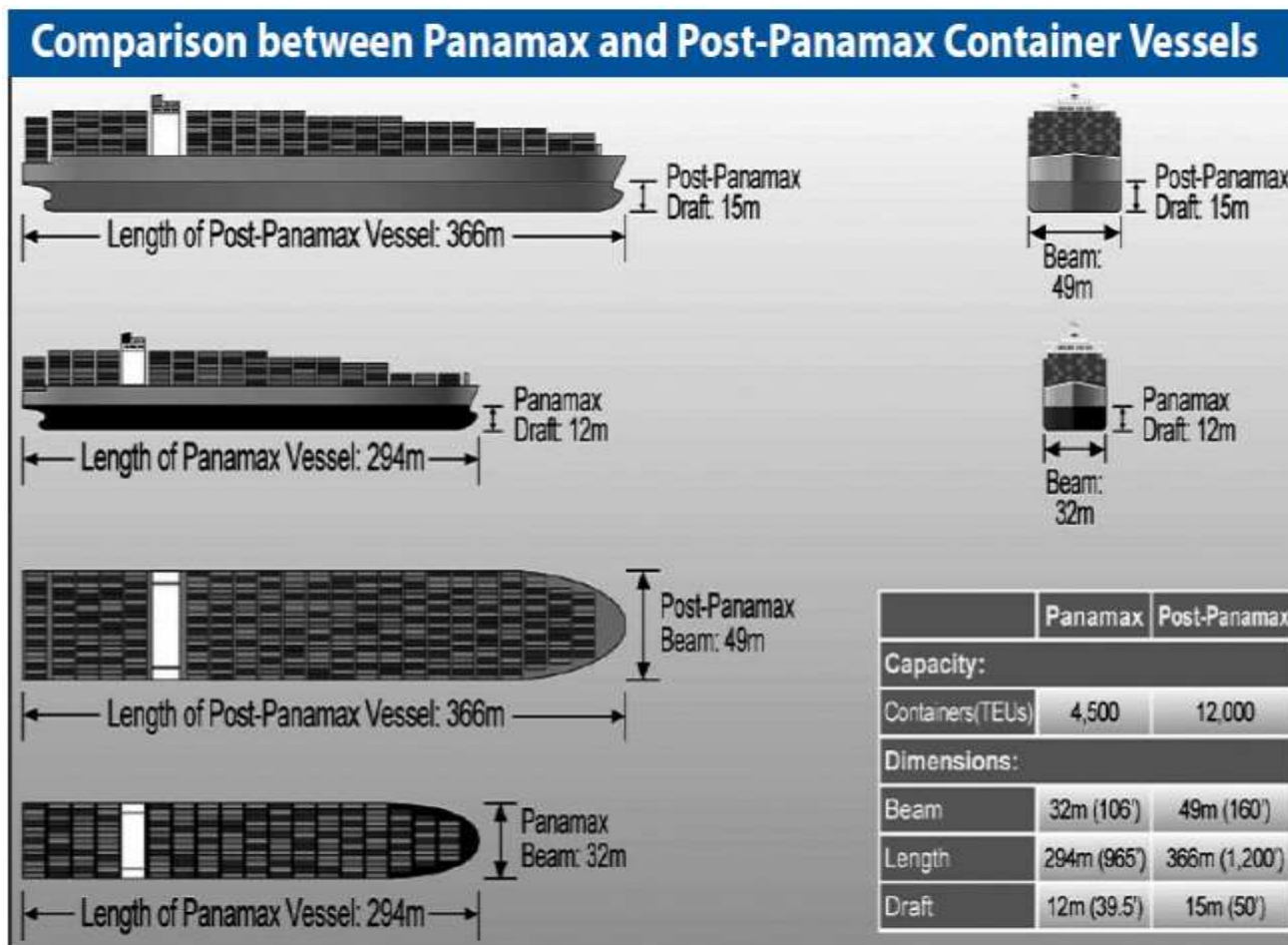
For the transfer of goods between transport modes.

Can be served by:

- Long-haul rail
- Long-haul trucks
- Less-than-truckload (LTL) trucks
- Container trucks
- Containers on flatcars (rail)
- Pipelines
- Cargo ships
- Airlines



Widening of the Panama Canal



Active Transport (Pedestrian, Bike, and Trail Systems)

- We are all pedestrians many times each day.
- Almost all trips of various modes start and end with some distance covered on foot.
- Planning and development of active transport systems is often overlooked because the responsibility for it is distributed across a wide array of agencies.
- Federal Americans with Disabilities Act (ADA) and safety are critical elements of active transport.



Safety is the major issue with pedestrian systems.

Innovations in Bicycle Facilities



Buffered Bike Lanes



Bike Boulevards



“Sharrows”



Two-way Cycle Tracks in Constrained Environments

Trail Systems

- Can accommodate multiple users (walking, bicycling, horse-riding, skating, etc.)
- Can serve transportation or recreational purposes
- Opportunities for Natural Preservation and Repurposing of Transportation Assets



Parking Systems

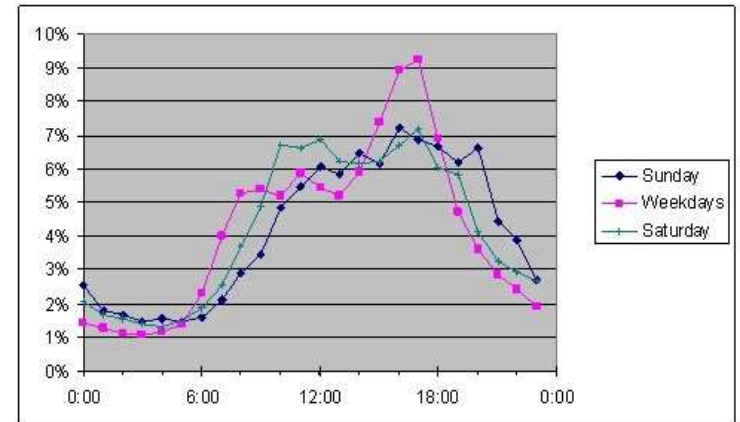
- The need for parking facilities has a huge impact on the use of urban land
- Auto-oriented cities use between 4 – 13 times more land for pavement, etc. than transit-oriented cities
- Parking is regulated mostly by local government ordinances



Transportation Demand Management

Includes programs and services aimed at managing available transportation system capacity


- Ridesharing
- Facility Pricing
- Flexible work hours
- Teleworking
- Promotion of transit use





Infrastructure Planning

Infrastructure Planning

- Planning Principles
 - Approach, Practices, and Tools
 - Range of Community Infrastructure Systems
 - Water Treatment and Distribution
 - Wastewater Collection, Treatment, and Disposal
 - Solid Waste Collection, Treatment and Disposal
 - Communications Systems
 - Power/Energy Systems
 - Ground Transportation (various modes)
 - Community Facilities
 - Green Infrastructure
 - Blue Infrastructure
 - Integrated Planning
- 
- Additional Infrastructure Systems Supporting Communities
 - Airfields and Other Aviation Facilities
 - Water Resource Developments (i.e. irrigation, hydroelectric power, flood control, recreation, and navigation)
 - Public housing

Typical Infrastructure Planning Steps

- Establishment of goals and objectives
- Problem identification and analysis
- Solution identification and impact analysis
- Formulation of alternatives and analysis
- Recommendations
- Decisions
- Implementation
- Operations and Management



Today's Most Important Infrastructure Issue: Asset Management

- Applies to ALL types of infrastructure systems
- Tracks extent, type, condition, age, remaining useful life, and cost to replace, among other data
- Serves as an essential decision-making tool on how/when/where to invest in public infrastructure
- Data-intensive and requires well established analytic and monitoring processes
- Stronger and stronger ties between asset management and federal and state funding



Range of Community Infrastructure Systems

- Water Treatment and Distribution
- Wastewater Collection, Treatment, and Disposal
- Solid Waste Collection, Treatment and Disposal
- Communications Systems
- Power/Energy Systems
- Ground Transportation (various modes)
- Community Facilities
 - Government buildings
 - Schools
 - Libraries
 - Hospitals
 - Police stations
 - Fire stations
 - Prisons
 - Public garages

Two major categories of infrastructure projects:

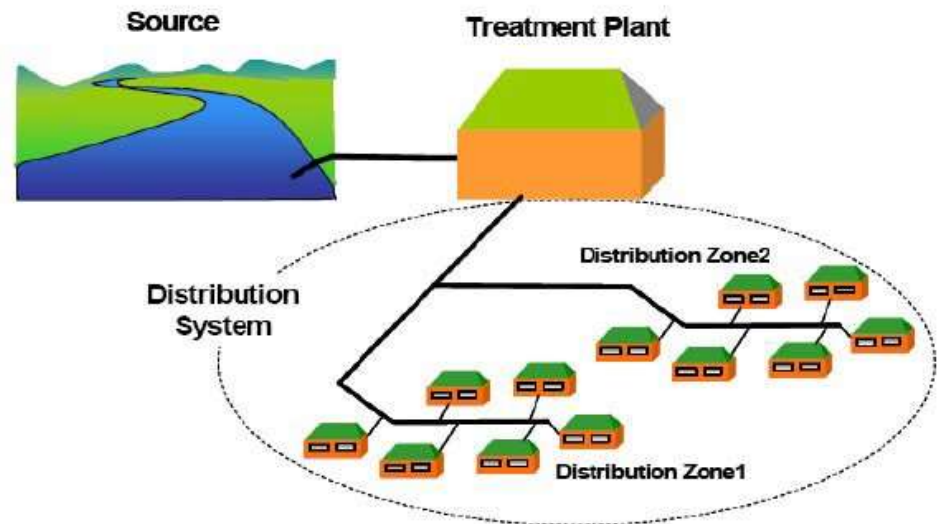
- “New” projects to provide expanded service for new growth and development

OR

- “Rehabilitation, reconditioning, or reconstruction” projects to upgrade, repair, restore system capabilities

Water Systems

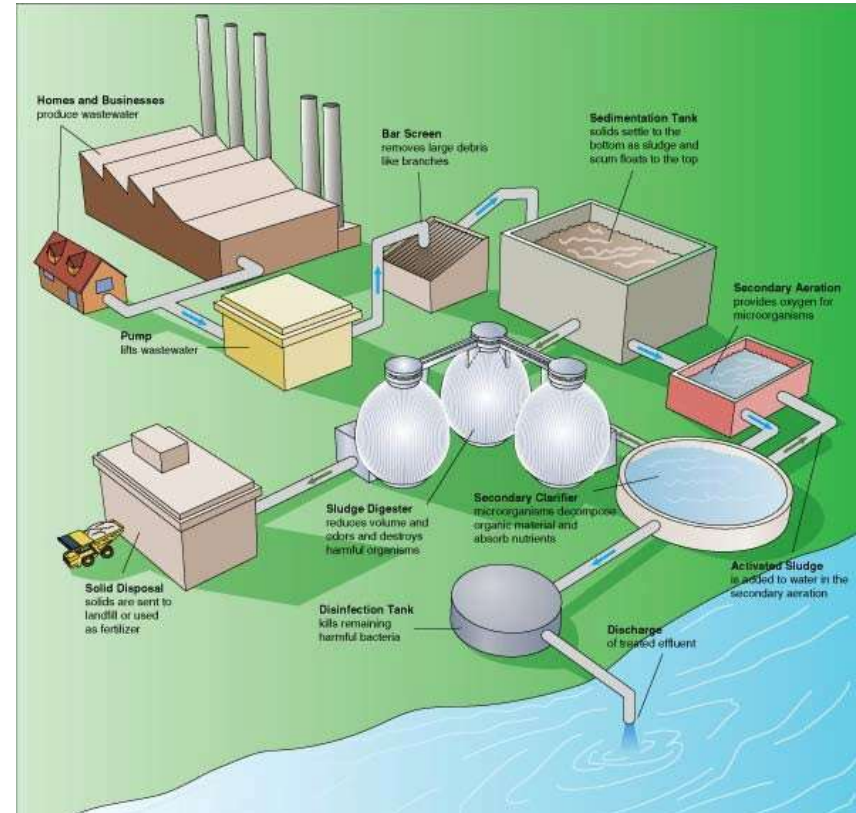
- Provision of water is a municipal (city or county) function
- It may involve agreements upon multiple jurisdictions
- Collection (from natural sources), treatment, and distribution are the major elements of the overall system
- Some communities set up “water authorities” or enterprises to manage water resource activities
- **Availability of water and wastewater systems is a PRIMARY determinant of what types and intensities of land use can be supported in a community**



Wastewater Systems

Wastewater systems collect and dispose of household wastewater generated from toilet use, bathing, laundry, and kitchen and cleaning activities. Any structure with running water, such as a house or office, must be connected to one of the following wastewater disposal systems:

- **Centralized** systems are **public sewer systems** that serve established towns and cities and transport wastewater to a central location for treatment.
- **Decentralized** systems do not connect to a public sewer system. Wastewater may be treated on site or may be discharged to a private treatment plant.



Electric/Gas/Power Systems

- Production and distribution of electric, gas and other power/energy systems is largely a **private sector function**
- Public sector planners have a **role in helping to determine the siting of power-related facilities**
(i.e. high capacity lines, generation facilities, etc.)
- Typically, these public sector planning activities occur in **high growth communities or regions or in areas with significant natural resources**
- New issues are emerging with the introduction and/or growth of new energy sources – solar, wind, natural gas, etc. – working with the public on these issues is an important role for planners



Community Facilities

Typically Includes:

- State, regional, and local government buildings (i.e. offices, clinics, labs, etc.)
- K-12 schools
- Colleges and universities
- Sports arenas
- Libraries
- Hospitals/Wellness Centers
- Police/Fire/Emergency Facilities
- Jails/Prisons
- Parks and Recreation Areas
- Public Garages
- Other Facilities



Green Infrastructure

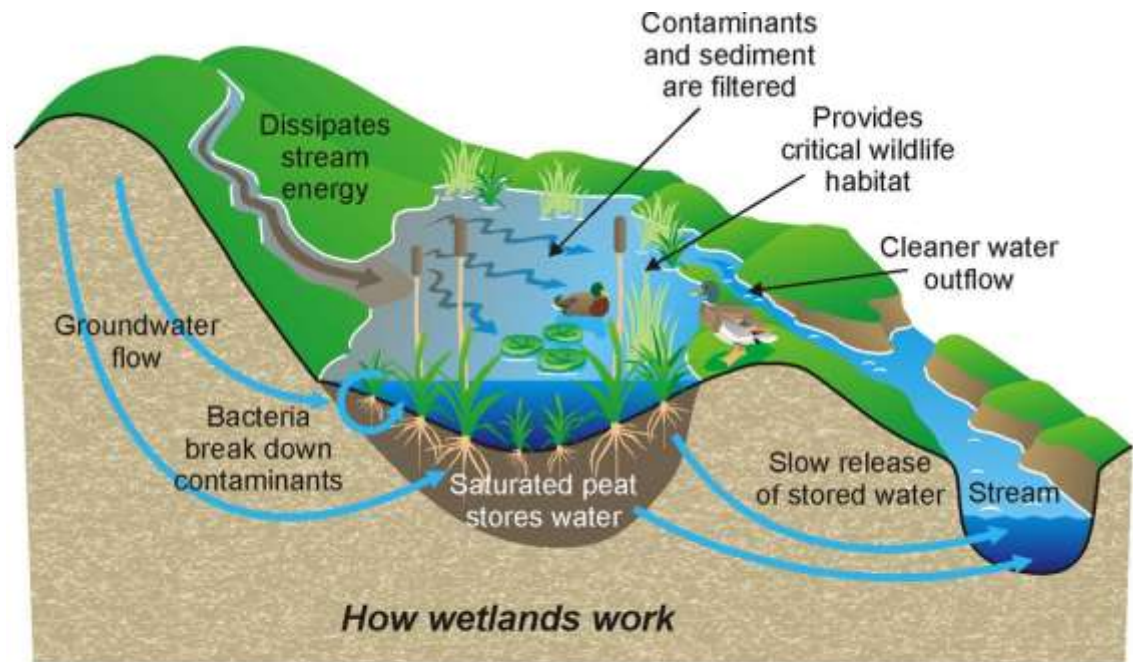
- Uses vegetation, soils, and other elements and practices to filter pollutants from stormwater runoff before it is discharged into water bodies
- Creates healthier urban environments
- Is a patchwork of natural areas that provides habitat, flood protection, cleaner air, and cleaner water.



Urban green infrastructure

Blue Infrastructure

Blue landscape elements are linked to water. They can be pools, ponds and pond systems, wetlands, and artificial buffer basins or water courses. Together they form the blue infrastructure system.



Integrated Infrastructure Planning



Concept of “Smart Cities” – Using Technology, Nature, and Quality Design of the Built Environment to Create and Maintain Livable, Prosperous, Sustainable Places



Thank You for Attending Today

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