Transportation Problems and Issues Excerpts from WWW Links

Reference
Bok, D. (2018). Transportation policy and planning.
https://www.hks.harvard.edu/courses/transportation-policy-and-planning

Transportation policy and planning course….

Provides an overview of the issues involved in transportation policy and planning, as well as an introduction to the skills necessary for solving the various analytic and managerial problems that are peculiar to this area. The course is organized around seven problems: (1) analyzing the market for a service; (2) costing and pricing; (3) operations management; (4) controlling congestion and pollution; (5) transport and land use; (6) investment evaluation; and (7) the regulation of private carriers. Examples are drawn from both urban and inter-city passenger and freight transportation. One-fifth of the classes are lectures, and the rest case discussions.

Reference
Schimek, P. (2018).Transportation planning and development
http://www.gsd.harvard.edu/course/transportation-planning-and-development-spring-2017/

A variety of intertwined topics are covered:
• How changing transportation technologies, private industry, regulation, and public investment shaped our cities.
• A summary of the formal transportation planning process as required by laws.
• The standard policies for highway design and the alternative perspectives that have increasingly challenged them in the past two decades.
• How transportation projects are funded, and the effect of these arrangements on investment decisions.
• The characteristics and costs of the various public transit modes.
• The role of walking and bicycling in urban transportation, including a look at the risk of injuries, and policies that might increase their use.
• How parking policies affect travel decisions—and also the built environment, housing, and public finance.
• The effect of transportation investments on land use and the effect of land use on travel behavior.
• The feasibility, effectiveness, and political difficulty of using pricing mechanisms to improve flow on expressways, keep traffic out of central areas, or reduce GHG emissions.
• The role of data and technology in reshaping city transportation and creating new roles for transportation planners and new models for planning.
• How new concepts—shared vehicles, connected vehicles, self-driving vehicles—could solve our mobility, safety, and environmental problems all in one go (or not).

• The new focus on active transportation for public health, and the related question of reducing deaths and injuries from road traffic.

Reference

US Department of Transportation Federal Highway Administration. (2017). Traffic congestion and reliability: Linking solutions to problems https://ops.fhwa.dot.gov/congestion_report_04/executive_summary.htm

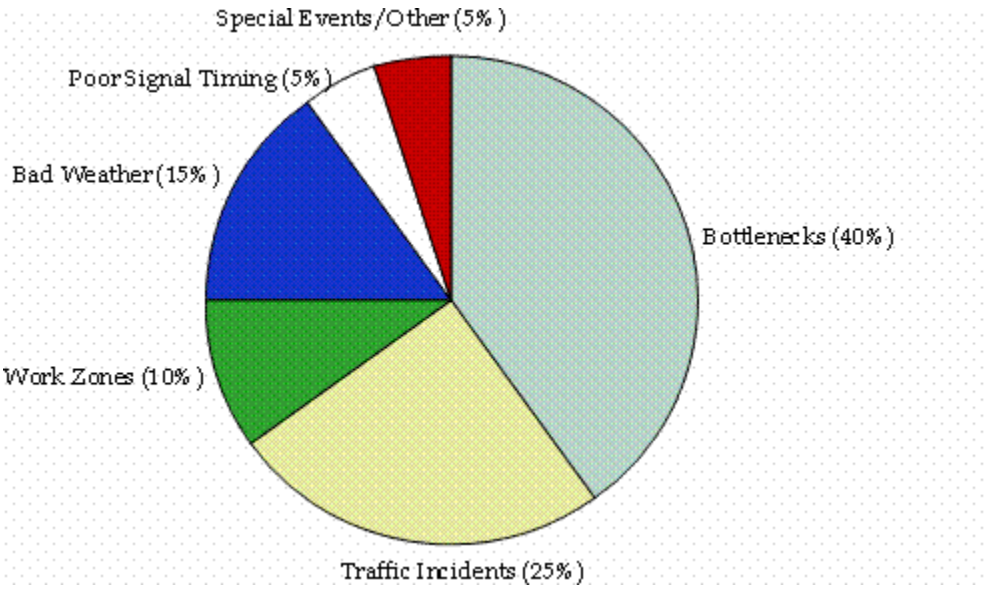
Is congestion getting worse? Yes. There are several statistics that point to worsening congestion levels. Congestion extends to more time of the day, more roads, affects more of the travel, and creates more extra travel time than in the past. And congestion levels have risen in cities of all sizes since 1982, indicating that even the smaller areas are not able to keep pace with rising demand.

Congestion is a lot more complex than simply "too many vehicles trying to use the road at the same time," although that is certainly a major part of the problem. Congestion results from the interaction of many different factors — or sources of congestion. Congestion has several root causes that can be broken down into two main categories:

1. **Too much traffic for the available physical capacity to handle** – Just like a pipe carrying water supply or the electrical grid, there are only so many vehicles that can be moved on a roadway for a given time or so many transit patrons that can be accommodated in a given number of buses or trains. Transportation engineers refer to this as the physical capacity of the highway system. ***Physical bottlenecks are locations where the physical capacity is restricted, with flows from upstream sections (with higher capacities) being funneled into smaller downstream segments.*** This is roughly the same as a storm pipe that can carry only so much water — during heavy rains the excess water floods the streets and houses behind the pipe. However, the situation is even worse for traffic. Once traffic flow breaks down to stop-and-go conditions, capacity is actually reduced — fewer cars can get through the bottleneck because of the extra turbulence. Bottlenecks can be very specific chokepoints in the system, such as a poorly functioning freeway-to-freeway interchange, or an entire highway corridor where a "system" of bottlenecks exists, such as a closely spaced series of interchanges with local streets. Physical capacity can be reduced by the addition of "intentional" bottlenecks, such as traffic signals and toll booths. Bottlenecks can also exist on long upgrades and can be created by "surges" in traffic, as experienced around resort areas.
2. **Traffic-influencing events** – In addition to the physical capacity, external events can have a major effect on traffic flow. These include traffic incidents such as crashes and vehicle breakdowns; work zones; bad weather; special events; and poorly timed traffic signals. When these events occur, their main impact is to "steal" physical capacity from the roadway. Events also may cause changes in traffic demand by causing travelers to rethink their trips (e.g., snow and other types of severe weather).

The level of congestion on a roadway is determined by the interaction of physical capacity with events that are taking place at a given time. For example, the effect of a traffic incident depends on how much physical capacity is present. Consider a traffic crash that blocks a single lane on a freeway. That incident has a much greater impact on traffic flow if only two normal lanes of travel are present than if three lanes are present. ***Therefore, strategies that improve the physical capacity of bottlenecks also lessen the impacts of roadway events such as traffic incidents, weather, and work zones.***

The Sources of Congestion
National Summary



What Causes Travel Times to be Unreliable? ***The interaction of all the sources of congestion produce unreliable travel times.*** Travel time reliability can be defined in terms of how travel times vary over time (e.g., hour-to-hour, day-to-day). The event-related sources (e.g., traffic incidents, weather, and work zones) that contribute to total congestion also conspire to produce unreliable travel times, since events and demand volumes vary day to day. The problem is worse when events are added on top of existing capacity-related congestion. When traffic flow has already broken down to stop-and-go conditions, any additional disturbance causes a large increase in congestion.

Transportation engineers and planners have developed a variety of strategies to deal with congestion — a toolbox for managing congestion. The strategies can be grouped as follows:

1. Adding more capacity for highway, transit and railroads;

2. Operating existing capacity more efficiently; and
3. Encouraging travelers to use the system in less congestion-producing ways.

Specifically, each of the three major categories of congestion management strategies entails the following:

1. **Adding More Capacity – Increasing the Number and Size of Highways and Providing More Transit and Freight Rail Service.** Adding more lanes to existing highways and building new ones has been the traditional response to congestion. In some metropolitan areas, however, it has become difficult to undertake major highway expansions because of funding constraints, increased right-of-way and construction costs, social effects and environmental constraints and opposition from local and national groups. However, it is clear that adding new physical capacity to highways, transit systems, and railroads is an important strategy for alleviating congestion. This often means that highway designers must find creative ways to incorporate new designs that accommodate all stakeholders' concerns. Since the worst highway bottlenecks tend to be major freeway interchanges, advanced design treatments that spread out turning movements and remove traffic volumes from key merge areas have been developed, often by using multilevel structures that minimize the footprint of the improvement on the surrounding landscape.

- **Key Strategies to Address Congestion**

  - Adding travel lanes on major freeways and streets (including truck climbing lanes on grades);
  - Adding capacity to the transit system (buses, urban rail or commuter rail systems);
  - Closing gaps in the street network;
  - Removing bottlenecks;
  - Overpasses or underpasses at congested intersections;
  - High-occupancy vehicle (HOV) lanes; and
  - Increasing intercity freight rail capacity to reduce truck use of highways.

- **Operating Existing Capacity More Efficiently – Getting More Out of What We Have.** In recent years, transportation agencies have embraced strategies that deal with the *operation* of existing highways, transit systems, and freight services, rather than just building new infrastructure. Collectively referred to as Intelligent Transportation Systems (ITS), real-time control of transportation operations involves making changes from minute to minute and take many forms. In addition to ITS, other Transportation System Management and Operations (TSM&O) strategies that improve the efficiency of the existing road system include minor widening projects, changing the operating methods or the policies that govern the use of the roadway, and monitoring transit vehicles in real-time. There are numerous operations-based congestion mitigation strategies that are enhanced by the use of advanced technologies or ITS.

Key Strategies to Address Congestion

- Metering traffic onto freeways;
- Optimizing the timing of traffic signals;
- Faster and anticipatory responses to traffic incidents;
- Providing travelers with information on travel conditions as well as alternative routes and modes;
- Improved management of work zones;
- Identifying weather and road surface problems and rapidly targeting responses;
- Providing real-time information on transit schedules and arrivals;
- Monitoring the security of transit patrons, stations, and vehicles;
- Anticipating and addressing special events that cause surges in traffic;
- Better freight management, especially reducing delays at border crossings;
- Reversible commuter lanes;
- Movable median barriers to add capacity during peak periods;
- Restricting turns at key intersections;
- Geometric improvements to roads and intersections;
- Converting streets to one-way operations; and
- Access management.

Encouraging Travel and Land Use Patterns that Use the System in Less Congestion Producing Ways – Travel Demand Management (TDM), Non-Automotive Travel Modes, and Land Use Management. Another key approach to the problem of congestion involves managing the demand for highway travel. These strategies include providing a variety of options that result in more people traveling in fewer vehicles, trips made during less congested times, or trips not made (at least in a physical sense). A major barrier to the success of demand management strategies is that they may require changes in traditional decisions about where, when and how to travel, live and work. Flexible scheduling, for example, is not possible for a large number of American shift schedule workers. Still, when considered as part of an overall program of transportation investments, demand management and non-automotive modes of travel can contribute substantially to a metropolitan area's transportation system.

The historical cycle of suburban growth has led to an ever increasing demand for travel. Suburban growth was originally fueled by downtown workers who moved from city centers to the urban fringe to take advantage of lower land prices and greater social amenities. In the past 20 years, businesses also have moved to the suburbs to be closer to their employees. This in turn allows workers to live even further away from city centers, thereby perpetuating suburban expansion. Strategies that attempt to manage and direct urban growth to influence these processes have been used in several metropolitan areas. The main problem with many of these strategies is that they can be contrary to market trends, burdening consumers with extra costs and dampening economic efficiency, at least in the short term. Unless a truly regional approach is followed — with cooperation of all jurisdictions within the region — and the policies are considered as part of a package of development options, sprawl may simply be attracted into areas not conforming to growth policies.

Key Strategies to Address Congestion

- Programs that encourage transit use and ridesharing;

- Curbside and parking management;
- Flexible work hours;
- Telecommuting programs;
- Bikeways and other strategies that promote non-motorized travel;
- Pricing fees for the use of travel lanes by the number of persons in the vehicle and the time of day;
- Pricing fees for parking spaces by the number of persons in the vehicle, the time of day or location;
- Land use controls or zoning;
- Growth management restrictions such as urban growth boundaries;
- Development policies that support transit-oriented designs for homes, jobsites, and shops; and
- Incentives for high-density development, such as tax incentives.