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Electric vehicles for public city transport

-- concepts of public transport –

prof. dr Branimir Stanic

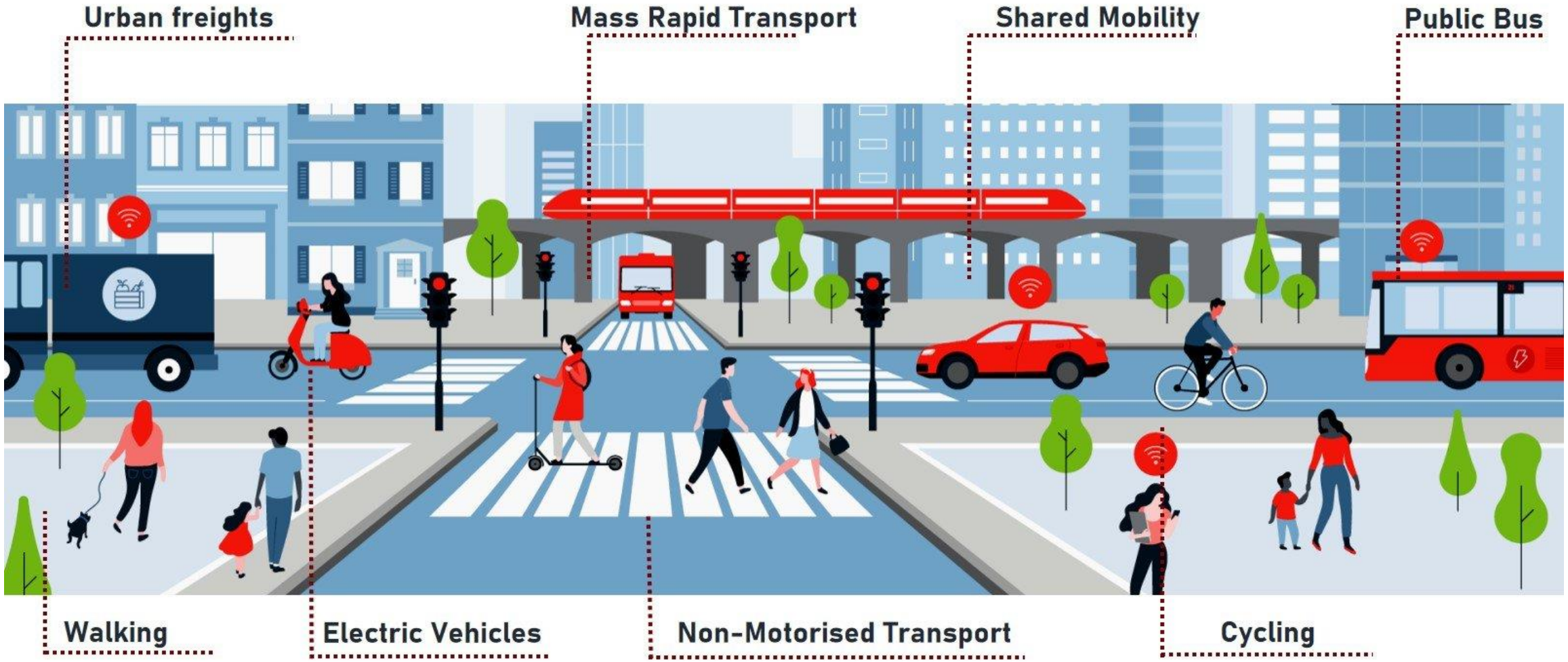
Partnership for Promotion and Popularization of Electrical Mobility through Transformation and Modernization of WB HEIs Study Programs/PELMOB

Call: ERASMUS-EDU-2022-CBHE-STRAND-2

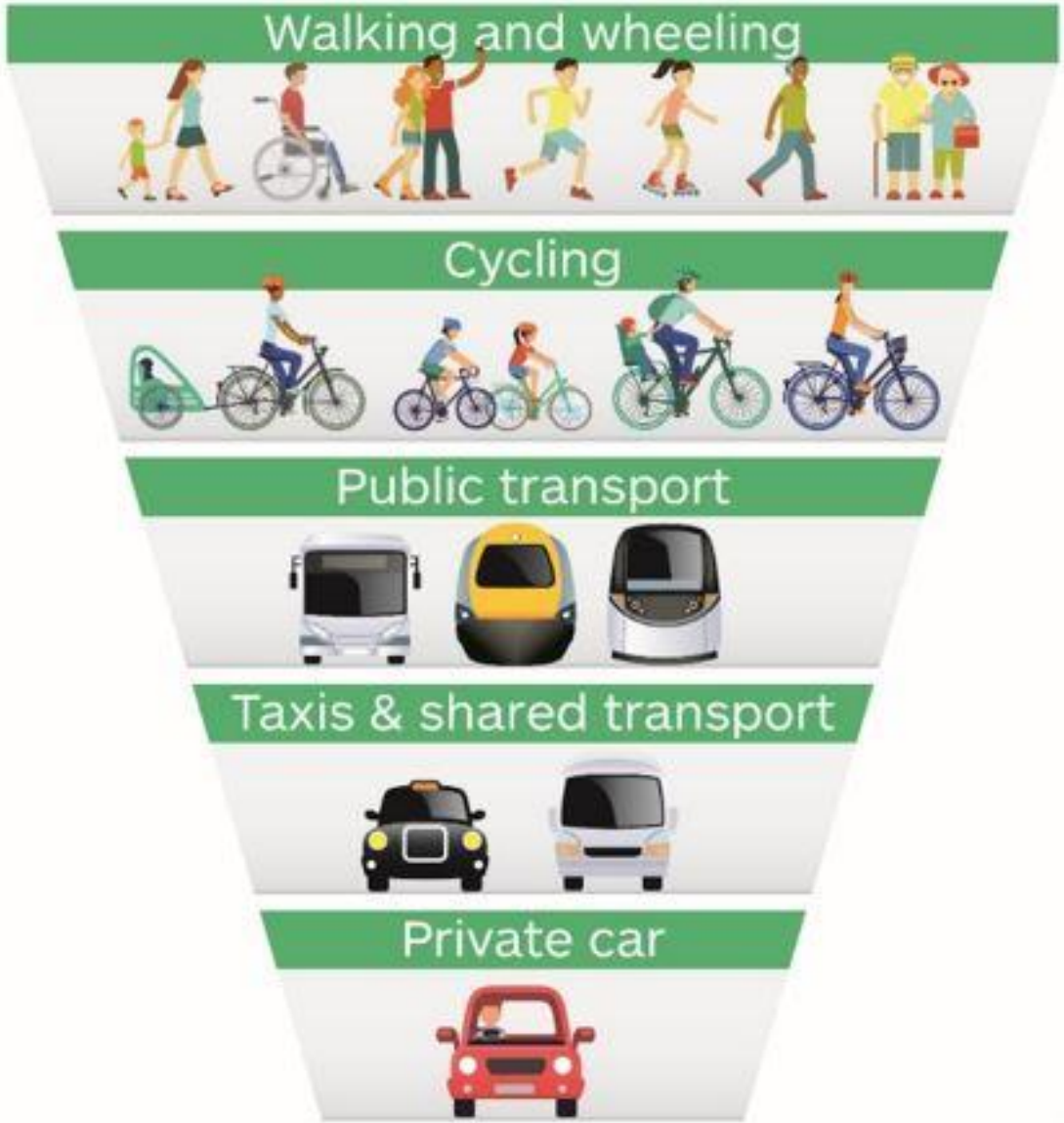
Project Number: 101082860

ELEMENTS

SUSTAINABLE URBAN MOBILITY



Prioritising Sustainable Transport



GEOG 80 Transport Geography

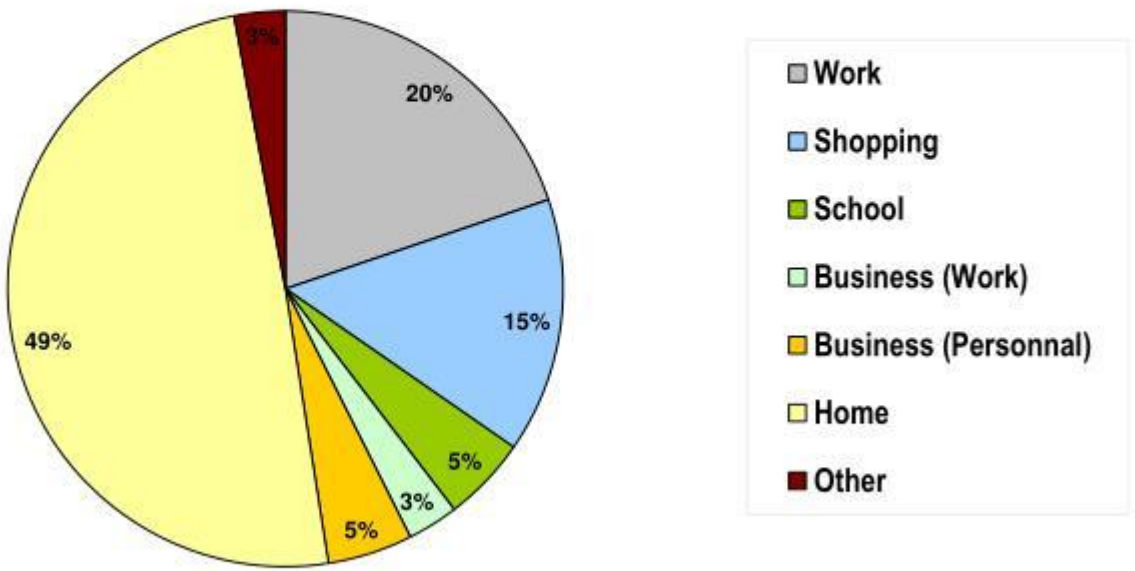
Professor: Dr. Jean-Paul Rodrigue

Topic 6 – Urban Transportation

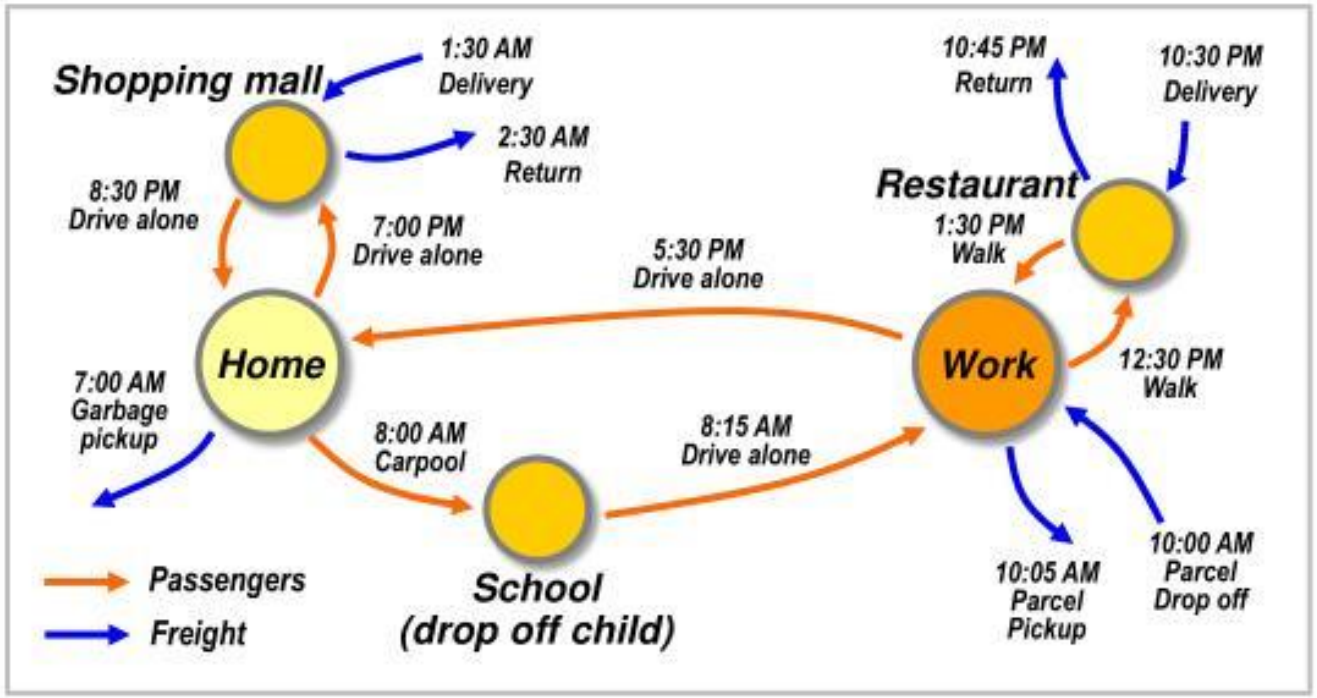
A. Transportation and Urban Form
B. Urban Land Use and Transportation
C. Urban Mobility
D. Urban Transport Problems

Mode	Limitations	Most Appropriate Uses
Walking	Requires physical ability. Limited distance and carrying capacity. Difficult or unsafe in some areas.	Short trips by physically able people.
Bicycle	Requires bicycle and physical ability. Limited distance and carrying capacity.	Short to medium length trips by physically able people on suitable routes.
Taxi	Relatively high cost per mile.	Infrequent trips, short and medium distance trips.
Fixed Route Transit	Destinations and times limited.	Short to medium distance trips along busy corridors.
Paratransit	High cost and limited service.	Travel for disabled people.
Auto driver	Requires driving ability and automobile. High fixed costs.	Travel by people who can drive and afford an automobile.
Ridesharing	Requires cooperative automobile driver. Consumes driver's time if a special trip (chauffeuring).	Trips that the driver would take anyway (ridesharing). Occasional special trips (chauffeuring).
Car sharing (Vehicle Rentals)	Requires convenient and affordable vehicle rentals services.	Occasional use by drivers who do not own an automobile.
Motorcycle	Requires riding ability and motorcycle. Average fixed costs.	Travel by people who can ride and afford a motorcycle.
Telecommute	Requires equipment and skill.	Alternative to some types of trips.

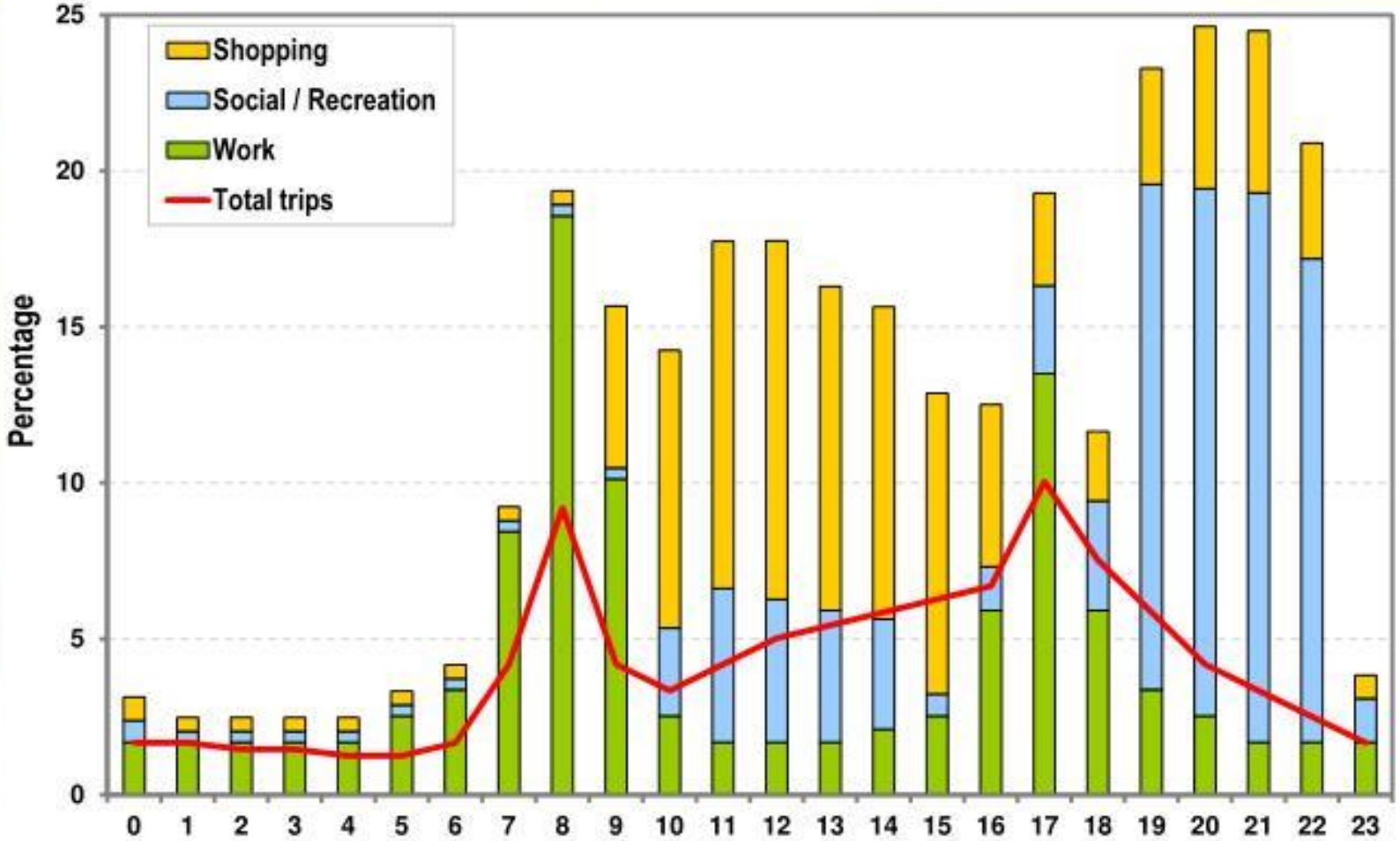
Main Purposes of Urban Trips



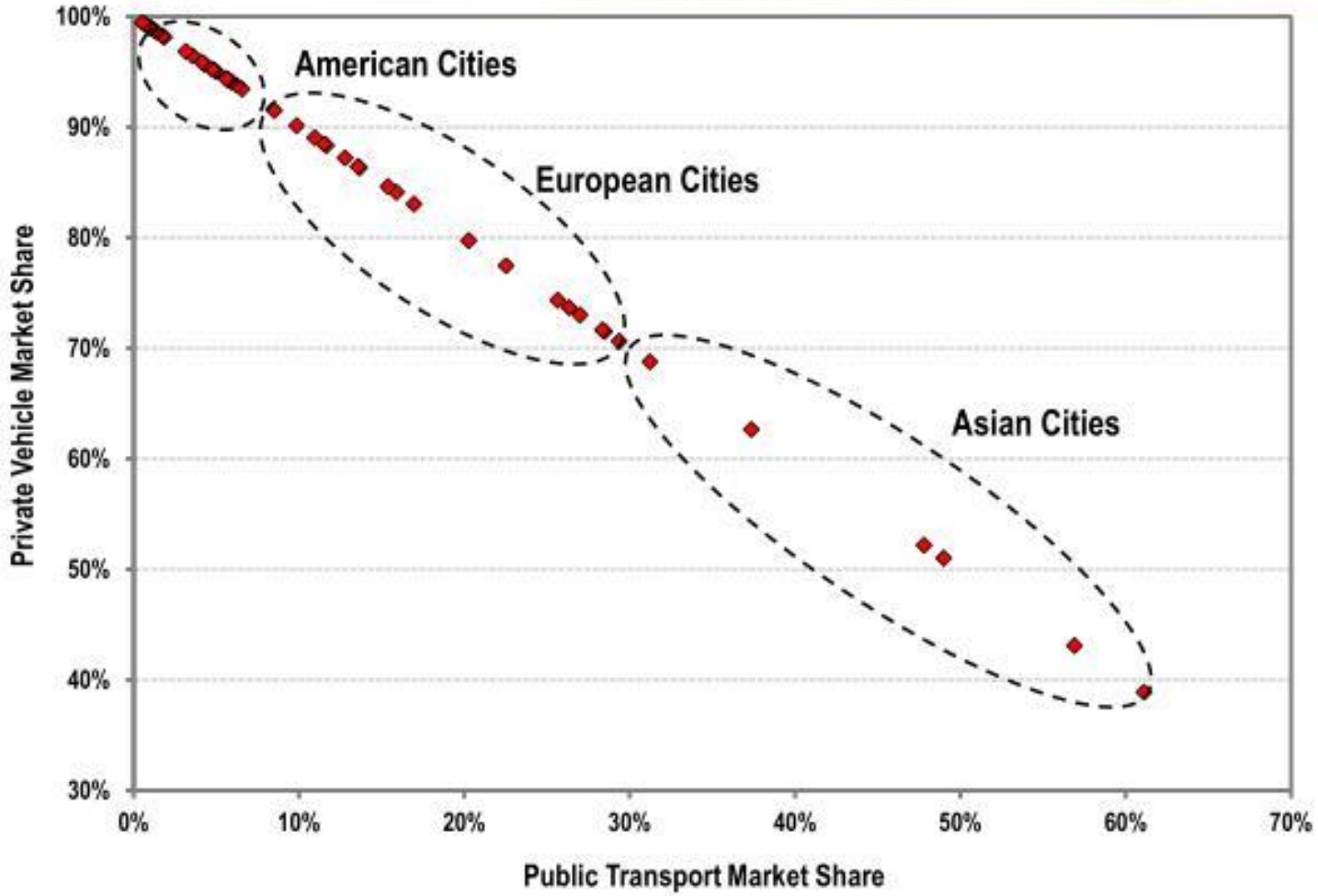
Typical Urban Day Trips by Modes, Origins and Destinations



Urban Travel by Purpose and by Time of the Day in a North American Metropolis



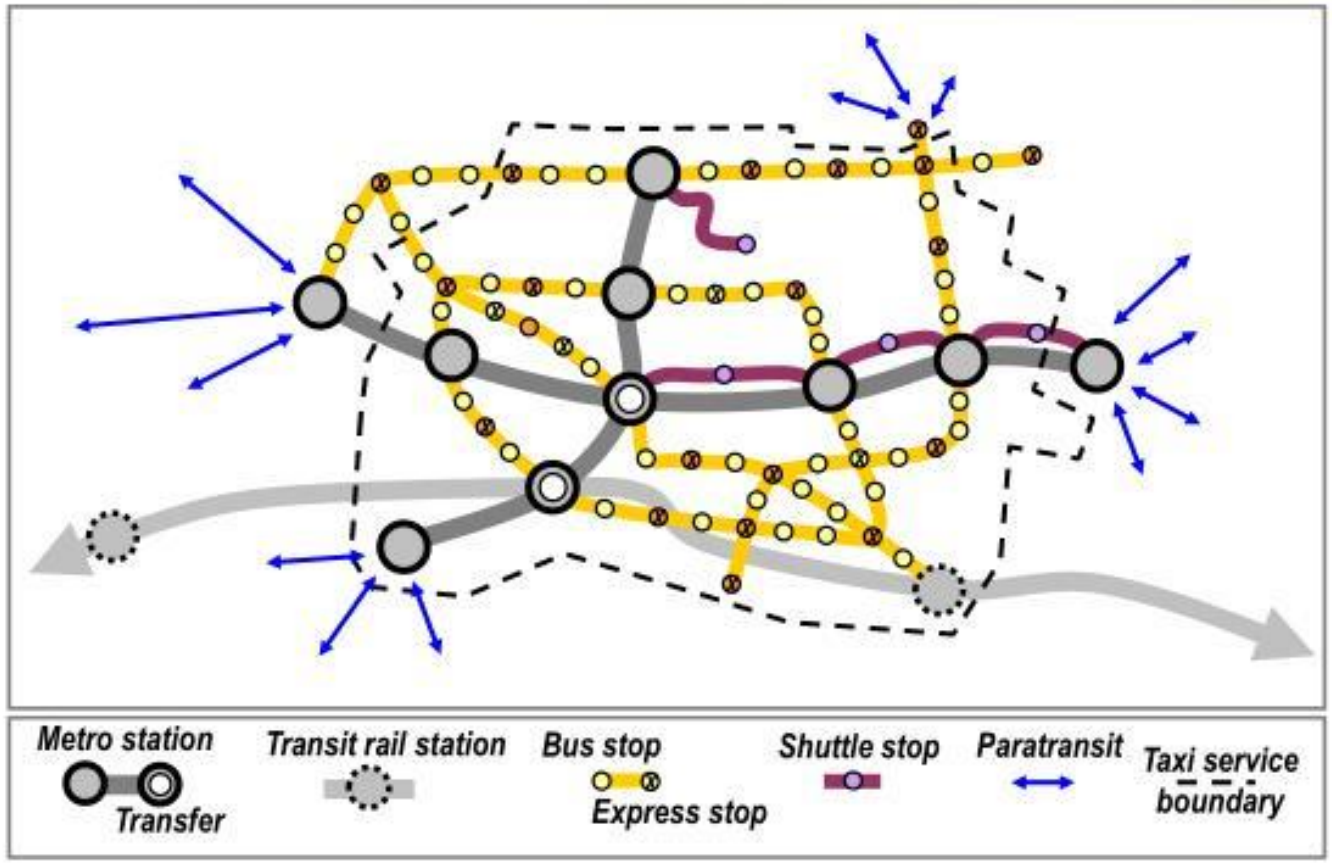
Private Vehicle and Public Transport Market Share, 1990/91



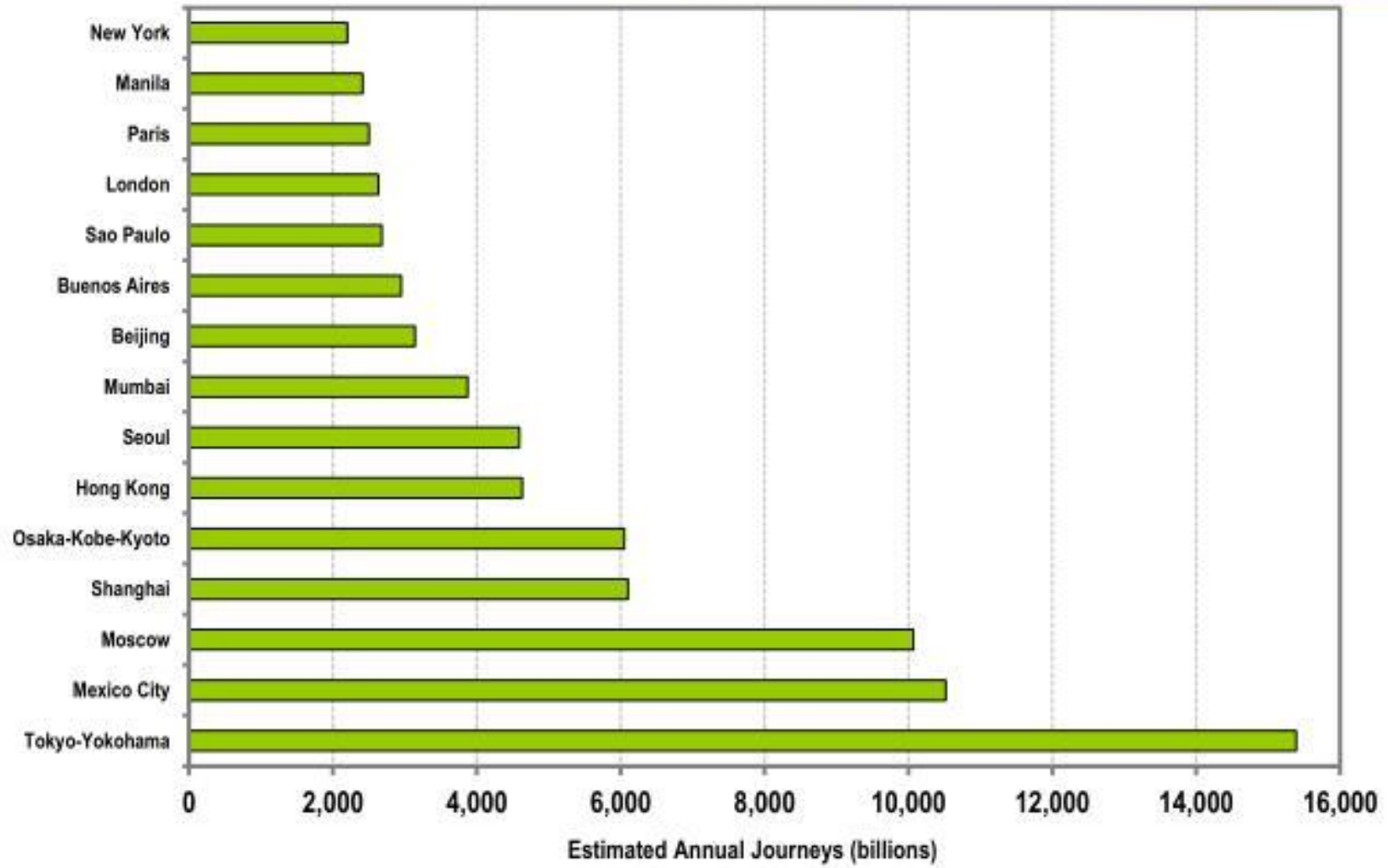
2. Urban Transit Systems

Subway system	Heavy rail system, often underground in central areas, with fixed routes, services and stations. Uniform frequency of services (peak hours increase). Fares are commonly access driven and constant.
Bus system	Scheduled fixed routes and stops serviced by motorized multiple passengers vehicles (45 - 80 passengers). Services are often synchronized with other heavy systems (feeders). Express services (notably during peak hours).
Transit rail system	Fixed rail (tram rail system and commuter rail system). Frequency of services strongly linked with peak hours. Traffic tends to be imbalanced. Fares proportional to distance or service zones.
Shuttle system	Privately (dominantly) owned using small buses or vans. Expanding mobility along a corridor during peak hour. Linking a specific activity center (shopping mall, university campus, industrial zone, hotel, etc.). Servicing the elderly or people with disabilities.
Paratransit system	Flexible and privately owned demand-response system. Door-to-door service, less loading and unloading time, less stops and more maneuverability in traffic.
Taxi system	Privately owned vehicles offering an individual demand-response system. Fares commonly a function of a metered distance/time. When competition is not permitted, fares are set up by regulations. Servicing an area where a taxi company has the right (permit) to pickup customers. Rights are issued by a municipality.

Components of an Urban Transit System



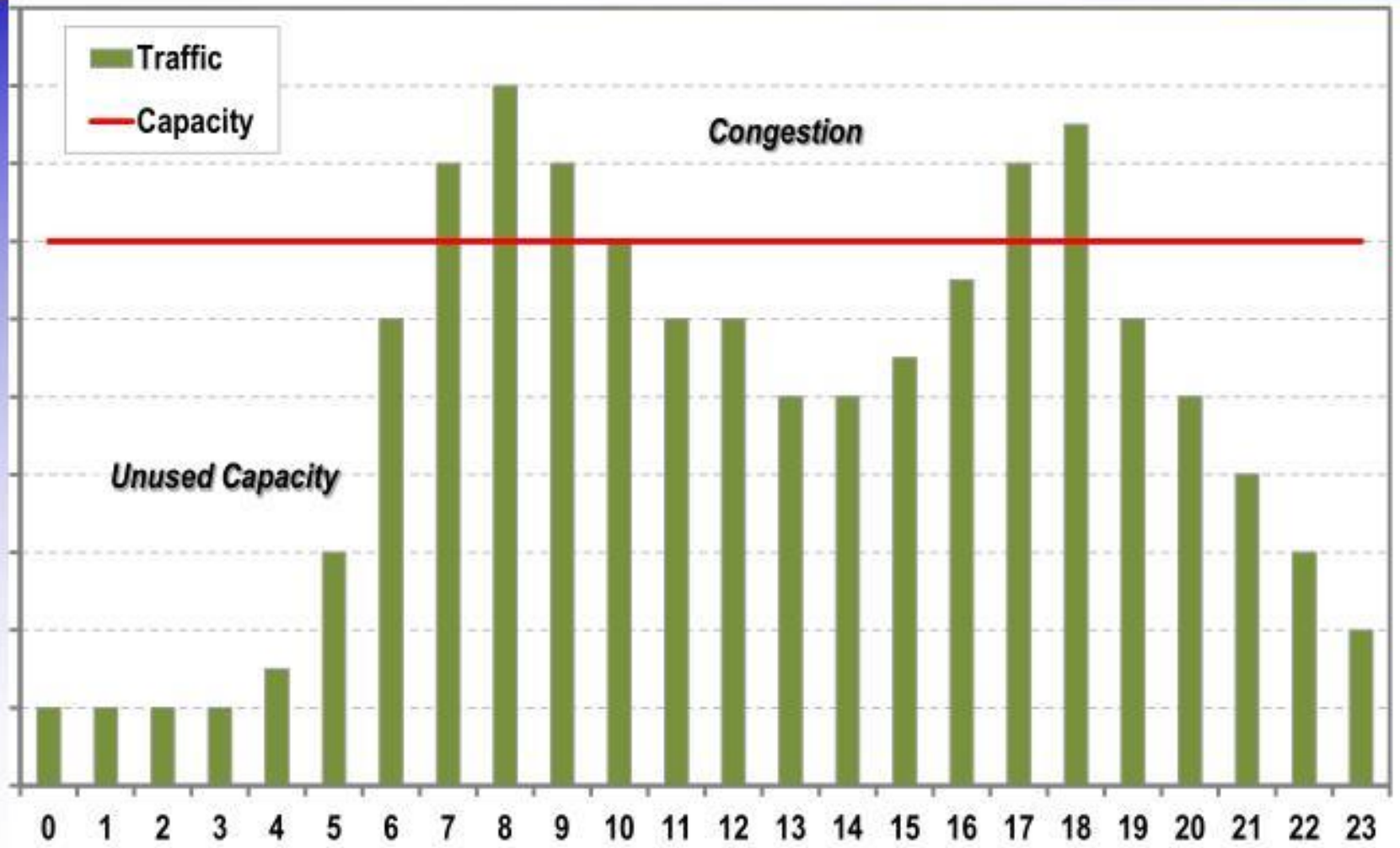
Estimated Ridership of the World's Largest Public Transit Systems, 1998



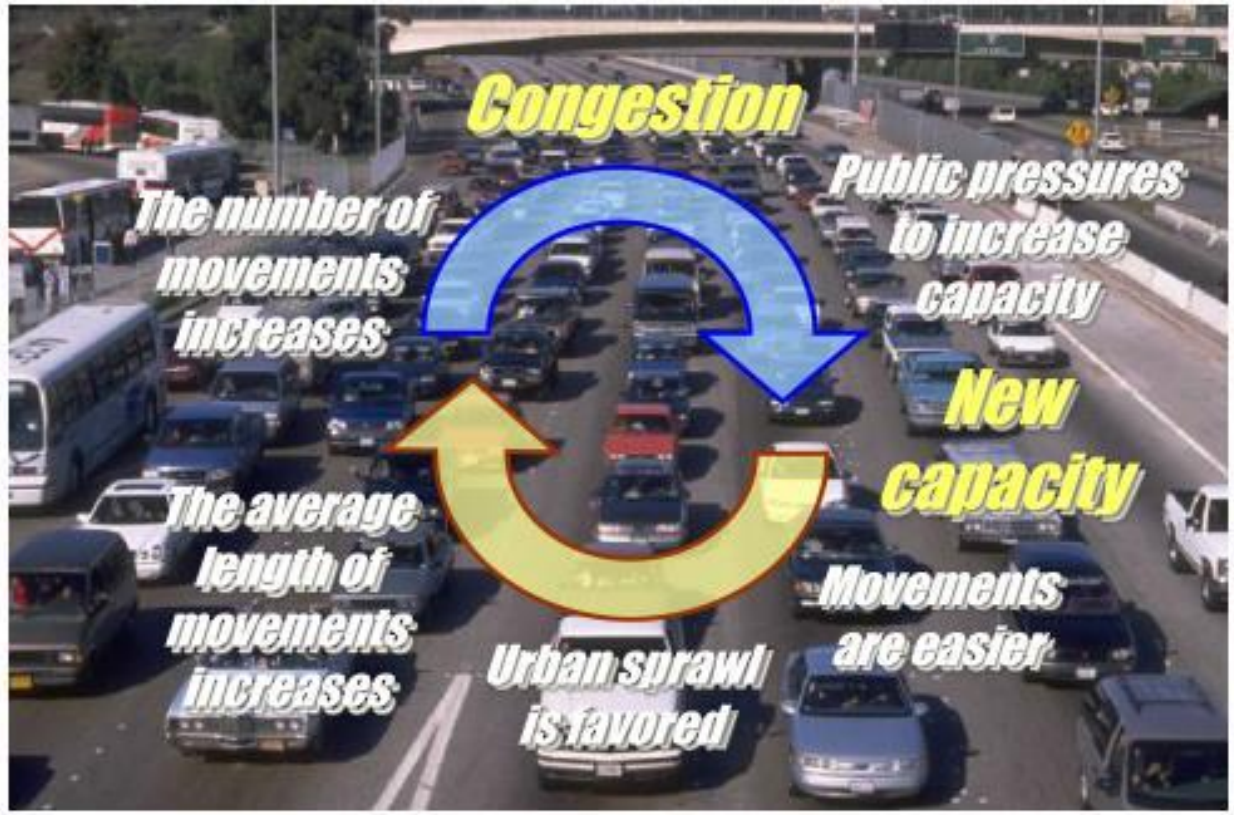
1. Geographical Challenges Facing Urban Transportation

Traffic congestion and parking difficulties	Supply of infrastructures has not kept up with the growth of mobility. Vehicles spend the majority of the time parked; motorization has expanded the demand for parking space.
Public transport inadequacy	Over or under-usage of public transport systems. Inability of public transit systems to be financially sustainable.
Difficulties for pedestrians	Intense traffic, where the mobility of pedestrians and vehicles are impaired. Lack of consideration for pedestrians in the physical design of facilities.
Environmental impacts and energy consumption	Pollution (e.g. noise) generated by circulation has impediments. Dependency on petroleum.
Accidents and safety	Growing traffic linked with a growing number of accidents and fatalities. Accidents account for a significant share of recurring delays.
Land consumption	Significant territorial imprint. Between 30 and 60% of a metropolitan area may be devoted to transportation.
Freight distribution	Globalization resulted in growing quantities of freight moving in cities. Shares infrastructures with the circulation of passengers. City logistics.

Recurring Congestion

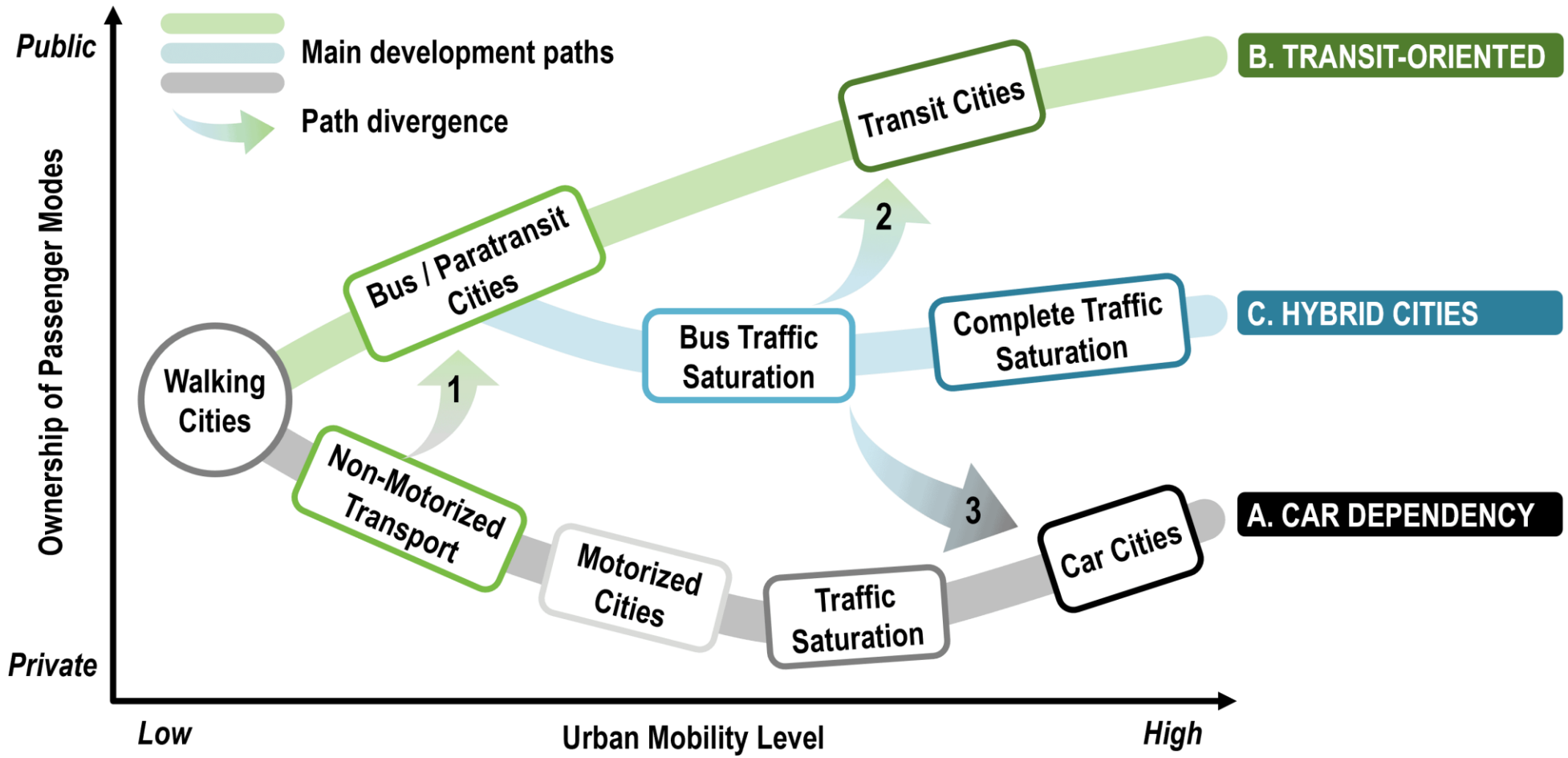


The Vicious Circle of Congestion



3. Congestion: Some Mitigation Measures

Ramp metering	Controlling access to a congested highway by letting automobiles in one at a time instead of in groups.
Traffic signal synchronization	Tuning the traffic signals to the time and direction of traffic flows.
Incident management	Making sure that vehicles involved in accidents or mechanical failures are removed as quickly as possible from the road.
Carpooling	Individual providing ridership to people having a similar origin, destination and commuting time. Two or more vehicle trips combined into one. Vehicle pools.
HOV (High Occupancy Vehicle) lanes	Vehicles with 2 or more passengers (buses, vans, carpool, etc.) have exclusive access to a less congested lane.
Public transit	Offering alternatives to driving.


Public
Private
Ownership of Passenger Modes
Low
Urban Mobility Level
High
Main development paths
Path divergence
Walking Cities
Bus / Paratransit Cities
Non-Motorized Transport
Motorized Cities
Transit Cities
Bus Traffic Saturation
Traffic Saturation
Complete Traffic Saturation
Car Cities
1
2
3
B. TRANSIT-ORIENTED
C. HYBRID CITIES
A. CAR DEPENDENCY

A) Car addiction. This development path leads to the establishment of car-dependent cities with continuous investment in motorization and the development of road and highway systems. The first step usually involves expanding non-motorized forms of transportation, especially bicycles. This was the case in cities in developed economies in the late 19th and early 20th centuries and in Asian cities (especially China) in the 1970s. At this stage, there is likely to be a divergence of path (1) towards the establishment of public transport services. However, the path followed in several developing economies concerns motorization with the motorcycle as an intermediate form, leading to cities saturated with motorcycles, buses and some cars. As investment in road infrastructure continues with economic development, the result is a car-oriented city in which the car accounts for the majority of passenger mobility. Such an outcome can also be achieved by cities that initially started transit development but moved towards car dependence via divergence (3) through the abandonment of several transit services or lack of further development to cope with mobility demand.

(B) Transit-oriented development. This development path implies slow levels of motorization and moderate road construction. Through massive investments in public transit and transit-oriented land use development strategies, this path leads to the establishment of transit cities where the majority of the population uses public transportation to meet their mobility needs. Such cities, however, are not so common, because as many cities began to develop, an additional path was followed that led to the development of hybrid cities.

(C) Hybrid cities. This development path is the result of further motorization, but the pace of road development is coming faster than the pace of urban transit development. This eventually leads to the saturation of the transport system with buses and cars. This situation characterized many cities in developed economies in the second half of the 20th century. Possible trajectory divergence includes rapid motorization and the move toward car dependence (3). Alternatively, through restrictions on car use and ownership and the development of alternative modes of transport, road divergence (2) can be achieved, leading to more transit-oriented forms.