XXV International Conference “Living and Walking in Cities”

New Scenarios For Safe Mobility In Urban Areas

Brescia
9-10 September 2021

Transport System & Infrastructure

George Yannis
Professor NTUA

Department of Transportation Planning and Engineering,
National Technical University of Athens

Outline

1. Urbanisation and Transport Infrastructure (3)
2. Urban Transport Network Hierarchy (2)
3. Public Transport (3)
4. Urban Streets (6)
5. Concluding Remarks (2)

Urbanisation and Transport Infrastructure (1/2)

- Europe's level of urbanization is expected to increase to approximately 83.7% in 2050 *(United Nations, 2018)*, while similar increasing trends are observed for the rest of the world.
- Transport infrastructure is facing and/or is responsible for several urban mobility problems.
- Numerous opportunities (mainly technology related) for developing sustainable, inclusive, and accessible cities.
- Widespread mobility difficulties result in higher acceptance for change

Urbanisation and Transport Infrastructure (2/2)

Existing transport infrastructure and systems

- (over) capacitated
- lack of space and/or resources to expand
- high maintenance cost
- unfair cost share between road users

Congestion

Environmental impacts

- Emissions
- Energy consumption
- Fuel dependency

Social impacts

- Delays
- Financial cost
- Crashes
- Exclusion
- Stress

Urban Mobility Choices

The high complexity of the urban environment makes mobility choices a very difficult task, attempting to balance several conflicting social needs and economical restraints:

- Traffic Efficiency (Speed) versus Traffic Safety
- Vehicles versus Active travelling
- Expensive but safe versus Cheap but unsafe (infrastructure, management)
- Setting priorities in policies, measures, research, etc.

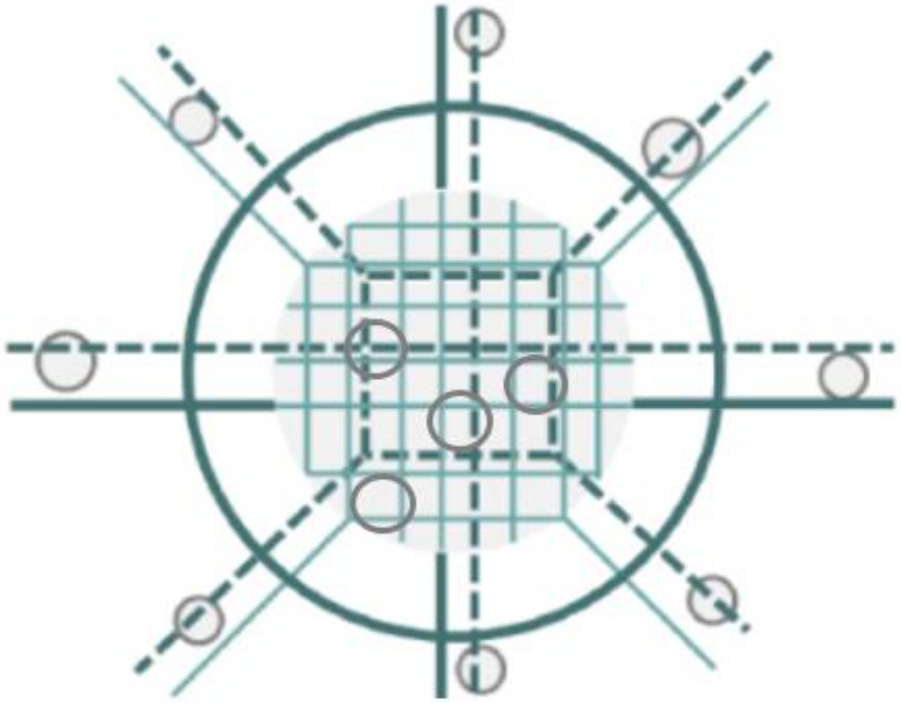
Urban Transport Network Hierarchy (Physical And Operational)

Motorways & Arterials (high speed, high traffic)

Public transport lines (train, metro, tram, bus)

Arterials and main and local roads
(motorized and non-motorized traffic)

Activity centers that generate or attract demand



- The city structure determines the design and operation of the transport network.
- The existence of all road types and public transport is a way to achieve efficiency and accessibility.
- Activity centers should be connected with each other and be accessible by all modes.

Motorways & Arterials Hierarchy

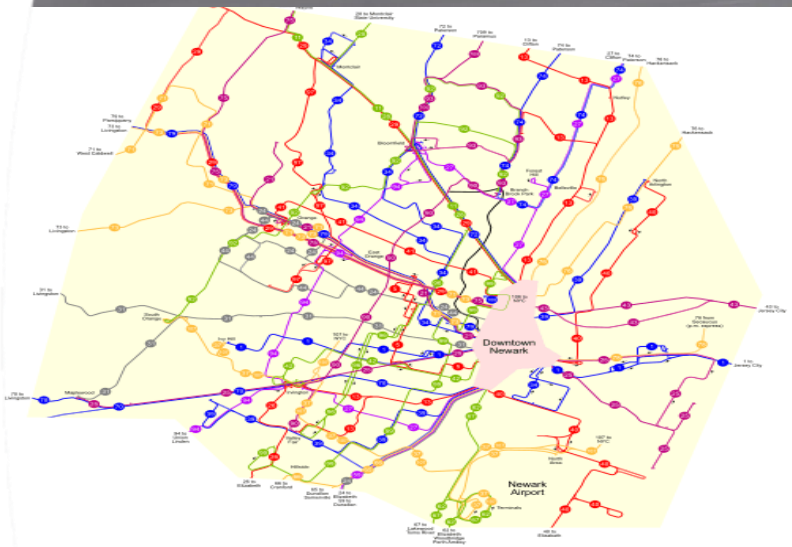
- While many cities are trying to promote active travel modes (i.e., walking, bicycling) along with public transport, maintaining a properly-operating road network is of high importance.
- A clearly defined road hierarchy enables easy point-to-point travel.
- High-traffic, high-speed road network (such as motorways and arterials) should cover a city in a way to connect long distance points.
- Corridors should cover N-S and E-W directions while the existence of one or more Ring Roads are essential to connect these corridors.
- Urban motorways/arterials alleviate traffic from local roads and enable the development of human-activities along local roads.

Public Transport Network (1/2)

- PT systems can simultaneously address congestion, safety, environmental and accessibility problems.

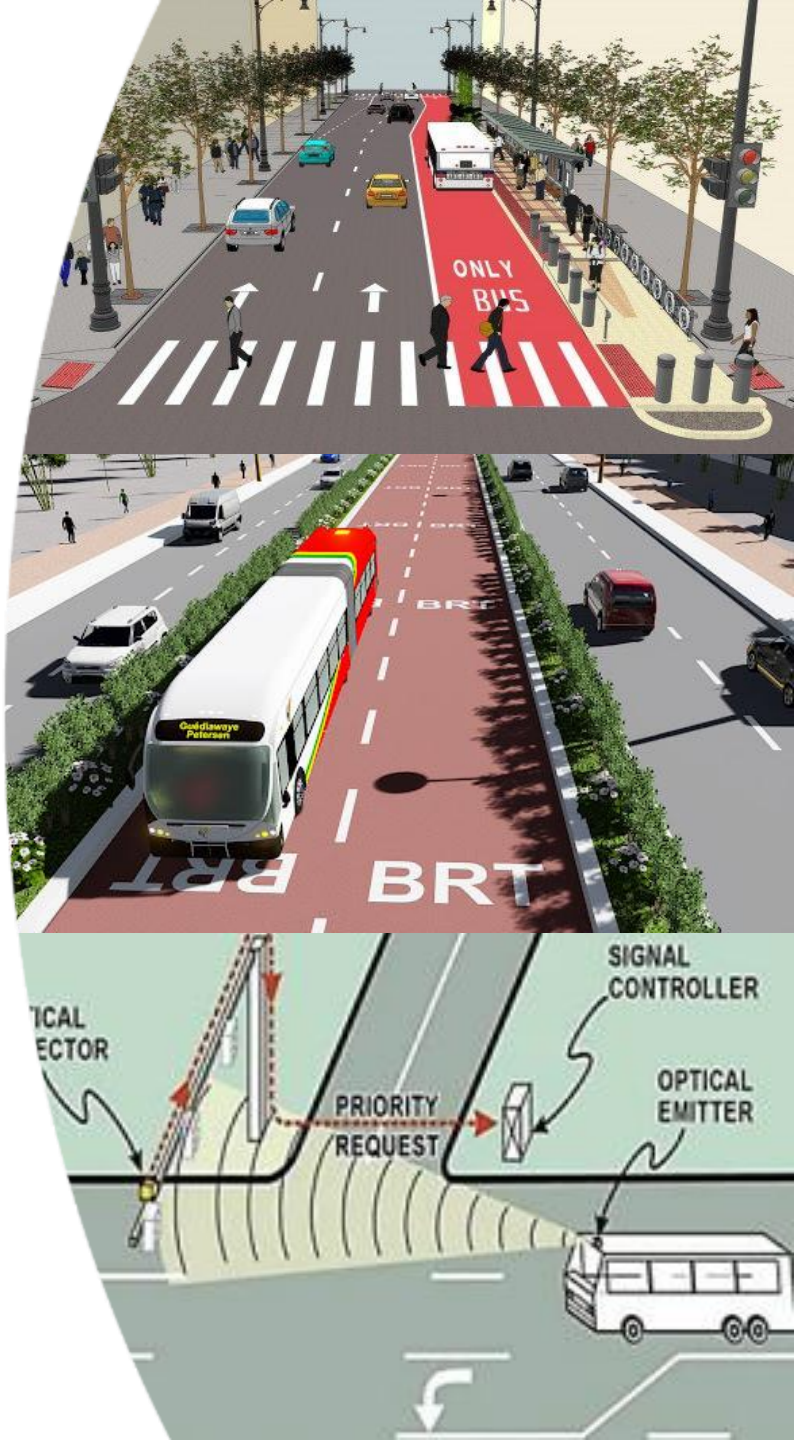
- PT systems are more likely to serve dense and compact areas instead of sprawl, low-density suburbs, however, several schemes exist to provide city-wide PT services:
  - Park-and-ride stations
  - Flexible transit lines
  - First/Last-mile problem: Car- or bike-sharing stations in the vicinity of PT stations

- The recent trend, Mobility-as-a-Service (MaaS) promotes sustainable models to reduce car share by coupling PT systems with other modes (e.g., bike-sharing) by relying on mobile-phone apps, real-time information, e-tickets, etc.



Public Transport Network (2/2)

- With the exemption of subways/metros, PT systems occupy road space making the urban road space allocation problem complex.
- Good solutions for accommodating bus lines or light rail need to be identified per case, working both at the network-level (e.g., selection of corridors) and the local-level (e.g., implementation of bus-only lanes and transit signal priority).
- Prioritizing PT over cars, increases traffic safety, equity and improves air quality and energy consumption:
  - Bus-only lanes
  - Bus-only corridors
  - Transit signal priority schemes



Free Public Transport

- Fairness / equity: Public transportation use should be free in the same way as road infrastructure use is free for passenger cars
- Environment: Reducing the carbon footprint of road transportation by encouraging more people to shift from cars to public transport
- Safety: Significant increase of traffic safety as public transport is the safest transport mode
- Affordability / social inclusion: Increasing the social welfare of people who may face limited opportunities due to access barriers
- Economy: The safety, environmental and traffic efficiency benefits can outweigh the additional subsidies required (which are already significant)

Urban Streets (1/3)

- Arterials, collectors, distributors, and local roads serve non-motorized users as well.
- Two challenging problems exist (1) the broader road space allocation and (2) the curb-space management, as different modes, users, and needs are present.

Passenger cars Taxis/ride-hailing Trucks Buses Bicycles E-scooter Pedestrians	Commuters Employees Children Elderly Disabled/Impaired individuals Tourists	Retail activity Residents Recreation

- Carefully selected policies can accommodate all users' needs, while ensuring efficiency and safety.
- Prioritisation of active travel modes can establish livability, improve public health and security, boost economic activity.

Urban Streets (2/3)

- **Policies to reduce car trips in local roads:**
  - Efficient parking management
  - Congestion pricing & access restriction measures
  - Creation of low-speed zones (20 or 30 km/h)
  - Increase public transport capacity and accessibility
  - Implementation of bus-only lanes
  - Prioritization of pedestrians/bicycles traffic signals

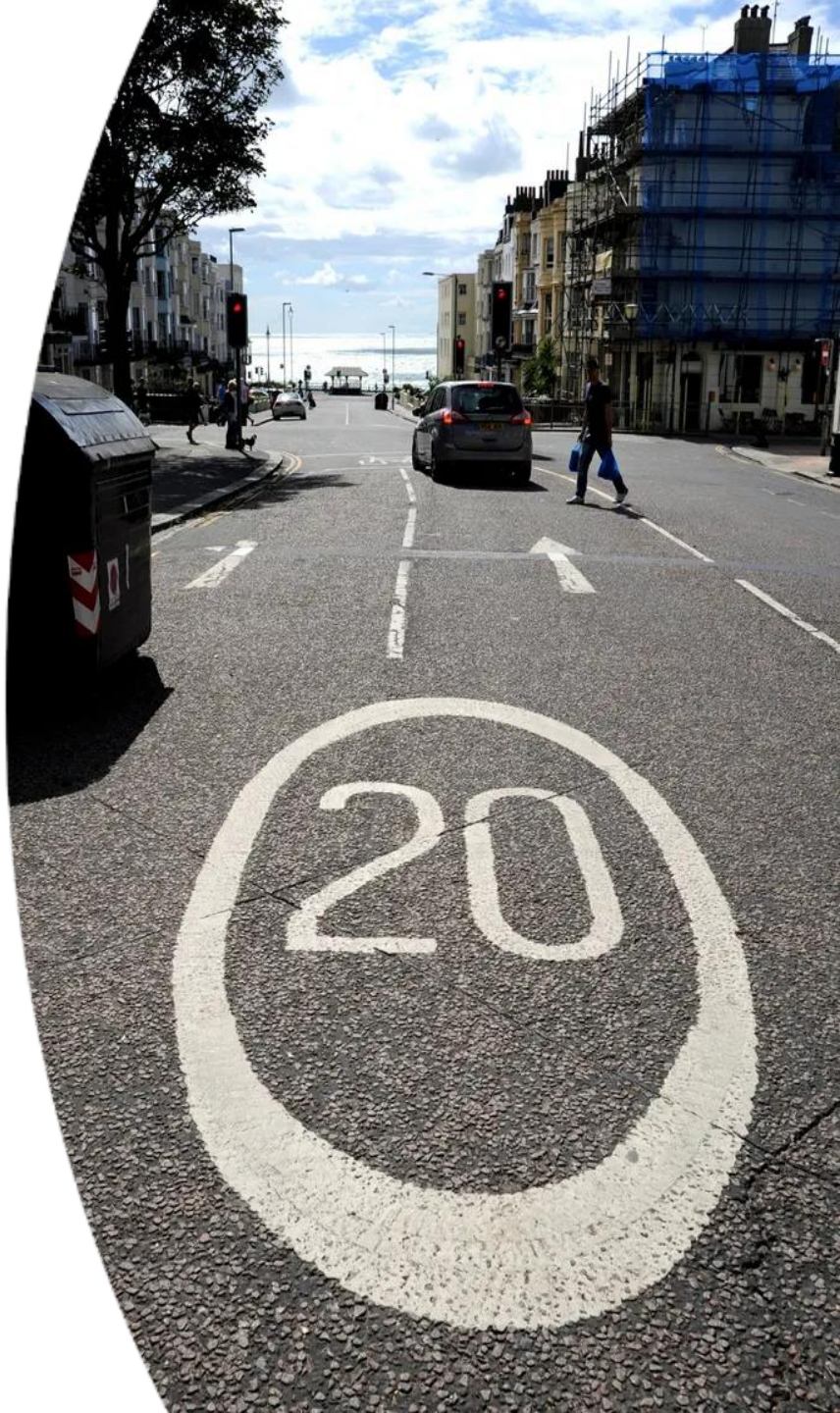
- **Measures to increase walkability:**
  - Installation of new and improvement of existing crossing facilities: clearly marked crosswalks, separated crosswalks, longer green time, actuated signals
  - Sidewalk improvement: wider and paved sidewalks
  - Proper lighting
  - Mixed traffic zones

Urban Streets (3/3)

- Compared to walking, for which facilities exist in all cities, cycling requires building new facilities along segments and at intersections so that people of all ages and abilities can shift towards utilitarian cycling.
- Due to the COVID19 pandemic, many cities world-wide (e.g., Milan, London, Boston) allocated road space for cyclists by implementing protected bike lanes (i.e., pop-up bike lanes), showing that achieving higher bicycle mode share is easier than thought.
- To establish safe cycle trips, cycle facilities are needed along the segment and the intersection:
  - Low-speed/volume streets: share roads with cars
  - Speed > 30 km/h: bike lanes or cycle tracks
  - Intersection markings, cycle signals, protected intersection are intersection-level treatments

Low-Speed Zones

- Reduced speed limits (20km/h or 30km/h) in selected zones / roads have been adopted in several European cities (Brussels, Warsaw, Bilbao etc.)
- A significant reduction both in the number of crashes as well as their consequences has been observed
- A decrease in noise pollution and subsequent increase in the quality of living can be expected
- Better integration of active travelers (being also Vulnerable Road Users) with the rest of the traffic is achieved, which further encourages the use of active transport modes



Mobility-as-a-Service

- "Mobility as a Service" (MaaS) combines different transport services (e.g., shared e-scooters and public transport) into a single service by using combined booking, payment and real time traffic information with objective to offer door-to-door transportation and eventually, reduce private car use.

- In addition to congestion related to extensive private car use, MaaS schemes have the potential to reduce transport cost, transport-related emissions, and increase accessibility, provided that these objectives are factored in viable MaaS business models.

- Infrastructure changes are essential to support MaaS schemes:

  - Facilitate the physical combination of transport modes: e.g., install bike-sharing docks next to public transport stations or better connect bus lines and train lines
  - Design user-friendly mobile-phone app to for booking, real time information, payment, etc. taking into account people of different ages and abilities
  - Provision of alternative, non app-based ways of using the service, e.g., use of a card for booking, ability to pay with cash.

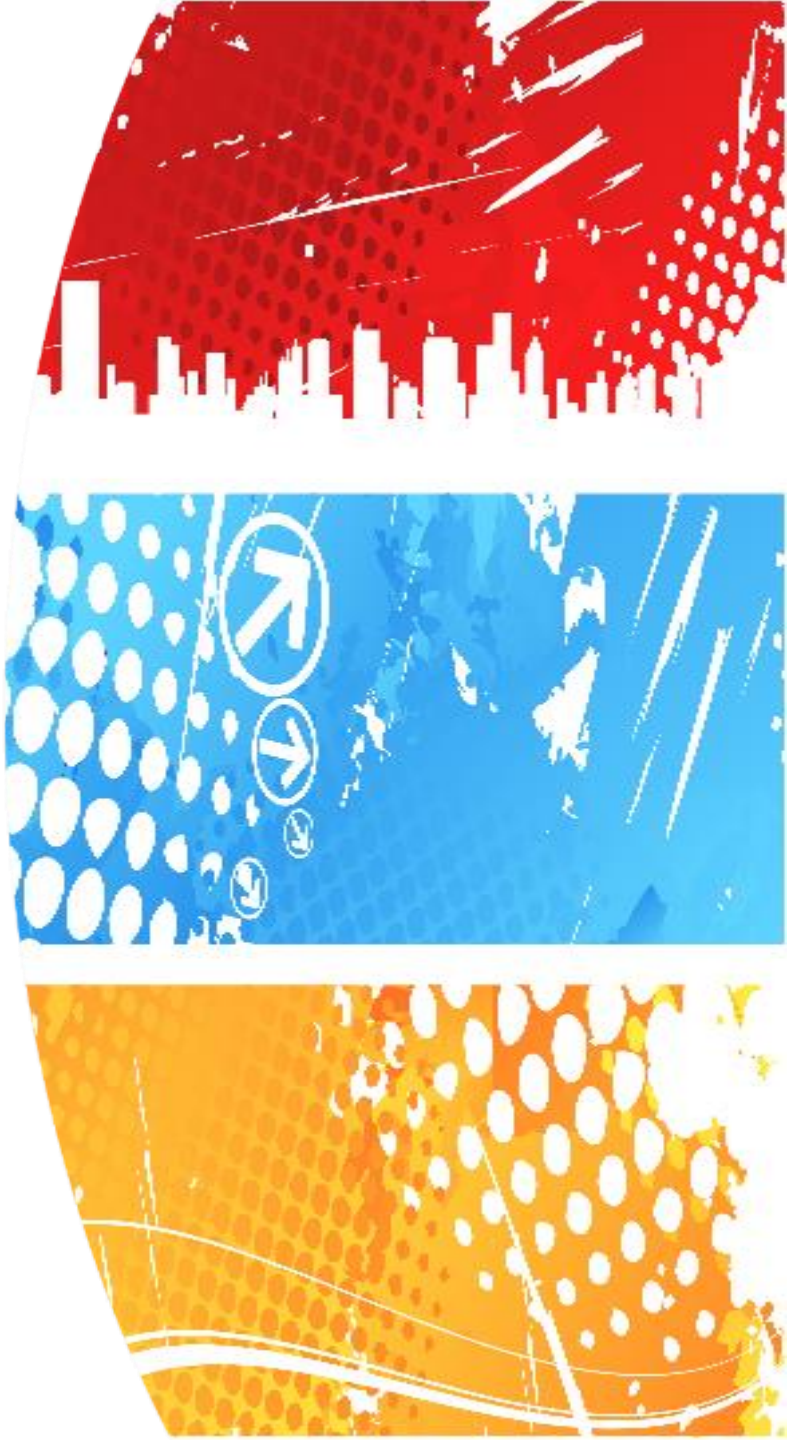
Twining Physical and Digital Infrastructure - Smart Cities

- A Smart City should provide all the necessary information and data related to its transport infrastructure

- The physical-digital twining empowers City Authorities and Operators with significant opportunities to enhance city services:
  - travelers information
  - travelers service
  - inclusive for all travelers
  - maintenance efficiency
  - operations optimization
  - lower costs

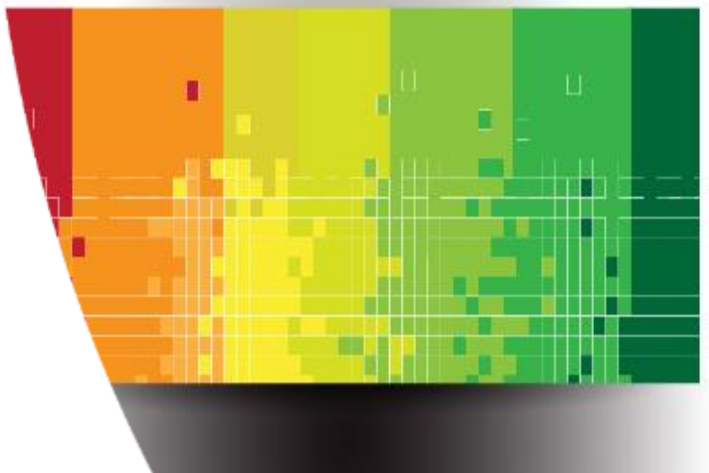
Concluding Remarks (1/2)

- Appropriate transport infrastructure hierarchy addresses deadlocks
- Need for proper infrastructure balance between transport modes
- Integration between transport infrastructure development and management
- Twinning physical and digital infrastructure



Concluding Remarks (2/2)

- Free Public Transport is the new equitable policy
- 30 km/h speed limit areas brings balance between motorized and active transport modes
- Dynamic repurposing of transport infrastructure (summer pocket parks, etc.)
- Infrastructure adjustments are needed to support Mobility as a Service



XXV International Conference “Living and Walking in Cities”

New Scenarios For Safe Mobility In Urban Areas

Brescia
9-10 September 2021

Transport System & Infrastructure

George Yannis
Professor NTUA

Department of Transportation Planning and Engineering,
National Technical University of Athens