Future scenarios of urban mobility.
General considerations
and the drivers of change

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Outline

1 The relevance of future urban mobility
2 The future is rooted in the past
3 The drivers of change
4 Scenarios and possible evolution paths
1. the relevance of future urban mobility

- The role of mobility in future cities can hardly be overestimated:
  - Urbanized population passed the “symbolic threshold” of 50% in 2007 and going to exceed 60% in 2030
  - Role of cities in the production of economic and intellectual value is increasing (only 600 urban centers generate about 60 percent of global GDP)

- The quality of the urban environment is increasingly seen as a major competitive factor of cities

The availability of transportation systems able to accommodate for future mobility needs of people and goods without consuming resources beyond acceptable levels is quintessential

The ease and “environmental footprint” of their mobility systems is one of the key factors contributing to its quality
1. the relevance of future urban mobility

At this point in time, transportation is a problem in most cities:

- It fails to achieve the standards of economic and environmental efficiency that would be desirable in the opinion of the experts, as well as for their citizens and institutions.

- Individual cities have very different levels of mobility supply and performances.

Outline

1. The relevance of future urban mobility
2. The future is rooted in the past
3. The drivers of change
4. Scenarios and possible evolution paths
2. the future is rooted in the past

- Future of urban mobility depends on how urban transportation systems, and more generally cities, are today.
- Cities around the world have different dimensions and structure, and have reached solutions to their mobility needs that are very diverse.
2. the future is rooted in the past

Similarities and Differences

- Building blocks of their transportation systems are very similar across cities, but they differ in the way these components are used
  - Different “pure” modes and related technologies to move people (e.g. muscular modes, cars and motorcycles, individual and collective taxis, public transport) and freight (hand carriers, small vans, medium and large size trucks) and several combinations of them (e.g. park and ride)
  - Different management arrangements (self production, production by companies operating in exclusive rights, licensing, competition in the market)
  - Different prices and pricing systems (e.g. congestion pricing, social tickets, oil and energy prices)
  - Different regulations (e.g. demand management schemes, delivery times, etc.)
  - Different technologies for monitoring the system components, to control them, to inform the general public and travelers

The future is rooted in the past, but we cannot predict it judging from the past as we cannot know the exact shape of a tree only by observing its roots

Change in complex systems are of two types:

- Incremental changes
- Revolutions
2. the future is rooted in the past

➢ Incremental changes

Changes that derive from modifications, either technological and/or organizational, of elements and their arrangements already existing

- The changes of urban transportation systems over the last 30-40 years are of this type

**In the ‘70s and ‘80s:**
- cars and transit systems
- metro and street cars
- parking arrangements and traffic lights
- traffic and congestion management schemes
- radio and tv information on traffic

**Modification and Applied Tech**
- car engines and dimensions
- Intelligent Transportation Systems
- information connected to personal computing first and to smartphones
- “Station Renaissance”
- new regulations and congestion reduction policies

2. the future is rooted in the past

➢ Incremental changes

- In some cases things have even gone “backward”

E.g. metro and surface mass transit systems or the comeback of the bike, either electrically powered or not

Transportation in Los Angeles today is closer to what it was in 1984 than to the future then imagined in “Blade Runner” for the year 2014 with flying cars and the rest!
2. the future is rooted in the past

➢ Revolutions

Significant and fast changes induced either by technology and/or organizational innovations

From Gilbert and Perl “Transport Revolutions”

“...a substantial change in a society's transportation activity that occurs in less than 25 years”, where substantial change is intended as “either something that was happening before increases or decreases dramatically, say by 50 percent, or a new means of transport becomes prevalent to the extent that it becomes a part of the lives of ten percent or more of the society’s population”

➢ Revolutions

Two examples from the past

➢ Urban transportation in North American cities in the first three decades of the last century with the widespread of individual cars, and similar delayed revolution in most European and non European countries following the World War II

➢ Urban transportation in a few decades during the second half of the XIX century as railways spread and the dimension and shape of cities changed accordingly
The relevance of future urban mobility

The future is rooted in the past

The drivers of change

Scenarios and possible evolution paths

3. the drivers of change

- Changes in urban transportation can be induced by a **number of factors** either **acting independently or jointly** to shape future configurations.

- **Different cities will have different evolution trajectories** as their present systems are different and the changes will differ as well.
3. The drivers of change

Proposal for the discussion of the Panel
Factors that will likely play a role in this process across several cities in the world

**Socio-economic factors**
- Land-use and city form
- Demographics
- Activity participation, lifestyles and consumption models
- Income levels and distribution
- City governance and citizens participation

**Energy and Power sources**
- Oil and traditional power sources (including biofuels) availability and prices
- Renewable energy sources, availability and prices

**Technological innovation in existing transport modes**
- Cars
- Trains and metros
- Trams and medium capacity surface mass transit
- Motorcycles and mopeds
- Bikes and e-bikes
- Buses

**Innovation in ICT and ITS**
- Personal information
- System-wide monitoring and control
- Individual mobility pricing

**Mobility markets**
- Ownership vs. Use of individual modes
- Provision of intermediate mobility services
- Regulation and pricing of transportation services

**New emergent modes**
- Individual/Collective mixed modes
- Autonomous driving vehicles

**City logistics and freight distribution**
- Technological innovations in distribution vehicles
- Regulation and pricing

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4. scenarios and possible evolution paths

- Strong correlations among some of the factors

E.g. A possible increase in fuel prices will probably reduce the demand for less energy efficient modes, increase the use and promote technological innovation of other modes, reduce available income and travel demand on the whole, and promote denser land use patterns

- Several **internally consistent scenarios** can be figured out based on **consistent sets of assumptions on the key drivers and related changes in other factors**

**Proposed criteria**

- To distinguish between important variables (i.e. variables offering the future but somehow predicable) and uncertain variables (i.e. elements subject to significant alternative outcomes)

- To adopt mixed scenario - Delphi method for the building of future scenarios

**Incremental Scenario I: business as expected**

**Vision:**
To represent the trends-as-they-are evolution of present urban mobility systems

- Major changes in energy prices and availability, **cars and individual modes** will evolve technologically but **will still the major urban mobility solutions for most cities in the world** with increasing overall market as developing countries motorization rates will approach those of developed ones

- **ITS technology** and possibly reduced car sizes will help in **providing capacity without major network extensions**, at least in developed cities, while major highway constructions are to be expected in developing cities, especially in the BRICS countries

- **Environmental requirements** will either be **eluded or complied** with a mix of increased fuel efficiency, optimal congestion management and new energy sources.
4. scenarios and possible evolution paths

Incremental Scenario II: modal equilibration

Vision:
No significant technological breakthroughs, but the joined effects of increased energy prices and/or environmental concerns and/or space and life quality reclamation will push many cities towards policies aimed at modifying modal shares at least for certain trip types

- Implementation of demand management policies, possibly based on widespread use of pricing and mobility credits, investing in better transit (and mostly mass transit systems), urban densification policies, the opening of transit and mobility services markets (e.g. car and bike sharing systems on larger scales), promotion of multimodal trips and chains for parts of the city
- ITS will be part of the process with an emphasis on trip planning, system monitoring and automatic toll/credits collection
- In several cities walking and biking will increase their share of urban mobility

Incremental Scenario III: cities specialization

Vision:
Diverging evolutionary paths will be followed by different cities, where urban mobility changes will result more from local choices than from global factors

- Some cities will evolve their mobility systems trying to optimize the use of individually owned cars while others will steer towards less car dependent systems based on livability as a competitive factor, with technologic evolutions supporting both type of choices
- It could also be possible than the same city will specialize parts of their territory according to different mobility schemes (e.g. car-less city centers as opposed to car-dependent peripheral areas)
- In this process the connection to High Speed Railways systems could influence cities specialization one way or another
4. scenarios and possible evolution paths

Revolution Scenario I: energy crisis

Vision:
Scarcity of traditional fuels and delays in new low cost energy sources will bring significant prices increases, and possibly limitations in the availability of fuels for individual modes, to a level where making car as we know it is no longer the basic option for urban mobility

- Car reduced use will not result from a planned congestion reduction strategy, but from overall reduced availability, inducing a lower car shares and a promotion of a number of changes in cities
- Real estate markets will show major changes as peripheral areas will be less and less attractive, traditional and new mobility services (e.g. trip planning, vehicles sharing, collective taxis) will develop with the help of ITS technologies
- Urban mobility is going to be a major factor of competitiveness among cities, with those cities with well-developed transit systems taking the edge

Revolution Scenario II: automatic city

Vision:
Prompted by technological innovation, especially in the field of individual vehicles

- Cars, or their substitutes, will increasingly be able to run in dual mode: drivers control and system control, with significant increases of system capacity and energetic efficiency
- Vehicles will either be individually owned and operated, as evolution of present day cars, or operated by mobility service providers responding with autonomous driving vehicles to the needs of travelers on whole trips or at least for some trip sections (e.g. access to terminals, main roads, etc.)
- ITS developments will accordingly support the diffusion of autonomous driving, individual trip planning and system optimization
- Energy prices will not be an issue either because traditional fuels will be available or because new low cost energy sources will be developed
basic references


Thank you for your attention!