The Future of Mobility in Megacities
Is there a sustainable growth path?

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ECONOMIC GROWTH vs MOTORIZATION

Many paths to chose from!

GDP per capita vs. modal share of motorized private mode (UITP, 2006, cited by Dalkmann & Sakamoto, 2011)
THE DILEMMA OF OUR CITIES

We are trapped in a Vicious spiral of our making
TRANSPORT AND ENERGY USE

If transport consumes 23% of total energy, more than half of it is consumed by personal mobility.
THE CONSEQUENCES OF SPRAWL

Average Annual cost of service (Police, fire, roadways, sewer)
US Urban Location: USD 88.67 per new HH
US Sprawl location: USD 1222.39 per new HH

GIZ – Sustainable Urban transport Project (Training Material)
DENSITY, DIVERSITY AND DESIGN

What the rich but sustainable cities are doing differently is the 3Ds:
• Increase density to reduce per capita energy consumption
• mixed land use and mixed income groups to reduce travel demand
• design for walking, cycling, shared mobility and public transit to provide sustainable mobility options
DENSITY IS IMPORTANT

• Atlanta and Barcelona have about the same population (3.8 million)
• 60% of the population of Barcelona is within 600m of a subway line (99km of line with 136 stations)
• To provide the same accessibility, Atlanta would have to build 3400 km of metro line with 2800 new stations
URBAN DENSITY AND ENERGY USE

At similar GDP the energy use of Atlanta is more than 5 times that of Barcelona or Singapore.
THE ENERGY EFFICIENCY PATH IN TRANSPORT

Avoid

Shift

Improve

• Decision to travel or not to travel and by which mode affects fuel consumption, and therefore carbon emissions: Number of vehicles, level of congestion, driver behaviour, vehicle condition, fuel type

Low carbon transport

TRAVEL / MODE CHOICES

• TRAVEL DOES NOT TAKE PLACE
Need/desire to travel has been reduced.

NON-MOTORISED TRANSPORT
Walking and Cycling

PUBLIC MOTORISED TRANSPORT
Public Transport – Bus, rail

INDIVIDUAL MOTORISED TRANSPORT
Car, motorcycles, taxi

TRADE-OFFS

Need/desire to travel has been reduced.
PLANNING INSTRUMENTS
Land Use Planning, transport infrastructure planning

TECHNOLOGICAL INSTRUMENTS
Fuel improvement, cleaner technologies, end-of-pipe control devices, cleaner production

REGULATORY INSTRUMENTS
Standards, traffic organization (speed limits, parking, road space allocation), production processes

INFORMATION INSTRUMENTS
Public Awareness Campaigns, mobility management and marketing schemes, co-operative agreements, eco-driving schemes

ECONOMIC INSTRUMENTS
Fuel taxes, road pricing, subsidies, purchase taxes, fees and levies, emissions trading

The Ecosystem of Instruments
The Smart Cities Mission is an innovative and new initiative by the Government of India to drive economic growth and improve the quality of life of people by enabling local development and harnessing technology as a means to create smart outcomes for citizens.

Source: www.smartcities.gov.in
Smart Cities focus on their most pressing needs and on the greatest opportunities to improve lives. They tap a range of approaches – digital and information technologies, urban planning best practices, public-private partnerships, and policy change – to make a difference. They always put people first.

SMART CITIES MISSION

The strategies and focus areas

- Adequate water supply,
- Assured electricity supply,
- Sanitation, including solid waste management,
- **Efficient urban mobility and public transport,**
- Affordable housing, especially for the poor,
- Robust IT connectivity and digitalization,
- Good governance, especially e-Governance and citizen participation,
- **Sustainable environment,**
- **Safety and security of citizens,**
- **Health** and education.
- Economic Activities & **Livelihood Opportunities.**

Source: www.smartcities.gov.in
SMART CITIES - ASSESSMENT

Liveability index

Source: http://smartcities.gov.in/upload/uploadfiles/files/LiveabilityStandards.pdf
Transportation and Mobility has the maximum indicators. Several other categories have indicators affected by mobility.

Source for slides #5-10:
Category 5: Safety and Security

5.1 Number of streets, public places, junctions covered through surveillance systems (Core)
Description: The extent to which public areas such as streets, public places like transport interchanges, government buildings, recreational spaces etc. and major traffic junctions in the city are covered through Closed-circuit Television (CCTV) surveillance cameras. This can facilitate real time monitoring of instances of crime or accident and quicker responses in emergency situations.

5.2 Number of recorded crimes per lakh population (Core)
Description: This denotes the prevalent crime rate in a city. Lower crime rates are indicative of higher levels of safety and security in a city, due to effective surveillance in public spaces, better SOS and crime registration systems, and police response mechanisms. Better planning and programming of public spaces, illumination of streets, compact and active neighbourhoods can also contribute to safer cities.

5.3 Extent of crimes recorded against women, children and elderly per year (Core)
Description: This denotes the proportion of crimes committed against vulnerable groups such as women, children and elderly.

5.4 Transport-related fatality per lakh population (Supporting)
Description: This denotes the level of safety of transport networks in the city. Better managed transport systems will tend to be safer and record lower transport related fatalities. Service Level Benchmarks (SLBs) for Urban Transport developed by the MoUD provide guidance on the service levels for transport.

Category 6: Economy And Employment

6.5 Percentage of vendors registered and provided formal spaces (Supporting)
Description: The extent to which the city has implemented inclusive strategies for protecting livelihoods of street vendors, by integrating such activities with public places (including streets) in line with the Street Vendors Act of 2014.
Category 8: 
Public Open Spaces

8.1 Per capita availability of green spaces (Core)
Description: The extent to which urban greens and open spaces such as recreational spaces, organized greens and common spaces like flood plains, forest cover, vacant lands etc. are available in the city leading to a better urban environment.

8.2 Per capita availability of public and recreational places (Core)
Description: This indicator denotes the extent to which recreational and public spaces are available in the city for recreation, social interaction and active physical activities. Such spaces can include playgrounds, stadiums and sports complexes, city and district parks, neighbourhood parks and tot lots, zoological-botanical gardens, multi-use open spaces and maidans for cultural events, publicly accessible waterfront areas, promenades, public squares etc.

Category 9: 
Mixed Land Use And Compactness

9.1 Share of mixed land use area in overall city land use (Core)
Description: This indicates the proportion of areas in the city which have been developed as multifunctional zones, i.e. areas where residential, commercial and non-polluting industrial activity/service industry are planned in close proximity to one another as an integrated mix. This is an important departure from the emphasis of modern planning on functional separation leading to unsustainable land use patterns (large monofunctional land uses, longer trip distances, overt reliance on motorized transport etc.). The URDPFI guidelines, 2014 provide the guidelines for planning of mixed land use areas.

9.2 Net Density (Core)
Description: This denotes the intensity of development in the city. Higher net densities coupled with mixed land use areas can result in a compact development pattern, potentially forming walkable and inviting activity centres and neighbourhoods.
Category 11: Transportation And Mobility

11.1 Geographical coverage of public transport (Core)
Description: This denotes the geographical coverage of public transport services (road, rail or water-based) in the city, and along with Indicator 11.2 is indicative of the overall availability of public transport facilities in the city. SLBs for Urban Transport developed by the MoUD provide guidance on the service levels for transport.

11.2 Availability of public transport (Supporting)
Description: This denotes the availability of public bus or rail transport in the city, in proportion to the population of the city. Along with Indicator 11.1 it is indicative of the overall availability of public transport facilities in the city. SLBs for Urban Transport developed by the MoUD provide guidance on the service levels for transport.

11.3 Mode share of public transport (Core)
Description: This is a critical indicator that denotes the extent to which people use public transport for moving within the city. Higher modal share in favour of public transport or non-motorized transport is desirable. The National Transport Development Policy Committee (NTDPC), 2013 provides the benchmarks for the level of service in a city.

11.4 Percentage of road network with dedicated bicycle tracks (Core)
Description: This denotes the availability of dedicated Right of Way (ROW) for bicycles in the city, thereby encouraging the use of such non-polluting transport options. Higher percentage would indicate a better non-motorised transport (NMT) network in the city. SLBs for Urban Transport developed by the MoUD provide guidance on the service levels for transport.

11.5 Percentage of interchanges with bicycle parking facilities (Supporting)
Description: The extent to which use of bicycles is encouraged in a city by providing adequate parking facilities at the major transport interchanges – bus depots/stations, metro or suburban rail stations and water transport terminals (e.g. ferry terminal).

11.6 Mode share of non-motorised transport (Core)
Description: This denotes the extent to which people walk or use bicycles and cycle rickshaws for moving within the city. Higher number of trips indicate better infrastructure available for pedestrian movement and cycling as well as higher acceptability of NMT as a transport option. The National Transport Development Policy Committee, 2013 provides the benchmarks for the level of service in a city.
11.7 Availability of Passenger Information System (Supporting)

Description: Passenger Information Systems (PIS) are the key communication link between transportation operators and the travelling passengers. They provide accurate information regarding arrival and departure times, gates etc.

11.10 Percentage coverage of footpaths – wider than 1.2m (Core)

Description: This denotes the availability of pedestrian facilities (footpaths wider than 1.2 metres) along the road network in the city. SLBs for Urban Transport developed by the MoUD provide guidance on the service levels for transport.

11.8 Extent of signal synchronisation (Supporting)

Description: The extent to which signals installed at traffic junctions on major roads in the city are interconnected and synchronised, so as to facilitate smooth traffic flow along the road networks.

11.12 Extent to which universal accessibility is incorporated in public rights-of-way (Supporting)

Description: The extent to which public right-of-way areas such as Government buildings, sidewalks/footpaths, subways and foot-over-bridges (FOB) have been designed in accordance with universal design principles (including design of appropriate signage) so as to facilitate use and access by all, including the differently abled. Guidelines have been provided by the MoUD for barrier-free environment (Harmonized Guidelines and Space Standards for Barrier Free Built Environment for Persons with Disability and Elderly persons, 2016)

11.9 Availability of paid parking spaces (Core)

Description: This is indicative of the restriction on free parking spaces for all vehicles in a city and measures the availability of paid public on-street parking spaces in the city, particularly along major arterial and sub-arterial roads. SLBs for Urban Transport developed by the MoUD provide guidance on the service levels for transport.

11.11 Percentage of traffic intersections with pedestrian crossing facilities (Supporting)

Description: The extent to which pedestrian crossing facilities such as zebra crossing, pedestrian signals, grade separators etc. are available at all traffic junctions on major roads in the city.
Category 15: Reduced Pollution

15.1 Concentration of $\text{SO}_2$ - air pollution (Core)
Description: This indicator along with 15.2 and 15.3 denotes the acceptable levels of air pollutants in the city. Sulphur Dioxide ($\text{SO}_2$) is considered one of the critical urban air pollutants, monitored on a regular basis by the Central Pollution Control Board.

15.2 Concentration of $\text{NO}_2$ - air pollution (Core)
Description: This indicator along with 15.1 and 15.3 denotes the acceptable levels of air pollutants in the city. Nitrogen Dioxide ($\text{NO}_2$) is considered one of the critical urban air pollutants, monitored on a regular basis by the CPCB.

15.3 Concentration of $\text{PM}_{10}$ - air pollution (Core)
Description: This indicator along with 15.1 and 15.2 denotes the acceptable levels of air pollutants in the city. Respirable Suspended Particulate Matter (size less than 10µm) or $\text{PM}_{10}$ is considered one of the critical urban air pollutants, monitored.

15.4 Level of noise pollution (Core)
Description: This denotes the level of noise pollution in a city. Prolonged exposure to ambient noise from industrial activity, construction, vehicles, loud speakers, generator sets etc. can have negative health effects on citizens, in addition to causing annoyance and sleep deprivation. Cities...
THE SMART CHALLENGE – Types of Mobility projects proposed

- Pedestrianization
- Cycling, bike-sharing, cycle rickshaws
- Open space improvement
- Street redesign for inclusion
- Street vending spaces and plans
- Street surveillance
- Parking management
- Electronic fines
- Street lighting

- Transit Hubs
- Bus stop improvement
- Bus operations, passenger info and route optimization
- Express services - airport
- Common mobility card
- App based journey planners
- Adaptive traffic control system
- Junction improvement for safety
- ...

- What is assessed gets proposed!

Source: http://smartcities.gov.in/content/innerpage/cities-profile-of-20-smart-cities.php
For more information

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Thank you

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