Land-Use and Urban Transport Planning
Questions

- Name advantages and disadvantages of a dense city?

- How useful can it be to separate working, living and services in a city?
### Urban Transport Challenges

<table>
<thead>
<tr>
<th>Topic</th>
<th>Details</th>
</tr>
</thead>
</table>
| **Growing Economy:**          | - Increased Car Ownership  
- Increased Traffic Volumes  
- Increased congestion                                                                                                               |
| **Urban Sprawl:**             | - More car dependency  
- Increased trip lengths  
- High costs for extending infrastructure and services                                                                               |
| **Climate Change:**           | - Global warming  
- Higher emission levels  
- Air and noise pollution                                                                                                               |
| **Road Safety:**              | - Increased speed  
- Increased conflicts among modes  
- Increased accidents and                                                                                                                |
| **Energy Consumption**        | Transport consumes 30% of total energy  
- Increased demand for fossil fuel  
- Increased GHG emissions                                                                                                                 |
- Greater demand for space
- Greater impact on health and environment
- Greater impact on traffic
- Greater demand for travel
- Living areas often far away from commercial activities

Source: Claudio Olivares, based on Wuppertal Institute
Solutions: What to do?

Sustainable Solution

Over time, achieving greater sustainability in transport means ...

... investing in schemes and initiatives that improve **ACCESSIBILITY** and developing more effective transit cities.

Transmilenio, 2005
Urban Transport Planning Approaches

Traditional Approach

Known as

Automobile centered Approach

Sustainable Approach

Contemporary Approach, planning to improve access
Effects of Car Oriented Approach Planning
How is space being used?
All traffic concentrates on few arterial roads.

Delhi: current situation

China: The Future we are heading to?
A typical zoning plan in the automobile oriented approach

Large blocks of uniform land use. Minimal mixed use zones

Uniform housing typology in each residential block

Single business district; unidirectional traffic movement inward in the morning and outward in the evening

Impact of current growth trend on City:

- Low-rise low-density development consumes unending amounts of land.
- Travel distances increase due to lack of mixed-use and increase vehicular pollution.

Schematic representation of current MPD norms implemented in Urban Extension

Sprawled low-density development consumes more open land.
A residential suburb in the automobile oriented approach

- Low rise, low density; expansive development
- Distant suburb located far away from the business district
- Completely residential, with no mixed land use
- Uniform housing typology, similar income category
- Connected streets, but not very permeable

The business district in the automobile oriented approach

Uniformly commercial / business land use. Far from residential areas

High rise developments. Inhuman scale

Floating population. Shuts down at night, leading to problems of safety and security

Houston, TX, USA – Source: http://www.photohome.com/pictures/texas-pictures/houston/downtown-houston-4a.jpg
Road hierarchy in the automobile oriented approach

Connected like tree branches; small local streets connect to bigger collector streets, which connect to bigger arterial roads ...

Segregation by function: throughfare (faster) v/s access (slower)

Limited permeability prevents moving between same level streets, without entering a higher level street
Planning Level - Failure of Existing Transport Network

Traffic dependent on major arterial roads even for short Local Trips!
Road infrastructure in the automobile oriented approach

Massive roads, with costly infrastructure like grade separation

Requires huge tracts of land

Unidirectional traffic congestion: toward the business district in the morning and towards the suburbs in the evening

Experience in the developing world ...

... Kathmandu is not very far behind

- Development of townships far from the city center
- Homogenous form. Predominantly residential. No mixed use
- Connected to the city center by broad roads, encourages automobile use.
- Ad-hoc development; no public transport, NMT networks planned
...so, what is the impact of the Traditional/automobile oriented approach to land use and transport planning?
...everybody has to buy a car!

Urban private motorisation in Africa: Doubling the fleet in 15 years
Example Nairobi

<table>
<thead>
<tr>
<th>Year</th>
<th>2004</th>
<th>2010</th>
<th>2015</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>207,339</td>
<td>327,366</td>
<td>486,207</td>
<td>716,138</td>
</tr>
</tbody>
</table>

Source: (Adopted) Study on Master Plan for Urban Transport in the Nairobi Metropolitan Area, 2006
Traditional Approach

Congestion, Pollution and Accidents

- Rampant increase in automobile ownership and usage (up to 14% in Maroc)
- Incessant traffic jams
- Fatalities and injuries due to accidents

1.6 million road fatalities every year worldwide!
Air and Noise Pollution

Top 30 most polluted cities in the world


Source: World Health Organization
High density / compact development

High density does not necessarily mean high-rise

- High rises require large setback that result in similar density as low rise development

- Mid-rise development (say 80% residences in 6-10 storey apartments) is optimal.

- It is important to note that most S. Asian cities already have high densities

Historically, cities were compact

Automobile oriented planning led to expansive cities

Population Density

- Densities in 7 major cities at the same scale in a 3 dimensional view

Source: Alain Bertaud
Comparative average population densities in built-up areas in 48 metropolitan areas

source: "Order Without Design" Alain Bertaud, 2003
http://en.wikipedia.org/wiki/List_of_cities_proper_by_population_density
KAMPALA: 1,7 mio / 9400/squkm

NAIROBI: 3,5 mio / 4850/squkm

ADDIS ABABA: 3,1 mio / 5100/squkm

Population size & density
(African average yearly urbanisation: 4%)

LAGOS:
12,1 mio / 19000/sqkm

DAR ES SALAAM:
4,4 mio / 3200/sqkm

Urban Density & Carbon Intensity

Transport-related energy consumption
Gigajoules per capita per year

Urban density and transport-related energy consumption


North American cities
Australian cities
European cities
Asian cities

Urban density
Inhabitants per hectare
To sum up, the traditional automobile oriented approach of planning has resulted in

Increased number and length of trips means:

- increased expenses on fuel,
- traffic congestion,
- strain on road infrastructure,
- increase in number of accidents/fatalities,
- excessive dependence on roads,
- adverse impact on human health.

To address the dynamic complexities of urban systems, a multi-disciplinary, Integrated Planning Process is needed.
Strategies to solve the problem

• Avoid sprawl
• Encouraging mixed Land Use
• Dense, compact development
• Transit oriented development
• Good urban design (buildings AND public realm)
• Not too much land for roads and parking (normally between 10 and 25% of land in a city, in US can be up to 45%, incl. parking)
The principles of the sustainable approach

- High density, compact development
- Mixed land uses
- Transit oriented development
- Pedestrian / NMT scale
Mixed-Use Norms create: Safety, Vibrancy & Reduced Travel Demand
Objectives - Integration of Transport and Land-use

• To increase access to Public Transport, Walking and Cycling so as to reduce dependency on personalized modes.

• To encourage people to travel short distances and make fewer trips.

• To encourage compact mixed use development near new or existing public transportation infrastructure that provides housing, employment, entertainment and civic functions within walking distance of transit.

• To reduce the fuel and energy consumption in the motorized forms of transport, reducing pollution and adverse impact on natural environment.
How to achieve Integration?

The most important task for any transport planning is to ensure accessibility.

Establish relation between mobility and accessibility

- **Accessibility**: The ease of reaching the desired destination
- **Mobility**: The movement required to achieve access (e.g. Walking, cycling, driving, public transport)

Transportation Policies, investments affect the accessibility, mobility and also the connectivity.

The kind, size and location of a particular land can have direct effect on transport system.
Current Norms encourage Large block sizes: increase walking distances, thus encouraging vehicle use.
Finer Street Network would increase Connectivity & provide short-cuts by foot or cycle.
Achieving Landuse – Transport Integration

Transit Oriented Development
What is Transit Oriented Development?

A Transit Oriented Development (TOD) is a mixed-use residential or commercial area designed to maximize access to public transport and incorporates features to encourage transit ridership.

Also Known as “Smart Growth”

Design for a livable, sustainable future!
TOD Features

- A vibrant mix of uses, including:
  - Residential
  - Retail
  - Office
  - Commercial
  - Institutional

- Thoughtfully designed community spaces, parks
- Exciting, pedestrian friendly areas for live, work and play
- Transit Station as prominent feature
1. **Density**
   Increased density tends to reduce per capita automobile travel and increase public transport ridership.

2. **Diversity**
   The more diverse the land uses, lesser the need to travel outside the area. Think of a well connected area with jobs, housing & shopping avenues within a small radius.

3. **Design Elements**
   These include elements such as footpaths & safe roadway crossings for pedestrians, safe & efficient bicycle paths, and a closely spaced grid-like roadway network.

4. **Destinations**
   This variable represents the attractiveness or vibrancy of an area. Availability of jobs or shopping areas for instance would influence this variable.

5. **Distance to Transit Service**
   The closer a transit stop, higher the probability of a transit trip in lieu of a trip by personal automobile.
Encourage Compact and Mixed Land use

- Mixed Land-use reduces the necessity to make some trips
- Distance traveled is greatly reduced
- Increases share of NMT

Source: GTZ Photo DVD
Mixed Land Use within accessible distance of transit stops
Pedestrian friendly connections to encourage walkability
Place Making: vibrant places, inclusive communities
TOD Plan

Influence Zones of Transit Stops

- Core station area (400m): Pedestrian access generates a significant portion of transit trips.
- Primary catchment area (800m): Bike and pedestrian access are major contributors to ridership.
- Secondary catchment area (1.5 km): Bike, feeder transit, and auto are the primary access modes to and from the stop or station.
Transit Oriented Development (TOD)

Transit users benefits:
- More destinations near transit stations
- Better walking conditions
- Increased security near transit stations

Transit operator benefits:
- Increased ridership
- Lower costs per rider
- Better image

Benefits to society:
- Reduced traffic
- Reduced public infrastructure / service costs
- Community liveability
- Increased property values / business activity / tax revenues

Source: Litman, 2006
Impact of TOD Policy on City:

- TOD Policy brings the planned population close to the transit neighborhoods.
- It releases more Green Open Space through Compact Development.
- High-density mixed-use cuts down travel demand, thus reducing vehicle kilometres travelled (VKT), and thus reduces pollution.

Schematic representation of proposed TOD norms implemented in Urban Extension

TOD densifies city along transit Stations – while other parts of city can remain at lower height/density, enabling more land to be for Green Open Space.
.....what are the **Policy Interventions needed** for the success of TOD?
Policy Interventions -1

• Govt. to locate public facilities (schools, colleges, recreational centers, etc.) along PT corridors

Example: Bogota built several schools along TransMilenio corridor

http://thecityfix.com/blog/boosting-property-values-near-brt/
Policy Interventions -2

• Priority to be given to Transit Centers and corridors when public investments are made to improve footpaths, roads, parks, public utilities and services such as water, sewage, electricity, etc.

Example: Rhode Island Transportation Improvement Plan (TIP) gives priority to projects that encourage compact development. Less money is spent on expanding roads.

Policy Interventions -3

• Zoning Codes – up zoning areas along transit corridors; down zoning areas off transit corridors

Example: In Curitiba, high-rise development is allowed only along BRTS corridors. This has resulted in striking increase in ridership

Curitiba High-rise towers flank iconic tubular bus stations. Note the modern buses.
http://www.coha.org/bus-rapid-transit-and-the-latin-american-city-successes-to-date-but-miles-to-go/
TOD Case: Curitiba, Brazil

1974

2006
Way forward for Integrated Planning
1. Pedestrian & NMT Friendly Environment

2. Connectivity and Network Density

3. Multi-Modal Interchange
4. Inducing Modal Shift

5. Placemaking and Ensuring Safety

6. High Density, Mixed-use, Mixed-Income Development
Connectivity Norms

Create dense networks of streets and paths for all modes.

Incomplete Road Network

Complete Vehicular Road Network @ 250m c/c
Complete Pedestrian Network @ 50-150m c/c
Example: Dwarka - Existing Street Grid
Example: Dwarka - Proposed Retrofitted Street Grid
Directions for the future

1. Policymakers’ positive views towards sustainable transport
2. Improve quality of service of public transport
3. Change Citizens’ negative perception of public transport, bicycles and walking
4. Change people’s feeling of a car as something very important
5. Improve citizen’s behavior towards road safety
6. Ensure Institutional Integration and Capacity Building

Goal: Change people’s travel choices
Do we have answered our initial questions ?

• Name advantages and disadvantages of a dense city?
• How useful can it be to separate working, living and services in a city?
Thank you!

GIZ SUTP project
sutp@sutp.org
transport@gtz.de