Specialized Technical Session on Sustainable Transport

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Sustainable Urban Transport Index (SUTI) for Asian Cities

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### Traffic Congestion in Asian Cities

<table>
<thead>
<tr>
<th>Rank</th>
<th>World Rank</th>
<th>City</th>
<th>Country</th>
<th>Congestion Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Mumbai</td>
<td>India</td>
<td>65% ▼ 1%</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>New Delhi</td>
<td>India</td>
<td>58% ▼ 4%</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
<td>Jakarta</td>
<td>Indonesia</td>
<td>53% ▼ 8%</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>Bangkok</td>
<td>Thailand</td>
<td>53% ▼ 2%</td>
</tr>
<tr>
<td>5</td>
<td>18</td>
<td>Chongqing</td>
<td>China</td>
<td>44% —</td>
</tr>
<tr>
<td>6</td>
<td>19</td>
<td>Tel Aviv</td>
<td>Israel</td>
<td>42% ▼ 2%</td>
</tr>
<tr>
<td>7</td>
<td>20</td>
<td>Zhuhai</td>
<td>China</td>
<td>42% —</td>
</tr>
<tr>
<td>8</td>
<td>23</td>
<td>Guangzhou</td>
<td>China</td>
<td>42% —</td>
</tr>
<tr>
<td>9</td>
<td>25</td>
<td>Tokyo</td>
<td>Japan</td>
<td>41% —</td>
</tr>
<tr>
<td>10</td>
<td>30</td>
<td>Beijing</td>
<td>China</td>
<td>40% —</td>
</tr>
</tbody>
</table>

% change in travel time

Source: Tomtom Traffic Index 2018
Rail based MRT in Asian Cities

![Graph showing the total rail length (km) for different cities. The y-axis represents the total rail length, and the x-axis lists the cities including Almaty, Changchun, Tbilisi, Chennai, Shijiazhuang, Tashkent, Dongguan, Bangalore, Changsha, Ankara, Ningbo, Bangkok, Hangzhou, Kuala Lumpur, Suzhou, Chengdu, Istanbul, Tehran, Tianjin, Hong Kong, Wuhan, Singapore, Chongqing, Delhi, Nanjing, Shenzhen, Guangzhou, Tokyo, Moscow, Seoul, Beijing, Shanghai.]
Public transport mode share in Asian cities
Urban Mobility in Asian cities

- Cities with good example of public transport: Tokyo, Singapore, Seoul, Hong Kong, China
- Mass transit system: Bangkok, Beijing, Delhi, Jakarta, Kuala Lumpur, Moscow, Tehran, Lucknow, etc.
- Bus Rapid Transit: Many cities in China (20) and India (8)
  - 44 Asian cities, 1624 route Km, 9.47 mil passengers/day
  - Tehran highest capacity-2 m, Jakarta longest route-207 km
- Cities of least developed and land locked countries
  - Mass transit: Almaty, Baku, Tashkent and Yerevan
  - Public mass transport in still developing stage
- Non-Motorized Transport: A significant population depends on walking & bicycling
- Bus service, para-transit, private vehicles
## Capital costs of development of different mass transit systems

<table>
<thead>
<tr>
<th>City</th>
<th>Type of system</th>
<th>Length, Km</th>
<th>Cost per km (mil $/km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Janamarg, Ahmedabad</td>
<td>BRT</td>
<td>82</td>
<td>2.4</td>
</tr>
<tr>
<td>Kuala Lumpur (PUTRA)</td>
<td>Elevated rail</td>
<td>29</td>
<td>50.0</td>
</tr>
<tr>
<td>Kuala Lumpur Monorail</td>
<td>Monorail</td>
<td>8.6</td>
<td>38.1</td>
</tr>
<tr>
<td>Bangkok (BTS)</td>
<td>Elevated rail</td>
<td>23.7</td>
<td>72.5</td>
</tr>
<tr>
<td>Beijing Metro</td>
<td>Metro rail</td>
<td>113</td>
<td>62.0</td>
</tr>
<tr>
<td>Shanghai Metro</td>
<td>Metro rail</td>
<td>87.2</td>
<td>62.0</td>
</tr>
<tr>
<td>Bangkok MRTA</td>
<td>Metro rail</td>
<td>20</td>
<td>142.9</td>
</tr>
<tr>
<td>Hong Kong Subway</td>
<td>Metro rail</td>
<td>82</td>
<td>220</td>
</tr>
</tbody>
</table>

*Source: Wright and Hook, 2007 and D. Hidalgo and A. Carrigan, 2010*
Transport Mitigation Strategies of Asia-Pacific Countries

- Improved Fuel & Vehicle Standards
- Intelligent Transport Systems
- Energy Efficiency Strategies
- Fuel Economy Standards
- Green Freight
- Public Transport - Metro
- Inspection & Maintenance
- Road Infrastructure Development
- E-Mobility
- Bio Fuels, LPG, CNG
- Public Transport - Bus
Sustainable Urban Transport Index (SUTI)

- To **measure sustainability** of urban transport and progress towards SDG target 11.2
- To help **summarize, compare and track** the performance of urban transport in cities
- To **facilitate** discussion to develop plans and policies to improve urban transport

**Simple Approach:**
- Not too many indicators
- Not complex calculations,
- Simple, based on existing methodology, policies

**Framework:** Sustainable Development, Sustainable Mobility, relevant SDG targets
Identification of potential indicators

- Extensive literature review of indicators
- 420 individual urban transport indicators identified
- Reduced to a **shortlist** of 20 most relevant indicators
- **Subjectively scored** using two sets of criteria
  - **Relevance** for Sustainable Transport framework
  - **Methodological** quality
- **Consultative process with cities, countries and experts**
- Reviewed & agreed at two UNESCAP meetings:
  - Expert Group Meeting, Kathmandu, September 2016
  - Regional Meeting, Jakarta, March 2017
- Resulting list of **10 indicators** in **four domains**:
  - Transport system, Social, Economic & Environmental domain
## 10 SUTI Indicators

<table>
<thead>
<tr>
<th>No</th>
<th>Indicators</th>
<th>Measurement units</th>
<th>Weights</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Extent to which transport plans cover public transport, intermodal facilities and infrastructure for active modes</td>
<td>0 - 16 scale</td>
<td>0.1</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>Modal share of active and public transport in commuting</td>
<td>Trips/mode share</td>
<td>0.1</td>
<td>10</td>
<td>90</td>
</tr>
<tr>
<td>3</td>
<td>Convenient access to public transport service</td>
<td>% of population</td>
<td>0.1</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>Public transport quality and reliability</td>
<td>% satisfied</td>
<td>0.1</td>
<td>30</td>
<td>95</td>
</tr>
<tr>
<td>5</td>
<td>Traffic fatalities per 100,000 inhabitants</td>
<td>No of fatalities</td>
<td>0.1</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Affordability – travel costs as part of income</td>
<td>% of income</td>
<td>0.1</td>
<td>35</td>
<td>3.5</td>
</tr>
<tr>
<td>7</td>
<td>Operational costs of the public transport system</td>
<td>Cost recovery ratio</td>
<td>0.1</td>
<td>22</td>
<td>100</td>
</tr>
<tr>
<td>8</td>
<td>Investment in public transportation systems</td>
<td>% of total investment</td>
<td>0.1</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>9</td>
<td>Air quality (pm10)</td>
<td>μg/m3</td>
<td>0.1</td>
<td>150</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>Greenhouse gas emissions from transport</td>
<td>CO2 Eq. Tons</td>
<td>0.1</td>
<td>2.75</td>
<td>0</td>
</tr>
</tbody>
</table>

**SUM**: 1.00
Normalization & SUTI Calculation

Linear Normalization of indicators 1-100 scale

\[ Z_{i,c} = \frac{(X_{i,c}) - (X_{\text{min},i})}{(X_{\text{max},i}) - (X_{\text{min},i})} \times 100 \]

\[ \text{SUTI} = \sqrt[10]{i_1 \times i_2 \times i_3 \ldots i_{10}} \]

Where \( i_1 \ldots i_{10} \) are the indicators

**Geometric mean** method chosen (similar to HDI)

‘Equal weight’ to each SUTI indicator is applied
SUTI-Publication, Data Collection Guidelines & Excel Calculation Sheet

Monograph Series - Assessment of Urban Transport Systems

Data Collection Guideline
http://www.unescap.org/events/capacity-building-workshop-sustainable-urban-transport-index-suti

SUTI Excel Sheet
## Data entry and normalization

**B1 DATA ENTRY**

Enter city data below. Replace '0' with actual value. Add year if different from year in A. GENERAL INFO sub-sheet.

<table>
<thead>
<tr>
<th>#</th>
<th>Indicators</th>
<th>Natural units</th>
<th>Weights</th>
<th>Range</th>
<th>COMMENTS ABOUT DATA SOURCES OR ISSUES RELEVANT FOR INTERPRETATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Extent to which transport plans cover public transport, intermodal facilities and infrastructure for active modes</td>
<td>0 - 16 scale</td>
<td>0.1</td>
<td>0</td>
<td>16</td>
</tr>
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<td>2</td>
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<td>% of trips</td>
<td>0.1</td>
<td>10</td>
<td>90</td>
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<td>30</td>
<td>95</td>
</tr>
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<td>5</td>
<td>Traffic fatalities per 100,000 inhabitants</td>
<td>% fatalities</td>
<td>0.1</td>
<td>35</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Affordability – travel costs as share of income</td>
<td>% of income</td>
<td>0.1</td>
<td>35</td>
<td>3.5</td>
</tr>
<tr>
<td>7</td>
<td>Operational costs of the public transport system</td>
<td>Cost recovery ratio</td>
<td>0.1</td>
<td>22</td>
<td>175</td>
</tr>
<tr>
<td>8</td>
<td>Investment in public transportation systems</td>
<td>% of total investment</td>
<td>0.1</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>9</td>
<td>Air quality (pm10)</td>
<td>µg/m³</td>
<td>0.1</td>
<td>75</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>Greenhouse gas emissions from transport</td>
<td>Tons/cap</td>
<td>0.1</td>
<td>2.75</td>
<td>0</td>
</tr>
</tbody>
</table>

**MUST SUM TO 1**

**B2 NORMALIZATION (AUTOMATIC INTERMEDIATE CALCULATION)**
SUTI Assessment in Asian Cities

Bhopal
SUTI: 42.33

Surat
SUTI: 60.92

Regional SUTI Workshop, Colombo, 2017
Workshop on Urban Mobility, Dhaka, Sept. 2018
Regional Workshop Hanoi, Hanoi, 2019

2019 cities: Thimphu, Ulaanbaatar, Khulna, Bhopal, Tehran
Application of SUTI in 2018

--- Bandung ---
Geometric mean: 46.42

--- Dhaka ---
Geometric mean: 47.76

--- Ho Chi Minh ---
Geometric mean: 24.97

--- Surabaya ---
Geometric mean: 35.01
Greater Jakarta: 52.5

Hanoi: 32.2

Colombo: 47.8

Kathmandu: 16
Key findings

- Much focus on planning but weak implementation
- Low mode share of Public Transport
- Various degree of accessibility
- Public perception low - quality and reliability of service
- Safety – looks good - concentration of population
- Low investment in Public Transport
- Mostly affordable - but operational costs - mostly subsidized
- Poor air quality
- GHG from transport still not concern
Innovative Examples

Suroboyo Public Bus

Purabaya Bus Terminal

Public Transport-BRT

Electric Mobility
Concluding Remarks

- Focus on implementation of mobility strategies & plans
- Strengthen capacity of different layers of government
- SUTI endorsed as a tool to measure sustainability of urban mobility by the Committee on Transport, 2018
- Track progress over time (2 yr) & compare with peer cities
- Reporting through Voluntary National Review (VNR) at HLPF
- Data collection, availability and standardization
- Expand application in African cities, countries
- UNESCAP ready to collaborate - with African cities/countries & partners - SSATP, ReCAP, UNHABITAT, UNECA
Thank you

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