Sustainability Assessment of Urban Public Transport System:
Sustainable Urban Transport Index (SUTI)

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Global & Regional Mandates on Urban Mobility

- **Target 11.2**: By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons.

- **New Urban Agenda, 2016**
  - Promote access for *all-safe, affordable, sustainable urban mobility*
  - TOD
  - Develop Comprehensive Mobility Plan
  - Develop *mechanisms and frameworks*
  - Greater *coordination of implementation*

- **Regional Action Programme on Sustainable Transport Connectivity (2017-2021):** Sustainable urban transport
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
### 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% (↑ 0%)</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% (↑ 0%)</td>
</tr>
<tr>
<td>8</td>
<td>23</td>
<td>Guangzhou</td>
<td>China</td>
<td>42% (↑ 0%)</td>
</tr>
<tr>
<td>9</td>
<td>25</td>
<td>Tokyo</td>
<td>Japan</td>
<td>41% (↑ 0%)</td>
</tr>
<tr>
<td>10</td>
<td>30</td>
<td>Beijing</td>
<td>China</td>
<td>40% (↑ 0%)</td>
</tr>
</tbody>
</table>

% change in travel time

Source: Tomtom Traffic Index 2018
Public transport mode share in Asian cities
## 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>

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>Range</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>
</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>
</tr>
<tr>
<td>3</td>
<td>Convenient access to public transport service</td>
<td>% of population</td>
<td>0.1</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>Public transport quality and reliability</td>
<td>% satisfied</td>
<td>0.1</td>
<td>30</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>
</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>
</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>
</tr>
<tr>
<td>8</td>
<td>Investment in public transportation systems</td>
<td>% of total investment</td>
<td>0.1</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>Air quality (pm10)</td>
<td>μg/m3</td>
<td>0.1</td>
<td>150</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>
</tr>
</tbody>
</table>

**SUM** | **1.00**
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>VALUE</th>
<th>YEAR</th>
<th>COMMENTS ABOUT DATA SOURCES OR ISSUES RELEVANT FOR INTERPRETATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>2017</td>
<td>Score is based on 'Prime Minister’s Decision No. 568/QD-Ttg: Approval for transportation development planning of Ho Chi Minh city by 2020, with a vision after 2020.</td>
</tr>
<tr>
<td>28.52</td>
<td>2017</td>
<td>Data is based on an update of travel survey, Ho Chi Minh DOT reports, 2017</td>
</tr>
<tr>
<td>75.77</td>
<td>2017</td>
<td>Based on Hanoi DOT reports, 2017</td>
</tr>
<tr>
<td>41.77</td>
<td>2017</td>
<td>Based on research &quot;Survey of people satisfaction indicator on public services in 2017&quot;</td>
</tr>
<tr>
<td>8</td>
<td>2017</td>
<td>Based on official police reports, 2017</td>
</tr>
<tr>
<td>5.71</td>
<td>2017</td>
<td>Based on bus ticket fare level and average income of citizen</td>
</tr>
<tr>
<td>22.1</td>
<td>2017</td>
<td>The data are for the 13 companies offering public bus service in the city</td>
</tr>
<tr>
<td>13.3</td>
<td>2017</td>
<td>Based on average transport investments by the city for the five years 2013-2017</td>
</tr>
<tr>
<td>29.96</td>
<td>2017</td>
<td>Data for four monitoring stations managed by Vietnam Environment Administration. The values are averaged by estimate of population exposed per city area (station 1 = 23.88%; station 2 = 76.12%);</td>
</tr>
<tr>
<td>0.38</td>
<td>2017</td>
<td>Based on estimate of traffic volumes (car, bus, motorcycles) on city road network for 2016, and average national emission factors per traffic mode</td>
</tr>
</tbody>
</table>

**B2 NORMALIZATION (AUTOMATIC INTERMEDIATE CALCULATION)**

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Natural units</th>
<th>Weights</th>
<th>Range</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<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></td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>Modal share of active and public transport in commuting</td>
<td>% of trips</td>
<td>0.1</td>
<td></td>
<td>10</td>
<td>90</td>
</tr>
<tr>
<td>Convenient access to public transport service</td>
<td>% of population</td>
<td>0.1</td>
<td></td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>Public transport quality and reliability</td>
<td>% satisfied</td>
<td>0.1</td>
<td></td>
<td>30</td>
<td>95</td>
</tr>
<tr>
<td>Traffic fatalities per 100,000 inhabitants</td>
<td>% fatalities</td>
<td>0.1</td>
<td></td>
<td>35</td>
<td>0</td>
</tr>
<tr>
<td>Affordability – travel costs as share of income</td>
<td>% of income</td>
<td>0.1</td>
<td></td>
<td>35</td>
<td>3.5</td>
</tr>
<tr>
<td>Operational costs of the public transport system</td>
<td>Cost recovery ratio</td>
<td>0.1</td>
<td></td>
<td>22</td>
<td>175</td>
</tr>
<tr>
<td>Investment in public transportation systems</td>
<td>% of total investment</td>
<td>0.1</td>
<td></td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>Air quality (pm10)</td>
<td>μg/m3</td>
<td>0.1</td>
<td></td>
<td>75</td>
<td>10</td>
</tr>
<tr>
<td>Greenhouse gas emissions from transport</td>
<td>Tons/cap</td>
<td>0.1</td>
<td></td>
<td>2.75</td>
<td>0</td>
</tr>
</tbody>
</table>

MUST SUM TO 1
SUTI Assessment of Indian 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: 46.24

--- Dhaka ---
Geometric mean: 47.96

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

--- Surabaya ---
Geometric mean: 35.01
SUTI Pilot Application, 2017

Greater Jakarta

52.5

Greenhouse gas emissions from transport
Modal share of active and public transport in transport
Convenient access to public transport service
User satisfaction with public transport service
Traffic fatalities per 100,000 inhabitants
Affordability – travel costs as part of income

Hanoi

32.2

Greenhouse gas emissions from transport
Modal share of active and public transport in transport
Convenient access to public transport service
Public transport quality and reliability
Traffic fatalities per 100,000 inhabitants
Affordability – travel costs as part of income

Colombo

47.8

SUTI Pilot Application, 2017 Workshop, Colombo, Oct 2018

Kathmandu

14

Greenhouse gas emissions from transport
Modal share of active and public transport in transport
Convenient access to public transport service
Public transport quality and reliability
Traffic fatalities per 100,000 inhabitants
Affordability – travel costs as part of income
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

- Electric Mobility – Shenzhen, China, Nepal
- Public Transport - Metro, Bus, BRT: China, India, (Surat)
- Suroboyo Public Bus - Surabaya
- Infrastructure for walking & cycling
- Purabaya Bus Terminal
Concluding Remarks

- Focus on implementation of mobility strategies & plans
  - Increase accessibility
  - Integration of services (Bus, BRT, Metro, LRT, NMT) and fare
  - Convenience - Integrated Transfer Stations
  - Affordability - how to make operation sustainable - public good

- Financing - Transport sector still has less projects in carbon financing, GEF, GCF and CDM - develop bankable projects
  - Other financing approaches PPP, value capture

- Strengthen capacity of different layers of government to implement - planning, management and governance

- SUTI tool to assess sustainability of urban transport systems and policies & track progress over time, VNRs
Thank you

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