Data needs and way forward for planning and assessment of urban transportation systems in Asian cities

Mar. 2, 2017

Sungwon Lee, Ph.D.
Senior Research Fellow
The Korea Transport Institute
Contents

About KOTI (Korea Transport Institute)

1. Overview of ST in Asian cities
2. Needs for ST and Scientific Policy Intervention
3. The Way forward and data availability
4. How to proceed?
About KOTI (Korea Transport Institute)
Function and Role

- **Comprehensive research institute for transport and logistics**
  - Developing nation-wide policy in the transport sector

- **Role as a National Think-Tank**
  - Developing transport strategies and future technologies to create a new growth engine

- **Hub for Global Transport Cooperation**
  - Managing KSP (Knowledge Sharing Program) and global cooperation
Support from the national and local governments

- Prime Minister’s Office
- Ministry of Land, Infrastructure and Transport
- KOTI
- Local Governments

NRCS
New KOTI Building in Sejong City
Transport Challenges in Asian Cities

- Asian megacities are experiencing huge challenges as a result of rapid urbanization and motorization.

- Recently, greenhouse gas emission and the possibility of global warming have become the main environmental concern in the transport sector.

- Transport sector is the dominant source of urban air pollution, traffic congestion and noise disturbance in most cities in the world.
  - 20 – 30% of total energy consumption
  - More than 90% of air pollutant emission in urban areas

- Controlling transport activity and thus energy consumption in the transport sector has been regarded as very difficult.

- Public transport has huge potential for reducing transport related social costs, especially in Asian mega-cities.
Urban Transport in Asian Mega-cities

Taxi in Colombo, Sri Lanka

Bus in Manila, Philippines

Subway in New Delhi, India

Downtown Beijing, China
Comparison of Cities

Leipzig, Germany

Dallas, United States

Sejong City, Korea

Bike Highway in Sejong City
Needs for Scientific Transport Policy Intervention

- Huge social costs due to transport

- Congestion cost alone exceeds 27 trillion won annually (about 240 billion US dollars) in Korea

- We usually know about policy impact directions but not about effectiveness
  - This requires quantitative policy impacts analysis
  - Econometric analysis on demand elasticities

- 264 million vehicles in Asia and increasing very rapidly
  - 218 cars per 1,000 inhabitants (370 in Korea)

- Econometric methodology (SP and discrete choice modeling) for impact analysis of hypothetical transport policy measures
  - Bases for scientific transport policy intervention
SUTI and Sustainable Transport Policy

- Linkage between sustainability index and transport policy required
  - Positive relationship between transport policy and the index/indicators

- SUTI should reflect ST policy efforts

- Support for scientific ST policy making

- Best practice benchmarking
Policy Measures for Reducing Energy and GHG in Transport

- Technological innovations
  - Engine efficiency
  - Aerodynamics
  - Transmission efficiency
- Vehicle mileage standards and emission standards
  - Fuel efficiency standards
  - Emissions standards
- Fuels policy
  - Lowering sulfur contents in diesel
  - Improving gasoline, additives, benzene or toluene levels
- Alternative fuels
  - Electric and hybrid vehicles
  - Fuel cells
  - Hydrogen and CNG
- Infrastructure for environmental sustainability
  - Rail and water transport related infrastructure
  - Bicycle roads
  - Infrastructure for intermodal transport
- Inspections and maintenance
  - In-use vehicle management
- Travel demand management (TDM)
  - Fuel and road pricing
  - Parking policy
  - Public transport promotion
- Traffic flow management
  - Signal synchronization
  - ITS
- Educational campaigns and information
- Controlling travel demand
  - Land use planning
  - Telecommuting and teleconferencing
### Estimation Results of Mode Choice Behavior of Car Users in Korea

<table>
<thead>
<tr>
<th>Variables</th>
<th>car → bus</th>
<th>car → bus + subway</th>
<th>car → subway</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>coefficient</td>
<td>t-value</td>
<td>coefficient</td>
</tr>
<tr>
<td>Car dummy</td>
<td>1.6362</td>
<td>5.505</td>
<td>0.99752</td>
</tr>
<tr>
<td>Fuel price</td>
<td>-1.01E-04</td>
<td>-3.067</td>
<td>-1.17E-04</td>
</tr>
<tr>
<td>Fare of bus or subway</td>
<td>-2.00E-04</td>
<td>-1.456</td>
<td>-1.41E-04</td>
</tr>
<tr>
<td>In-vehicle time</td>
<td>-4.21E-02</td>
<td>-8.106</td>
<td>-2.76E-02</td>
</tr>
<tr>
<td>Out-vehicle time</td>
<td>-4.41E-02</td>
<td>-3.486</td>
<td>-2.81E-02</td>
</tr>
<tr>
<td>Parking fee</td>
<td>-3.63E-04</td>
<td>-6.36</td>
<td>-2.49E-04</td>
</tr>
<tr>
<td>Crowdedness</td>
<td>0.83081</td>
<td>8.38</td>
<td>0.64431</td>
</tr>
<tr>
<td>$\rho^2$ (Rho square)</td>
<td>0.19</td>
<td></td>
<td>0.20</td>
</tr>
<tr>
<td>No. of responses</td>
<td>943</td>
<td></td>
<td>1,783</td>
</tr>
</tbody>
</table>

*Source: Sungwon Lee et al. (2008)*
Policy Implications from SP analysis in Korea

- Fuel price elasticity of demand for passenger car use → -0.078~0.171 (inelastic)
- With 50% increase in fuel price, modal change from car to bus or subway is expected at minimum 3.9% to maximum 8.5%
- Modal change from car to mass transit with 50% fare decrease → 4.35% at most
- Increase of monthly parking fee by US $33.00 → decrease car use by 13~15%
- Speed of subway improves two folds → 29% of car users transfer to subway
- Decrease out-vehicle time of transit by 10~50% → modal change up to 19%
Policy of increasing frequency of bus and subway
→ very effective for promoting use of transit modes and reducing traffic congestion in Korea
Level of service in transit modes is defined as the level of crowdedness

Decrease congestion of transit modes by one step
→ 18~25% of car users transfer to alternative modes
→ improving in-vehicle congestion is very important for promoting the use of transit modes and reducing traffic congestion in Seoul

Summary of Policy Implications

- Ineffective policy measures
- Small effect of fuel price policy
- Fare related policy (Excluding user subsidy)

- Effective policy measures
- Parking regulation or pricing policy
- Express bus, express urban trains, and HOV lanes
Distance based fare

- Subway single trips
  : fare according to distance-traveled
  (basic fare : 1,000 Korean won (1 US Dollar) up to 12 km;
   extra fare of 100 Korean won for every additional 6 km)
- Bus single trips : single fare of 1,000 won

Free of charge for transfers

- For transferring trips
  : accumulated distance-based fare system
  → (basic fare up to 10km;
   extra fare for every additional 5 km)
Bus System Modernization in Seoul

- **Exclusive Bus lane**
  - Provides faster and reliable travel within the service area
  - Attracts patronage from private vehicles

Median exclusive bus lane

Bus lane Network In Seoul
Singapore’s ERP (Electronic road pricing)
Seoul subway equipped with free wifi
Data Collection for the Index Building

- **Working Group for SUTI**
  - National delegate designation
  - WG meetings on SUTI
  - For relatively easily available data

- **Roundtable for SUTI**
  - National experts designation
  - Roundtable meetings
  - For highly processed or qualitative data
Suggestions for Data Collection Limitations

- Limitation of measuring sustainability only by readily available data
- Policy effort related indicators desired

→ Evaluation framework which employs not only measurable data but also policy efforts

In Korea, Transport Sustainability Competition among Local Governments has been implemented
Data groupings by availability levels

- Tier 1 readily available, Tier 2 for developed countries and Tier 3 for limited availability

*Possible Performance Measures*

**Tier 1**

*Indicator is useful for countries, AND measure has some standard definition.* measure is currently widely applied at all (or most) of the sampled countries; based on a scan of several countries and international sources, data are generally available.

**Tier 2**

*Indicator would be very helpful for countries, BUT currently data are only developed or available in a few countries,* measure is not consistently used, etc. This tier will have less detail on the measure but more detail on implementation (e.g., recommendations for developing better data and getting measure ready to use).

**Tier 3**

*Indicator would be very helpful for countries, BUT is currently only feasible in the countries with the most developed institutions* due to data requirements, level of analysis, or transport system characteristics. This tier will have detail on the measure itself, but also include recommendations for positioning all counties to implement the measure.
Why Focus on Indicators for Sustainable Urban Transportation?

- Provide a framework for transport sector performance
  - Relevant policy making tool
- Prioritize transport investments in areas where they are most needed
- Assess effectiveness of the investments
- Improve efficiency, transparency, and accountability through measurable results
Discussions

Thank you for your attention!

Sungwon LEE: swlee@koti.re.kr