Reformation of Mass Transportation System in Seoul Metropolitan Area

2013. 11.

Presenter: Dr. Sang Keon Lee
Co-author: Dr. Sang Min Lee (KOTI)
General Information

- Population of South Korea: 51.8 Million ('13)
- Size of South Korea: 99,990.5 km²
- South Korean Capital: Seoul
## Korea’s Pathways at a glance

### Economic Development

<table>
<thead>
<tr>
<th>Era</th>
<th>Post-war recovery</th>
<th>Economic takeoff</th>
<th>Heavy-Chem. Industry drive</th>
<th>Stabilization-Growth-Balancing-Deregulation</th>
<th>Economic Crisis &amp; Restructuring</th>
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### Territorial Development

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### Transport

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### Population (1,000 pop.)

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<tr>
<td>1950</td>
<td>20,189</td>
<td>24,989</td>
<td>31,435</td>
<td>37,407</td>
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<td>45,985</td>
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<td>1,154</td>
<td>1,994</td>
<td>3,358</td>
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### GDP ($)

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### No. Cars (1,000 cars)

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### Length of Road(km)

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<tbody>
<tr>
<td>1950</td>
<td>25,683</td>
<td>27,169</td>
<td>40,244</td>
<td>46,950</td>
<td>56,715</td>
<td>88,775</td>
<td>105,565</td>
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<tr>
<td>1960</td>
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Population and Size

- Seoul-Metropolitan Area
  
  - Regions: Seoul, Incheon, Gyeonggi
  - Radius: Seoul City 11~16 km
    Metro Seoul 48~72 km

<table>
<thead>
<tr>
<th></th>
<th>Population (million)</th>
<th>Size (㎢)</th>
<th>Density (per ㎢)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seoul</td>
<td>10.36</td>
<td>605.3</td>
<td>17,115</td>
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<tr>
<td>Incheon</td>
<td>2.66</td>
<td>1,002.1</td>
<td>2,654</td>
</tr>
<tr>
<td>Gyeonggi</td>
<td>11.11</td>
<td>10,183.3</td>
<td>1,091</td>
</tr>
<tr>
<td>Total</td>
<td>24.13</td>
<td>11,790.7</td>
<td>2,047</td>
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</table>
Changes of Urban Development

1980s
- Concentration in the city of Seoul

1990s
- 1st Generation of Suburbanization

2000s
- 2nd Generation of Suburbanization
70s: Housing Construction Promotion Act

88-92: 200M Housing Policy

2008: 150M Affordable Housing Policy

Policy:

1960
1970
1980
1990
2000
2010

New town development:

1960: Ulsan
1970: Seongnam, Gwacheon
1980: Mok-dong
1990: Five new town
2000: Nine new town
2010:
Seoul Metropolitan Area
History of Urban Transport Policies

1960
- Road Traffic Act (1961)
- Road Management Promotion Act (1967)
- National Expressway Act (1970)

1970

1980
- Urban Transport Management Promotion Act (1986)

1990
- Transport System Efficiency Act (1999)
- Promotion of Mobility Disadvantaged Persons Act (2005)
- Special Act on Managing Regional-Wide Transport for Metro Areas (1997)
- Public Transit Promotion Act (2005)

2000

2005

SOC Investment

TSM

TDM

Multimodal & Public Transit
Transport Timeline: Urban Transport

1899 - 1st tram operation in Seoul
1928 - 1st city bus service: Kyungseong
1961 - Passenger business regulation
1969 - Suspending Seoul tram
1970 - Vehicle restriction regulation in Seoul
1977 - Vehicles registration number exceeded 0.1 million
1996 - Congestion charge: Namsan 1,3 tunnel
2005 - Cheonggyecheon restoration

1912년 - Launching 1st passenger business: mini-bus services
- Taxi-hiring business
1945 - Rapid urbanization
1967 - City-operated bus between the center and outskirts
1974 - Opening of subways in Seoul
1984~85 - Introduction of TSM to deal with increasing traffic on road
1989~ - Opening of BRT in Seoul
2004 - Operation of integrated transit fare system
2006 - A promotion act for the mobility handicapped

1960 - Post-war population influx to the capital city
1970 - Rapid urbanization
1980 - Industrial city development
1990 - New town development
2000 - Multiple nuclei urban development

Sustainable development
Urban regeneration
1980’s : Chaos of Public Transportation

- Explosive urban population growth  
  Increase in # of Trips
- Lack of public transport of Subway and bus Provision
- Increase in Privately Owned Cars (As of 1985, exceed 1 million cars)
  - Decrease in bus passengers
  - Traffic Impact Analysis/TSM need to be Introduced.
1970-1990: Rapid Increase in Personally Owned Cars

- Total 127,000 – 17,941,000: 10 times increase
- Seoul 60,000 vehicles – 3,000 thousand vehicles: 50 times increase
  - Need for policy of mass transport and metropolitan transport
  - Need TDM strategy
Gridlock in Seoul in 90’s
Gridlock in Seoul in 90’s

- **Air Pollution and Energy Consumption**
  - Car centric Society

- **External Effects and Costs**
  - Traffic Accidents & Discomfort
1990-2000: Completion of 155km subway line #5,6,7,8

- World’s unique construction record: 300km construction in 30 years
2010: 540km of Urban Railway in Metropolitan Area

- Gyeongbu Line
- Gyeong-in Line
- Gyeongwon Line
- Bundang Line
- Gwacheon Line
- Gwacheon Line
- Ilsan Line
- Ansan Line

Seoul Metropolitan Subway Line No. 8

7 Central Government Metropolitan Lines

Total Length 540KM
Gridlock in Seoul in 90’s

- **Air Pollution and Energy Consumption**
  - Car centric Society

- **External Effects and Costs**
  - Traffic Accidents & Discomfort
Seoul Public Transport Reform

- Problems in bus system before the reform

- Drop in the number of bus passengers
- Financial difficulties in bus companies
- Deterioration of bus services

Public transport in Seoul

Bus industry operated by private company

Expansion of metro system
Revitalizing Public Transport Market

- Traffic congestion in urban area and resulted costs are so severe to be globally competitive city
- City can not afford space for new cars
- Increasing energy price can not be accommodated by ordinary people
- People’s desire for more livable and sustainable city has increased

Public transport is only option for above requests; making better public transport to invite users left
Directions for Bus System Reform

**Problems**

- Poor management (less developed management structure, lack of transparency, accumulation of losses and subsidies)
- Routes determined by business interests (long-distance/circuitous/detour routes, overlapping/concentration inconvenience associated with transfer, difficulty in operating new lines)
- Lack of reliability and speediness (irregular headways, difficulty in predicting arrival times, low travel speed)
- Low level of services (antiquated facilities, poor operating services, shortage of information on bus operations, inconvenience associated with late-night bus use, insufficient intermodal transfer services)

**Directions for Improvement**

- Management improvement
  - Overhaul of operations system
  - Strengthening the public functions of city buses
- Demand-oriented route restructuring
  - Expansion of new lines
  - Enhancing inter-route connectivity
- Restoration of trunk route functions, bus priority system, more rigorous implementation of bus-only lanes
- Upgrading and diversifying bus services
  - Expanding operation information services
  - Extending bus operating hours
  - Fare system reform, expanding the basic bus infrastructure

**Policy measures**

- Introduction of the semi-public bus operation system
- Introduction of a route bidding system
- Strengthening the supervisory functions
- Route redesigning centered on trunk and branch routes, reinforcing the bus-subway connectivity
- Bus Rapid Transit (introduction of median bus lanes)
- Introduction of CNG, low-floor buses, establishment of BMS and transport card system, implementing a distance-based fare system
1) Network: Operation of Four Types of Buses

- Trunk Lines · Feeder Lines · Circular Lines · Wide Area Lines

- Red: Downtown to major sub-centers
- Green: Subway to nearby residential areas
- Blue: Major trunk roads
- Yellow: Circular in downtown or sub-centers
1) **Network**: Trunk – Feeder – Circular – Inter-city Lines

- **Trunk Lines**
  - Inter-regional Lines
  - Meet the demand of private car.

- **Feeder Lines**
  - Connecting suburban areas and center cities
  - Punctuality and speediness.

- **Circular Lines**
  - Link trunk line buses or subways for easy transfer
  - Satisfy the local needs and securing accessibility.

- Circular bus service for business and shopping in urban areas.
2) Bus priority facilities for Bus Rapid Transit

- Introduction of Bus Rapid Transit (BRT)
  - Introduced in 2004 by the Seoul City Government
  - Transit Network of Median Exclusive Bus way
    * Seoul Metropolitan Area: 13 corridors, 157km (2011)
  - Provides faster and reliable travel within the service area

Median exclusive bus lane

BRT Network In Seoul
Route Map of Median Exclusive Bus Lane
### Improvements achieved through median bus lane operation

<table>
<thead>
<tr>
<th>Goals</th>
<th>Achievement indicators</th>
<th>Goal achievement rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>Travel speed (km/h)</td>
<td>16.7 (2003. 12) → 22.0 (2004. 12)</td>
</tr>
<tr>
<td>Punctuality</td>
<td>Distribution of operation intervals</td>
<td>0.69(2004. 7 curbside) → 0.56(2004. 7 median) → 0.50 (2006 2 median)</td>
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<tr>
<td>Transport efficiency</td>
<td>Number of passengers</td>
<td>Up 26.8% (2004. 12 → 2005. 12)</td>
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<tr>
<td>Cost reduction</td>
<td>Travel cost reduction benefits</td>
<td>Saving of about 225.1 billion won</td>
</tr>
</tbody>
</table>
2) Bus priority facilities : Bus & Bus & Metro Transfer Center
Establishment of public transport transfer centers in Seoul (draft plan)
Transfer Center

- Cheongnyangni Transfer Center

- Yeouido Transfer Center
3) Adaptation of ITS in Public Transit Reform

- ITS (Intelligent Transportation System) for Public Transit

- Traffic Information
- Traffic Management
- Electronic Payment
- Safety Management
- Public Transport Information
- Traffic Control Center
3) ITS: Fare Collection

- Transportation Card
  - Smart Card, etc.

- Benefits
  - Distance-based Fare
  - Free Charge for Transfers
3) ITS : Changes in Fare System

- **Distance based fare**
  - Subway single trips
    : fare according to distance-traveled
    → basic fare: 800 KRW up to 12km;
    extra fare of 100 won for every additional 6km
  - Bus single trips
    : single fare of 800 KRW

- **Free of charge for transfers**
  - For transferring trips
    : accumulated distance-based fare system
    → basic fare up to 10km;
    extra fare for every additional 5km
3) ITS : Bus Management System

- BMS: Key role for efficient management of bus services

For Passenger
- BIT
- ARS
- Mobile
- Internet
- Route and operation Info.
- Bus Arrival Time

On-board device installed on every bus

Bus Company
- Bus Location
- Allocating Buses
- Notice
- Bus Interval Info.
- Bus Operation Info.

Seoul BMS
- Real-time Bus Operation Information
- Route and Transfer Information
- Real-time Bus Operation Info.
- Bus Operation DB

- Bus real-time location Info.
- Interval and operation Info.
3) ITS : Bus Information System

- Information Display at bus stop
- Smart Phone Application
### 4) Mobility Rights: Barrier free & Environment

- **Expansion in Low Floor Buses and Convenient Facilities to secure Mobility of the Transport Vulnerable**
  - As of 2011, 3,999 Low Floor Buses are on service (adopted as a part of intra-city bus in 2004)
  - *Supply Rate in 2011: Seoul 22.1%, Nationwide 12.1% → Goal in 2016: Seoul 55%, Nationwide: 41.5%*
  - Promoting Expansion of Convenient Facilities for the Transport Vulnerable

- **Replacing Intra-city Buses with Eco-friendly Buses**
  - 100% CNG Bus Operation in Seoul as well as 6 Other Metropolitan Cities
  - 95% of Licensed City-bus (30,359) changed to CNG bus (as of 2011)
5) Key Practices Favorable to Public Transport

- **Reliability and Frequency of Transit Service**
  - Increase operating speeds
  - Prepaid tickets, Smart cards
  - Low-floor buses with wide doorways

- **Comfort, Safety, and Convenience of Service**
  - Amenities at transit stops
  - Sidewalks leading to stations
  - Uniform and simplified fare structures, Discount for transfer
  - Color-coded buses and lines

- **Transit Priority Policy**
  - High automobile taxes & fuel taxes
  - Parking limits, Restrictions on driving in certain areas
### 5) Achievements of the public transport reform in Seoul (1)

<table>
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<tr>
<th>Categories</th>
<th>Achievement indicators</th>
<th>Goal achievement rates</th>
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<tr>
<td>Speed</td>
<td>Operation speed (km/h)</td>
<td>16.7 → 22.0</td>
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<tr>
<td>Service supply</td>
<td>Operation rate (%)</td>
<td>82.5 → 96.4</td>
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<tr>
<td>Operation safety</td>
<td>Accidents (number)</td>
<td>659 → 493</td>
</tr>
<tr>
<td>Punctuality</td>
<td>Distribution of operation intervals</td>
<td>0.69 → 0.56</td>
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<tr>
<td>Affordable fares</td>
<td>Fare per trip (won)</td>
<td>620 → 592</td>
</tr>
<tr>
<td>Revenue transparency</td>
<td>Card usage rate (%)</td>
<td>77.4 → 88.9</td>
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<td>Public transport promotion</td>
<td>Modal split (%)</td>
<td>61.2 → 62.3</td>
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<tr>
<td>Improvement of the atmospheric environment</td>
<td>Particulate matter ((PM10))</td>
<td>69 → 61</td>
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<tr>
<td>Cost reduction</td>
<td>Travel cost-reduction benefit</td>
<td>Saving of about 225.1 billion won</td>
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5) Achievements of the public transport reform in Seoul (2)

<table>
<thead>
<tr>
<th>Categories</th>
<th>Units</th>
<th>Year 1996</th>
<th>Year 2002</th>
<th>Year 2003</th>
<th>Year 2004</th>
<th>Year 2005</th>
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<tbody>
<tr>
<td>Seoul population (population of the capital area)</td>
<td>1,000 people</td>
<td>10,470 (21,065)</td>
<td>10,281 (22,877)</td>
<td>10,277 (23,240)</td>
<td>10,288 (23,527)</td>
<td>10,297 (23,782)</td>
</tr>
<tr>
<td>Ridership</td>
<td>1,000 trips/day</td>
<td>27,800</td>
<td>29,680</td>
<td>29,375</td>
<td>30,344</td>
<td>31,004</td>
</tr>
<tr>
<td>Modal splits</td>
<td>%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Public transport</td>
<td></td>
<td>59.5</td>
<td>60.6</td>
<td>61.2</td>
<td>62.0</td>
<td>62.3</td>
</tr>
<tr>
<td>- (Buses)</td>
<td></td>
<td>(30.1)</td>
<td>(26.0)</td>
<td>(25.6)</td>
<td>(26.2)</td>
<td>(27.5)</td>
</tr>
<tr>
<td>- (Urban railways)</td>
<td></td>
<td>(29.4)</td>
<td>(34.6)</td>
<td>(35.6)</td>
<td>(35.8)</td>
<td>(34.8)</td>
</tr>
<tr>
<td>- Taxis</td>
<td></td>
<td>10.4</td>
<td>7.4</td>
<td>7.1</td>
<td>6.6</td>
<td>6.5</td>
</tr>
<tr>
<td>- Passenger cars</td>
<td></td>
<td>24.6</td>
<td>26.9</td>
<td>26.4</td>
<td>26.4</td>
<td>26.3</td>
</tr>
<tr>
<td>- Other modes</td>
<td></td>
<td>5.5</td>
<td>5.1</td>
<td>5.3</td>
<td>5.0</td>
<td>4.9</td>
</tr>
</tbody>
</table>
5) Achievements of the public transport reform in Seoul (3)

- Effects of New Bus System

- Increase of Public Satisfaction
- Increase of Bus Service Reliability
- Spread into other Cities in Korea
- Decrease of Bus Related Accidents
- Public Route Control
- Increase of Public Modal Share
5) Achievements of the public transport reform (Summary)

- In parallel with Passenger Car TDM, Transition to Public Transport-oriented Transport System
- With User-oriented Fare System Reform, Fare Equity Promoted
- Improvement in Accessibility and Mobility with Bus-Subway Route Integration
- Saving Competitiveness of Bus Travel by Operating Bus Priority Policy
- Setting a Scientific Foundation for Public Transportation Operation Management
- Minimizing High Costs Transport Facility Investment Demands and Social External Diseconomy
- Public-Private Partnership (PPP) Promotion
- Setting Foundation for Sustainable Transport System
5) Future Public Transportation Strategy and Vision

- Expansion in Bus/Urban Railway-oriented Public Transportation
- System Construction for Intermodal Planning and Operation with Focus on User accessibility, Convenience and Immediacy
- Transport Welfare Policy to Expand Transport Service Provision at place where transportation is underserved
- Modal Integration System Construction not only for Intra-region, but also in Inter-region
- Integrated Governance System Construction for Modal Integration Plan and Operation
5) Principles and Directions for Public Transport

**Physical Continuity**
- Securing seamless transport in terms of transport facilities
- Establishing an integrated transport system between KTX, rail and long-distance bus

**Time Minimization**
- Rationalizing operation schedule and headway to minimize transfer, access and waiting time
- Securing connectivity between hub and spoke

**Economic Utility**
- Securing a competitiveness of public transport fare (transfer discount, seasonal pass, and other various fare policies)
- Maximizing a payment convenience by one card all pass system in the nation

**Informative Convenience**
- Increasing user convenience by providing information on transport modes, transport facilities and transfer stations
- Providing real-time information on transport operation and transfer stations

**Administrative Efficiency**
- Integrating administrative service by securing inter-regional transport modes and transport service facilities
- Securing a capability to cope with unified management of fare, discount, financial resources and conflict and a fast decision-making process
Thank you so much!!!

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