Seoul’s Smart Urban Solutions

Sunghoon Kris Moon & Eunhee Roh
May 10, 2017
Seoul Urban Solutions Agency

This is not an ADB material. The views expressed in this document are the views of the author/s and/or their organizations and do not necessarily reflect the views or policies of the Asian Development Bank, or its Board of Governors, or the governments they represent. ADB does not guarantee the accuracy and/or completeness of the material’s contents, and accepts no responsibility for any direct or indirect consequence of their use or reliance, whether wholly or partially. Please feel free to contact the authors directly should you have queries.
# Table of Contents

- The Seoul Advantage
- Seoul’s Urban Solutions
  - 1. Smart Water Management
  - 2. Smart Solid Waste Management
  - 3. Smart Transportation
  - 4. Smart e-Government
- Seoul: a Smart City
- Smart City Application: Seoul’s Big Data
Table of Contents

The Seoul Advantage

Seoul’s Urban Solutions

1. Smart Water Management
2. Smart Solid Waste Management
3. Smart Transportation
4. Smart e-Government

Seoul: a Smart City

Smart City Application: Seoul’s Big Data
The Seoul Advantage

Seoul, the best partner for urban development
The Seoul Advantage

Seoul’s journey from ruins in the 1950s to a smart metropolis

Population and Area Growth

Seoul’s Gross Regional Product

GPCI(Global Power City Index)
Seoul’s Growth Trajectory

Transformation of Seoul’s urban development

Source: seoulsolution.kr
# Seoul’s Growth Trajectory

## Growth of the city

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Aftermath of the Korean War: Destruction of Seoul’s urban foundation and identity</td>
<td>Rapid post-war reconstruction to establish urban foundation</td>
<td>Expansion of city center to accommodate economic and population growth</td>
<td>Han river rejuvenation in preparation for global events – Seoul 1988 Olympics</td>
<td>Large scale urban regeneration project and new town developments</td>
<td>Installations of physical features to facilitate enhanced quality of life for Seoulites</td>
<td>Transforming to a city with a historical heritage, culture and identity</td>
<td></td>
</tr>
</tbody>
</table>

### Water Purification
- 1941: Guui water center
- 1948: Seoul Tap Water Bureau
- 5 water purification plants
- Installation of tap water pipes
- 1981: Office of water works established
- 1984: Water pipes replaced
- 1991: 100% water supply

### Waste Water Management
- Sewers 225km
- No treatment facilities
- 1976: First Sewage Treatment Plant (Jungrang)
- 1972~1976: 4 Septic Soil Sanitary Disposable Plants
- 1987: Han River Sewage Mgmt
- 1991: 100% water supply

### Solid Waste Management
- Five dump sites (no designated landfills)
- 1978: Nanji Landfill opened
- 1992: Sudokwon Landfill opened
- 1993: Nanji Landfill closed
- 1996: First Resource Recovery C. opened

### Transportation
- 1965: Express buses
- 1968: Tram ops suspended
- 1974: Subway line 1
- 1984~5: Subway lines 2~4
- 1989: Launched TSM
- 1996: Bus Card
- 2004: Public Trans. Reform/BRT

### e-Government
- Computerization
- Online connection
- Network formation
- Smart govt’ + city + society

---

**Water Purification**
- 1941: Guui water center
- 1948: Seoul Tap Water Bureau
  - 5 water purification plants
  - Installation of tap water pipes
- 1981: Office of water works established
- 1984: Water pipes replaced
- 1991: 100% water supply

**Waste Water Management**
- Sewers 225km
  - No treatment facilities
- 1976: First Sewage Treatment Plant (Jungrang)
- 1972~1976: 4 Septic Soil Sanitary Disposable Plants
- 1987: Han River Sewage Mgmt
- 1991: 100% water supply

**Solid Waste Management**
- Five dump sites (no designated landfills)
- 1978: Nanji Landfill opened
- 1992: Sudokwon Landfill opened
- 1993: Nanji Landfill closed
- 1996: First Resource Recovery C. opened

**Transportation**
- 1965: Express buses
- 1968: Tram ops suspended
- 1974: Subway line 1
- 1984~5: Subway lines 2~4
- 1989: Launched TSM
- 1996: Bus Card
- 2004: Public Trans. Reform/BRT
Seoul’s Growth Trajectory

Transforming the city

**Sangam Digital Media City**
New media cluster and park on a former landfill

**Cheonggyecheon Restoration**
Rebirth of water landscape in downtown

- **Fast development**
- **Hardware based**
- **Transformation**
- **Pursuit of high quality life**
- **Environmentally conscious**
Table of Contents

- The Seoul Advantage
- Seoul’s Urban Solutions
  1. Smart Water Management
  2. Smart Solid Waste Management
  3. Smart Transportation
  4. Smart e-Government
- Seoul: a Smart City
- Smart City Application: Seoul’s Big Data
Integrated Smart Solutions

Smart City urban planning – Focus areas

- Water
- Transportation
- Public Space & Culture
- Energy
- Housing
- Health & Education
- IT Connectivity & Digitalization
- e-Government
- Waste Management
- Safety & Security

Smart City

Infrastructure Technology

Information Technology
1. Smart Water Management

Arisu – quality tap water

**[Overview]**

- 10 million: Population served
- 3.2 million m²: Average daily production
- 4.35 million m²: Daily production capacity
- 13,846 km: Tap water piping network
- 94%: Rate of water flow

**[Inexpensive & 24/7 Supply]**

- **Production/Impose Volume & Rate of Water Maintained**
  - 100% water supply
  - 95.1% water maintained

- **Number of Water Quality Items Tested**
  - 163 items tested
  - WHO: 163
  - Seoul: 163
  - USA: 102
  - Japan: 121
  - France: 63
  - Australia: 199

**Scientific and systematic tap water operation utilizing Information Technology**

- **Arisu Combined Info System (CIS)**
  - Production Control: Weather Information, Date Information, Previous Supply Data
  - Supply Control: Effective Monitoring, Water Quality, Leaks and outage
  - Remote Control: Real-time Operation, CCTV Monitoring, Video Conferencing

**Revenue Water Ratio of the World’s Major Cities**

- KOR SEOUL: 95%
- FRA PARIS: 91%
- USA BOSTON: 84%
- UK LONDON: 74%

**Water Utilities Bill of the World’s Major Cities**
1. Smart Water Management

Waste water management

- Before 1960
  - GNI: USD 80/capita
  - Area: 268km²
  - Pop.: 2.4 mil.
  - No treatment plants
  - Sewage and night soil discharged into streams and Han River

- 1960s ~ 1970s
  - GNI: USD 1,645
  - Area: 605km²
  - Pop.: 8.3 mil.
  - Streams in Seoul severely contaminated
  - All 36 streams dangerous
  - 24 streams covered up
  - Increase in sewage volume → serious pollution

- 1980s ~ 1990s
  - GNI: USD 10,841
  - Area: 605km²
  - Pop.: 10.3 mil.
  - Greater demand to improve environment
  - Mandatory onshore treatment of sludge
  - Strengthened sewage treatment standards

- 2000 ~ Present
  - GNI: USD 20,250 (2010)
  - Area: 605km²
  - Pop.: 10.17 mil.
  - Construction sludge treatment facilities
  - Introduce advanced sewage treatment facilities
  - Transform into a facility that produces new and renewable energy
  - Ensure transparent management of the sewage treatment facilities
  - Eliminate sewer plant odor and build parks for citizens

Reconstruction and extension of sewers (225km)

- 1. Institutional arrangements and organization reform
- 2. Construction of 5,940km sewers
- 3. Open sewers were covered up
- 4. Construction of two sewage treatment facilities

Level of Han River (where waste water is released after treatment) contamination
### 1. Smart Water Management

**Development of water related policies and infrastructure**

- **1981**: Office of Water Works established
- **1984**: Water pipes replacement started
- **1991**: 100% water supply achieved

**Five water supply offices**

- **1948**: Seoul Tap Water Bureau
- **1941**: Guui Water Center

**Installation of tap water pipes**

- **1976**: First Sewage Treatment Plant (Jungrang) built
- **1972~6**: 4 Septic Soil Sanitary Disposal Plants
- **1987**: Han River Sewage Management

**225km of sewer pipes existed**

* No treatment plant

**1984**: Advanced treatment

**1998**: 99.8% Sewage treated

**2009**: 4 Water Reclamation Centers

**Sludge treatment facilities installed**
2. Smart Solid Waste Management

Seoul’s adoption and improvement of national policy on solid waste management.

1. *Waste reduction at source*
2. *Utilization of waste* 
   (recovery of material and renewable energy)

Seoul currently operates…
- Four resource recovery centers (incinerators) and
- One landfill shared by the entire Seoul metropolitan area.
2. Smart Solid Waste Management

From maximum treatment to minimum waste

Volume-based Waste Fee System

- Wastes (general, recyclables, industrial and food waste)
  - Recycling Waste
  - Food Waste
  - Industrial Waste

- Waste separation
- Volume-Based Trash Bags
- Waste Disposal Site
- Recycling Factories
- Feed Farm Animals

- Increased waste recycling
- Recycling: 35%
- Incineration: 65%
- Landfilling: Animal feed
2. Smart Solid Waste Management

Waste as resource: Yielding Economic + Environmental benefits

- Input Waste
  - Household waste
  - Organic food waste
  - Sludge
  - Construction waste

- Process
  - Incinerated
  - Remains after incineration
  - Dried and processed
  - Dried and processed

- Output
  - Electricity generated
  - Construction block
  - Animal feed
  - Coal alternative (energy blocks)

- Landfill Gas Power Plant Overview
  - City area landfill site
  - 50MW Power plant
  - Power transmission

<table>
<thead>
<tr>
<th>4+1 Centers</th>
<th>Number of resource recovery centers in Seoul + 1 landfill site for the Metro area</th>
</tr>
</thead>
<tbody>
<tr>
<td>$30 M USD</td>
<td>Worth of electricity generated to provide for 43,000 residents by burning landfill gas</td>
</tr>
<tr>
<td>850,000 CO2 tons</td>
<td>Decreased due to CDM technology and generating eco-friendly energy</td>
</tr>
</tbody>
</table>

Reference: Sudokwon Landfill Site Management Corporation www.slc.or.kr
2. Smart Solid Waste Management

Resource Recovery Centers

- **Nowon Resource Recovery Center**
  1997; 800 tons/day; SK Construction/~USD68M

- **Mapo Resource Recovery Center**
  2005; 750 tons/day; GS Construction/~USD150M

- **Yangcheon Resource Recovery Center**
  1996; 400 tons/day; SK Construction/~USD28M

- **Gangnam Resource Recovery Center**
  2001; 900 tons/day; SK Construction/~USD90M

---

Mapo Resource Recovery Center Introductory Video
2. Smart Solid Waste Management

Development of solid waste related policies and infrastructure

- 1978: Nanji Landfill begin operation
- 1992: Sudokwon Landfill begin operation
- 1993: Nanji Landfill shut down
- 1996: First Resource Recovery Center begin operation (Yangcheon)
- 2005: Food waste segregation begin
- 1995: Volume-base Waste Fee policies installed
- 1978: Nanji Landfill begin operation
- 5 trash dump sites in operation
  - No designated landfill sites

NAVY: Infrastructure  GREEN: Policies
3. Smart Integrated Transportation

Transportation infrastructure – convenient mobility

Public transportations and roads in Seoul

- 331.6km for subway
- 7,430 buses
- 72,065 taxis
- 9.5% of roads for bike
- 22.43% of land area for roads

Seamless Integration: Transfer Center connects various transportations in one place

Mode share

- Subway: 66%
- Bus: 39%
- Taxi: 27%
- Bike: 22.8%
- Train: 6.8%
- Roads: 4.4%

Amount of mobile source emissions

- 2001: 242
- 2008: 163
- 2012: 126

Unit: thound Ton
3. Smart Integrated Transportation

Transportation Reform 2004

**Issues**

1. Worsening traffic conditions with increased number of personal vehicles
2. Weakened bus industry competitiveness
3. Decreased bus service quality related to bus driver’s job insecurity
4. Increased passenger dissatisfaction
   - Irregular bus interval
   - Aggressive driving
   - Passing bus stop

**Bus Routing & Operating Systems**

- Semi-public bus operation
- Trunk & Feeder lines
- Scientific operation management

**Infrastructure**

- Median bus lanes
- Transfer center improvements
- Bus fleet improvements

**Supporting Systems**

- Integrated transit fare system
- Enhanced ICT

**Social Consensus via Citizen Committee**

**Outcome**

1. Increased bus ridership (14% from pre-reform in 2004)
2. 11% increase in public transportation ridership from 2004 to 2014
3. Increased usage of transit card (99% for bus & subway; 55% for taxis)
4. Increased satisfaction level especially on easy transfer between bus and subway
3. Smart Integrated Transportation

Optimized Bus Rapid Transit with Seamless Transfer Centers

Median Bus Lanes

Transfer Center
3. Smart Integrated Transportation

Intelligent Transportation System – TOPIS

[Transport Operation and Information Service (TOPIS)]

- Unmanned Enforcement
- Bus operations
- Road traffic
- Transportation card
- Regional Construction & Management Administration
- Seoul Traffic Broadcasting System
- Seoul Metropolitan Police Agency
- Expressway Corporation

TOPIS Operation Room

Information Supply for Citizens

[Smart Card]
Integrated distance-based transit fare system
- Free transfer between bus-bus and bus-subway, within 30 min. (max 4 times)
- Introduction of “smart card”

10km: 1,250won
5km: 100won

[ITS Units]

- Bus Information Terminal
- On Board Unit
- Traffic Information
- Route Terminal

Reference: Seoul Public Transportation
3. Smart Integrated Transportation

Development of transportation related policies and infrastructure

- 1974: Subway Line 1
- 1984~5: Subway Line 2~4
- 1996: Bus Card
- 2004: Public Trans. Reform/ Median Bus Lanes
- 2004: TOPIS/Smart Card
- 2000: Integrated ITS Plan
- 1996: Bus Card
  - 1989: Launched TSM*
  - 1984~5: Subway Line 2~4
  - 1984: 5-Year Seoul Transportation Improvement Plan
- 1974: Subway Line 1
  - 1968: Suspension of tram operations
- 1965: Operation of express buses

* TSM: Transportation System Management
4. Smart e-Government

Three objectives

- Efficiency: Providing time & cost effective civil service on online by interlinking different departments
- Transparency: Securing administrative trust via seamless access and authentic flow of information
- Citizen Participation: Improving citizen engagement in decision making via e-Governments’ various channels

[Key Elements of e-Government]

<table>
<thead>
<tr>
<th>IT Infrastructure</th>
<th>Citizen Services</th>
<th>Citizen Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT Super Highway</td>
<td>Public smartphone charging station</td>
<td>Oasis of 10 Million Imagination</td>
</tr>
<tr>
<td>Public WiFi</td>
<td>Seoul website</td>
<td>m-Voting</td>
</tr>
<tr>
<td></td>
<td>Information Communication Plaza</td>
<td>Smart complaint report</td>
</tr>
</tbody>
</table>
Facilitating citizen convenience and promoting citizen participation

Eung-dap-so
Civil complaint and proposal integrated system

mVoting
“Simply ask and all can vote”

120 Dasan Call Center
Quick QnA: Citizen-centered call center

Oasis (Oasis of 10 Million Imagination)
Bringing ideas into reality
4. Smart e-Government

A Day of Seoulites with Smart e-Government

- In the morning, check the e-mail with smart devices.
- On the way to work, get the bus arrival information at a bus stop or online (http://topis.seoul.go.kr).
- At night, check and pay taxes imposed on overseas direct purchase.
- Receiving real-time responses to any inconveniences from Complaint Center.
- During a break, cast a vote on Participatory budgeting System with smart devices.
- Make a call 120 Dasan Call Center for inquiring any questions about Seoul city life (http://120dasan.seoul.go.kr).
- At work, get messages about delivery information of parcels (https://parcel.epost.go.kr).

SEUL METROPOLITAN GOVERNMENT
Table of Contents

- The Seoul Advantage
- Seoul’s Urban Solutions
  1. Smart Water Management
  2. Smart Solid Waste Management
  3. Smart Transportation
  4. Smart e-Government
- Seoul: a Smart City
- Smart City Application: Seoul’s Big Data
**e-Government Development Phases**

**Toward Smart City**

- **1990**
  - Industrial Society Paradigm

- **1999**
  - **Phase 1**
    - Computerization
    - Build database
    - Developed website

- **2007**
  - **Phase 2**
    - Online Connection
    - Online civil complaint system
    - Integrated government resources
    - Expanded e-government service

- **2011**
  - **Phase 3**
    - Network Formation
    - Started mobile service
    - Open platform for public info
    - Online participation

- **2016**
  - **Phase 4**
    - Smart Government
    - Customized spatial service based on citizen needs
    - Two-way citizen participation through SNS
    - Smart decision-making and communication based on data

**Information Society Paradigm**
Smart City: Meaningful Connections

Leverage technology to serve its citizens and make cities more liveable

- Convenient Citizen Life
- Efficient City Management
- Transparent Governance

Information Communication Technology and Network

People

CONNECT

Information

Resources

Things
Smart City Foundation: Network & Data

Building Smart City in the period of exponential growth – a virtuous circle

- Cloud
- Data Collection
- Analytics Mechanisms
- ICT
- Smart City

- Analyze
- Judge
- Command

- Big Data

SEOU METROPOLITAN GOVERNMENT
## Connections that Generate Data

**Seoul’s sample** illustration of data that are captured at various sources

<table>
<thead>
<tr>
<th>Category</th>
<th>Data Source</th>
<th>Types of Data</th>
<th>Usage</th>
</tr>
</thead>
</table>
| Solid Waste Management | Incineration facilities            | Volume and type of waste generated, waste composition, energy generated      | Efficient City Management  
- Resource forecasting and planning  
- Water/energy supply chain management  
- Disaster management  
- Early warning system |
|                        | TOPIS (ITS)                        | Public transport, fleets, traffic speed                                        | Augment Policy Design  
- Changes in existing policies  
- Traffic light system rearrangements |
|                        | CCTV                               | Traffic, parking violations                                                   |                                                                      |
|                        | Smart Card                         | No. of passengers, OD info., transfers, distance travelled                   |                                                                      |
| Transportation         | Water quality monitoring system    | Source water quality, volume, substance                                        | New Policy Introduction  
- Based on enhanced understanding of pain points  
- Public transportation (re)routing |
|                        | Water purification facilities      | Water quality, volume, supply, production                                     |                                                                      |
|                        | Pipe leakage monitoring            | Leaking pipes by region                                                       |                                                                      |
| Water Management       | Energy meter                       | Production, supply, consumption                                               | New, Convenient Citizen Applications  
- Mobile ITS services  
- Safer public spaces |
| Energy                 | Energy meter                       |                                                                               |                                                                      |
| e-Government           | Voice of citizens                  | Citizen needs, complaints, infrastructure issues                              |                                                                      |

*Seoul Metropolitan Government*
Big Data Applications

Collected big data pool is cleansed, analyzed, communicated and utilized

Convenient Citizen Life
- Applications that makes better use of time and resources
- Safer public spaces
- Healthier city

Efficient City Management
- Optimized use of resources
- Consumption based production
- Timely execution

Intelligent Policy Solutions
- Better knowledge of citizens’ pain points and needs through big data analysis
- Intelligence-based solutions and implementation

Transparent City Governance
- Open data
- Public participation
Vision: New Connection, Different Experiences

Social City
11 Action Plans

- Citizen-led digital governance
- Strengthen citizen communication
- Align cooperation with private sector
- Vitalize public-private open data platform

Diginomics
6 Action Plans

- Vitalize start-ups and incubate ventures
- Digital economy integrated platform
- Converge digital with existing industries
- Support innovation start-ups utilizing Seoul’s big data

Digital Innovation
21 Action Plans

- Solve urban challenges through digital solutions
- Enhance quality of life through digital technologies
- Recommend policy solutions based on in-depth data analysis

Global Digital Leader

- Early adoption of cutting-edge digital technology
- Build state-of-the-art digital infrastructure
- Build capacity to grow digital business
- Share experiences with the world
Making of Seoul as a Smart City

1. Understand my city (Big Data)
2. Efficient city management (Smart ICT on infrastructure)
3. Connections that make city more liveable (IoT Living Lab)
4. Platform to stimulate economic growth
5. Intelligent policy making through Big Data Analysis
Efficient City Management

Smart ICT on Infrastructure

Smart City

- Infrastructure Technology
- Information Technology

Water

Transportation

Waste Management

e-Government
Connections that Make Cities More Liveable

Seoul’s IoT Living Lab: Solve urban challenges thru application of IoT in Bukchon

Problems in Bukchon

Residents

• Living inconvenience due to increasing tourists (noise, safety, littering, transportation issues, etc.)
• Limited development to preserve traditional Korean houses

Small/Mid-size Business

• Insufficient business vitalization
  • Accommodations
  • Food
  • Shopping
  • Souvenirs and crafts

Tourists

• No Free WiFi
• Lack of tourist information
  • Info on things to see, do and eat
• Difficulty in maneuvering the old neighborhood

• Limited development to preserve traditional Korean houses
Connections that Make Cities More Liveable

Connecting people, things and places thru concerted public-private efforts

City of Seoul

• Free public Wi-Fi
• CCTV cameras
• Multilingual contents & audio
• Open API for spatial information (Open platform for private sector to develop IoT solutions)

Private Sector

• Tourist solutions
• Resident solutions
• Community solutions

Smart garbage bins
Smart tourism
Parking lot sharing
Auto indoor temp. regulation
Children location tracker
Elderly care service
Fire prevention
Table of Contents

- The Seoul Advantage
- Seoul’s Urban Solutions
  1. Smart Water Management
  2. Smart Solid Waste Management
  3. Smart Transportation
  4. Smart e-Governance
- Seoul: a Smart City
- Smart City Application: Seoul’s Big Data
Seoul’s Policy using Big Data Analytics

Big Data @ Seoul 2015

2’55”
Big Data Application Strategy

Communicate with Citizens and Find Urban Solutions

Big data-based Policies & Services
Solving urban challenges with policies based on big data

Transportation
Welfare
Economy

Provision of Analysis Service on Platforms
Established big data sharing platforms

Integrated data storage
Improved analysis System
Strategic project identification and analysis

Realization of Social Innovation Ecosystem with Public-Private-Industry-Academia Cooperation

Operating Big Data Campus

Identifying and analyzing cooperative governance
Sharing Data Analysis Result
Creating Seoul Data Mix Zone

* Analysis performed for 25 projects, starting from Night Owl Bus in 2013
Big Data Platform

**Internal Data Collection and Load**
- SMG Work System
  - Data Search
  - Refinement/standardization
  - Connection/load

**External Data Search, Collection and Load**
- Data Search
- Consultation
- Connection/load

**Big Data Integrated Storage**

**Citizen**
- Big Data Utilization
- Citizen Participation

**Utilization of policy analysis by departments-in-charge**

Seoul Metropolitan Government
Big Data Platform

Demand based Project identification and analytics system

[ Capture Citizens’ Voice ]

"Ten Million Oasis Imagination"

Complaint Center

NPO Suggestions

Project Selection

Relevant Data Search

Big Data Analysis

Draw Insights

Offer Policy Recommendation

*NPO: Non-profit organization
Big Data Campus

Objectives

Create New Social Values with Citizen Participation

Realize Social Innovation with Citizens

Provide Big Data Analysis through Public-private-industry-academia cooperation

Share Useful Data with Citizen

Sangam Campus

Gaepo Campus
Big Data Campus

Services provided

Partnership
Free Sourcing

* Paid sourcing minimized but decided on needs basis

Big Data Campus

Public Space

Local Business District
- 42 data sets
- Real estate
- Floating population
- Statistics on the use of public transportation

Spatial Data Warehouse (SDW)
- 473 types
- Spatial information
- Policy map

Open Data Plaza
- More than 4,000 data sets
- Locations
- Current status of Seoul administrative office
- Facilities and transportation
- http://data.seoul.go.kr/

Public Data
Open Data
Private Data
Third Party Right
Derived Statistics
Open Data Plaza
SDW
Enterprise
Raw data
Unit of Collection
Raw data

BDW

---

Partnership
Free Sourcing
Big Data Campus

Current status of operation

207 Teams

344 Participants

137 projects covering 10 sectors
(Unit: project, as of 2017. 1. 31)

- Urban Management: 50 projects
- Economy: 25 projects
- Transportation: 18 projects
- Culture and Tourism: 8 projects
- Health and Welfare: 6 projects
- Environment: 7 projects
- Education: 3 projects
- Safety: 2 projects
- General Administration: 2 projects
- Others: 16 projects
Seoul’s Big Data based Services

25 projects in 4 sectors (2013~2016)

Transportation
- Night bus optimal route analysis
- Taxi operation data analysis
- Optimization of local bus routes
- Analysis on road accident blackspots
- Analysis on parking problems
- Impact analysis on trafficsigns
- Location analysis for Taxi station

Welfare
- Location analysis for life/job planning for retired people
- Location analysis for senior leisure and welfare center
- Traffic accidents analysis for transportation vulnerable
- Tuberculosis trait analysis
- Operation of taxi service for disabled
- Analysis of moving range of disabled
- Location analysis for installing braille block
- Adjustment for free shuttle bus for transportation vulnerable

Economy
- Local business district analysis service
- Public Wi-Fi Locational Analysis
- Application of social data for crime investigation
- Shinchon Water Gun Festival analysis
- Local festival analysis
- Tourist consumption pattern analysis

Administration
- Public Wi-Fi optimal locational analysis
- Location analysis for E-Civil Service
- Gentrification Analysis
- Location analysis for city publicity material
Case 1: Night-owl Bus

Capturing and responding to the citizens’ demand through Big Data analysis

Late-night bus routes

Why Late-night bus?

"Buses don’t run by the time I get off work. I don’t have a car. I hope there will be buses available at late night...!"

@gu****

Response of the City

Let’s set-up Late night bus routes

Facing Problems

1. Limited resources – bus, drivers, budget
2. Where are the passengers in mid-night?
3. Where do they want to go?
Case 1: Night-owl Bus

Background and data used

**Background**

- **Pilot Operation of Night Bus** ('13.4~)
- **Increased ridership**
- **Expansion of Night Bus Service**
- **Selection of 8 Routes**
- **Enhanced Usage of Bus Routes** (demand data analysis)

**Data Used**

- **KT Floating Population Data**
  - Period: 1 mo. (3/1~3/31)
  - Usage: 100M call/day

- **Taxi Ride Information**
  - Period: 1 week (3/18~3/24)
  - Usage: 0.6~0.8M ride/day

*O:Origin, D:Destination*
Case 1: Night-owl Bus

Analysis methodology used

[ Primary Analysis of Demand based on Taxi Ride Information ]

1. Taxi ride data by date of week
2. Building layers based on taxi ride locations
3. Summarized statistics on number of taxi ride
4. Mapping on hexagon → Used as Predicted Demand

[ Adjustment of Route and Dispatch Timetables by Floating Population Pattern Analysis ]

Floating Population Density Analysis
Optimization of Routes based on Floating Population
Adjustment of Dispatch Timetable based on Floating Population
Case 1: Night-owl Bus

Revised bus routes by reflecting results from big data analysis

Late night owl bus routes

Bus route changes thru big data analysis
Case 1: Night-owl Bus

Results

For administrative aspect
- Communication channel for conflict resolution
- 10% increase of ridership without additional routes
- Covers 42% of Seoul residents

For citizen’s benefit
- (Enhancing customer satisfaction)
  8.9% decrease in taxi refusing a passenger
- (More jobs and safety)
  11% increase in women’s activities at night
- Ranked 1st among the top 10 Seoul news in 2013

Passengers
- 9,883 persons/day (as of Dec. 2016)
- For who cannot find taxis due to limited no. of taxis
- For Safe Trip back home for women

Student 11.9%
Chaffer Service driver 23.5%
Company Worker 64.6%
Case 2: Local (Golmok) Business District Analysis Service

**Background & Data Used**

- Increase of Subsistence
  - Self-employed
- Demand for Golmok Business
  - District Information
- Need for Market Stabilization
  - through Market Change Outlook

**Market-related Data**

- Consumption Pattern
- 200B data/yr
- Floating Population
- SNS Trend
- Store
- Purchasing Power
- Main/attraction Facilities

**Provision of Market Info**

- Start-up Risk Index
- Type of Business Index
- Sales Trend
- Competition Index
- Customer/Population Data
- Hinterland Information

**Various Unit of Info**

- My Store Area
- Golmok/Central Business District
- Administrative District

(SEOUL METROPOLITAN GOVERNMENT)
Case 2: Local (Golmok) Business District Analysis Service

Provides various indices such as store records, rent/lease price, degree of competition

<table>
<thead>
<tr>
<th>Business District Type</th>
<th>Semi-residential Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business District Area</td>
<td>20.103㎡</td>
</tr>
<tr>
<td>Selected Store Type</td>
<td>Restaurants &gt; Korean</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Business District Type</th>
<th>Semi-residential Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business District Area</td>
<td>38.311㎡</td>
</tr>
<tr>
<td>Selected Store Type</td>
<td>Restaurants &gt; Korean</td>
</tr>
</tbody>
</table>

Overcrowding Scale
- Business Activity Index
- Business Growth Index
- Business Stability Index

Floating Population by Time

<table>
<thead>
<tr>
<th>Time</th>
<th>Average # of peoples by month</th>
</tr>
</thead>
<tbody>
<tr>
<td>00-06</td>
<td>480</td>
</tr>
<tr>
<td>06-11</td>
<td>3,244</td>
</tr>
<tr>
<td>11-14</td>
<td>3,052</td>
</tr>
<tr>
<td>14-17</td>
<td>3,549</td>
</tr>
<tr>
<td>17-21</td>
<td>3,003</td>
</tr>
<tr>
<td>21-24</td>
<td>2,510</td>
</tr>
</tbody>
</table>

Increasing/decreasing rate compared to previous month and same day

Floating Population by Day of Week

<table>
<thead>
<tr>
<th>Day</th>
<th>Sun</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>480</td>
<td>3,244</td>
<td>3,052</td>
<td>3,549</td>
<td>3,003</td>
<td>2,510</td>
<td></td>
</tr>
</tbody>
</table>

Change in Floating Population

- Increasing/decreasing rate compared to previous month
- Increasing/decreasing rate compared to previous month and same day

Result

- Intuitively grasp start-up risk and district selection
- Existing self-employed can search potential customers
Case 3: Traffic Accidents Analysis for Transportation Vulnerable

Objective: Prevent traffic accidents of transportation vulnerable by finding accident patterns

Data Used
- Traffic Accident History
- Traffic Safety Facilities
- Taxi DTG
- Car Speed
- Floating Pop
- Weather
- Bus Stop Location

Results

Children
- Concentrated when commuting to/from school
- Sharp increase in number of accident in 1st Graders

Senior
- 65.4% of senior pedestrians result in serious injury or more
- Sharp increase in 4 AM and 10 AM
Case 3: Traffic Accidents Analysis for Transportation Vulnerable

Results

[ Derived Focal Area within Children Protection Zone ]

Children Traffic Accident

Speed bump

Frequent accident occurred where lacking speed bump
⇒ Need to install speed bump at blackspot

[ Designated additional Senior Zones ]

△ Vicinity of Bulgwang Sta.
△ Vicinity of Shin Shilim Market

△ Vicinity of Cheongnyangni Sta.
△ Vicinity of Wolgok Sta.

Current Senior Zone

Concentrated around welfare/senior centers

Additional Senior Zone

Centered around blackspot
Case 3: Traffic Accidents Analysis for Transportation Vulnerable

Initiated traffic safety policies for transportation vulnerable

- **Installed speed bumps for road safety**
  - Analyzed blackspots, traffic safety facilities for installation

- **Road safety training for lower graders**
  - Produced educational materials with video clips

- **Improved facilities around blackspots**
  - Installed barriers to prevent jaywalking
  - Installed Accessible Pedestrian Signal for pilot

- **Customized Training for Seniors**
  - Operated Participatory 3D Road Safety Training
How can we apply the big data based policies to DMCs?

SUSA’s knowledge transfer references to other cities

1. **Buenos Aires City**: “Golmok” (neighborhood) Market Places Analysis
   - For supporting and boom up old market and small merchants

2. **World Bank**: Production of Mobile based ITS Guidebook which includes “Seoul Late Night Bus”
   - Mobile based ITS services for developing countries
   - Pilot Services

3. **Kiev City**: Big Data Based Transportation System Improvement Project
   - Feasibility Study for building data based scientific decision making system
How can we apply the big data in DMCs?

Projects for Consideration

1. Transportation
   - Public transportation optimization
   - Parking problem mitigation
   - Road accident prevention
2. Industries
   - Business District (market place) Identification for Startups
3. Tourism/Festival promotion
4. Etc.

PROPOSAL
Applicable projects for DMCs

TARGET SYSTEM
Building the data based decision making support system

FEASIBILITY STUDY
for DMCs in demand

1. Data Center
2. Big-data Platform
3. Smart City and policy decision support system
4. Urban Transportation Optimization and Surveillance system
5. Others base on big data platform

To analyze needs of DMCs and to solve urban problems

- Transport
- Market
- Tourism
- others
Smart Execution: Seoul Urban Solutions Agency

What we do

[Overseas Project Process]

[Areas We Work In]
- Transportation
- Metro Rapid Transit
- Water Treatment
- Sewage Treatment
- Urban Planning and Housing
- Environment
- Waste Management
- e-Government
- Citizen Safety
- Disaster Prevention and Management

[Services We Provide]
- Study Visits
- Training Program
- Advisory/Consulting
- Project Implementation
- Public-Private Partnership Projects
Smart Execution: Seoul Urban Solutions Agency

How we work – provide integrated solution

[Policy Solution + Business Solution]

City's urban development needs

Public Sector Capabilities + Business Solutions

Integrated Solutions:
- Policy package
- Software solutions
- Hardware solutions
- Expertise transfer

Increased quality of life for city dwellers
SUSA works as the agent that bridges various players with keen understanding of the role and stake each part has in accomplishing the mission.

Solutions that improve the quality of life for urban dwellers

- Private Sectors
- International Organizations
- Affiliated Organizations
- SMG
- Foreign Governments & Agencies
- Foreign Cities
Thank You

www.susa.or.kr