SEOUL METROPOLITAN GOVERNMENT

Utilizing Big Data to Solve Urban Issues: *The Case of Seoul*

SEOUL METROPOLITAN GOVERNMENT

SUSA
Seoul Urban Solutions Agency

Sunghoon Kris Moon
Seoul Urban Solutions Agency

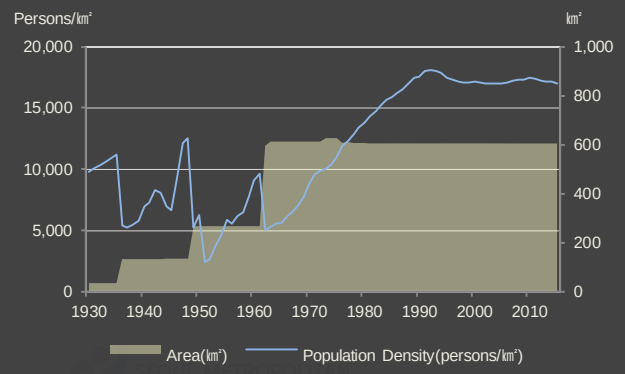
Table of Contents

SEOUL METROPOLITAN GOVERNMENT

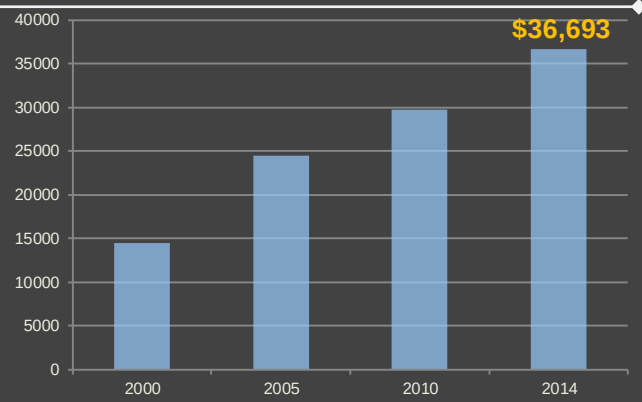
Seoul: A City Old and New

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

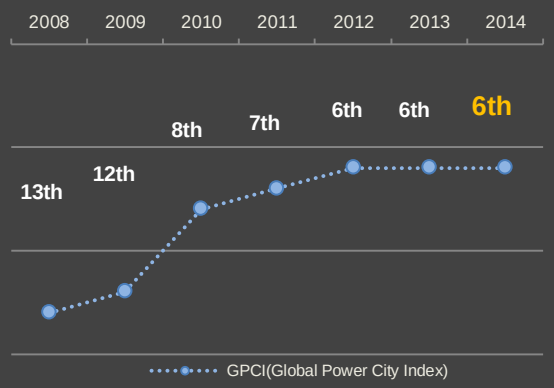
Population and Area Growth



Seoul's Gross Regional Product

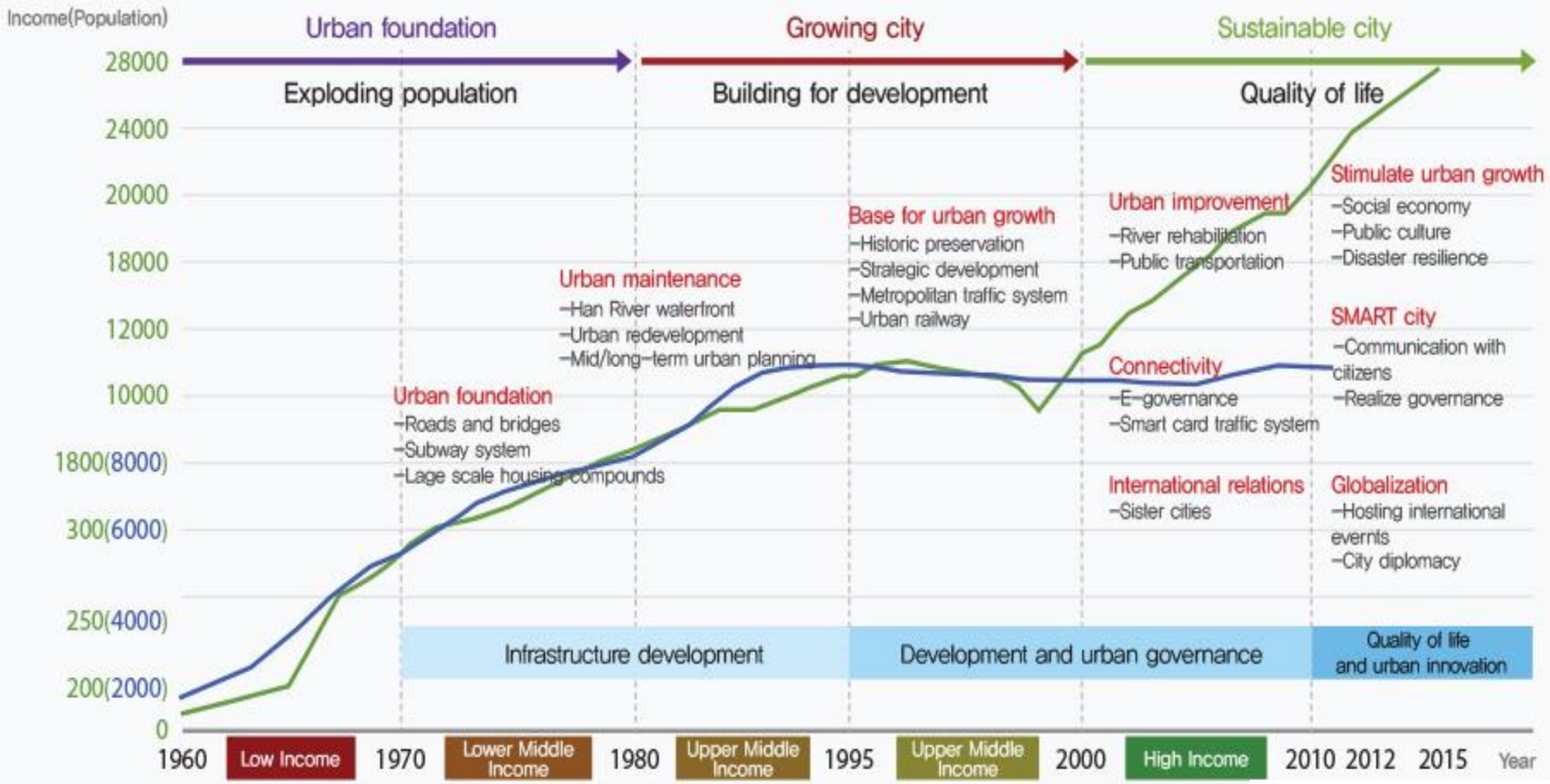


GPCI(Global Power City Index)



Seoul's Growth Trajectory

Transformation of Seoul's urban development



Source: seoulsolution.kr

SEOUL METROPOLITAN GOVERNMENT

GNI per capita [$]
Population ('000)

Seoul's Growth Trajectory, cont'd

Growth of the city

1950-53 Korean War

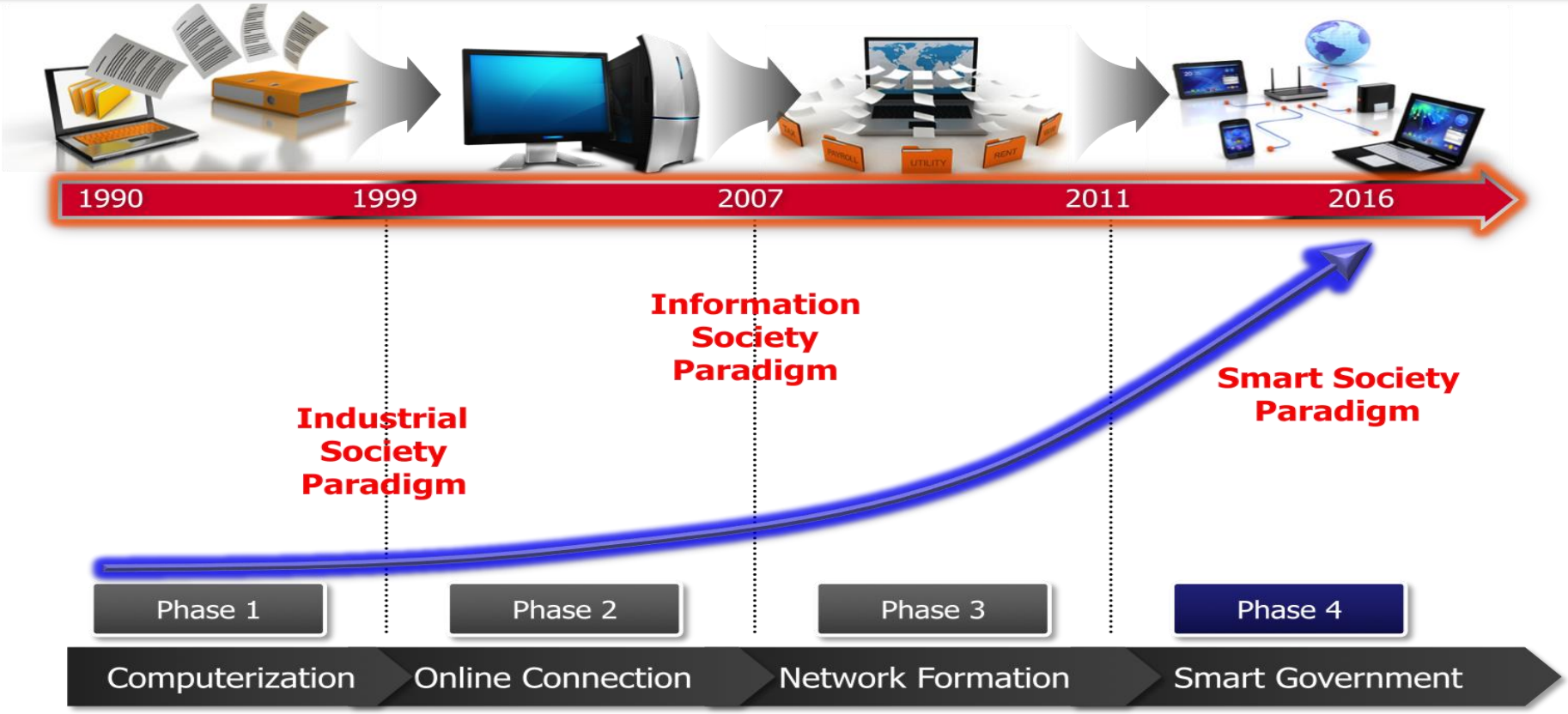
1988 Seoul Olympic

2002 World Cup

	1950	1960	1970	19	1990	000	2010
	Aftermath of the Korean War: Destruction of Seoul's urban foundation and identity	Rapid post-war reconstruction to establish urban foundation	Expansion of city center to accommodate economic and population growth	Han river rejuvenation in preparation for global events – Seoul 1988 Olympics	Large scale urban regeneration project and new town developments	In llations of physical features to facilitate enhanced quality of life for Seoulites	Transforming to a city with a historical heritage, culture and identity
Water Purification	• 1941: Guui water center • 1948: Seoul Tap Water Bureau • Five water purification plants • Installation of tap water pipes			• 1981: Office of water works established • 1984: Water pipes replaced • 1991: 100% water supply			Six water purification plants
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			• Four water reclamation centers	• Advanced treatment installed
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				Four R.R.C under operation
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		

Seoul as a Smart City: Developments

Seoul as a Smart City grew in line with Network expansion and ICT developments



- Build database
- Developed website

- Online civil complaint system
- Integrated government resources
- Expanded e-government service

- Started mobile service
- Open platform for public info
- Online participation

- Customized spatial service based on citizen needs
- Two-way citizen participation through SNS
- Smart decision-making and communication based on data

SEOUL METROPOLITAN GOVERNMENT

Smart City: Meaningful Connections

Leverage technology to serve its citizens and make cities more livable

Convenient Citizen Life

Efficient City Management

Transparent Governance

People

Information

CONNECT

Resources

Things

Network + ICT + Data Analytics

SEOUL METROPOLITAN GOVERNMENT

Making of Seoul as a Smart City

1. Understand my city upon Big Data
2. Efficient city management through ICT on infrastructure
3. Smart IoT connections that make the city more livable
4. Provision of platform to stimulate economic growth
5. Facilitate transparency and stimulate citizen participation
6. Intelligent policy making through Big Data Analysis

Citizen Life
City Admin

INCREASE
- Impact
- Efficiency
- Transparency
- Speed

SEOUL METROPOLITAN GOVERNMENT

Global Digital Seoul 2020 (SMG 2016)

Vision: New Connection, Different Experiences

Social City
11 Action Plans

Citizen Participation and Communication

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

Diginomics
6 Action Plans

Stimulate Economic Growth

- 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

Improve Citizen Life thru Innovative Solution

- 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

Provide Exemplary Practices

- 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

SEOUL METROPOLITAN GOVERNMENT

Efficient City Management

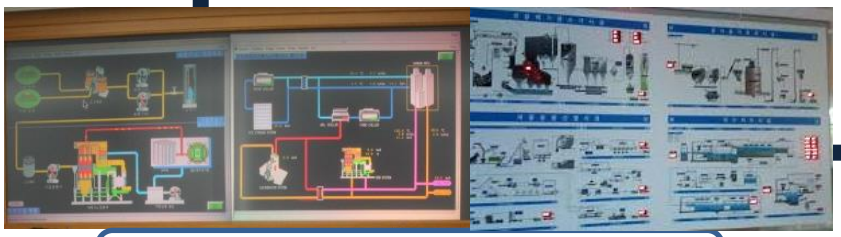
Smart ICT on Infrastructure

Water

Smart City

Infrastructure Technology + Information Technology

Transportation



Waste Management

e-Government

SEOUL METROPOLITAN GOVERNMENT

Connections that Make Cities More Livable

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

SEOUL METROPOLITAN GOVERNMENT

Seoul's Big Data based Services

24 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 traffic signs
- 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 braille block
- Adjustment for free shuttle bus for transportation vulnerable

Economy

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

Administration

- Public Wi-Fi optimal location analysis
- Location analysis for E-Civil Service
- Gentrification Analysis
- Location analysis for city publicity

Analysis Method: Location Analysis, Demand Forecast, Effect Analysis, Unstructured Data Analysis

SEOUL METROPOLITAN GOVERNMENT

Seoul's Policy using Big Data Analytics

SEOUL METROPOLITAN GOVERNMENT

Becoming "Smart" through Big Data

Collect → Analyze → Understand → Problem Solving

Issue Finding

Understand the issues, know what and where the problems lie.

Select Data Pool

↓

Data Analysis

↓

Issue 1 | Issue 2 | Issue 3…

↓

Clear understanding of the problems

Optimized Solutions

Evidence-based approach in generating optimized solutions.

Select Data Pool

↓

Data Analysis

↓

Fact 1 | Fact 2 | Fact 3…

↓

Recommendations for Solutions

SEOUL METROPOLITAN GOVERNMENT

Big Data for Problem Solving

Demand based project identification and process of analysis

[Capture Citizens' Voice]

Project Selection

Relevant Data Search

Big Data Analysis

Draw Insights

Offer Policy Recommendation

SEOUL METROPOLITAN GOVERNMENT

*NPO: Non-profit organization

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*****

No public transportation in 01:00 AM ~ 05:00 AM

Subway Bus Taxi

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?

SEOUL METROPOLITAN GOVERNMENT

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

Taxi Ride Information

Period 1 week(3/18~3/24) Usage 0.6~0.8M ride/day

*O:Origin, D:Destination)

KT Floating Population Data

Period 1 mo. (3/1~3/31) Usage 100M call/day

*O:Origin, D:Destination)

SEOUL METROPOLITAN GOVERNMENT

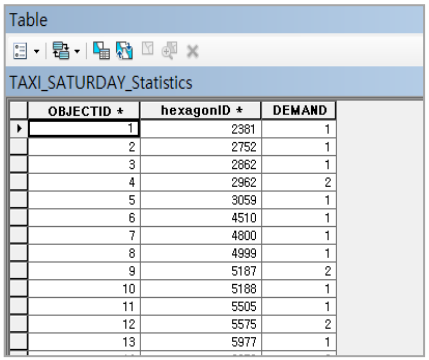
Case 1: Night Owl Bus

Analysis methodology used

[Primary Analysis of Demand based on Taxi Ride Information]

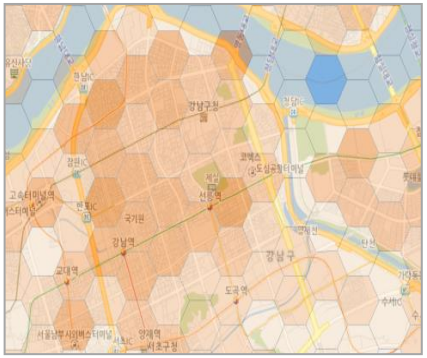
1 Taxi ride data by day of given week

2 Building layers based on taxi ride locations



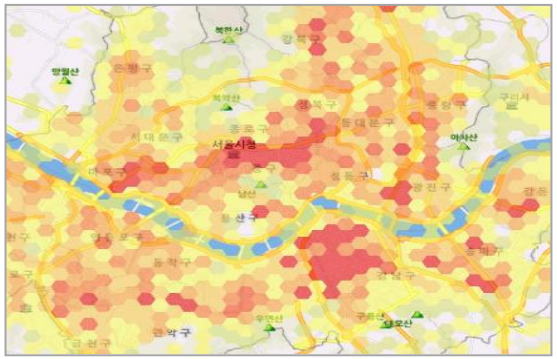
OBJECTID *	hexagonID *	DEMAND
1	2381	1
2	2752	1
3	2862	1
4	2962	2
5	3059	1
6	4510	1
7	4800	1
8	4999	1
9	5187	2
10	5188	1
11	5505	1
12	5575	2
13	5977	1

3 Summarized statistics on number of taxi ride

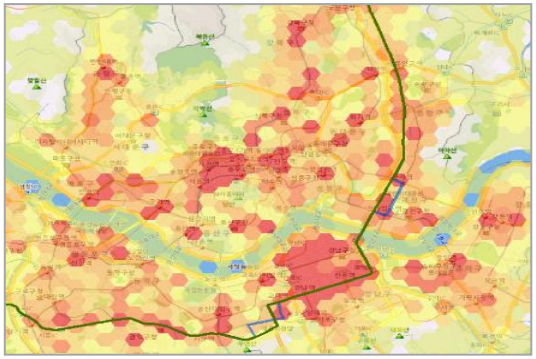


4 Mapping on hexagon
→ Used as Predicted Demand

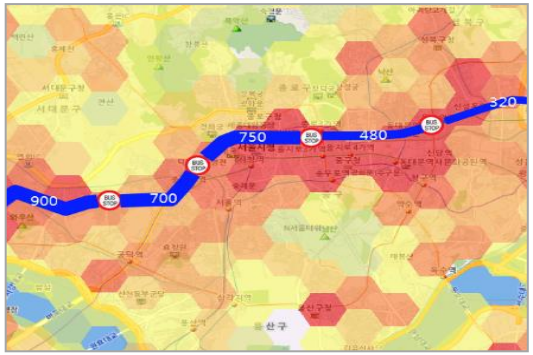
[Adjustment of Route and Dispatch Timetables by Floating Population Pattern Analysis]



Floating Population Density Analysis



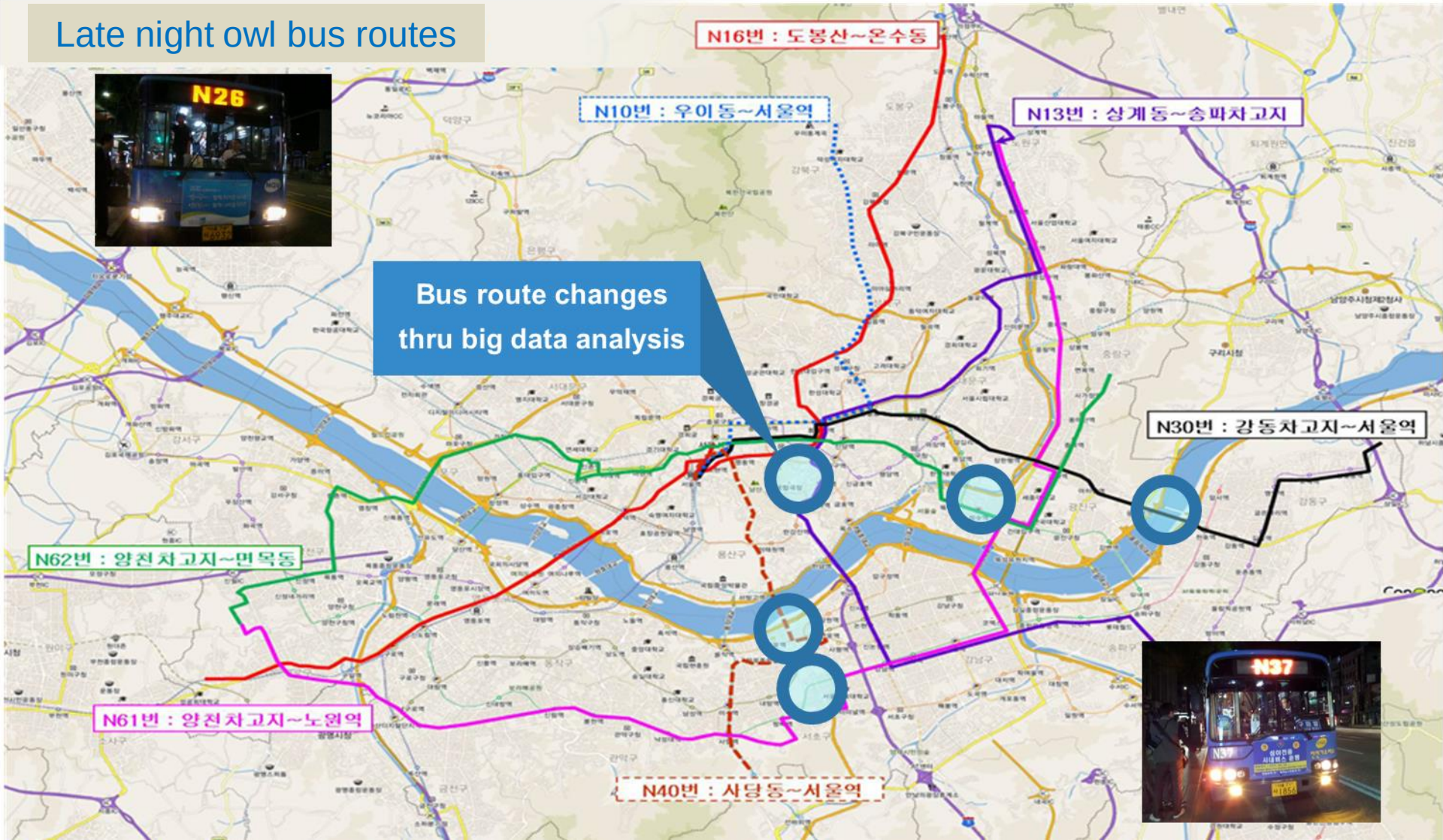
Optimization of Routes based on Floating Population



Adjustment of Dispatch Timetable based on Floating Population

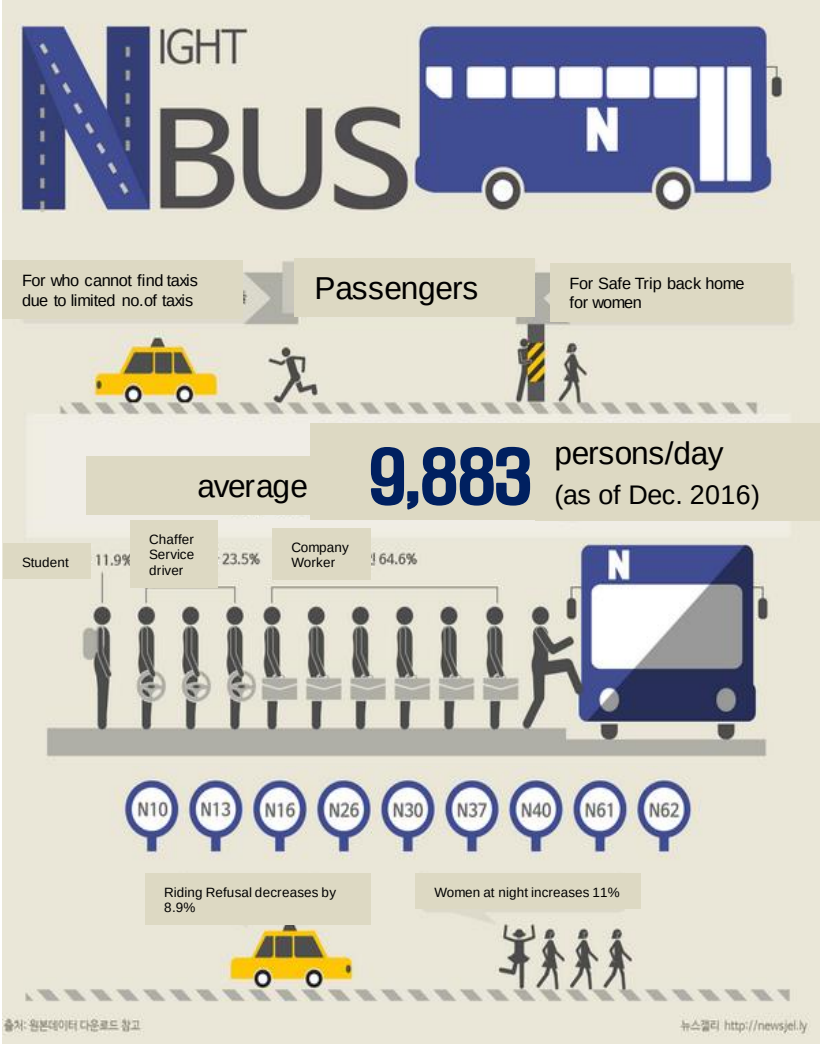
Case 1: Night Owl Bus

Revised bus routes by reflecting results from big data analysis



Case 1: Night Owl Bus

Results



For administration

- ✓Systematically capturing citizens' needs and generating viable solution
- ✓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

Case 2: Neighborhood *(Golmok)* Business District Analysis Service

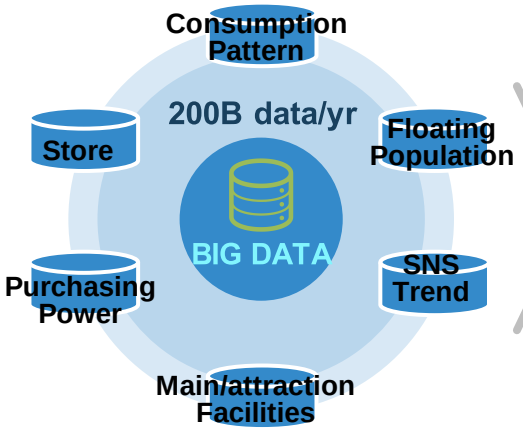
Background & Data Used

Increase of Subsistence Self-employed

Demand for Golmok Business District Information

Need for Market Stabilization through Market Change Outlook

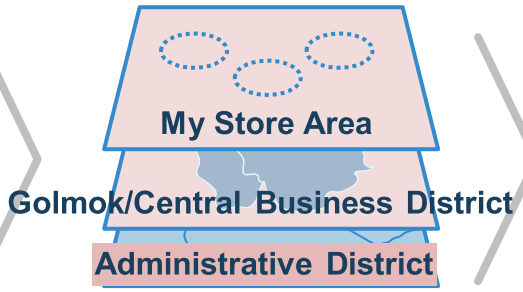
Market-related Data



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



Self-employed

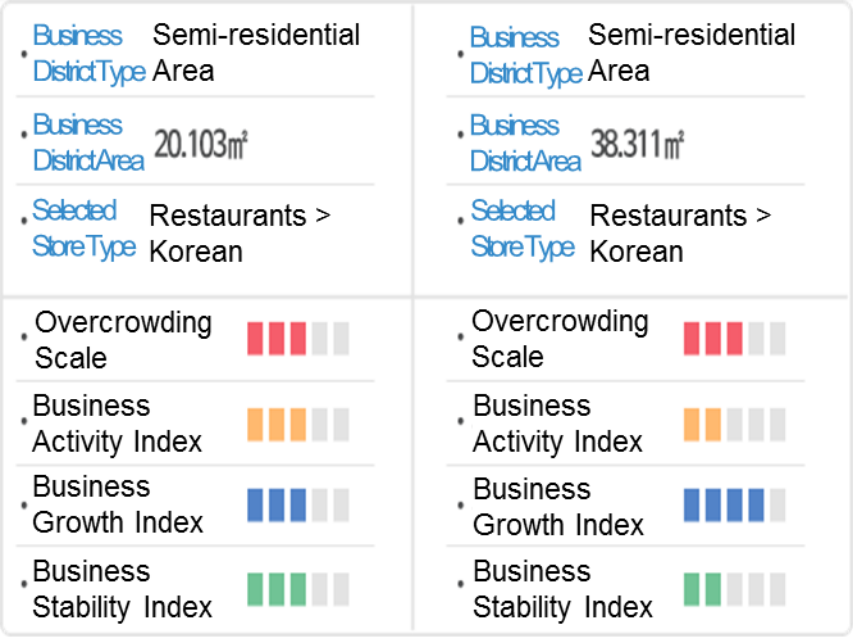
Policymaker

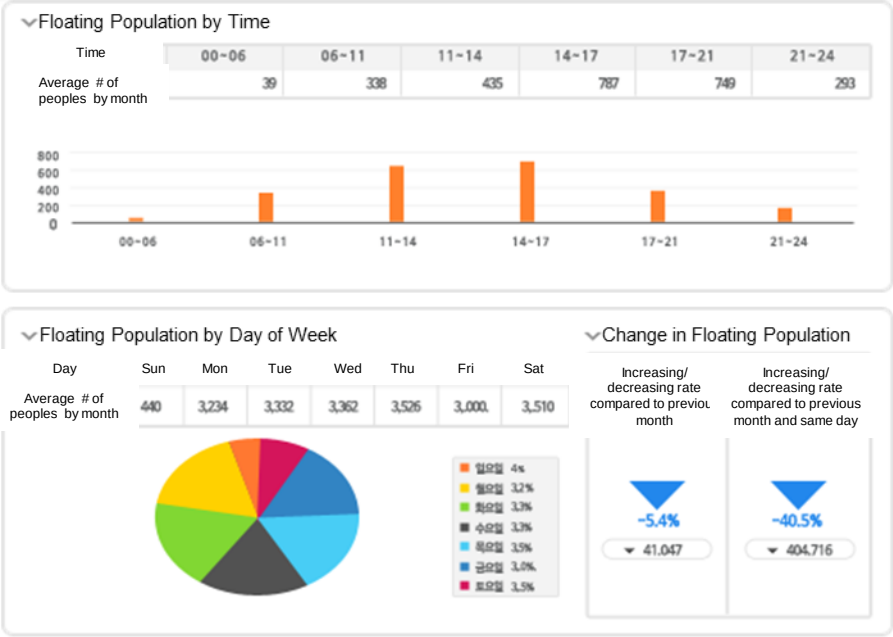
Professional

SEOUL METROPOLITAN GOVERNMENT

Case 2: Neighborhood *(Golmok)* Business District Analysis Service

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





Result

- Intuitively grasp start-up risk and district selection

- Existing self-employed can search potential customers

Case 3: Traffic Accidents Analysis for Transportation Vulnerable

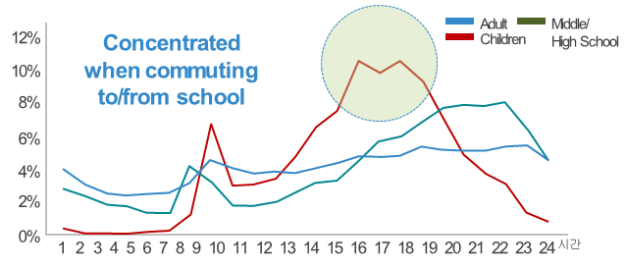
Objective: Prevent traffic accidents of transportation vulnerable by finding accident patterns

Data Used

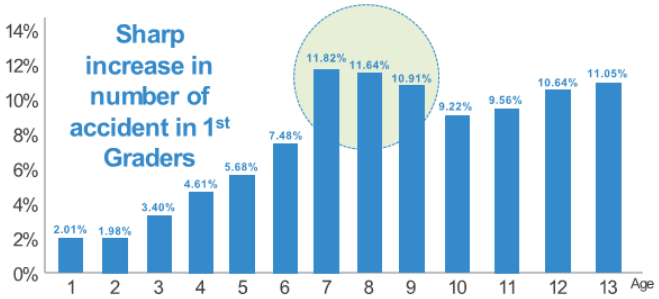
- Traffic Accide History
- Traffic Safety Facilities
- Taxi DTG
- Car Speed
- Floating Pop
- Weather
- Bus Stop Location

Results

Children

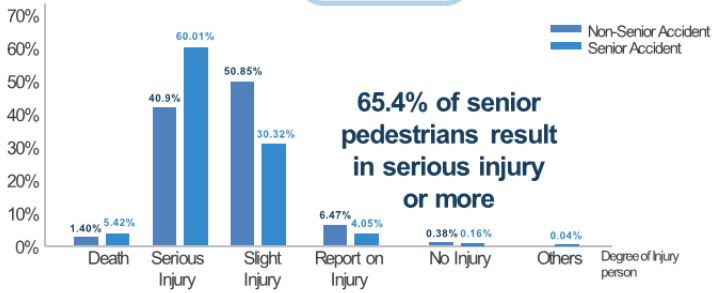


Child and Teenager Pedestrian Traffic Accident by Time

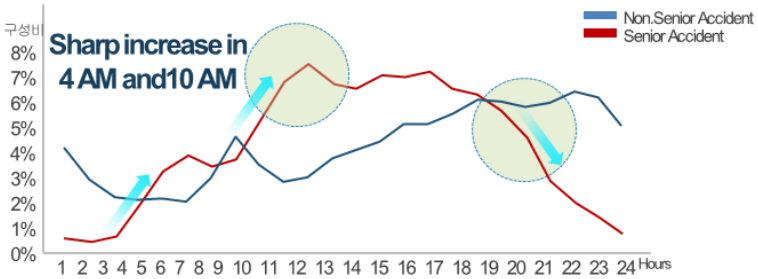


Child Pedestrian Traffic Accident by Age

Senior



Senior/Non-Senior Pedestrian Accident by Degree of Injury



Senior/Non-Senior Pedestrian Accident by Time

SEOUL METROPOLITAN GOVERNMENT

Case 3: Traffic Accidents Analysis for Transportation Vulnerable

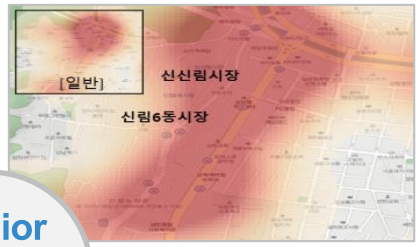
Results

[Derived Focal Area within Children Protection Zone]

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

[Designated additional Senior Zones]

▲ Vicinity of Bulgwang Sta.

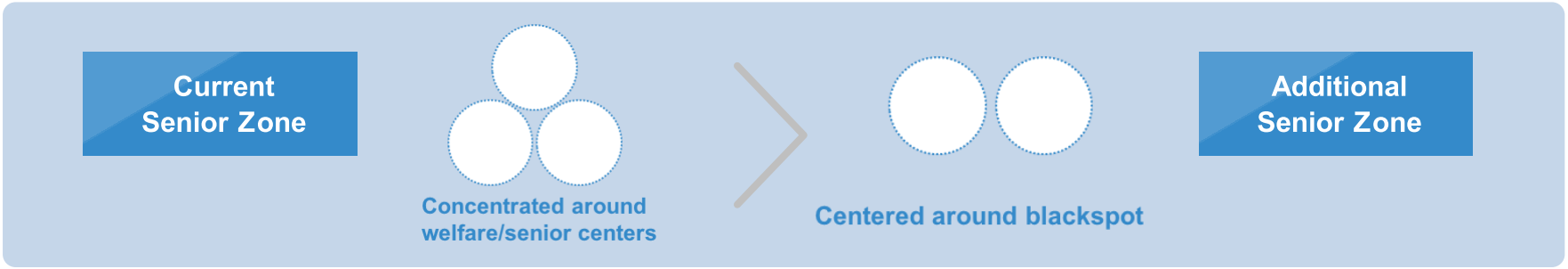


▲ Vicinity of Shin Shilim Market

Senior Pedestrian Accident

▲ Vicinity of Cheongnyangni Sta.

▲ Vicinity of Wolgok Sta.

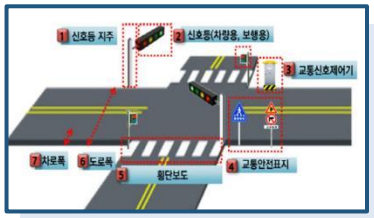


SEOUL METROPOLITAN GOVERNMENT

Case 3: Traffic Accidents Analysis for Transportation Vulnerable

Initiated traffic safety policies for transportation vulnerables

- **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

SEOUL METROPOLITAN GOVERNMENT

Seoul's Big Data based Services

24 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 traffic signs
- 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 braille block
- Adjustment for free shuttle bus for transportation vulnerable

Economy

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

Administration

- Public Wi-Fi optimal location analysis
- Location analysis for E-Civil Service
- Gentrification Analysis
- Location analysis for city publicity

Analysis Method: Location Analysis | Demand Forecast | Effect Analysis | Unstructured Data Analysis

SEOUL METROPOLITAN GOVERNMENT

Sources of Big Data

Where do Big Data come from?

Public Data

- Free of charge
- Limited access and use due to legal binds

Data from central govt and affiliated agencies

Data from city's IT systems

Data from city infrastructure (CCTVs, monitoring systems, transportation, etc.)

Data from outside non-profit organizations

Private Sector Data

- Limited sourcing
- High cost at times
- Data manipulation (privacy issues)
- Limited access and use due to legal binds

Mobile phone related data

Finance (credit card) data

Floating population, spatial data

SNS data, etc.

Connections that Generate Data

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

Category	Data Source	Types of Data	Usage
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 Augment Policy Design • Changes in existing policies • Traffic light system rearrangements • Public transportation (re)routing New Policy Introduction • Based on enhanced understanding of pain points New, Convenient Citizen Applications • Mobile ITS services • Safer public spaces
Transportation	TOPIS (ITS)	Public transport, fleets, traffic speed	
	CCTV	Traffic, parking violations	
	Smart Card	No. of passengers, OD info., transfers, distance travelled	
Water Management	Water quality monitoring system	Source water quality, volume, substance	
	Water purification facilities	Water quality, volume, supply, production	
	Pipe leakage monitoring	Leaking pipes by region	
Energy	Energy meter	Production, supply, consumption	
e-Government	Voice of citizens	Citizen needs, complaints, infrastructure issues	

SEOUL METROPOLITAN GOVERNMENT

Main Takeaways

What will ensure successful utilization of Big Data Analysis in your respective cities?

1

Big Data Analysis is not of and in itself a solution, rather it is…
- A powerful mechanism to understanding the problem and
- An intelligent way of generating solutions

→Must have an objective to fulfill for data analysis

2

Need minimal data pool
- Publically generated data
- Access to private sector data

3

Understand the limitations in using the data
- Legal and other institutional issues that may prevent from collecting new data and utilizing available data sets

SEOUL METROPOLITAN GOVERNMENT

Cases of Seoul's big data based policy application to other cities

Seoul's (via SUSA) knowledge transfer on Big Data Analysis

1. **Buenos Aires City** : Neighborhood *(Golmok)* Business District Analysis
   - For supporting and boom up old market and small merchants

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

3. **Kiev City** : Big Data based Transportation System Improvement Project
   - Feasibility Study on building data based scientific decision making system

Smart Execution: Seoul Urban Solutions Agency

How we work – provide integrated solution

[Areas We Work In]

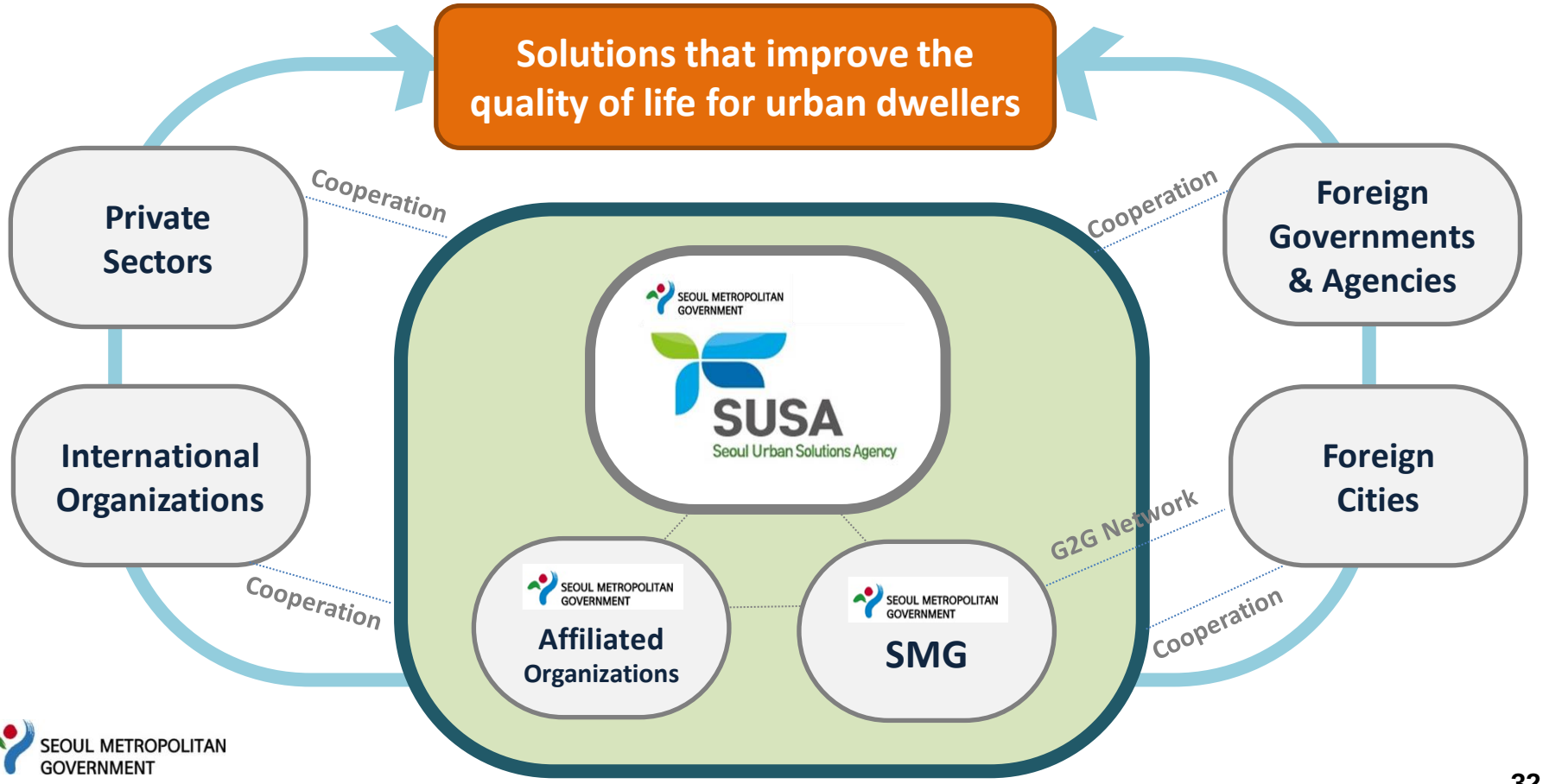
[Policy Solution + Business Solution]

SEOUL METROPOLITAN GOVERNMENT

Smart Execution: Seoul Urban Solutions Agency

How we work – SUSA as a agent in delivering the integrated solution

SUSA works as the agent that bridges various players with keen understanding of the role and stake each part has in accomplishing the mission.



SEOUL METROPOLITAN GOVERNMENT

Smart Execution: Seoul Urban Solutions Agency

Services SUSA is providing (Samples)

- **Study Visits**
  - India-Korea Smart City Knowledge Exchange (World Bank, September 2016)
- **Training Programs**
  - Establishment of Local Business District Analysis System Using Big Data (Buenos Aires, Argentina, January 2017)
  - Intelligent Transport Systems Development for Mongolia (ADB, May 2017)
- **Advisory and Consulting**
  - Production of Mobile-based ITS Guidebook for Developing Countries (World Bank, February 2017)
  - Feasibility Study on Big-data-based Transportation System Improvement for Kyiv, Ukraine (National IT Industry Promotion Agency, May 2017)
  - Intelligent Transport Systems and Public Transportation Systems Improvement in Kenya (KEXIM, August 2017)
  - Seoul's Case on Sustainable Tourism Linking Urban Regeneration and Heritage Conservation for Local Economic Development (World Bank, February 2017)

Thank You

SEOUL METROPOLITAN GOVERNMENT

SUSA

Seoul Urban Solutions Agency

www.susa.or.kr