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GREEN GROWTH IN ACTION

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02

Korea Green Growth Partnership

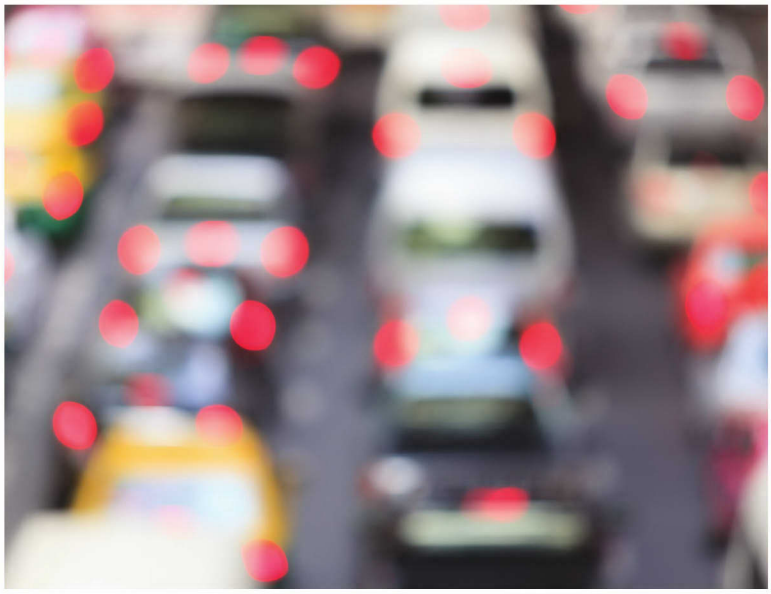
WORLD BANK GROUP

LEAPING FORWARD IN GREEN TRANSPORT: THE CASE OF KOREA

CHANGGI LEE, NANCY L. VANDYCKE, NAK MOON SUNG, TRANSPORT & ICT GLOBAL PRACTICE GROUP, WORLD BANK; **SANG DAE CHOI, EUN JOO ALLISON YI,** CLIMATE CHANGE CROSS-CUTTING SOLUTIONS AREA, WORLD BANK; **SANGJOO LEE,** URBAN, RURAL, AND SOCIAL DEVELOPMENT GLOBAL PRACTICE GROUP, WORLD BANK

I. INTRODUCTION

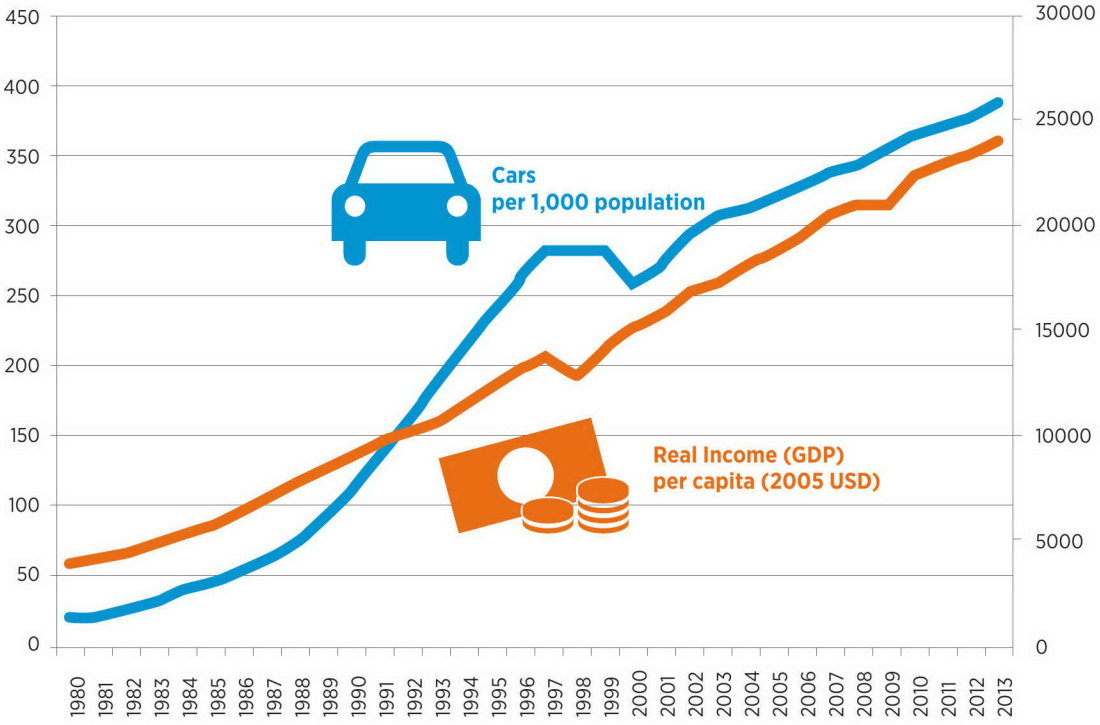
What do Bangkok, Cairo, Lagos, Mumbai, and Nairobi have in common? These megacities—like others in burgeoning emerging market economies—are magnets for people seeking better opportunities. They also suffer from serious traffic congestion, high levels of greenhouse gas (GHG) emissions, and heavy air pollution. These urban areas face a stark dilemma: economic expansion attracts more people and vehicles; but the resulting traffic and pollution hinder further growth while reducing the quality of life for their citizens.



Economic expansion attracts more people and vehicles; but the resulting traffic and pollution hinder further growth while reducing the quality of life for their citizens.

Not long ago, Seoul and other cities in Korea faced a similar conundrum. In the years after the Korean War, the government invested massively in road construction to spur recovery and economic development. Starting around 1980, the number of vehicles on the road began to rise noticeably, along with income (Figure 1). And from the late 1980s to 1997, when the Asian financial crisis hit, the number of cars shot upward, rising more than twice as fast as income. Traffic congestion and air pollution became major policy issues, especially in Seoul. The growing metropolis had become trapped in a vicious cycle in which the increasing number of passenger cars and the expansion of roads to support them crowded out the development of public transport. It became apparent that continuous road expansion was not sustainable.

FIGURE 1: RISE IN NUMBER OF CARS AND GDP PER CAPITA IN KOREA, 1980–2013

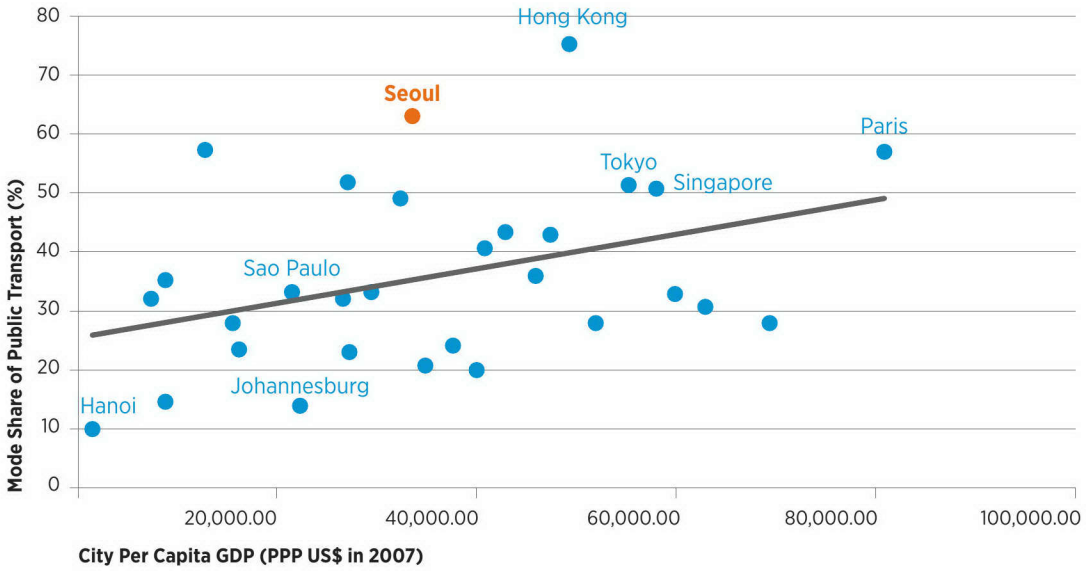


The number of cars increased exponentially from the 1980s until the Asian financial crisis in 1997. During the late 1980s and early 1990s, the rate surpassed that of income. **Cars per 1,000 people increased more than 10 times to 213 in 1994 from 19.5 in 1980** while income increased less than 3 times. In 2013, the number reached 386 cars per 1,000, which meant each household had an average of at least one car. Yet with enough cars to use at their disposal, people are continuing to use public transport, with a modal share of more than 60% in Seoul.

Sources: World Development Indicators, World Bank; Korea transport database, Korea Transport Institute.

FIGURE 2: INTERNATIONAL COMPARISONS OF GREEN TRANSPORT: KEY INDICATORS

A. MODE SHARE OF PUBLIC TRANSPORT IN MAJOR WORLD CITIES, BY GDP PER CAPITA, 2011



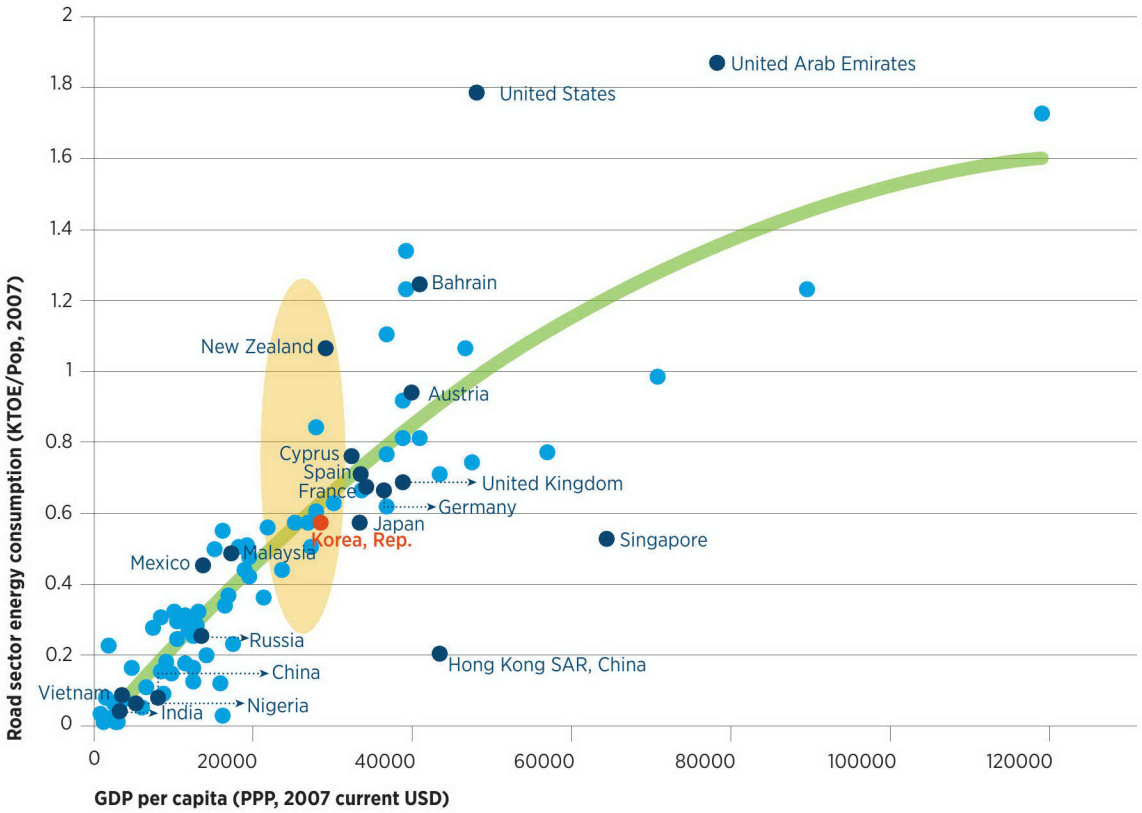
Source: UT data base, World Bank

So Korea made a historic course change on urban transport. It shifted from supply-side policies focused on expanding roadways and metro lines to green demand-side policies focused on creating transit-oriented cities.

Today, with more than 10 million people within its borders and 25 million people in its metropolitan area, Seoul boasts a passenger-trip share (modal share) for metro and bus of more than 60%, notably higher than Beijing's, at 23%, and Singapore's and Tokyo's, at 51% (Figure 2). At the same time, energy consumption in Korea's road sector is lower than in other countries with similar GDP. Congestion costs have been decreasing, and CO2 emissions in the transport sector have been kept under control. Emboldened by its achievements in green transport, Korea in 2010 started moving toward another ambitious goal: reducing GHG emissions in the transport sector by one-third by 2020.

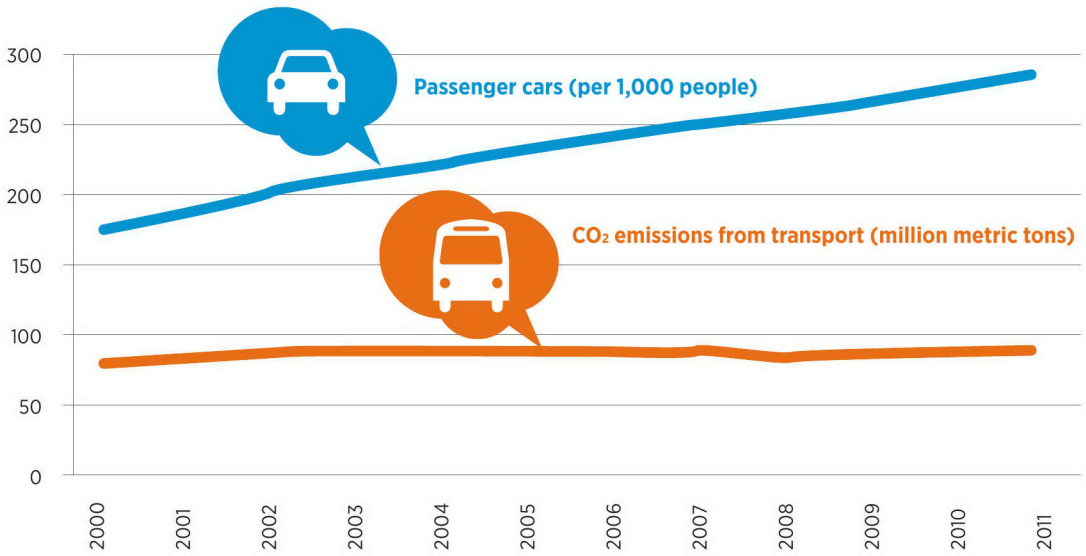
This path breaking transition to green transport was founded on integrated, multimodal solutions in a context of strong political leadership and public sector financing. The following sections discuss what Korea learned from its supply-side approach to motorways, how its transport strategy evolved into an integrated system, and the elements of Korea's green transport policy.

B. ROAD SECTOR ENERGY CONSUMPTION (2007)



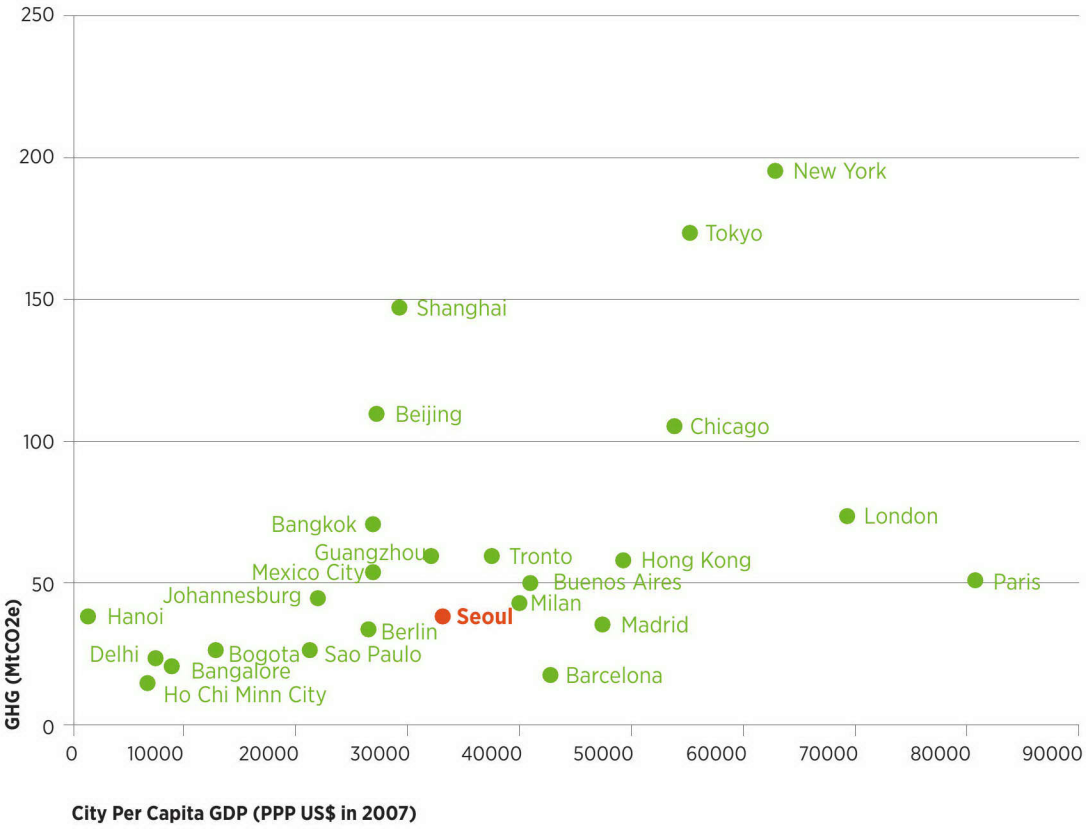
Source: World Development Indicators, World Bank 2012; econstats.com

C. KOREA: CO_2 EMISSIONS FROM TRANSPORT AND NUMBER OF PASSENGER CARS, 2000–11



Source: World Development Indicators, World Bank

D. GREENHOUSE GAS EMISSIONS IN MAJOR WORLD CITIES, BY GDP PER CAPITA, 2011

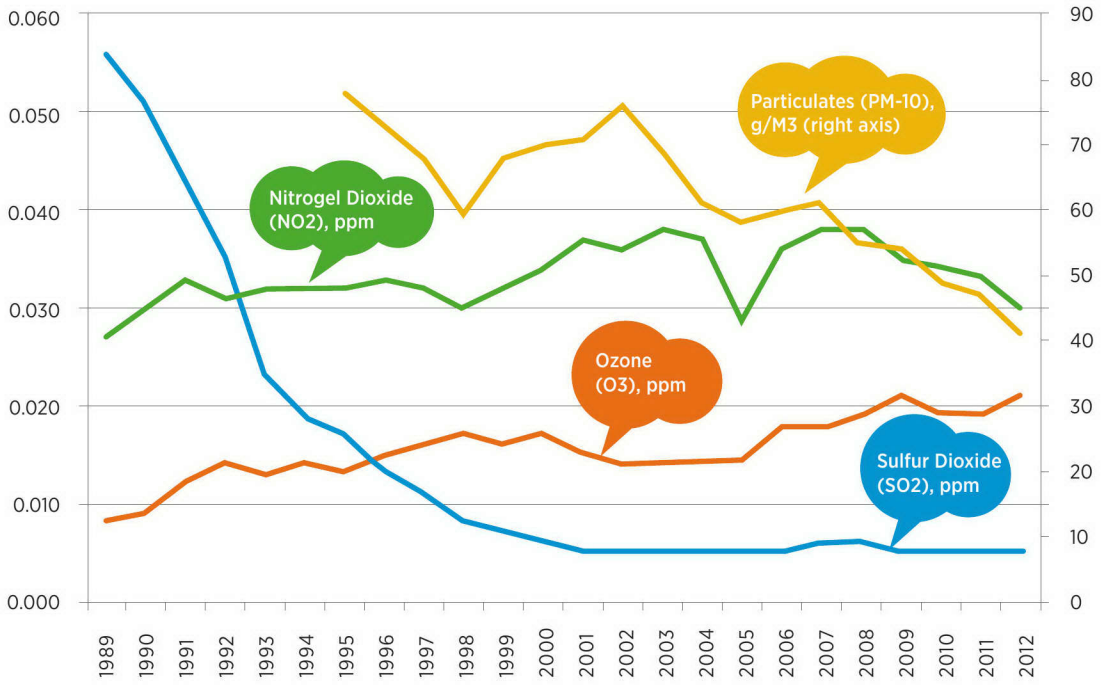


As Korea pursued green transport policies, even though the number of passenger cars increased alongside economic growth, CO2 emissions were kept under control. Seoul's GHG emission level is relatively low compared to other major cities with similar income levels.

Source: UT data base, World Bank

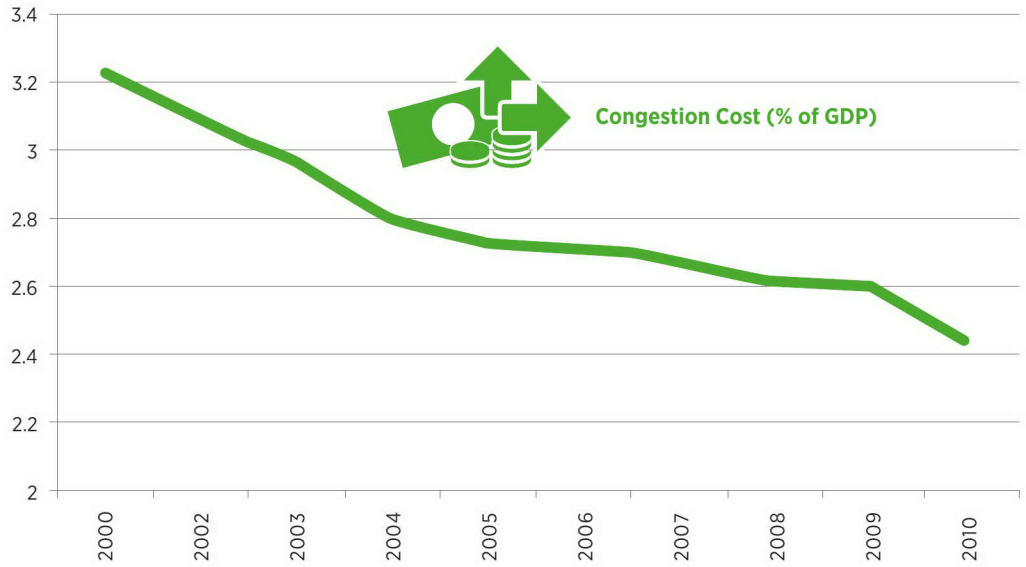
Emboldened by its achievements in green transport, Korea in 2010 started moving toward another ambitious goal: reducing GHG emissions in the transport sector by one-third by 2020.

E. AIR POLLUTION LEVELS IN SEOUL, 1989–2012



Source: Korea transport database, Korea Transport Institute

F. COST OF TRAFFIC CONGESTION IN KOREA AS A PERCENT OF GDP, 2000–10



Congestion costs, measured in terms of GDP, have been decreasing constantly and the majority of air pollution indicators have improved or were kept under control after the mid-2000s.

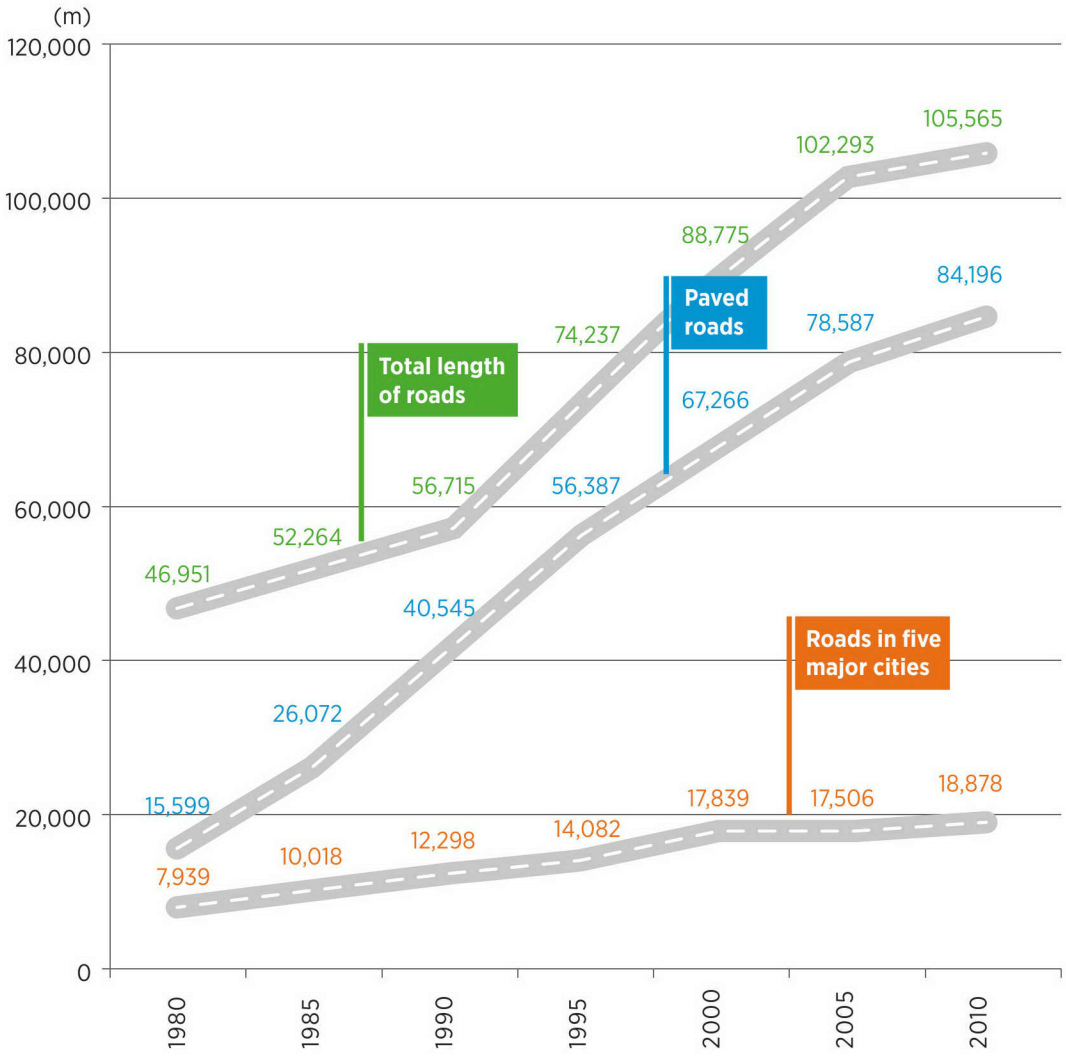
Source: Korea Transport Database. 2014

II. LESSONS FROM SUPPLY-SIDE POLICIES

From 1980 to 2010, the total length of all roads in Korea more than doubled, to 105,565 kilometers, and the length of paved roads increased by 540%, to 84,196 km. By 2000, Seoul's road density reached 12.9 km/km2, much greater than even the 2003 levels in Beijing (3.16) and Shanghai (4.42).[1] (Figure 3)

The road expansion became increasingly counterproductive socially, environmentally, and economically. From 1980 to 1997 estimated congestion costs in Korea quadrupled, to 18.5 trillion won, or 3.6% of GDP, with Seoul accounting for one-fourth of the costs. Air pollution from road traffic cost an estimated $13.3 billion in 2006.

FIGURE 3: GROWTH OF THE ROAD SYSTEM IN KOREA, 1980–2010



Source: Ministry of Land, Infrastructure, and Transport 2013.

[1] *Calculated based on the total length of roads provided in Seoul government database [in Korean] (2014) http://traffic.seoul.go.kr/archives/293; and Pucher and others 2007.*

The reliance on supply-oriented transportation policies began to lose its appeal.

One of the greatest symbols of both the existing and ensuing policies was Seoul's Cheonggye expressway (Case study 1). An icon of development when built in 1971, the elevated road was constructed over a river to connect downtown Seoul with the city's eastern outskirts. But as congestion intensified over the years, the highway came to resemble a parking lot more than a road to progress. In 2002, the city government tore down the expressway, revived the river, and built a pedestrian promenade along its banks. The restoration and transformation created a new market for shops and restaurants and spurred economic growth. And as travelers began to shift from cars to public transport, performance actually improved along some of the roads that had become the substitute for the Cheonggye expressway. However, the path to better transit and less congested roads was not straightforward.

Seoul had been expanding its metro transit network for more than a decade before it demolished the elevated expressway (Figure 4). But adding more metro lines had not been a panacea for gridlocked roads because most of the rise in metro ridership came from former bus riders rather than passenger car drivers. The impact on the bus system was self-reinforcing: as bus ridership declined, so did bus service. Between the mid-1990s and 2002, almost half of the city's 103 bus companies shut down. After the 2002 expansion of the metro network, automobile passenger trips and metro ridership were both higher than in 1996, while bus ridership was lower (Figure 5).

But a comprehensive reform in 2004 began a dramatic reversal in the trend. What was the policy that drew people out of their cars and into the public transport system? The key was an integrated multimodal approach to public transport backed by new information and communication technology.

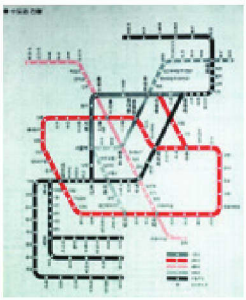
Wide Roads Prove No Solution

As congestion intensified over the years, the highway came to resemble a parking lot more than a road to progress.

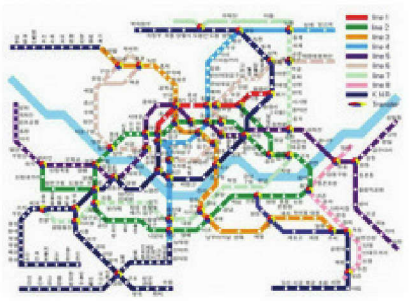
Photo Source: Seoul Metropolitan Government

FIGURE 4: EXPANSION OF THE METRO SYSTEM IN THE SEOUL METROPOLITAN AREA

A. FOUR LINES, 1985



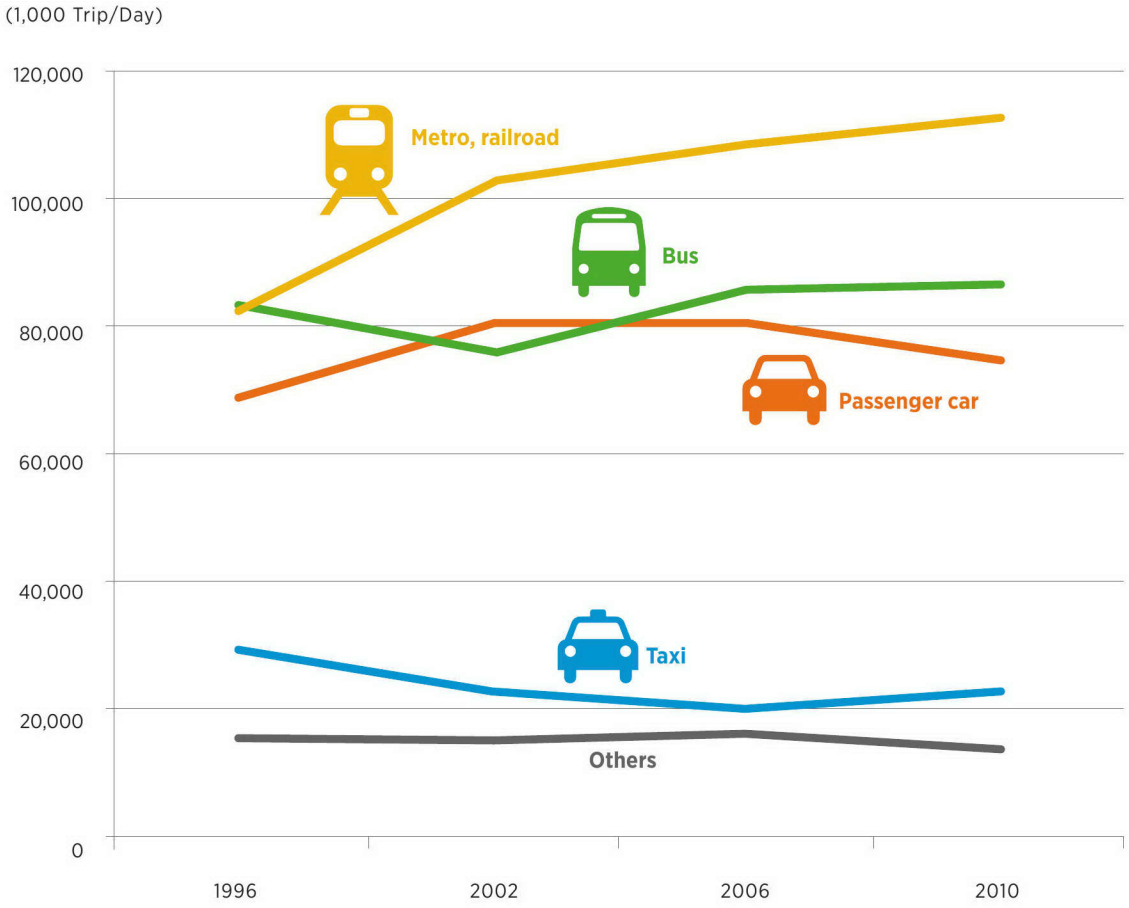
B. EIGHT LINES, 2000



C. SEVENTEEN LINES TODAY

The 17 metro lines of Seoul and neighboring cities are integrated into one massive Seoul Metropolitan Area (SMA) metro system. But expanding metro was insufficient to reduce car congestion until the 2004 reform of the bus system. Then the SMA system became the backbone of an integrated transport network of bus and rail. Comprising more than 900 kilometers of track, the SMA system today is the world's most extensive multioperator metro network.

FIGURE 5: TRAVEL VOLUME IN SEOUL, BY MODE, 1996–2010



Source: http://traffic.seoul.go.kr/archives/289

Case Study 1.
Seoul Unpaved Paradise and Put Up a Promenade[2]

When visiting downtown Seoul, a pedestrian oasis meanders through a valley of high-rise office buildings. It is Cheonggyecheon stream, a highly acclaimed model of urban river restoration.

The Cheonggyecheon case shows how the perception of solutions changed as traffic congestion increased and the economy developed. When there was little traffic, the expressway was welcomed. In what earlier would have been seen as a paradox, tearing it down when its traffic became gridlocked made the city a better, more enjoyable, and more profitable place. Today, when strolling along its banks and taking a break from busy urban life, it is hard to believe that the stream was once the route of the city's widest, most congested expressway.

Cheonggyecheon is a living showcase of how the thinking on transport and development has changed over time in Korea. In the 1950s, the stream gave way to a road, and later to an elevated expressway.

By the 2000s, the corridor had become unsafe to use; the mayor decided to demolish it and restore Cheonggyecheon stream.

PHOTO CS1.1: CHEONGGYECHEON STREAM TODAY

Photo Source: Seoul Metropolitan Government

[2] *To paraphrase the lyric in Joni Mitchell's 1970 song, "Big Yellow Taxi": "They paved paradise and put up a parking lot," http://jonimitchell.com/music/song.cfm?id=208*

Symbol of development

In 1958, the city government covered the stream to use it as a road and by 1977 the entire length was covered by an expressway. Regarded as a symbol of development at the time, hindsight showed that the road was an inefficient investment considering the low volume of traffic it served.

PHOTO CS1.2: EXPRESSWAY BEING CONSTRUCTED OVER CHEONGGYECHEON STREAM

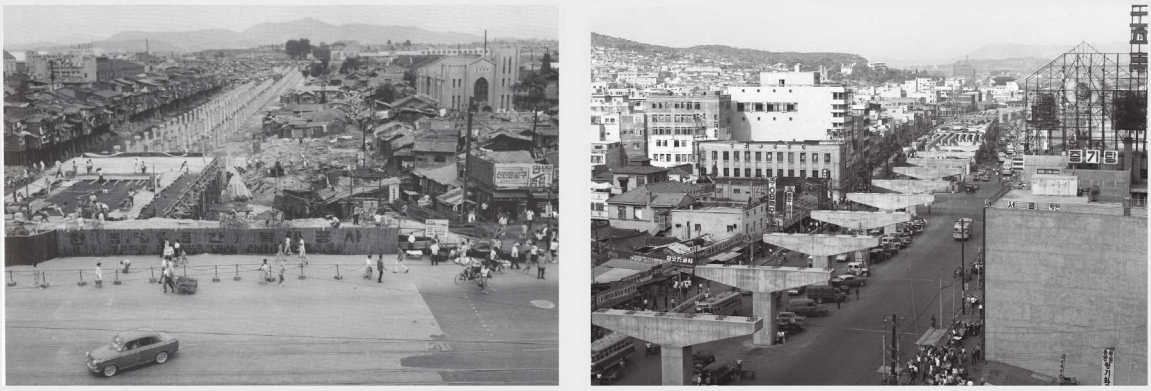


Photo Source: Seoul Metropolitan Government (Left and Right)

Demolition

Decades later, rapid economic growth and an exponential increase of cars on the road turned the expressway into a fast way into the city center. But by the 2000s, the corridor became unsafe for use and the mayor decided to demolish it and restore the stream beneath.

PHOTO CS1.3: CHEONGGYE EXPRESSWAY BECOMES CONGESTED

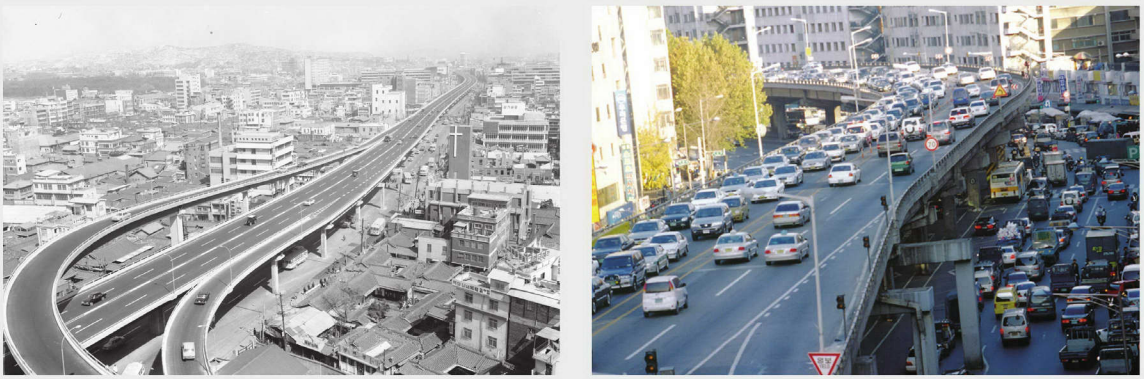


Photo Source: Seoul Metropolitan Government (Left and Right)

Despite concerns that the expressway's demolition would exacerbate traffic problems, worsening congestion never occurred due to public transit improvement plans. Instead, the restored stream and waterfront made downtown more attractive to visitors and, as a result, more high-value businesses moved into the area.

The Cheonggyecheon case is paradoxical. It shows how the perception of solutions changed as traffic congestion increased and the economy developed. When there was no traffic, the expressway was welcomed. When roads were gridlocked with cars, closing it off made the city a better, more enjoyable, and profitable place.

III. SUPPORT FOR MULTIMODAL TRANSPORT SOLUTIONS

The reform in Seoul made bus-to-bus and bus-to-metro transfers swift and free of charge. The city rearranged bus routes to broaden passenger access, built bus rapid transit (BRT) lanes and transit centers for faster and more reliable service, and introduced branch buses connecting remote locations to the main artery system. The plan also replaced diesel buses with compressed natural gas models that emitted fewer pollutants. The new multimodal system was supported by innovative ICT that enabled rechargeable transport cards to work with distance-based fares and provided real-time route and schedule information to travelers. Bus companies and unionized drivers, opposed to the plan at first, eventually accepted the changes, which included expanded subsidies.

Transfers became more convenient; the speed and reliability of bus service improved (Table 1); and bus-related accidents and injuries declined by about 25% just one year after the reform (Table 2 and Case Study 2). Seoul saw a continuous increase in the number of subway, rail, and bus passengers and a drop in the use of cars.

TABLE 1: TRAVEL TIME RELIABILITY, AND PRE- AND POST-REFORM BUS SPEED, ON SELECTED BUS ROUTES IN SEOUL

	Travel time reliability				Bus speed before and after the reform (km/h)		
Route	Distance (kilometers)	Travel time (minutes)	Bus travel time variance (minutes)	Car travel time variance (minutes)	Before (July 2003 to June 2004)	After (July 2004 to June 2005)	Change
Dobong-Mia	15.2	44.3	± 2.7	± 15.3	9.0	30.8	+21.8 (242%)
Susaek-Sungsan	6.8	18.1	± 1.2	± 15.6	7.5	20.2	+12.7 (169%)
Gangnamdaero	4.8	16.7	± 1.3	± 4.6	9.1	17.4	+8.3 (91%)

Source: Ko, J. 2014a.

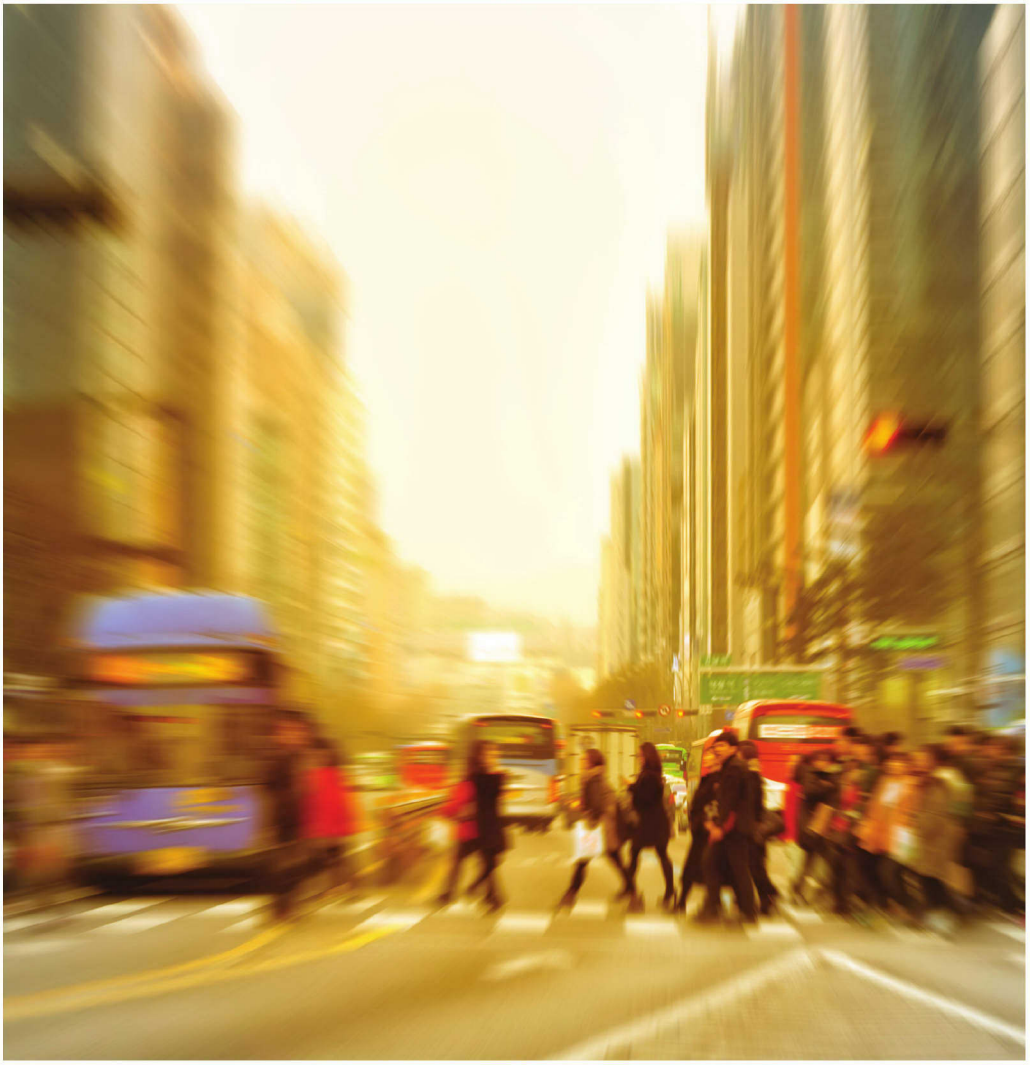
TABLE 2: BUS-RELATED ACCIDENTS AND INJURIES IN SEOUL BEFORE AND AFTER THE REFORM

	Before (July 2003 to June 2004)	After (July 2004 to June 2005)	Change
Number of accidents	7,966	5,971	–1,995 (25.0%)
Number of persons injured	12,015	8,835	–3,180 (26.4%)

Source: Ko, J. 2014a.

Seoul's mayor, Lee Myung-bak, who steered the planning and implementation of the landmark public transit reform, was elected president of Korea in 2008. Based on his experience in Seoul, he declared "green growth" to be a national priority and led the advance of green transport on a national scale.

The strategy of transit-oriented development uses BRT and metro transit centers as hubs of economic activity for both new land development and urban rehabilitation. Major stations on high-speed rail lines have been transformed into business and entertainment destinations. Interregional bus transfer centers set up at highway service areas have improved connectivity for smaller cities. The rechargeable transport card has now become virtually a nationwide fare system, and cities continue to make innovative strides in their transit networks.



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Case Study 2.
How the Seoul Government Made Bus Riders Happy

In 2003, the year before Seoul's reform of public transit, the number of vehicles registered in the city stood at 2.8 million, 46 times more than in 1970. As the number of cars on the road increased over that period, the average speed of traffic decreased, and buses lost their competitive edge. The average daily number of passengers per bus was halved between 1983 and 2003, from 1,069 to 504, and the modal share of travelers fell to below 30%.

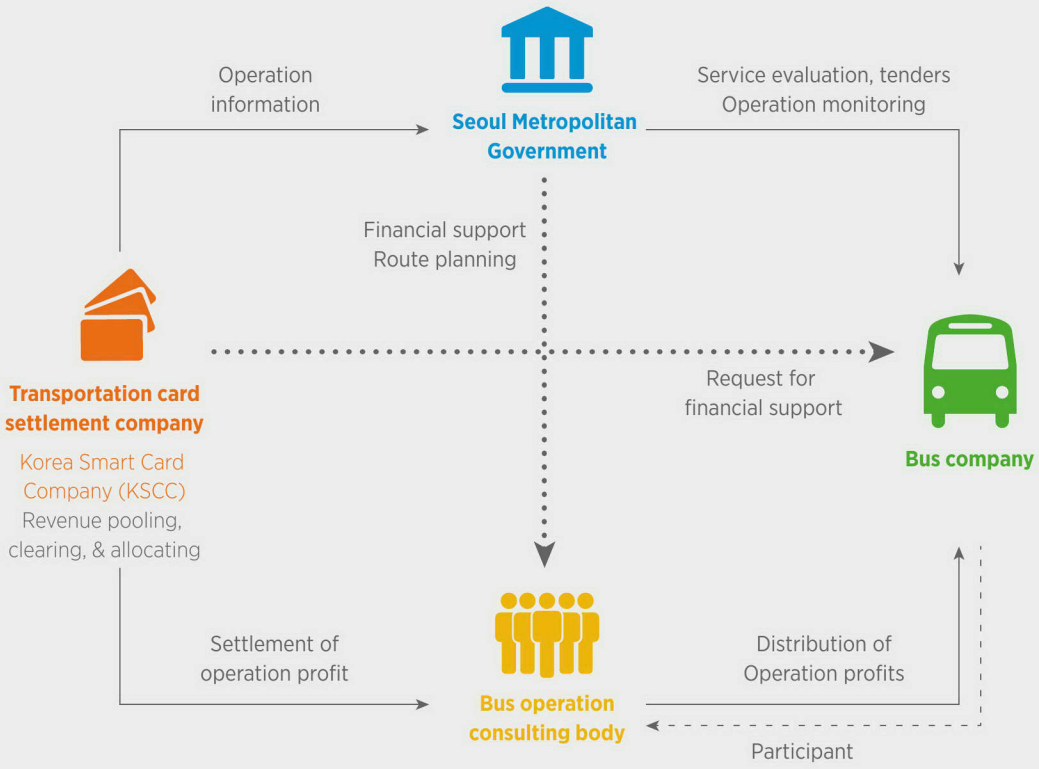
As bus service deteriorated, buses tended to speed and have more accidents, skip bus stops with few passengers, and remain longer at popular stops in order to board more passengers. These practices made buses even less reliable and incurred more operating deficits.

Yet, one year after the 2004 reform, passenger satisfaction with the bus system, rated on a scale of 1 to 10 moved up from 4.85 to 5.61, reaching 7.5 in 2012. How did that happen?

Key Features of the Reform

A semipublic bus system. Before the reform, Seoul's government regulated the level of bus fares and provided subsidies but did not involve itself with route planning. The reform created a semipublic system under which many bus routes were redrawn with more focus on accessibility and less on profitability.

FIGURE CS2.1: MANAGEMENT STRUCTURE OF SEOUL'S SEMIPUBLIC BUS SYSTEM



Source: Ko, J. 2014b, Seoul Institute.

The new system gave both the bus companies and the government a role in managing costs. The government and the bus companies agree in advance on the allowable level of operating costs for the year, and the government continually monitors the bus companies' service quality and operations records. Pooled revenue is distributed to individual companies on the basis of travel records, and the government covers any gap between pooled revenue and agreed cost.

Same distance, same fare: The fare system was changed from a per-trip charge to one based on distance with no charge for transfers. Regardless of the mode or number of transfers, the fare remains the same for the same travel distance. The change was facilitated by enhancing the existing rechargeable transit cards with the ability to process distance information. The result increased the use of transfers, lowered traveling costs, and increased the use of buses. Moreover, metro ridership also increased because of the free transfers and distance-based fares.

Bus route simplification: Bus riders no longer needed to remember bus routes. Routes were reorganized into a trunk and feeder system. Trunk lines connect major destinations to a network of feeder lines that reach surrounding neighborhoods. With free transfers, passengers now just travel to the closest transit center and check the route map to find the correct feeder line to their final destination.

Improved infrastructure: The reform upgraded bus stops with shelters and electronic displays providing real-time schedule information, replaced diesel buses with models powered by compressed natural gas to reduce air pollution, and built dedicated bus rapid transit (BRT) lanes in major corridors. The cost per kilometer to build the BRT lanes was $1.5 million, far less than road construction ($30–80 million) or new metro lines ($100 million).

Results of the Reforms

Buses became safer and the number of bus-related accidents decreased by 25% in a year. The number of bus passengers increased by 14% within one year and has since stabilized. And as noted at the outset, bus riders have said they are happier.

The government had been subsidizing bus companies before the reform, but with the new emphasis on accessibility, the bus deficit almost tripled. Nonetheless, considering Seoul's population of 10 million, the annual bus deficit of around $200 million, or about $20 per person, was considered a small price to pay for the benefits of reduced fares, and a shift from auto use to public transportation.

In fact, the total combined deficit for bus, metro, and rail actually decreased after the reform, as did the estimated social costs of transportation. In 2005, Seoul's government reported a gain of nearly $2.4 billion in social benefits through reductions in travel time ($2.0 billion), driving costs ($0.3 billion), accidents ($47 million), and air pollution ($41 million).

IV. KEY POLICIES THAT ENABLED THE TRANSITION TO GREEN GROWTH

Seoul's shift to green transport had four fundamental characteristics:

- Multimodalism
- Integrating the modes with information and communication technology (ICT)
- Vision and political will
- Financial support

These elements also defined green transport policies that spread to other parts of the country.

A. MULTIMODALISM

Key elements of multimodalism were transit-oriented development; a distance-based, free transfer fare system; and a community shuttle-bus system.

1. Transit-oriented development

In the 1980s, housing shortages worsened in Seoul as more people moved there for better economic opportunities. In the 1990s, five "new towns," or satellite cities, were developed on the outskirts, with 292,000 housing units for 1.17 million residents. The metro network was expanded to serve them with seven new lines with a total length of 159 kilometers.

The simultaneous rise of the new towns and the new metro lines set a precedent for a partnership between land use planning and transportation planning called transit-oriented development. Since then, plans for new land development have been centered around BRT and metro to BRT and BRT to metro stations. Under plans for redevelopment, existing stations are refurbished and converted into complexes that connect long-distance rail, metro, and buses while serving as commercial and cultural hubs (Photo 2).

PHOTO 2: TRANSIT HUB CITIES: PRIVATE INVESTMENT IN SEOUL PUBLIC TRANSPORT

A. 1980'S YONGSAN STATION

B. YONGSAN STATION AFTER

Before its transformation, Yongsan Station—a major transit hub in Seoul for national rail and city metro lines—had no function except as an entry point for boarding a train. The station was rebuilt using private investment and started its operation as the starting point of the southwest-bound KTX high-speed rail-line in 2004. . Investors also built a shopping mall with a department store and cinema, which became a destination in itself. Major KTX stations and some metro stations operated by Korail have since been developed in Seoul and elsewhere in Korea in the same way, with some featuring conference centers so business travelers from other regions need not leave the station to attend meetings.

Photo Source: Korea Railroad Corporation (Left), I Park Mall (Right)

2. Distance-based, free transfer fare system

Creating a price system based on free transfers and distance-based fares was a key achievement. As many bus routes had been established before the expansion of metro lines, the two transit modes competed for customers along many of their routes. As road congestion worsened, travelers who had a choice favored the metro system. For those who had to use both modes, transfer fees constituted a large share of their travel cost.

The new fare system, based on ICT, was bundled with bus route reforms that reduced overlapping services and broadened access to more travelers. With distance-based fares and free transfers, each transport mode became a branch of the overall integrated system. People came to enjoy being able to combine modes of public transit to get to their destinations more quickly and more cheaply.

3. Community shuttle bus

The community shuttle bus system, which currently accounts for about 10% of the country's public transit ridership, is a key element of Korea's green transport model.[3] Small buses operated by private companies connect neighborhoods with nearby metro stations or major bus transfer centers. They serve all parts of the city, including both rich and poor residential neighborhoods, which are often far from the wider transit system. In some poorer hilly neighborhoods, the shuttle bus is the only transportation mode for elderly people (Photo 3).

The cost of a shuttle ride averages about $0.75, but the trip is part of the distance-based fare system. Shuttle-bus travelers use the transit system smart card (T-card); if they need to connect to a regular bus or the metro, the transfer is free so that the cost of the full length of the trip is calculated as a single ride.

PHOTO 3: INCLUSIVE PUBLIC TRANSPORT SYSTEM AT YOUR DOORSTEP

Community shuttles are usually smaller public buses or vans that connect regular bus lines or metro stations with destinations difficult to reach by those modes. In Seoul, the traveler's smart card integrates the cost of the trip with the distance-based, free-transfer fare system used on public transit throughout the metropolitan area.

Photo source: Eun Ko, 2015

"저녁에 1번 출구서 만나"… 밤마다 교통지옥으로 변하는 '강남역'. 이경주, 장은석, *2014.6.23.*, 서울신문 *[article title, author, date published (access date does not matter)] [in Korean], http://www.seoul.co.kr/news/newsView.php?id=20140623018001.*

B. INFORMATION AND COMMUNICATION TECHNOLOGY

To obtain the efficiencies of a multimodal system, the bus and metro elements had to be linked by ICT. The technology made the existing smart card system adaptable to distance-based fares and enabled real-time schedule information for passengers by connecting to a global positioning system (GPS).

1. Transportation smart card system

The role of ICT was crucial for some innovations, such as the transportation smart card (T-card) and cost-based revenue distribution systems. When it was introduced in Korea in the 1990s, the T-card was used only as an alternative to paper tickets or tokens. But it turned out to have a catalytic role in the success of the reform: by allowing a distance-based fare system employing free transfers, it brought passengers to buses.

Under the previous system, each bus or metro trip was priced as a separate full fare. In the new system, T-cards became smart cards—the tool needed to differentiate transfers from new trips and to register the start and end point of trips. Passengers have to touch their T-card to the card reader when they board a bus or enter the metro system. When they disembark or exit, they touch the card to the reader again, and the base fare plus a charge for any additional distance is deducted from the card's value. When a passenger takes another bus or metro trip within 30 minutes, the transfer is free, meaning that only the extra distance will be charged at the end of the second leg. Because a new base fare is not assessed on the second ride, the total cost is less than two separate trips. The system encouraged more people to use transfers, which resulted in savings in time and expense for consumers and more efficient use of public transport at the same cost of operation.

T-cards were widely used before the reform, so it took only a short time to implement the free transfer system. The T-card has since evolved into an all-purpose payment tool that can be used for public parking, highway tolls, taxi fares, and train and long-distance bus tickets as well as at the post office, for online shopping, and at some retail establishments. Currently, 97% of Seoul's citizens use T-cards, which can be manually recharged or connected to a credit account so that it automatically recharges.

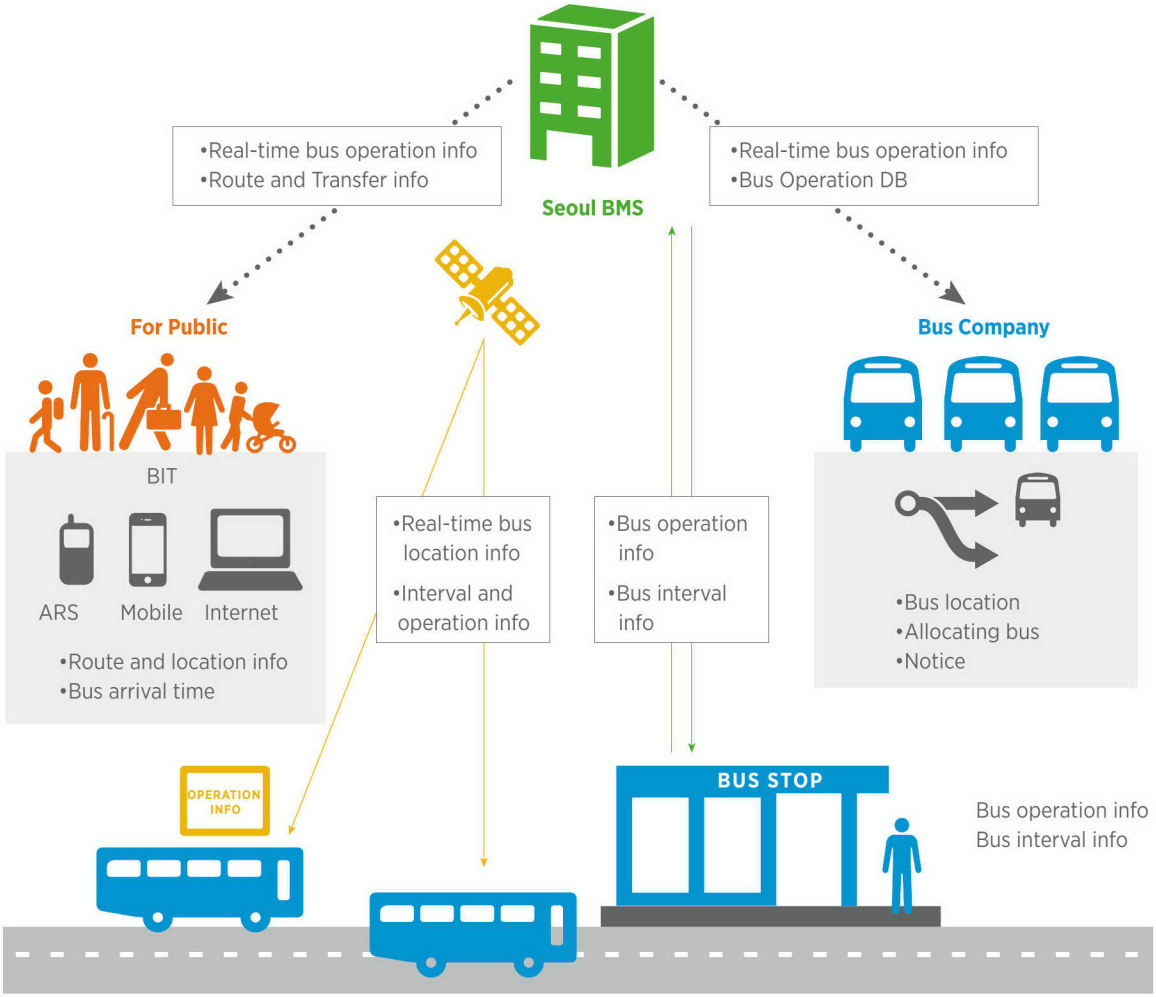
The role of ICT was crucial for some innovations, such as the transportation smart card (T-card) and cost-based revenue distribution systems.

In 2014, smart card systems throughout Korea merged and now recognize T-cards bought anywhere in the country. Imagine taking a taxi to a train station, buying a ticket, traveling to the other end of the country, taking a local bus to a coffee shop, and paying for it all with a T-card. That is the new normal in Korea, and what made it possible was the integration of ICT and transportation.

2. GPS-based transportation information system

Each major city now operates a comprehensive transportation information system that includes GPS tracking of every one of its buses. In Seoul, TOPIS (Seoul Transport Operation and Information Service) provides locations and arrival times of all community shuttles, buses, and metro trains updated at 10-second intervals. Travelers use the information to guide their trips, government uses it to evaluate its transport operations, and bus associations and the smart card company use it to distribute revenue according to distance traveled.

FIGURE 6: SEOUL BUS MANAGEMENT SYSTEM (BMS)



Source: Ko, J., 2014b, Seoul Institute.

C. VISION AND POLITICAL WILL

The bus companies and many transit riders initially opposed the reforms. While the new system was innovative, success required all aspects to be implemented simultaneously, including the distance-based fare system, changes in bus routes, and a trustworthy reimbursement system. Thus, it was the type of high-risk, high-return project that brings immediate opposition, with benefits seen as coming far later. Overcoming such opposition requires the vision and will of key politicians and officials. In Seoul, public transport reform was one of the major pledges of the then-mayor, who was able to get political support from both the government and citizens.

At first, the bus companies objected to the reform mainly because they feared it was the prelude to a public takeover. The rearranging of routes might also reduce profits, and drivers worried that the reform would cause large layoffs. However, after persistent negotiations, Seoul's government finally assuaged the fears of the bus companies and the bus drivers' union.

The resulting greening of transport and urban development in Seoul stimulated business activity and over time gained widespread public support. As in a chain reaction, improvements in traffic flow reduced air pollution and enhanced the quality of the urban environment. With that, more economic activities were created, which in turn bolstered public support for the government's attempts to improve mass transit.

D. FINANCIAL SUPPORT

1. Initial construction costs for upgraded bus service

There is no comprehensive estimate of the total cost of Seoul's bus reform. The spending was spread over diverse budget items and mixed with other projects and overhead costs. However, in 2004 the Seoul government allocated 30 billion won (approximately $30 million) to build 59.5 km of BRT lanes; and in 2003 and 2004 combined it allocated 15.9 billion won to establish a transportation control center. In addition, it paid the bus companies 4 billion won to defray the cost of repainting their buses for a new color code required by the reform. Overall, the initial construction and preparation costs for the revamped bus system probably amounted to about $100 million.

2. Operating losses for buses

Seoul's government spends about $200 million per year to cover the operating losses of the bus system, which translates to about $20 per person. The subsidy is generally regarded as affordable, given the public economic benefit of the fare system and the potentially higher economic losses, stemming from more congested roads, if the bus system had not been revitalized.

3. Rail transit

Rail transport is a key component of green transport. From 2008 to 2012, investment in railroads in Korea almost doubled (Case study 3). The central government shares construction costs, and the regional governments are responsible for covering operating deficits.

If a regional government has a successful urban public transport plan, the government should keep in mind not only the initial construction costs but also the long-term implications of operational costs. How much responsibility the public sector will take for daily operation costs and how to get the exact figure of the costs should also be considered. The central government could have a supportive role for better urban transport, but regional governments should make prudent plans based on realistic estimates.

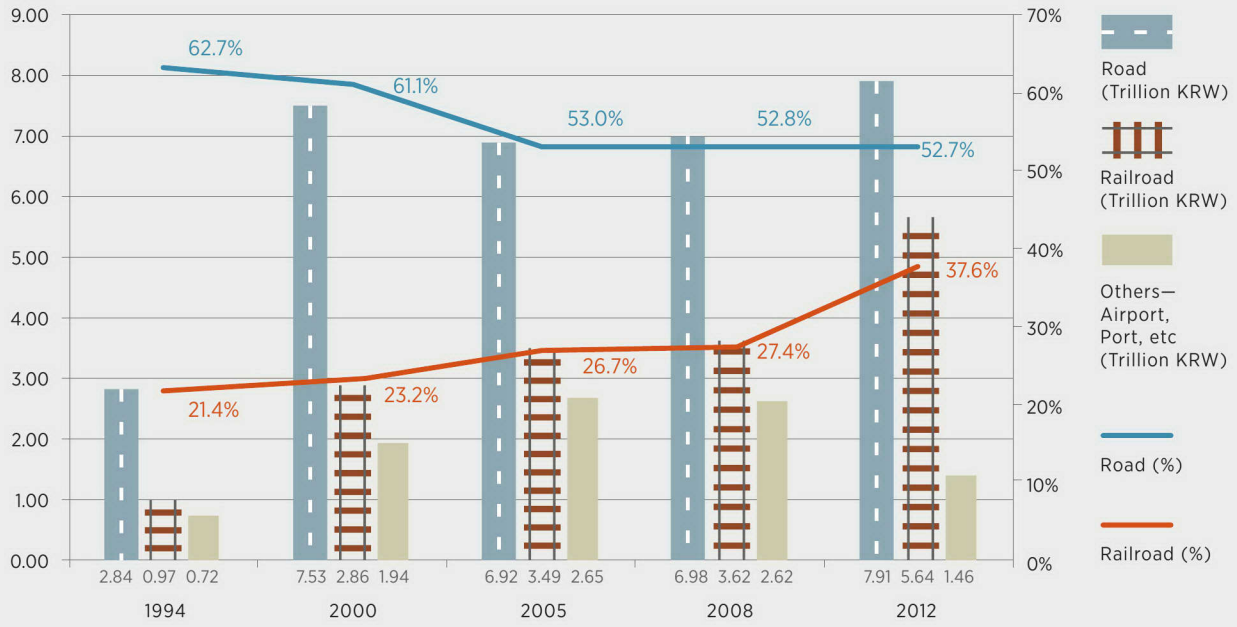
Case Study 3:
What Is the Central Government's Role?

The central government of Korea does not engage in every detail of regional governments' policy decisions. But it substantially affects those decisions by setting a national agenda, devising master plans, and adjusting major investment programs.

In 2004, when he was the mayor of Seoul, Lee Myung-bak initiated the popular and successful reform of the city's public transportation system that boosted mass transit. When he was elected president of Korea in 2008, he placed "green growth" on the national agenda. For transportation, the central government developed a master plan that gave heightened priority to improving public transit as well as nonmotorized transport and demand management. The change had an effect on national spending on infrastructure.

Traditionally, Korea's road sector had received the biggest slice (around 60%) of the national transportation infrastructure budget, while railroads received around 20%. Between 1994 and 2008, investments in road were declining as a share of national spending on transportation infrastructure, while the share for rail was drifting up (figure CS3.1).

FIGURE CS3.1: KOREA'S INVESTMENT IN TRANSPORT INFRASTRUCTURE, BY MODE, 1994–2012



Source: Presidential Committee on Green Growth. 2013. *Green growth and the better Korea: Policy handbook on green growth* [in Korean]. Seoul: Presidential Committee on Green Growth

However, the 2008 action at the national level gave regional governments a stronger incentive to include green priorities in their own transport plans because doing so would generate more financial support from the central government.

Between 2008 and 2012, the road share of national spending on transportation infrastructure held steady at about 53%, but the share for rail rose sharply, from 27% to 38%, as was consistent with the national master plan initiated in 2008.

V. KEY LESSONS AND NEW CHALLENGES

In spite of rapid growth, urbanization, and motorization, Korea has succeeded so well in expanding the use of public transport that it has stabilized energy consumption per capita in the road sector.

Before it matched its supply-side policies—building roads and metros—with demand-side policies that improved intermodal service, Korean transport policy was at a dead end, unable to stop the rise of highway congestion. The solution began in Seoul, which upgraded and revived the bus system with BRT and neighborhood feeder routes and linked it to rail with ICT. The result was an integrated urban, and ultimately national, mass transit system that could stem the rise of automobile use.

In 2010, Korea took aim at a new 10-year goal with its green transport master plan: reduce GHG emissions by one-third while maintaining its competitiveness. To do so, Korea seems poised to create more cutting-edge transport innovations that can serve as models for other countries. Stay tuned.

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Korea Green Growth Partnership

The World Bank

1818 H St. NW, Washington, D.C., 20433

kggtfsecretariat@worldbank.org

The Korean Green Growth Trust Fund (KGGTF)—a partnership between the World Bank Group (WBG) and the Republic of Korea)—promotes, creates, and communicates knowledge about Green Growth approaches and projects based on the real-world experience of policy makers and Green Growth technical practitioners in Korea. The KGGTF seeks to strengthen and expand the World Bank's green portfolio by sharing evidence-based practical knowledge with WBG staff, WBG client countries, and other interested parties. In partnership with the WBG, KGGTF activities disseminate knowledge and promote the creation of a green growth knowledge network to help WBG clients design, plan, and implement green growth strategies and investments.