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KOTI Knowledge Sharing Report

06

Korea's Best Practices in the Transport Sector

Bicycle Transport Policy in Korea

by Hee Cheol Shin et al.



THE KOREA TRANSPORT INSTITUTE

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**KOTI Knowledge Sharing Report: Korea's Best Practices in the Transport Sector
Issue 6: Bicycle Transport Policy in Korea**

by Hee Cheol Shin, Dongjun Kim, Jae Yong Lee, Jaeyoung Park, Seong Yub Jeong

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• Preface

Facing the challenge of tackling global climate and environmental issues, countries around the world are exerting various efforts to reduce carbon emissions. As for Korea, it is aiming to slash its greenhouse gas emissions by 30% relative to the level of BAU by 2020. Attaining this target particularly requires reduction endeavors in the transport sector, which accounts for 20% of the nation's total GHG emissions. Against this backdrop, a lot of efforts are being put into projects to promote the use of bicycles as a most prominent non-motorized, no-carbon mode of transport.

Korea is not a bicycle-oriented country; Its modal share of bikes reached just 2.1% as of 2010. However, the Korean government is actively trying to promote cycling, considering the low level of bike usage as an opportunity. Through a diversity of government-initiated efforts, the number of bike users in the nation is rising rapidly. This book describes four major policy measures the government has implemented to facilitate cycling — the master plan for national bike roads, four-river bike paths, the new town bicycle project, and, the introduction of public-bike sharing systems.

The “master plan for national bike roads” was the first of its kind developed at a state level in Korea. As such, it represented a departure from the past practice of leaving local administrative bodies to their own devices when building bike roads. By ensuring coordination among nationwide bike roads, the master plan helped improve the efficiency of various bike projects separately promoted by local governments. The master plan led to the designation of national bike paths, the total length of which amounts to 4,838 km, as well as the steady expansion of cycling infrastructure facilities. The expansion in bike infrastructure, in turn, has led to increases in the number of people riding bicycles for livelihood and/or leisure activities.

The “four-river bike paths” plan was implemented as part of the four rivers restoration project, a kind of Korean New Deal program aimed at improving the quality of water, restoring healthy ecological systems, and creating jobs. Built

along the four rivers, which connect the nation's major cities, the trails formed a cross-country cycling route. The 1,757 km-long network of riverside bike paths was built in harmony with the surrounding natural environments. Besides, the bike courses have been built on the river banks, thereby ensuring the safety of cyclists by reducing the possibility of bike-car conflicts. These features are making the riverside bike paths all the more popular among cyclists.

Korea, a small country in terms of land area, is exerting efforts to resolve its urban traffic problems through systematic development of new towns. The “new town bicycle project” should be viewed from this perspective. The project is serving as a model example of new town development, providing guidelines for the ongoing efforts to develop customized bike-oriented urban development plans based on analysis of bicycle usage and travel patterns of Koreans.

Through the “public bike sharing systems,” a growing number of Korean cities are creating environments under which anybody can easily rent and use bicycles. In particular, through the operation of transit-linked public bike systems, these cities are generating the effects of promoting the use of public transport as well as bikes. By using the nation's advanced IT technologies, they are further developing the public bike sharing systems that can provide more convenient services to the users.

A cycling boom has just begun in Korea. This book describes in detail the major bike policies that have contributed to the boom as well as the process of building infrastructure, its results, implications, and new ideas that should merit attention. We hope that this book will serve as a guide to the countries seeking to follow the example of Korea in promoting the use of bicycles.

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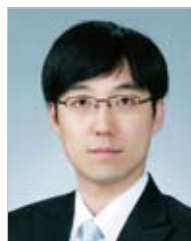
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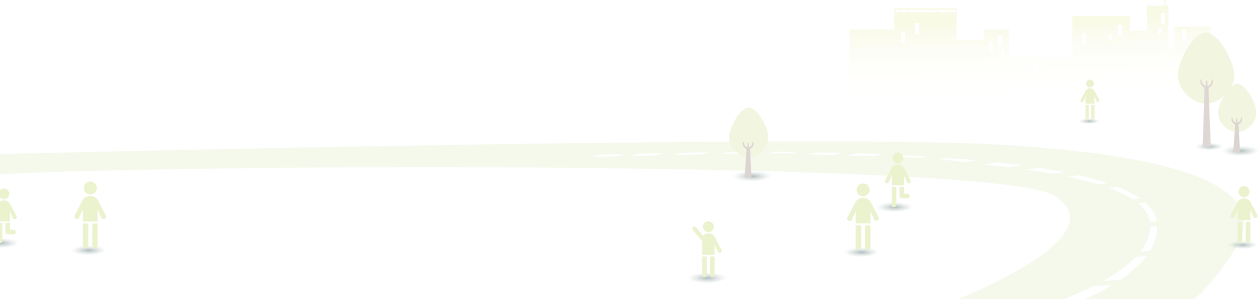
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- Summary

01

The Present Status and Future Prospects of Bicycle Policies of Korea

Korea, which was a typical example of an underdeveloped country during the Korean War, has since achieved remarkable economic growth, rising to the ranks of developed nations in the 21st century as a member of the OECD. Significant progress has also been made in the nation's transport sector, the full-fledged development of which began with the construction of expressways in the 1970s. Today, Korea boasts state-of-the-art transport technologies exemplified by its high-speed rail system called KTX and the smart traffic card scheme. However, increases in the number of cars and private car ownership led to a reduction in the use of bicycles. This trend reached its peak in the mid-2000s. The 2005 census showed that cycling had a modal split of just 1.2%. In 2010, it rose a bit to 1.7%, which was still a very low rate.

The Korean government has made a lot of efforts to turn the situation around. Since the enactment of relevant laws in 1995, the government has implemented various measures, including the construction of bike paths and the overhaul of various related facilities, for the facilitation of cycling. In 2009, the government devised a national bike path master plan. The plan included an infrastructure expansion scheme and covered a wide range of relevant topics such as educational programs, publicity measures and guidelines on building and managing bike paths. The Lee Myung-bak government, which was inaugurated in 2008, implemented a program to build riverside bike paths as part of its four major rivers restoration project. Amid such expansion of cycling infrastructure, the number of bike users in Korea has been steadily increasing, although most of them are leisure-oriented cyclists. The bicycle usage pattern of Koreans is also increasingly getting closer to

those of advanced countries.

The construction sector has played an important role in the nation's rapid economic development. One of its main achievements is the construction of new towns. When developing new towns, emphasis had previously been placed on designing car-centric traffic systems. Since the 2000s, however, it has become increasingly important to ensure the operation of eco-friendly modes of transport, resulting in the establishment of bike plans at the same time as other transport plans. In addition, a growing number of cities are introducing a public bike system* based on the nation's technological prowess in the IT sector. Korea is considered to be in a very advantageous position in relation to public bike systems, the promotion of which requires environment-friendly policies as well as pertinent leading-edge technologies. Korea has promoted cycling through the development of relevant state plans, the construction of bike infrastructure in association with large-scale projects, the establishment of bike policies related to urban development oriented toward increasing the efficiency of an urban traffic system, and the provision of various means aimed at increasing user convenience. This may provide important implications for countries or cities trying to facilitate the use of bicycles.

* Public Bike System (PBS) is often referred to as public bike sharing system or bike sharing system. A hyphen may be used between bike and sharing. This paper uses PBS as acronym for the term.

02

The Master Plan for National Bike Roads

The world is facing “environmental” and “resources” crises exemplified by climate change and high oil prices, respectively. As part of efforts to tackle the global problem, the Korean government has proposed the idea of “green growth.” The task for the transport sector with regard to the national policy goal of “green growth” is to encourage and promote the use of low-carbon green modes of transport like cycling and walking. Determined to “firmly establish an ecological culture by linking every part of the nation with bike paths,” the government has developed a national bike road plan to ensure the safe and convenience use of bicycles in everyday life.

To devise a framework for building national bike roads, the Korea Transport Institute and several engineering design companies formed a consortium. With a budget of 2.35 billion KRW, the consortium implemented tasks to develop a master plan for national bicycle policies, guidelines on building and managing cycling facilities, and bike road plans. Finally, the master plan was completed by a consultative body composed of the engineering design companies, central government officials, pertinent experts and representatives of local administrative bodies. The total length of the finally selected routes reaches 4,835.4 km, which breaks down to 3,214.4 km of the circular route and 1,621 km of the inland connection routes. The circular route breaks down to 569.4 km for the existing bike roads, 70.3 km for sections included in various plans, 400.2 km for national highway sections, and 2,174.5 km for municipal and provincial road sections (165.9 km for municipal roads, and 2,008.6 km for provincial roads). The 1,621 km-long inland route consists of 675.2 km for national highway sections and 945.8 km for municipal and provincial roads (89.9 km for municipal roads and 858.9 km for provincial roads).

The master plan for the national bike road network has been progressing smoothly since it was established in 2010. In 2010, bike roads that measured 178 km in total length were built in 50 districts. With the construction of the national

bike road network, bike roads built within cities are being used for utility purposes, while those connecting cities are being used for utility and leisure purposes. By establishing such a massive plan, the government could also carry out the project in a coordinated manner and effectively use the relevant budget. The national bike road master plan was the first of its kind developed at a state level in Korea. It was a particularly meaningful achievement in that the government manifested its financial commitment to promoting cycling as a project worthy of national endeavors. A growing number of people are using bicycles thanks to the expansion in bike infrastructure, thereby promoting their health and enjoying their leisure and ultimately, a better quality of life.

03

Four-River Bike Paths

The Lee Myung-bak government implemented the four rivers restoration project to tackle the problems of floods and drought caused by climate change, improve the quality of water and restore a healthy ecological system, and secure water-friendly spaces that can be used for leisure and cultural purposes. The project was also aimed at creating jobs and facilitating the recovery of economic vitality in a kind of green New Deal project. Targeting the Han, Nakdong, Geum and Yeongsan rivers, the project was implemented through 2012 with investments worth 22.2 trillion KRW. These investments were used to reinforce the aging levees, recover river ecosystems, construct eco-friendly river beams, build flood control facilities, and foster river bike paths. The four rivers restoration project led to the construction of a 1,757 km-long network of river bike paths that connect the nation.

The riverside bike paths were constructed under guidelines placing the utmost emphasis on accessibility, safety and environment-friendliness. By fostering the paths along the riverside areas where conflicts between bikes and cars seldom occur, it was possible to ensure the highest level of safety and seamless bike traffic. Besides, the bike paths were separated from footpaths and rest facilities

by using curb stones and trees. The bike paths were built by using eco-friendly design techniques, giving the utmost consideration to environmental factors from the planning, design and construction stages to the final stage of using finishing materials. They were also designed to ensure safety during floods.

The construction of the riverside bike paths led to the establishment of a nationwide bike road network involving the existing bike paths built by local governments and the national bike roads. As a result, it has become possible to use bike roads conveniently and safely not only for utility but leisure purposes. Opening of the riverside bike paths led to a steep rise in the number of cyclists. For example, the South Han River trial was found to have been used by 300,000 people during eight months following its opening (as of the end of July, 2012). Various tour programs have been developed in relation to the bike paths, paving the way to the exploration of new types of leisure travel and improving the culture level and the quality of life of the people.

04

New Town Bicycle Project

To facilitate the implementation of “low-carbon green growth,” which has been selected as one of the most important national policy goals, the government is developing a diversity of pertinent action plans. One of them is a new town project being promoted by the Ministry of Land, Infrastructure and Transport. The ministry envisions building new-concept towns with low-carbon, energy-saving structure by changing paradigms in regards to urban energy consumption. To overhaul the energy-consuming structures of the existing new towns as well, the ministry is also trying to reform public transport, improve wide-area traffic systems, establish bike paths and take other carbon-reducing measures. The continued occurrence of abnormal weather conditions throughout the world is raising the need to adopt eco-friendly approaches in pursuing urban development. The transport sector, in

particular, is facing the necessity for promoting the use of bicycles in an effort to reduce energy consumption and greenhouse gas emissions. To achieve this task, the utmost priority should be placed on the following objectives: raising the bike mode share, building a seamless bike transport network, and securing the facilities and systems necessary for promoting the use of bicycles.

Amid growing importance placed on green growth and carbon reductions, newly planned or constructed cities are placing considerable emphasis on building bike infrastructure, which, in some cases, include median bike lanes and bike paths installed with photovoltaic power generation facilities. Previously constructed towns are also taking steps to repair and expand bike roads and related facilities. Dongtan 2 New City and Sejong City can be cited as prominent examples in regards to bike plans of new towns in Korea. In Dongtan 2 New City, the indirect benefits from the implementation of the bike road project is projected to reach 58.3 billion KRW a year in terms of money value. Of them, about 55.7 billion KRW worth of benefits are expected from the reduction of about 371,600 tons of CO₂. In this regard, Dongtan 2 New City is being cited as a model case showing the realization of a low-carbon green city. Sejong City is attracting attention with regard to its bike road installed with photovoltaic power generation facilities as well as its median bike path. With such achievements, Sejong is referred to as a prominent example of a new town promoting cycling through the use of new-concept leading-edge technologies

These efforts have helped lay the groundwork for ensuring a status shift for bicycles. Bike have come to be regarded not just as a tool for leisure but as a mode of transport that can be used in association with public transportation for commute and utility purposes. The efforts have led to an increase in the bike utilization rate, which in turn improved the level of comfort and safety, eventually enhancing the prospects of realizing sustainable urban development. Additionally, they helped realize a low-carbon transport system oriented toward green growth based on a shift from car- to human-centric cities. The bike projects have also generated environmental impacts. They have led to the construction of eco-friendly cities by helping to ensure clean air quality through reduction of greenhouse gases as well as by lowering the level of noise through reduction of car traffic. Furthermore, the

bike programs have contributed to building healthy cities by promoting the health of citizens and consequently, reducing medical costs and facilitating various social exchanges.

05

Introduction of Public Bike-Sharing Systems in Korea and an Exemplary Case

The public bike system is a bike sharing scheme designed to ensure that anyone can use bicycles as conveniently as possible, anytime (24 hours) and anywhere (locations nearest to an unspecified number of users), and regardless of the destination. Public bike systems can be divided into manned and unmanned systems, depending on the operating method. This paper deals with unmanned systems which are being widely used throughout the world. Introduced by more than 300 cities worldwide, the system is expected to replace the demand for short-distance travel by car. It is regarded as a useful tool that can be used in efforts to solve or ease various urban problems such as traffic congestion, accidents and air pollution. As such, the system is expected to be adopted by a growing number of cities throughout the world.

The public bike system helps to increase transport accessibility and expand basic transport rights. Generally installed at intervals of 300 meters, public bike stations are easily available, providing excellent transport accessibility. In particular, public bikes can provide the level of convenience close to that of passenger cars because users can ride them at any time they desire. This is an advantage that cannot be provided by public transportation. In addition, compared to passenger car use that requires spending considerable time parking cars at destinations, cycling ensures expeditious connections between starting points and destinations, even in long-distance trips, through linkage with other modes of public transport. In Korea, city-level public bike systems have been actively established since the late 2000s in relation to efforts to promote cycling. Public bike systems were in operation in

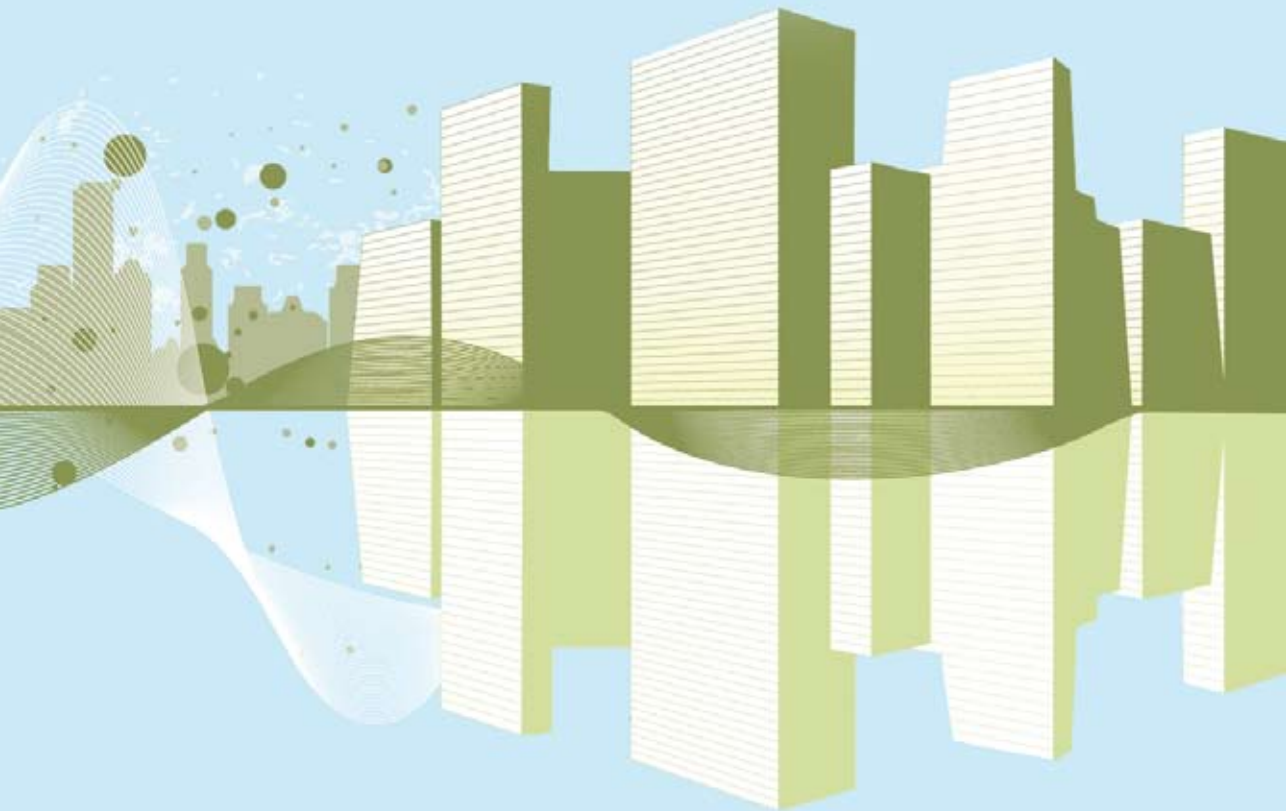
14 cities as of 2012. Of these cities, those operating more than 200 bicycles are Changwon, Daejeon, Seoul, Goyang, Busan and Yeosu. Changwon and Goyang have the largest fleets of over 3,000 bikes. A number of other cities are providing free bike services or operating large and small public bike rental programs.

Car-centric urban transport systems cause various social costs related to traffic congestion, air pollution, accidents and the construction and management of road facilities. Efforts are being made to tackle this problem through facilitation of the use of non-motorized modes of transport. However, Korea has been showing very low bike utilization rates, which can be attributable, to a considerable extent, to the problems of bike thefts and the shortage of bike parking lots. The public bike system can be used very effectively to tackle these problems.



CHAPTER 01

The Present Status and Future Prospects of Bicycle Policies in Korea



Korea was a typical example of an underdeveloped country in the 1950s during and after the Korean War. The situation changed dramatically through its rapid economic growth. It became affluent enough to join the OECD, and achieved the status of an advanced nation in the 21st century. Significant progress was also made in the nation's transport sector, beginning with the construction of expressways in the 1970s. Today, Korea boasts state-of-the-art transport technologies represented by its high-speed rail system called KTX and the smart traffic card scheme.

The situation is somewhat different when it comes to bicycle transport. In terms of development stages, cycling differs from other sectors involving cutting-edge modes of transport. The bike modal split tends to be high during initial stages of economic development. However, it goes down during periods of full-fledged economic growth. The bicycle mode share picks up again when a nation reaches an advanced economy status. Cycling in Korea has been showing a similar trajectory.

According to a traffic volume survey conducted on Sejongno streets near Gwanghwamun in 1946, bicycles had the highest modal share of 24%, followed by passenger cars with 20.4%, cargo trucks with 19.5%, horse- or cattle-drawn carriages with 1.8%, three-wheeled motor vehicles with 1.7%, and rickshaws

with 0.4% (Chosun Ilbo, June 26, 1946). Until the 1980s, the high usage of bikes continued, with Korea being listed as one of the leading bicycle exporters. The situation began to change with economic growth; Increases in the number of cars and private car ownership led to a reduction in the use of bicycles. This trend reached its peak in the mid-2000s. The 2005 census showed that cycling had a modal split of just 1.2%. In 2010, it rose a bit to 1.7%, which was still a very low rate (see Table 1.1 on the next page).

The Korean government has made a lot of efforts to change the situation. Since the enactment of relevant laws in 1995, the government has implemented various measures, including the construction of bike paths and the overhaul of various related facilities, for the facilitation of cycling. In 2009, the government devised a national bike path master plan. The plan included an infrastructure expansion scheme and covered a wide range of relevant topics such as educational programs, publicity measures and guidelines on building and managing bike paths.

The Lee Myung-bak government implemented a program to build riverside bike paths as part of its four major rivers restoration project. Such an expansion of cycling infrastructure helped increase the number of bike users, although most of them are leisure-oriented cyclists. Thus, the bicycle usage pattern of Koreans is increasingly getting closer to those of advanced countries.

The construction sector has played an important role in the nation's rapid economic development. One of its main achievements is the construction of new towns. When developing new towns, emphasis had been placed on designing car-centric traffic systems. Since the 2000s, however, it has become increasingly important to ensure the operation of eco-friendly modes of transport, resulting in the establishment of bike plans at the same time as other transport plans. This may provide important implications for countries trying to build new cities. In addition, a growing number of cities are introducing a public bike system¹⁾ based on the nation's technological prowess in the IT sector. Korea is considered to have secured a very advantageous position in this area, which not only features environment-

¹⁾ Public Bike System (PBS) is often referred to as public bike sharing system or bike sharing system. A hyphen may be used between bike and sharing. This paper uses PBS as acronym for the term.

friendly features but requires leading-edge technologies.

In terms of the bicycle modal share, Korea still cannot match such countries as the Netherlands and Denmark. However, the Korean government's endeavors, the devotion of researchers, and the people's aspirations for the future will surely contribute to increasing the cycling's modal split.

In Chapter 2, this paper explains Korea's national bike path plan with emphasis on bike infrastructure. Chapter 3 focuses on bike paths built along the four major rivers, while Chapter 4 concentrates on bike projects of new towns developed since the 2000s. Chapter 5 is devoted to the public bike projects in Korea, dealing with the achievements and implications after reviewing the background and process of each project.

Table 1.1. Mode splits in relation to commuting to work and school (multimodal travel excluded)

(unit: %)

Year	Trip purpose	Walking	Cycling	Bus	Rail	Passenger car	Taxi	Others	Total
2010	Commute to work	20.6	1.6	19.9	7.0	45.7	0.7	4.5	100
	Commute to school	45.8	1.9	38.0	6.1	7.8	0.2	0.3	100
	Total	26.7	1.7	24.3	6.7	36.5	0.6	3.5	100
2005	Commute to work	24.9	1.2	18.1	7.8	42.6	0.6	4.8	100
	Commute to school	45.7	1.4	39.1	7.1	6.4	0.1	0.2	100
	Total	30.3	1.2	23.5	7.6	33.3	0.5	3.6	100
2000	Commute to work	24.4	1.3	22.2	6.8	38.0	1.0	6.2	100
	Commute to school	35.6	1.5	51.1	6.9	4.5	0.1	0.3	100
	Total	27.4	1.4	30.0	6.8	28.9	0.8	4.6	100
1995	Commute to work	27.3	1.8	27.8	5.1	29.0	1.1	7.8	100
	Commute to school	34.3	1.9	56.3	4.3	2.5	0.1	0.7	100
	Total	29.4	1.8	36.2	4.9	21.2	0.8	5.7	100
1990	Commute to work	23.8	3.2	48.6	6.0	13.6	1.5	3.3	100
	Commute to school	35.7	2.6	57.1	2.9	1.0	0.0	0.6	100
	Total	28.3	3.0	51.8	4.8	8.8	1.0	2.2	100

* Source: Homepage of the Bicycle and Green Transport Research Center, KOTI.





CHAPTER 02

The Master Plan for National Bike Roads Network



01 Introduction

02 Basic Concept for Building a National Bike Road Network

03 Plan to Build National Bike Roads

04 Achievements and Implications



SECTION 01.

Introduction

1. Background and Purpose

The world is facing “environmental” and “resources” crises exemplified by climate change and high oil prices, respectively. In particular, the phenomenon of climate change is threatening the existence of mankind by causing weather disasters and unsettling the fundamental ecosystem. There are predictions that should the current “energy overconsumption structure” be left unchecked, the worldwide losses caused by climate change would amount to 5-20% of the annual global GDP. Amid such dire forecasts, the Korean government has proposed the idea of “green growth.” This move is designed to join in global efforts to reduce greenhouse gas emissions while coping with the rapidly changing external conditions such as the soaring energy prices and the stricter enforcement of environmental regulations. Green growth can be defined as growth based on the “development of promising new products and technologies through the utilization of energy- and environment-related technologies and industries, as well as the creation of new growth engines and jobs through the convergence of energy/environment and conventional industries.”

In regards to the green growth policy, the government presented 10 major goals. One of them envisions creating a green national land space structure as

well as a green transport system. Calling for the development of disaster-free national and regional land spaces, the objective puts forth action programs such as the structural overhaul of land spaces, the maintenance and regeneration of the existing cities, and the development of compact cities with low-carbon structure. It also aims to transform the conventional car-centric transport system into a low-carbon, eco-friendly system through the promotion of green highways, bike roads and green cars. This approach is designed to ensure the recovery of urban comfort by progressively resolving various social problems related to the excessive reliance on motorized cars, such as traffic accidents and regional segregation. In this context, cycling merits particular attention as a method that can be employed easily and expeditiously to facilitate green transport. This is because bicycles can be used freely in everyday life by anybody, regardless of gender and age. In addition, changes in social conditions such as the implementation of the five-day work week system and the resultant growth in leisure and sports activities made it increasingly necessary to build an eco-friendly green transport system that includes bike roads. The task for the transport sector with regard to the national policy goal of “green growth” is to encourage and promote the use of low-carbon green modes of transport like cycling and walking. Determined to “firmly establish an ecological culture by linking every part of the nation with bike roads,” the government developed a national bike road plan to ensure the safe and convenience use of bicycles in everyday life.

2. Process of Developing the Master Plan for National Bike Roads Network

The Ministry of Security and Public Administration enacted the “Act on Promoting the Use of Bicycles” in 1995 and the “Rules on the Structure and Facility Standards Related to Cycling” in 1997, laying the legal groundwork for the government’s cycling promotion policies. In 2003, the central government’s authority over bike policies was handed over to local governments in accordance with a Cabinet decision. In March 2008, shortly after the inauguration of the Lee Myung-bak

government, the authority was transferred back to the ministry's Department of Regional Development as part of various government structural changes. In November 2008, the government announced comprehensive measures aimed at facilitating the use of bicycles, setting in motion its national cycling policy project.

In January 2009, the government began promoting a national bike road project as a program symbolizing its determination to expand infrastructure networks throughout the nation. For the cycling project, the government envisaged constructing cycling belts along the coastal and border areas, and connecting them with provincial bike routes.

In February 2009, the ministry reported to the President its proposal for building a nationwide network of bike roads, and began mapping out specific plans by inaugurating a national bicycle transport research center at the Korea Transport Institute.

The institute formed a consortium with three engineering design companies (Dong Myeong Engineering Consultants, Cheil Engineering, Dohwa Engineering), and began devising a master plan for national bicycle policies, guidelines on building and managing cycling facilities, and bike road plans with a budget of 2.35 billion KRW.

Field surveys and consultations were carried out after dividing the nation into several zones. First of all, presentations were held by zone with the participation of representatives of pertinent cities, wards and counties. They were followed by one-on-one consultations between the engineering design companies and the local administrative bodies. In the meantime, experts committee meetings were held periodically to prepare new criteria for bike roads. In addition, seminars were held to discuss and publicize the contents developed through the committee meetings. Finally, the master plan was completed by a consultative body composed of the engineering design companies, central government officials, pertinent experts and representatives of local administrative bodies.

SECTION 02.

Basic Concept for Building a National Bike Road Network²⁾

1. The Concept of a National Bike Road Network

Overseas bike roads have been reviewed in relation to this study, particularly regarding the hierarchy and titles. Most of the countries surveyed were found to be categorizing their bike roads as national, metropolitan and regional bike roads. It was also found that circular bike roads were being built as part of national bike road network projects.

Utility bike roads are used mainly for everyday household or business activities, or short-/mid-distance shopping trips. These paths, which can also be used for commuting to work or school, are planned to be built along the shortest optimum routes. There are also bike roads designed for people to enjoy leisure or sports activities. These paths are planned to be built along the suburban roads, at parks or on riverbanks.

Interregional bike road connect neighboring cities, serving as branch lines linking inland areas.

²⁾ This section is based on a partial summary of a report on the bike road master plan.

Table 2.1. Classification of national bike roads

Classification	Characteristics	Authority in charge	Functions
A nationwide circular route	<ul style="list-style-type: none"> • Framework of national National bike road network • National bike road network (1 Rectangle) • Planning and connection of bike roads under construction by the central government 	Central government	Interregional connection + Utility cycling + Leisure
Inland connection routes	<ul style="list-style-type: none"> • Concept of forming national bike road networks • Including inland connection routes (3×3) • Bike roads connecting cities • Bike roads linking disconnected sections between regions • Planning and connection of bike roads under construction by the central government 	Central government + Local autonomous body	Interregional connection + Utility cycling + Leisure
Intercity routes	<ul style="list-style-type: none"> • Connecting major small and medium cities and remote villages • Including passages on major national highways (400 km) • Creating bike roads along the four major rivers in connection with the 4-river restoration project 	Central government	Interregional connection + Leisure
Local bike roads	<ul style="list-style-type: none"> • Concept of a network of bike roads built by local autonomous bodies • Urban transportational and leisure-type bike roads 	Local autonomous body	Utility cycling

* Source: Ministry of Security and Public Administration, *National Bike Road Master Plan*, 2010, p. 313.

2. Directions for Building a National Bike Road Network

The main purpose of the national circular route is to connect adjacent cities and arterial bike roads within cities. The plan for this route calls for building utility bike roads first and then constructing leisure-oriented paths gradually afterwards. It constitutes the first phase of the national bike road network project.

Inland routes are to be built along the major intercity arterial roads, thus connecting the metropolitan and regional bike roads. They are designed to ensure the seamless connections of bike roads for multipurpose trips between metropolitan cities. To be implemented as the second-phase national bike road project promoted by the Ministry of Security and Public Administration, these inland routes will serve as the internal framework of the national network of bike road routes. Project implementation periods can be adjusted depending on demand for bike transport and other socioeconomic conditions. Bike roads are also being built along the four major rivers under a cycling project promoted by the Ministry of Land, Infrastructure and Transport. These bike roads will be used mainly for

leisure and interregional connections.

Bike roads will also be built on the national highways near urban areas to connect residential and industrial facilities as well as to accommodate demand for utility-type cycling (commuting to work and school, shopping, etc.). To be implemented by the Ministry of Land, Infrastructure and Transport, this program is designed to link major small- and medium-sized cities and residential communities.

In addition, bike roads designed by local governments are slated to link bike lanes on collector/distributor roads with arterial bicycle paths. Closely related to the lives of local residents, these bike roads will place the utmost emphasis on connectivity and accessibility.

3. Idea for Building National Bike Roads

To establish a national network of bike roads, it is essential for the state to build the arterial routes. Research into relevant foreign cases shows that the central government should play a leading role in building major bike roads. Implementing a state-level project to construct a framework of cycle paths is a prerequisite to ensuring national bike road connectivity.

A survey of geographical locations of the nation's major cities shows that they can be roughly divided into the inland and coastal living areas. Living zones have been formed naturally around such areas as Seoul, Incheon, Gyeonggi Province, Daegu and Busan. Such areas have bike roads naturally developed for linkage with adjacent cities. In contrast, coastal cities have significant shortages of arterial bike routes. So, it would take considerable time to complete bike roads running through multiple regions, if local governments were left to their own devices regarding the national bike road project.

The most effective way to establish a national bike road system linking coastal cities and border areas is to build it in a circular fashion. This will actually be rectangular in shape, connecting such major places as Haengju Bridge, Ganghwa of Incheon, Mokpo in South Jeolla Province, Haeundae in Busan, Pohang in North Gyeongsang Province, and the Unification Observatory. This rectangular route will

serve as the basis for ensuring connections with major national parks and regional tourist attractions as well as for building bike paths towards historic and cultural resources.

It is also necessary to make it possible to travel round the nation by bike. This idea can be realized by completing a nationwide circular corridor while maintaining the basic directions for building utility bike roads. The completion of the circular route linking coastal cities should serve as the framework of the national network of bike roads. The circular route should later be followed by the construction of inland routes connecting major inland cities.

In short, the fundamental frame of the national bike road network should be one rectangular route around the nation plus 3 X 3 inland routes. The round-the-nation route is being implemented as the first-phase project (2010-2019). It would be followed later by the second-phase project for building 3 X 3 inland routes.

- A round-the-nation rectangular route linking major coastal cities;
- Three north-to-south routes: Seoul-Daejeon-Gwangju, Seoul-Daejeon-Busan,

Figure 2.1. A conceptual framework for national bike roads

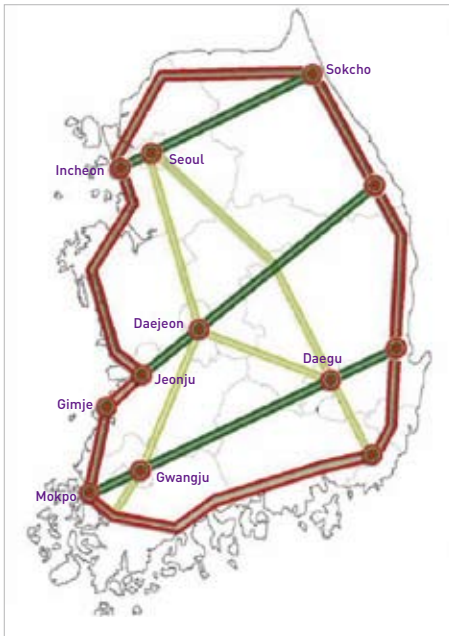
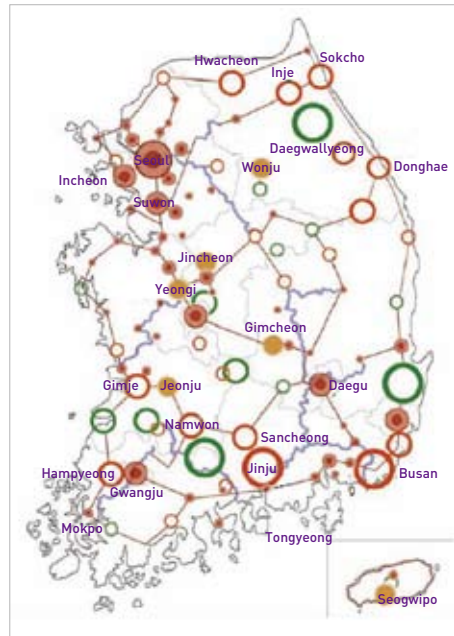


Figure 2.2. A conceptual plan for national bike roads



• Source: Ministry of Security and Public Administration, *National Bike Road Master Plan*, 2010, p. 321.

Seoul-Gangwon/Chungbuk;

- Three east-to-west routes: Incheon-Sokcho, Gimje-Donghae, Mokpo-Pohang.

This framework has been developed on the basis of the present network of bike roads as well as future plans for national bike roads and land use (tourist complexes). Also taken into account was demand for bike transport among cities involved.

- Linkage to 4-river restoration project (Han, Nakdong, Geum, Yeonsan, Seomjin rivers, etc.)
- Linkage to the development of Sejong City (Yeongi County)
- Consideration of bike roads based on various themes such as national parks, cultural & historic sites, and local festivities



SECTION 03.

Plan to Build National Bike Roads³⁾

1. Route Selection

A weighted analysis was conducted by applying the ANP (Analytic Network Process) method, based on the presumption that there are correlations among the following evaluation items: potential, connectivity, safety, environmental-friendliness, and convenience. The evaluation items for selecting the routes as well as their importance values are shown in Table 2.2.

Optimal routes for the national bike road network need to be selected through a systematic and detailed process. So, as shown in Figure 2.3, this study established a route selection process that involves various procedures like on-site surveys, the accommodation of pertinent local governments' views, and the application of route selection criteria.

Selection of optional routes should be based on a review of various courses, including those desired by local governments as well as bypass or outer lines. These various courses need to be compared and analyzed to determine whether they are suitable for the construction of bike roads in relation to the national bike

³⁾ This section is based on a partial summary of a report on the bike road master plan.

Table 2.2. Results of weighted analysis by evaluation items for selection of national bike roads routes

Evaluation categories	Sub-evaluation categories	Importance values	Evaluation item rankings
Potential	Utilization of existing roads	0.250163	1
	Viability		
	Potential demand		
Connectivity	Connection with public transportation	0.241977	2
	Connection between regions		
	Accessibility and prospects for completion		
Safety	Weather-related danger	0.189926	3
	Road traffic environment		
	Harmonization with pedestrian roads		
Environment-friendliness	Harmonization with the natural environment	0.16073	4
	Terrain adaptation		
	Indigenous resources		
Convenience	Convenience facilities	0.157202	5
	Straightness and diversity		
Total		1	

* Source: Ministry of Security and Public Administration, *National Bike Road Master Plan*, 2010, p. 329.

road project.

On-site surveys were conducted for the routes that had been selected through a review on the map. The final options were chosen based on the results of the surveys as well as consultations with pertinent local governments.

The fundamental principle for national bike roads was that bike roads would be built through widening lanes or reducing the number or width of car lanes and sidewalks through road diets. Thus, cross sections of target roads and the conditions of the terrain around them were selected as survey items to explore the prospects of installing bike paths and estimate project costs.

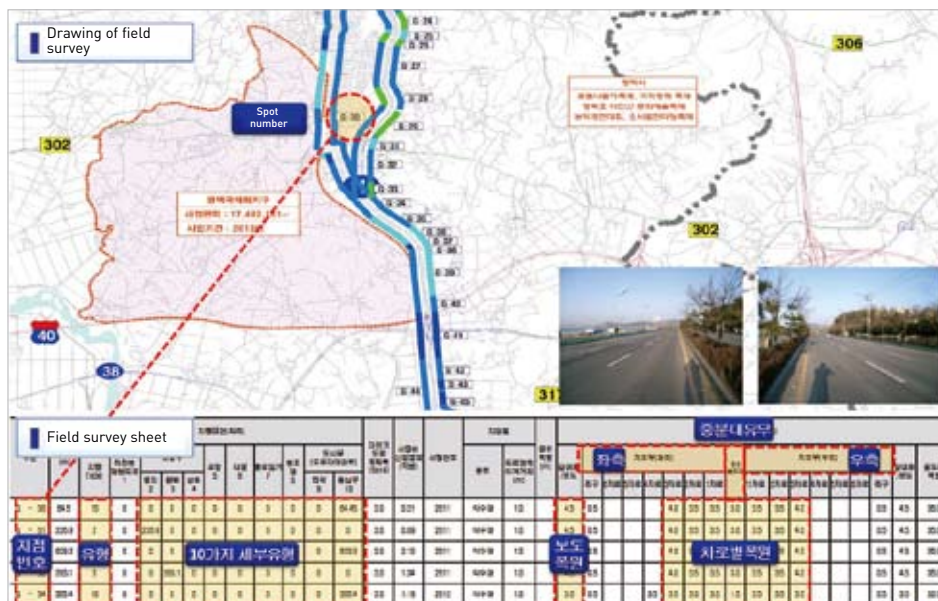
Survey items were largely divided into cross sections and longitudinal slopes of target roads, conditions of the terrain around the roads, barriers, confirmation of road hierarchy, and photo and video shooting. For cross-section surveys, the roads were divided into the right and left sides relative to the center lines. Surveys were also conducted to find out the existence medians, the number of lanes on the left and right sides, and the width of lanes, gutters, road shoulders and sidewalks.

Figure 2.3. Route selection process



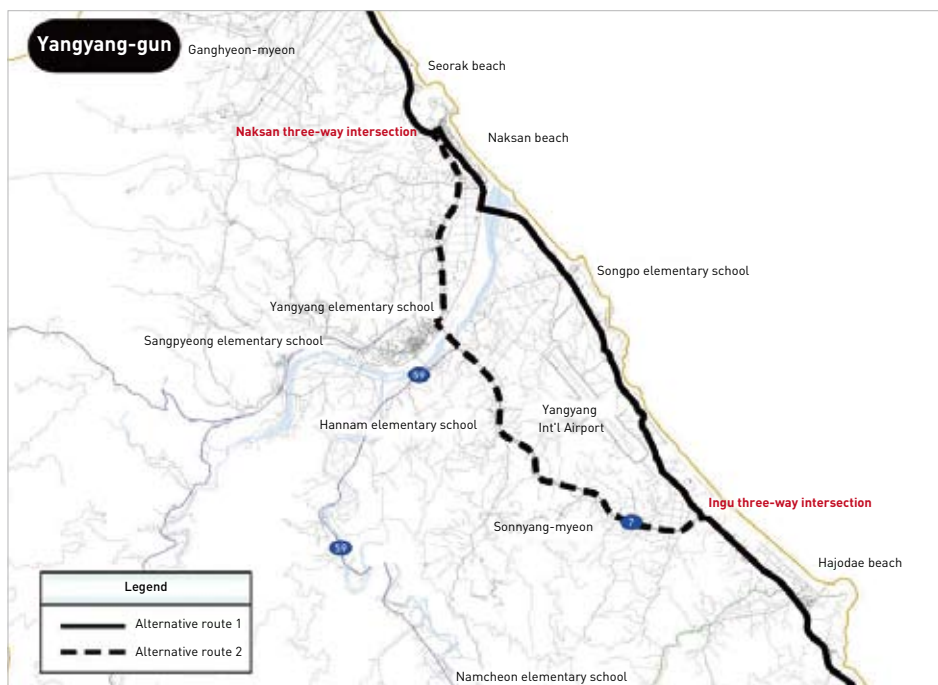
• Source: Ministry of Security and Public Administration, *National Bike Road Master Plan*, 2010, p. 332.

Figure 2.4. Results of on-site surveys in Pyeongtaek, Gyeonggi Province



• Source: Ministry of Security and Public Administration, *National Bike Road Master Plan*, 2010, P. 335.

Figure 2.5. Examples of final alternative routes whose priorities needed to be determined



• Source: Ministry of Security and Public Administration, *National Bike Road Master Plan*, 2010, p. 336.

Final options were selected based on on-site survey sheets and a collection of drawings, and the results were summed up so that they could be used as data for selection of project sections and estimation of project costs.

Through the application of route selection criteria, priorities of the alternative routes were determined.

Table 2.3. An example of the route prioritization process based on scores

Starting point		Naksan intersection, Jucheon-ri, Ganghyeon-myeon, Yangyang-gun				Optimum route selection		
Ending point		Ingu intersection, Ingu-ri, Hyeonnam-myeon, Yangyang-gun				Option 1		
Evaluation categories		Importance values (a)	Final evaluation score (Option 1)⑥ =∑(c)+∑(d)		28.7754	Final evaluation score (Option 2)⑥ =∑(c)+∑(d)		21.1938
			Evaluation score (b)	Average value (c)	Importance application value (d)=②×(c)	Evaluation score (b)	Average value (c)	Importance application value (d)=②×(c)
Potential	Utilization of existing roads	0.250163	5	5.000	1.251	5	3.667	0.917
	Viability		5			4		
	Potential demand		5			2		
Connectivity	Connection with public transportation	0.241977	4	4.333	1.049	3	3.000	0.726
	Connection between regions		4			3		
	Accessibility and prospects for completion		5			3		
Safety	Weather-related danger	0.189926	5	4.667	0.886	5	4.333	0.823
	Road traffic environment		5			4		
	Harmonization with pedestrian roads		4			4		
Environment-friendliness	Harmonization with the natural environment	0.160730	5	5.000	0.804	4	3.667	0.589
	Terrain adaptation		5			4		
	Indigenous resources		5			3		
Convenience	Convenience facilities	0.157202	5	5.000	0.786	3	3.000	0.472
	Straightness and diversity		5			3		

* Note: Average value ③= the average of evaluation scores for evaluation categories ②, Importance application values ④=②×③, Final evaluation scores ⑥ were calculated by adding the total of average values ③ and the total of importance application values ④.

* Source: Ministry of Security and Public Administration, *National Bike Road Master Plan*, 2010, p. 336.

The alternative routes were given scores for each of the five evaluation categories as well as importance values. Through this process, Option 1 with 28.7754 points was determined to be a high priority, compared to Option 2 which was given 21.1938 points.

Optimum routes were chosen from among these alternative routes through further consultations involving the central government and local administrative bodies. The consultations focused on ensuring that projects to build bike paths along the four major rivers and the areas along the DMZ would be connected harmoniously with the existing bike roads built by local governments. On the basis of the consideration of the project implementation period, these routes were divided into circular and inland routes, as shown in Figure 2.6.

Figure 2.6. Optimum routes for national bike roads



• Source: Ministry of Security and Public Administration, *National Bike Road Master Plan*, 2010, p. 337.

2. Route Plan

The total length of the finally selected routes reaches 4,835.4 km, which breaks down to 3,214.4 km of the circular route and 1,621 km of the inland connection routes.

The circular route breaks down to 569.4 km for the existing bike roads, 70.3 km for sections included in various plans, 400.2 km for national highway sections, and 2,174.5 km for municipal and provincial road sections (165.9 km for municipal roads, and 2,008.6 km for provincial roads). The 1,621 km-long inland route consists of 675.2 km for national highway sections and 945.8 km for municipal and

provincial roads (89.9 km for municipal roads and 858.9 km for provincial roads).

Table 2.4. National bike road route plan

(unit: km)

Classification	Total	Circular route						Inland connection routes			
		Total	Existing sections	Related plan sections	General national highways	Municipal roads	Provincial or lower-hierarchy roads	Total	General national highways	Municipal roads	Provincial or lower-hierarchy roads
Total	4,835.4	3,214.4	569.4	70.3	400.2	165.9	2,008.6	1,621.0	675.2	86.9	858.9
Seoul	182.9	182.9	127.1	5.6	0.0	12.4	37.8	0.0	0.0	0.0	0.0
Busan	79.7	79.7	2.5	0.0	13.4	5.9	57.9	0.0	0.0	0.0	0.0
Daegu	60.4	60.4	11.8	0.0	0.0	2.4	46.2	0.0	0.0	0.0	0.0
Incheon	138.4	138.4	50.7	5.2	0.0	8.6	73.9	0.0	0.0	0.0	0.0
Gwangju	81.1	81.1	46.0	0.0	0.0	18.8	16.3	0.0	0.0	0.0	0.0
Daejeon	52.1	49.5	19.2	3.2	0	13.8	13.3	2.6	0.0	1.0	1.6
Ulsan	80.9	80.9	15.8	0.0	13.3	12.6	39.2	0.0	0.0	0.0	0.0
Gyeonggi	606.0	436.8	102.2	15.3	57.5	39.2	222.6	169.2	16.4	7.4	145.4
Gangwon	788.0	506.2	2.7	0.0	101.4	10.0	392.1	281.8	143.0	0.0	138.8
Chungbuk	371.2	12.2	0.0	0.0	6.4	0.0	5.8	359.0	157.8	13.6	187.6
Chungnam	367.3	330.5	10	37.7	57.4	1.8	223.6	36.8	5.6	0.0	31.2
Jeonbuk	283.3	162.1	5.5	3.3	59.9	17.5	75.9	121.2	59.0	34.5	27.7
Jeonnam	422.3	309.7	8.4	0.0	34.0	15.4	251.9	112.6	90.7	0.0	21.9
Gyeongbuk	612.4	307.8	1.0	0.0	42.6	0.0	264.2	304.6	118.8	19.5	166.3
Gyeongnam	418.1	184.9	13.3	0.0	14.3	7.5	149.8	233.2	83.9	10.9	138.4
Jeju	291.3	291.3	153.2	0.0	0.0	0.0	138.1	0.0	0.0	0.0	0.0

SECTION 04.

Achievements and Implications

1. Achievements of the National Bike Road Master Plan

The master plan for the national bike road network has been progressing smoothly since it was established in 2010. In 2010, bike roads that measured 178 km in total length were built in 50 districts. It was followed by the construction of new bike roads, the combined length of which amounted to 252.5 km, in 52 cities, counties and wards throughout the nation in 2011. The rate of progress varies depending on local governments, due to differences in the budget scale and design periods. Overall, however, the plan is progressing without a hitch, amid expectations that the projected construction of bike roads would be completed by 2012. Bike roads built within cities are being used for utility purposes, while those connecting cities are being used for utility and leisure purposes. Local governments showed particularly positive responses to the construction of intercity bike roads because it was a project that could not be implemented by individual local administrations. It also represented the central government's strong will to push ahead with the national bike project, thereby helping to draw more active participation by the local governments. By establishing such a massive plan, the government could also carry

out the project in a coordinated manner and effectively use the relevant budget.

2.Implications

The national bike road master plan was the first of its kind developed at a state level in Korea. It was a meaningful achievement in that the government manifested its financial commitment to promoting cycling as a project worthy of national endeavors. It also helped initiate efforts to address the problem of local bike projects being implemented ineffectively in small scales as well as to the long-delayed task of linking bike roads among regions. By developing the master plan, the government now could map out specific and systematic budget plans for cycling promotion programs, avoiding the practice of “pouring water in a bottomless pit.” The comprehensive plan helped enhance the confidence of both the central government and local administrations regarding the national bike road project, thereby inducing their more active investments. The bike infrastructure is gradually expanding throughout the nation, helping to enhance the quality of life for a growing number of people using bicycles to promote their health and enjoy their leisure time.





CHAPTER 03

Four-River Bike Paths

01 Background to the Construction of 4-River Bike Paths

02 Process of Building 4-River Bike Paths

03 Achievements of the 4-River Bike Paths Project

04 Implications of the 4-Rivers Bike Paths Project



SECTION 01.

Background to the Construction of 4-River Bike Paths

Up until 2009, Korea had no state plan to build a nationwide network of bike paths, thus allowing local governments to build their own bikeways. Bike paths were built around city centers, but they fell far short of satisfying the conditions for building a system of bikeways to connect the nation.

The Lee Myung-bak government implemented the four rivers restoration project to tackle the problems of floods and drought caused by climate change, improve the quality of water and restore a healthy ecological system, and secure water-friendly spaces that can be used for leisure and cultural purposes. The project was also aimed at creating jobs and facilitating the recovery of economic vitality in a kind of green New Deal project. Targeting the Han, Nakdong, Geum and Yeongsan rivers, the project was implemented through 2012 with investments worth 22.2 trillion KRW. These investments were used to reinforce the aging levees, recover river ecosystems, construct eco-friendly river beams, build flood control facilities, and foster river bike paths. The four rivers restoration project led to the construction of a 1,757 km-long network of river bike paths that connect the nation.

SECTION 02.

Process of Building 4-River Bike Paths

Bike paths along the four major rivers were built as part of the four rivers restoration project. Led by the Ministry of Land, Infrastructure and Transport, the restoration project was implemented with the participation of three other government ministries – the Ministry for Food, Agriculture, Forestry and Fisheries, the Ministry of Environment, and the Ministry of Culture, Sports and Tourism. The Ministry of Land, Infrastructure and Transport was responsible for river maintenance and dam construction, while the Ministry of Food and Agriculture was in charge of renovating and expanding agricultural reservoirs. The Environment Ministry carried out water improvement programs, and the Culture Ministry executed projects to develop culture and tourism

Figure 3.1. 4-river bike paths



• Source: Ministry of Land, Infrastructure and Transport/Ministry of Security and Public Administration

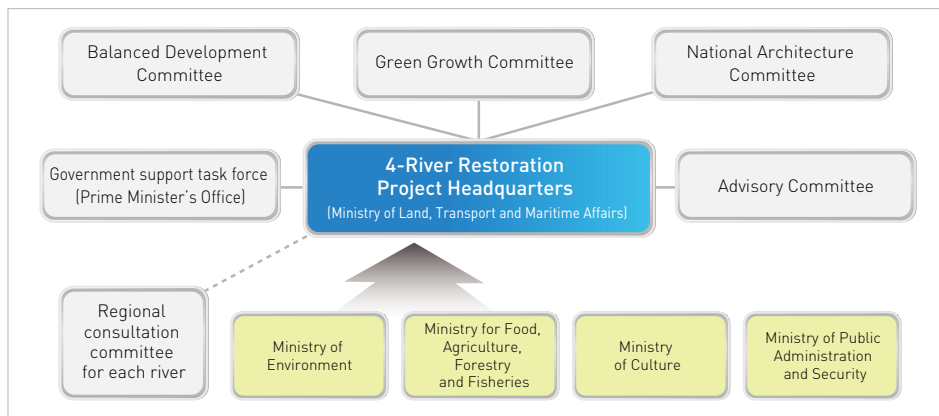
resources.

The following is a brief timeline of the 4-river restoration project:

- The Regional Development Committee decided to implement the 4-river restoration project as a kind of Korean New Deal project (December 2008)
- The Korea Institute of Construction Technology, a water-related specialized research institute, developed a master plan, with the support of the Culture and Tourism Institute (June 2009)
- Pilot programs were launched in Andong/Naju (December 2008), Chungju (February 2009) and Busan (March 2009)
- An evaluation board for the project was inaugurated (January 2009)
- An inter-ministerial task force was set up at the Ministry of Land, Infrastructure and Transport (February 2009)
- A conference meeting was held jointly by three committees and four ministries involved in the project (April 2009)
- Public hearings, regional briefing sessions, inter-ministerial consultations and experts' advisory meetings were held (May 2009)
- Four-river bike paths were completed (April 2012)

The utmost emphasis was placed on securing the riverside bike paths' accessibility, safety and environment-friendliness. The chances are very low that

Figure 3.2. 4-river restoration project implementation system



• Source: Ministry of Land, Infrastructure and Transport, *4-River Restoration Master Plan*, 2009.

Figure 3.3. North Han River abandoned bridge section



Figure 3.4. Bongan tunnel section



Figure 3.5. Ihwaryeong pass section



Figure 3.6. Safety fence made of wood from forest thinning



Figure 3.7. An abandoned pay phone booth being used as a certification center



Figure 3.8. A bike path built on a village road



• Source: 4 Rivers Guide homepage (www.riverguide.go.kr)

conflicts between bikes and cars take place along the riverside, so it was possible to ensure the highest level of safety and seamless bike traffic. Besides, the bike paths were separated from footpaths and rest facilities by using curb stones and trees.

Figure 3.9. 4 Rivers Guide homepage (www.riverguide.go.kr)



• Source: 4 Rivers Guide homepage (www.riverguide.go.kr)

Figure 3.10. 4 Rivers Guide mobile applications



to safeguard the environment and save the budget. Wood from forest thinning was used instead of steel to erect safety fences along the dangerous sections, thereby ensuring environmental protection and saving the project expenses.

Public pay phone booths, which had been slated to be removed due to the increasingly infrequent use of pay phones, were also recycled to be used as bike path certification centers, adding flavor to cross-country bike rides.

The 4-river restoration master plan included suggestions for installing resting areas every 30 km, building campsites every 60 km, and establishing designated bike hotels every 50 km to

The bike paths were built by using eco-friendly design techniques, giving the utmost consideration to environmental factors from the planning, design and construction stages to the final stage of using finishing materials. They were also designed to ensure safety during floods.

Abandoned railways and rail bridges were recycled to be used in building bike paths. This move represented the government's efforts to minimize damage to the environment. In addition, abandoned way stations and old railroad tunnels were transformed into exhibition spaces, rest facilities and bike tunnels. Besides, endeavors were made to actively use the existing village alleys and farm trails in a move

Figure 3.11. Cross-country cycling certification passport



Figure 3.12. Cross-country cycling certification center



Figure 3.14. A train car carrying bikes



Figure 3.13. Locations of certification centers



Figure 3.15. Bikes brought onto a subway car



• Source: 4 Rivers Guide homepage (www.riverguide.go.kr)

be used as hubs for providing accommodation, information, repair and maintenance services.

A variety of measures are being taken to promote cycling: information guide online portal services, smartphone applications, tour programs, cross-country bike certification system, etc.

The 4-river guide portal service (www.riverguide.go.kr) provides comprehensive information on bike courses, tourist attractions, festivities, events, accommodations, eateries, and repair facilities.

Smartphone applications designed to provide GPS-based information on cycle routes have also been developed. By using the applications, cyclists can obtain information on 4-river bike paths, 33 thematic courses, and tour attractions along the cycle routes. These applications also include various functions like memo

writing, SNS sharing, displaying the roads travelled, and listening to stories.

For the 4-river cross-country bike certification program, 40 certification centers have been established along the riverside bike paths. Cyclists can get section finish certification, and are awarded a certificate and a medal when they finish the entire riverside courses.

To ensure the ease of access, the riverside bike paths have been connected to subway and rail services.

Cyclists can ride “green bike trains,” which have carriages that can carry bikes, up to stations near the bike paths. There is also a subway line that is connected to the South Han River bike path.

SECTION 03.

Achievements of the 4-River Bike Paths Project

The 4-river bike paths were fully opened on April 22, 2012, encompassing the bikeways along the Han, Geum, Nakdong and Yeongsan rivers and Saejae. They measure 1,757 km in total length.

Table 3.1. Length of 4 rivers cross-country bicycle paths

	Han River	Geum River	Yeongsan River	Nakdong River	Saejae	Total
Length (km)	310	305	377	665	100	1,757

* Source: Ministry of Security and Public Administration homepage (www.mospa.go.kr)

The Han River cross-country bike paths have a total length of 213 km, which breaks down to the existing 213 km-long Han River bike path section (Seoul), the 21 km-long Gyeongin Ara Waterway bikeway, and the 136 km-long South Han River bike path. (If the paths along the river branches such as the North Han River are included, the total Han River cross-country route measures 310 km). Along this route, there are three reservoirs – Ipo, Yeoju and Gancheon – and a number of scenic and resting places such as Dumulgyeong, Eoksaegyeong, Pasagyeong, Ineunggyeong, Sillokgyeong, Bawineupgyeong, Bonghwanggyeong and Tangeumgyeong.

Bikers along the Geum River trail can see three reservoirs - Beakje, Gongju and Sejong. The scenic and resting places include the river estuary migratory birds park, the Sinseong-ri reeds fields, Ganggyeong Port, Gudeurae Sculpture Park, Wangjinnaru, Gomanaru pine fields, Sejong Park and Hapgang Park.

The bike path along the Yeongsan River has two reservoirs - Juksan and Seungchon – and eight scenic spots: Damyang bamboo forest, Gwangju Pungyeong Pavilion, Juksan reservoir, Naju plain, Seungchon Reservoir, Naju Hwangpo Sailing Boat, Muan Neureoji, and Mokpo Yeongsan Lake.

The Nakdong River has eight reservoirs, including those at Changnyeong Haman, Dalseong and Sangju. The riverside area is known for 12 tourist attractions: Eulsukdo Eco

Figure 3.16. A map of four rivers bicycle paths



• Source: 4 Rivers Guide homepage (www.riverguide.go.kr)

Figure 3.17. Han River bicycle path landscape



• Source: 4 Rivers Guide homepage (www.riverguide.go.kr)

Park, Hwangsangyeong, Nakdong River Eco Area, “Banquet of reeds on mountains and fields,” Green Eco Park, Dalseong Wetland, Hogukgyeong, Seonhakgyeong, Buyonggyeong, Gyeongcheongyong, and Samgangeolgyeong.

The construction of the riverside bike paths led to the establishment of a nationwide bikeway network involving the existing bike paths built by local governments and the national bike roads. As a result, it has become possible to use bikeways conveniently and safely not only for utility but leisure purposes. Opening of the riverside bike paths led to a steep rise in the number of cyclists. For example, the South Han River trial was found to have been used by 300,000 people during eight months following its opening (as of the end of July, 2012).

Cross-country cycling courses from Seoul to Busan have been developed along with various related tour programs, paving the way to the exploration of new types of leisure travel. Such developments will eventually lead to the improvement of the culture level and the quality of life in the nation.

The increase in the number of cyclists using the riverside trails is also contributing to promoting economic activities in relevant areas, thereby helping to ensure a balanced development of the nation.

Figure 3.18. Geum River bicycle path landscape



• Source: 4 Rivers Guide homepage (www.riverguide.go.kr)

Figure 3.19. Yeongsan River bicycle path landscape



• Source: 4 Rivers Guide homepage (www.riverguide.go.kr)

Figure 3.20. Nakdong River bicycle path landscape

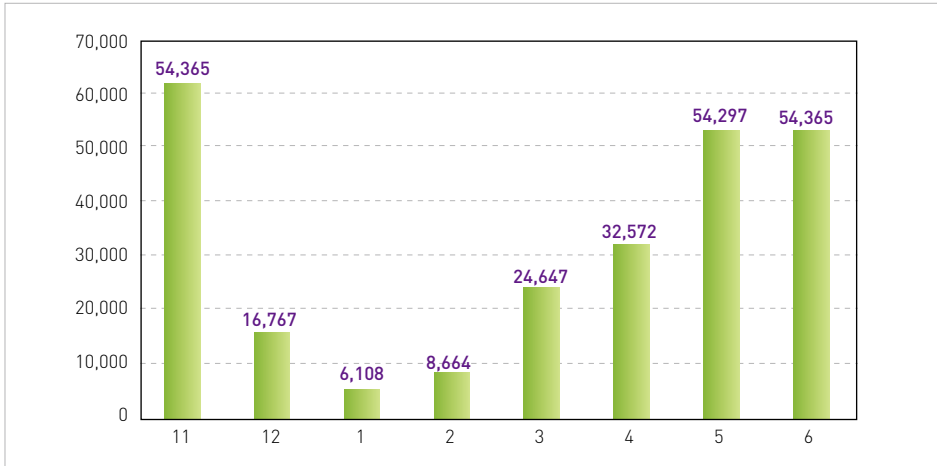


• Source: 4 Rivers Guide homepage (www.riverguide.go.kr)

Previously, leisure trips during weekends had been excessively dependent on cars. Now, however, the cycling population is increasing, particularly those

cycling along the rivers. Promotion of the riverside cycling for weekend travel is predicted to be able to reduce the social costs caused by traffic congestion by more than 5 trillion KRW a year.⁴⁾ It is also forecasted to help improve public health, consequently reducing medical expenses and increasing the overall competitiveness of the nation.

Figure 3.21. Status of monthly bike users



* Source: Ministry of Land, Infrastructure and Transport, *4-River Restoration Master Plan*, 2009.

⁴⁾ Nam Cheon BAEK, “Strategic significance of the construction of the 4-river bike paths”, *Construction Technology News*, Jan. 26, 2010.



SECTION 04.

Implications of the 4-Rivers Bike Paths Project

In a very short period of time, Korea built cross-country bike paths measuring 1,757 km in length.

The bike paths running along the four major rivers constitute a nationwide system of bikeways. It represents a departure from the past when there were only regional or local bike paths. Skeptics had expressed concern about the construction of a 1,700 km-long network of bikeways, referring to the low level of cycling demand in Korea. However, the number of people riding bicycles has been steadily increasing since the opening of the riverside bikeways. The riverside trails are particularly popular among cyclists because of the low possibility of conflicts occurring between bikes and cars as well as the scenic beauty of the courses.

The construction of the riverside bike paths has been characterized by efforts to safeguard the environment, such as the recycling of abandoned railways and bridges and the use of infrequently used village and farm roads.

Amid growing awareness of the health-related effects of cycling as well as the government's active cycling promotion campaign, the number of people using bikes has been rapidly increasing.


On the basis of its cycling master plan and relevant policies, the government is exerting efforts to further expand the nation's bike infrastructure and promote the use of bicycles.





CHAPTER 04

New Town Bicycle Project



01 Overview of the New Town Bicycle Project

02 New Town Planning and Relevant Bike Policies

03 Bike Plans of Dongtan 2 New City

04 Bike Plans of Sejong City

05 Achievements and Implications of the New Town Bike Project



SECTION 01.

Overview of the New Town Bicycle Project

1. Necessity of the New Town Bicycle Project

“Low-carbon green growth” is an idea designed to achieve the following objectives: coping with climate change through greenhouse gas reductions; ensuring energy self-reliance by slashing fossil fuel consumption and effectively using other energy resources; and, promoting environment-friendly economic growth through development of clean energy and green technologies.

To facilitate the implementation of “low-carbon green growth,” which has been selected as one of the most important national policy goals, the government is developing a diversity of pertinent action plans. One of them is a new town project being promoted by the Ministry of Land, Infrastructure and Transport. The ministry envisions building new-concept towns with low-carbon, energy-saving structure by changing paradigms in regards to urban energy consumption. To overhaul the energy-consuming structures of the existing new towns as well, the ministry is also trying to reform public transport, improve intercity traffic systems, establish bike paths and take other carbon-reducing measures.

The continued occurrence of abnormal weather conditions throughout the world

is raising the need to adopt eco-friendly approaches in pursuing urban development. The transport sector, in particular, is facing the necessity for promoting the use of bicycles in an effort to reduce energy consumption and greenhouse gas emissions.

2. Purpose of the New Town Bicycle Project

The transport sector accounts for 20% of the nation's total energy consumption. Its share rises to 36% when it comes to the consumption of oil. These figures demonstrate the need for the sector to focus on efforts to slash its use of energy and carbon emissions. The efforts should include those aimed at ensuring environment-friendly urban development through the establishment of a green transport system.

Establishing a green transport system requires endeavors to increase the mode shares of cycling and walking, and to facilitate the use of bikes through linkage to public transportation. Specifically, the utmost priority should be placed on the following objectives: raising the bike mode share, building a seamless bike transport network, and securing the facilities and systems necessary for promoting the use of bicycles.



SECTION 02.

New Town Planning and Relevant Bike Policies

1. History of New Town Development in Korea

The history of new town development in Korea can be largely divided into five stages. The 1st stage (before the 1960s) is a pre-modernization period before the nation launched its economic development plans. During this period, new cities were developed in accordance with the need to distribute administrative functions and establish a national administrative framework. Prominent examples are newly developed administrative and military cities like Jinhae, Uijeongbu, Nonsan and Daejeon. The 2nd stage (the 1960s) saw the emergence of new cities related to the nation's modernization and economic development plans. For example, Ulsan and Pohang were built as the outposts of the nation's industrial development, while Masan was developed as an export-oriented city. The 3rd stage (the 1970s) saw the full-fledged development of new towns in relation to the Saemaeul (New Community) Movement and the population distribution policy under the 1st Comprehensive National Land Development Program. During the 4th stage (the 1980s), the government developed 12 hub cities for regional growth in an effort to prevent the excessive expansion of metropolitan cities under the 2nd

Figure 4.1. Aerial photos of Bundang and Ilsan new towns



• Source: Naver Encyclopedia (<http://terms.naver.com/>)

Comprehensive National Land Development Program. It also implemented large-scale housing projects, developing new towns such as Gaepo, Godeok, Mokdong and Sanggye within the city of Seoul. The 5th stage (the 1990s) focused on the construction of five new towns in the vicinity of Seoul – Bundang, Ilsan, Pyeongchon, Sanbon and Jungdong. They were built to increase the supply of new houses and curb real estate speculation in the nation’s capital region.

As explained above, new towns developed in the early stages were industrial cities or those built for national administrative or military purposes. As such, they are different in nature from new towns constructed near metropolises to address

Table 4.1. Stages and major features of new town development projects in Korea

Development stages	Contents	Characteristics
1st Stage (Before the 1960s)	Emergence of new towns as a result of the operation of laws and systems designed to distribute administrative functions and establish relevant systems	Spontaneous emergence of new towns, despite the absence of new town development plans
2nd Stage (1960s)	Emergence of new towns as a product of the modernization policy	Emergence of industrial new towns as a consequence of the modernization policy
3rd Stage (1970s)	Planned development of new towns under the 1st comprehensive national land development plan	Emergence of planned towns under the comprehensive national land development plan
4th Stage (1980s)	Active development of new towns under the 2nd comprehensive national land development plan	Opening of the era of hub cities and the development of nationwide corridors
5th Stage (1990s)	Development of new towns in the capital area to curb real estate speculation and distribute the population of Seoul	New town development aimed at ensuring balanced national development and population distribution

• Source: Korea Land Development Corp., *Master Plan for the Ilsan New Town Development Project*, 1990.

modern urban problems. It was in the 1970s that the Korean government began developing new town plans aimed at solving urban problems. In particular, the plans were focused on building new towns in the capital area to tackle problems caused by population explosion in Seoul, such as housing shortages, traffic congestion, high commodity prices and environmental pollution.

New towns were built in the provinces as well. However, they were purely designed to ensure population distribution and ease the problem of housing shortages. These cities were built without taking into account the need to develop appropriate transport plans and secure environment-friendly facilities. The situation began to change in the 2000s, amid growing concerns about climate change. In developing new town development plans, the government came to consider the need to reduce energy consumption and carbon emissions as well as the necessity for dispersing the population.

2. Korea's New Town Bike Projects and the Cycling Development Process

Bicycles, which began to be produced domestically in the 1950s, were used as an important mode of transport for commuting to work and school during the 1960s and 1970s. However, they were replaced by cars beginning in the late 1970s, with the government implementing car-centric transport policies in relation to the need to pursue economic growth. The decreased role of bicycles led to a rapid drop in the number of people using bikes. In contrast, the use of cars continued to increase, causing traffic congestion, parking problems, traffic accidents and excessive consumption of energy. In addition, the increased use of cars caused air pollution, contributing to the problems of environmental destruction and global warming.

With the global emergence of environment issues in the 2000s, the Korean government began to exert efforts to pursue green growth through reduction of carbon emissions and energy consumption. In the transport sector, the “Act on Promoting the Use of Bicycles” and the “Rules on the Structure and Facility Standards Related to Cycling” have been revised to facilitate the use of bicycles.

In addition, both the central and local governments are trying to establish relevant policies and systems, while intensifying efforts to conduct pertinent research and expand cycling infrastructure. These efforts have led to an increase in demand for bike transport and progress in the cycling-related industries.

As part of efforts to achieve green growth through carbon reductions, newly planned or constructed cities are placing considerable emphasis on building bike infrastructure, which, in some cases, include median bike lanes and solar-powered bike paths. New cities, which have been already established, are also taking steps to repair and expand bikeways and related facilities. Dongtan 2 New City and Sejong City can be cited as prominent examples in regards to bike plans of new towns in Korea.

SECTION 03.

Bike Plans of Dongtan 2 New City

1. Overview

The Dongtan 2 New City project, initiated in 2008, is slated to be completed by the end of 2015. It is aimed at creating a hub city that is self-sufficient in terms of residence, education, culture and business. Being developed over an area of 24,014,896 km², in Hwaseong, Gyeonggi Province, the new city is projected to accommodate 285,878 residents in 115,323 households. The project is being implemented by Korea Land & Housing Corporation and Gyeonggi Urban Innovation Corporation.

Dongtan 2 New City is attracting attention as an environment-friendly city

Figure 4.2. A map showing the geographical location of Dongtan 2 New City



because of its plan to secure bike infrastructure, which will be the largest of its kind among new cities in Korea. The city plan calls for establishing a bike-centric transport system designed to prevent problems such as cyclists being threatened by cars and mutual interference of cyclists and pedestrians.

Dongtan 2 New City is expected to be equipped with a bikeway system free of such problems as user complaints, low usage rates and excessive investment. It is being built in a way that can ensure a safe and comfortable system of bikes that can be used as a travel mode in real life.

2. Bike-Centric New Town Planning

Bike Infrastructure Plan

Dongtan 2 New City is designed as a new town where the residents can readily use bikes as a major mode of transport in everyday life. The total length of its bikeways amounts to 191 km (125 km of dedicated bike paths and 66.8 km of bike/pedestrian paths). It is the longest of all the bike paths built in new towns in Korea. Its extensive bikeway system definitely gives the city an advantage in terms of cycling promotion.

The 191 km-long bike network is not meant to execute just a single function or achieve a single purpose. Rather, it is composed of hierarchical bikeways designed on the basis of analysis of user behavior, usage frequency, purpose and estimated travel routes. They can be largely divided into five categories: intercity, arterial, sub-arterial, collector, and local routes. These routes were built by taking into account the following five factors: safety, connectivity, convenience, environment-friendliness, and potential.

The intercity route, which covers 6.35 km, is designed for intercity connections. It is used mainly by long-distance leisure cyclists and those who commute out of the city. The arterial routes measure 20.95 km. They are designed to make it possible for citizens to travel non-stop from their residential areas to business districts, entertainment facilities or tourists spots. The sub-arterial routes, with a combined total length of 40.62 km, is to provide bike transport to areas lacking in

arterial route services as well as to connect arterial routes. They also provide access to the city's circular transport corridor and transfer centers. The collector routes measure 59.33 km in length. Door-to-door utility bikeways used mainly for short-distance trips, these courses are linked to neighborhood and community facilities. Lastly, a 63.17 km-long network of local bikeways will be built to increase accessibility to dedicated bike paths and to ensure short-haul bike trips, thereby maximizing the convenience of users.

Table 4.2. Functions and locations of bikeway networks

Classification	intercity network	Arterial network	Sub-arterial network	Collector network	Local network
Major functions	<ul style="list-style-type: none"> • Interregional linkage function 	<ul style="list-style-type: none"> • Forming a major mobility corridor in the urban structural skeleton 	<ul style="list-style-type: none"> • Connecting the urban circulation corridor and central city areas 	<ul style="list-style-type: none"> • For short-haul trips and the securing of accessibility • Linked to neighborhood facilities within districts 	<ul style="list-style-type: none"> • Routes for short-haul mobility • Mobility in districts without exclusive bike paths
Route locations	<ul style="list-style-type: none"> • Minimizing the damage to river ecology by constructing bike paths using farm irrigation lots 	<ul style="list-style-type: none"> • Fostered within riverside park spaces and public land lots 	<ul style="list-style-type: none"> • Fostered within public land lots • Established along sidewalks in the case of business districts 	<ul style="list-style-type: none"> • Install dedicated bike lanes along pedestrian ways 	<ul style="list-style-type: none"> • Pedestrian/bike paths to be built in CBD to promote business activities

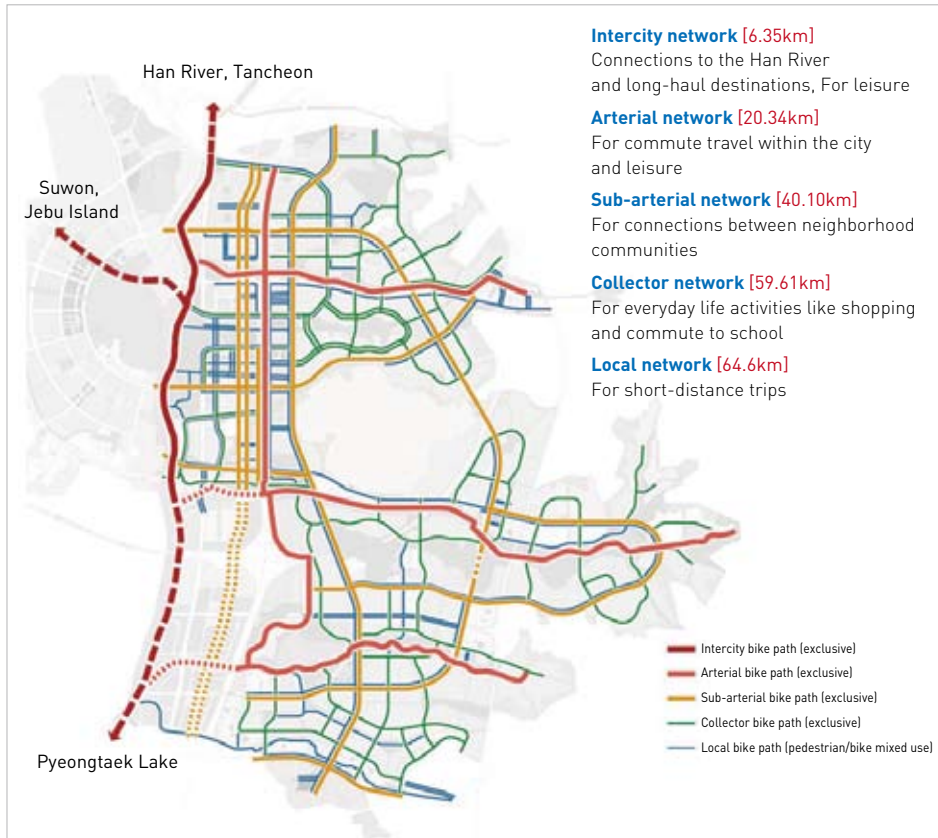
* Source: Based on Korea Land & Housing Corporation's research (2011) on ways to develop Dongtan 2 New City as a model city for cycling development

In addition, Dongtan 2 New City is seeking to enhance its image as a bike-oriented city by building cycling-related entertainment and convenience facilities along the major bicycle routes. As a newly developed town, the city has a shortage of tourism resources. So, it is planning to promote itself as a model bike city as part of its efforts to invigorate the residents' economic activities and attract visitors from nearby cities.

Such specialized facilities of the city will include the "Velo Community Center," "X-Game Park," "Bike Art Park" and "Bike Campsite." The community center is to be built in major districts of the city in an effort to facilitate the community activities of local residents. In a move to encourage the residents to more actively use bicycles, the city will also build specialized facilities like "bike campsites" along the major cycle routes.

The city is trying to establish user-friendly bike infrastructure by taking into

Figure 4.3. A conceptual drawing of Dongtan 2 New City's bike path network



* Source: Based on Korea Land & Housing Corporation's research (2011) on ways to develop Dongtan 2 New City as a model city for cycling development

account such factors as bike path types, the cycling environment and the cityscape, disaster prevention, mobility improvement, and geometric structure.

Based on a survey of bike users, the city has decided to construct the bikeways as two-way paths separated from vehicle roads. Such a scheme will help improve accessibility and ensure the safety of cyclists. The paths will also be separated from sidewalks, avoiding inconveniences that might be caused by the conflicts between pedestrians and cyclists.

It has been decided to secure pleasant green spaces for pedestrians and cyclists by reducing the width and number of car lanes. Trees will be planted on both sides of the bike paths so that they can form natural shades to help cyclists use the roads

Figure 4.4. Specialized facilities for bike use in Dongtan 2 New City



* Source: Based on Korea Land & Housing Corporation's research (2011) on ways to develop Dongtan 2 New City as a model city for cycling development

without being bothered by precipitation or solar radiation.

Riverside bike paths will be built in areas above the flood level so that they are not damaged by floods or torrential rains. In addition, the bike paths will be designed in such a way that cyclists can pass intersections nonstop through connection routes or passage boxes. Overall, the plan envisions building an environment-friendly city through the establishment of bike-centric roads and

Figure 4.5. A two-way bike path separated from car roadways and sidewalks. It is designed to ensure accessibility to commercial districts



* Source: Based on Korea Land & Housing Corporation's research (2011) on ways to develop Dongtan 2 New City as a model city for cycling development

Figure 4.6. Bike paths through a green space



* Source: Based on Korea Land & Housing Corporation's research (2011) on ways to develop Dongtan 2 New City as a model city for cycling development

traffic facilities.

Two or more roads cross each other at intersections, causing conflicts among modes of transport. They consist of roadways for vehicle traffic and crosswalks for pedestrian traffic. Recently, bikeways are built on roadways or pedestrian crossings to ensure smooth bike traffic. However, most of the bikeways are used both by cyclists and pedestrians. Or, they are located at marginal zones of the vehicle roadways. These conditions are leading to frequent conflicts and accidents involving bikes, cars and pedestrians. Various suggestions have been made to address the problem, but it is difficult to implement such measures because of difficulties related to the geometric structure of roads and budgetary issues. To ensure the safety of pedestrians, cyclists and car drivers under these conditions, bike paths on the intersections should be built by fully considering the characteristics and types of bikeways. Fully aware of this aspect, Dongtan 2 New City has designed its bike paths by placing pedestrians ahead of bikes, which in turn are given priority over cars, in the order of importance. In addition, to ensure safe intersection crossings by cars, bikes and pedestrians, the bike paths have been designed in such a way that

Figure 4.7. An intersection bike path designed to ensure seamless bike traffic



* Source: Based on Korea Land & Housing Corporation's research (2011) on ways to develop Dongtan 2 New City as a model city for cycling development

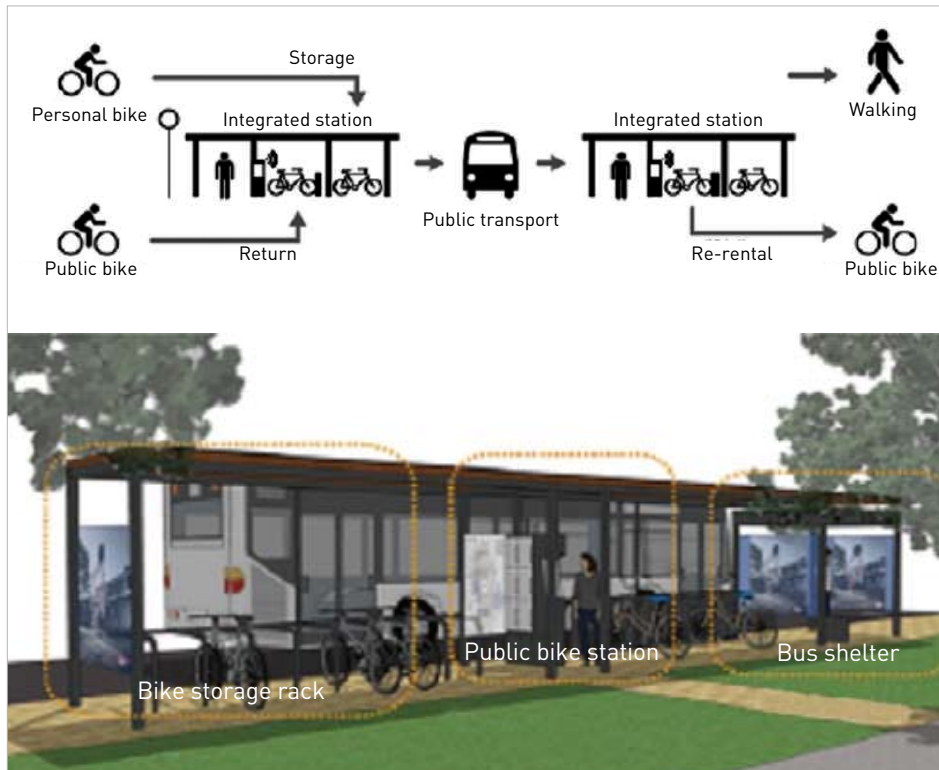
they can meet the following conditions: the continuity of bikeways, the lowering of curbs, increasing the visibility through dark red pavement, and separate placement of pedestrian waiting spaces.

Cycling Facilitation Plan

The central government and a number of local administrations are developing policy measures to facilitate the use of bicycles in everyday life. Despite such efforts, cycling is considered somewhat unfit for long-distance travel. Besides, transfers between bikes and public transportation are not being realized systematically. To address these problems, Dongtan 2 New City has introduced the concept of BTOD (Bicycle & Transit Oriented Development) designed to ensure expeditious access to stations and speedy transfers during long-distance commuting to work or school. Based on the perception of bikes as a mode of transport, the BTOD concept is to ensure linkage between land use plans and public transport systems, thereby developing highly efficient high-density cities.

Most of the new towns built in other parts of the nation have no transfer systems

Figure 4.8. Specialized facilities for bike use in Dongtan 2 New City



* Source: Based on Korea Land & Housing Corporation's research (2011) on ways to develop Dongtan 2 New City as a model city for cycling development

between bicycles and public transportation. Even those with bike-transit transfer systems are generating negligible effects due to poor integration of the relevant facilities. To address such problems, Dong 2 has developed an integrated design integrating bike storage spots, public bike stations and bus stops. This scheme allows the users to speedily rent or park their bikes, and transfer to other modes of transport.

To encourage the use of bikes, the city is also offering benefits such as transfer discounts, mileage accumulation, tax incentives and public (or private) fee discounts. Besides, it has installed roadside information guide devices in an effort to promote cycling.

Public Bicycle Plan

Public bike stations are usually located in areas where there is demand for bike use, thus making it easy for citizens to rent and return bicycles. This scheme offers particularly good accessibility to short-haul transportation. It can also be used effectively for long-distance travel by ensuring expeditious connections

between starting points and destinations through linkage to other modes of transport. The best known public bike system in Korea is being operated in Goyang, one of the planned cities, under the title of “FIFTEEN.” A growing number of cities are following the example of Goyang to introduce their own public bike programs.

The bicycle is a human-powered means of transport, so the frequency of its use goes down when it comes to long-distance travel or trips along slope sections. In an effort to address this problem, Dongtan 2 is planning to introduce electric public bikes for the first time in Korea. The use of electric bikes is predicted to lead to increases in the average travel distance and speed, the frequency of use for uphill cycling, and the number of bike users among the elderly and those with mobility handicaps. The city is implementing a plan to install 130 bike stations in the city areas and designate regions of use with the radius of 300~500m in order to achieve its goal to raise its bike mode share to 10% by 2020.

Figure 4.9. A conceptual drawing of an electric bike and rental facilities





SECTION 04.

Bike Plans of Sejong City

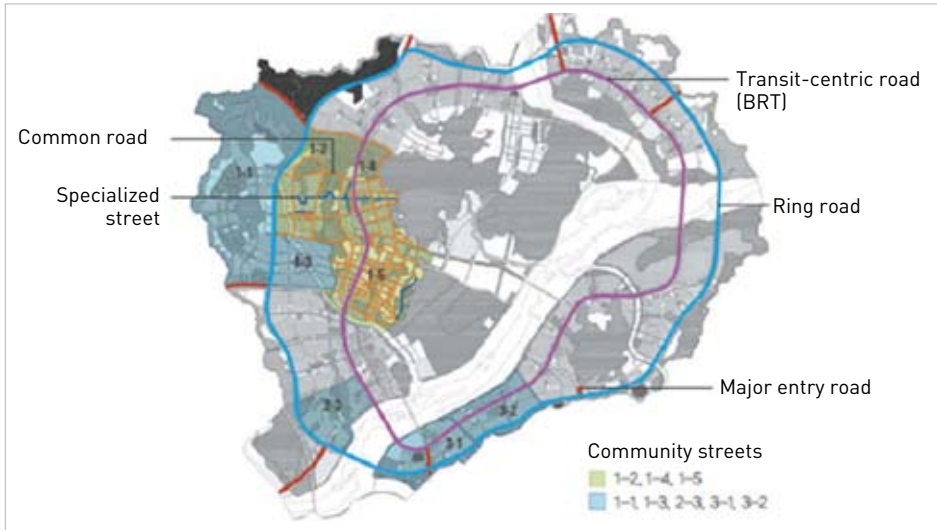
1. Overview

Located in the northeastern part of South Chungcheong Province, Sejong City borders North Chungcheong Province to the east, Gongju City to the west, Daejeon Metropolitan City to the south, and Cheonan City to the north. The area is 72.91 km², about three-quarters the size of Seoul. The city is projected to have a population of 500,000.

Sejong City is a planned city built pursuant to a special law on constructing a multi-functional administrative city in the Yeongi-Gongju area, which had originally been designated as the site for the new administrative capital. A number of ministries and public agencies have been relocated to this new town, which is designed as an administrative hub equipped with various self-sufficient urban functions. In this respect, Sejong is different in nature from the existing planned cities that have been built to address the problems of housing shortages.

The city is aiming to become a comfortable eco-friendly city marked by the harmony of nature and human beings, a human-centered city that ensures

Figure 4.10. Sejong City's major road networks and districts



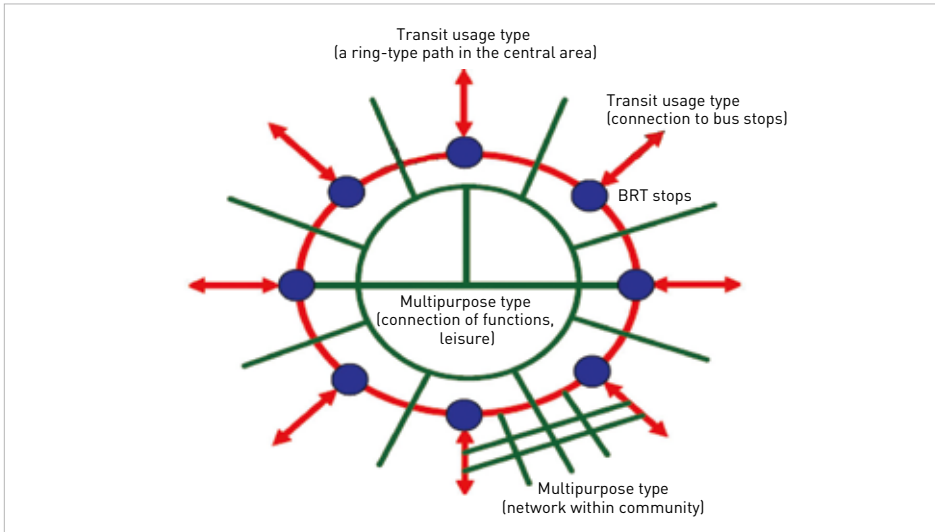
convenience and safety, and a cultural information city where culture combines with state-of-the-art technologies. To achieve this vision, the city fostered transit-oriented concentric roads, and formed networks of bus lanes, bike paths and pedestrian roads. Through the facilitation of their use, the city is planning to increase the mode split of public transportation (including buses and bikes) to over 70%. To improve the mobility of bikes, dedicated median bike lanes have been constructed. In addition, photovoltaic facilities have been established along the bike paths to increase the mobility of bikes through power generation. With these facilities, Sejong surely can be called a new-concept bicycle city.

2. Plan to Build Multipurpose Bike Paths

Bike Route Plan

The bike route plan of Sejong City calls for building concentric bike paths along the public transport corridors and forming bikeway networks to ensure connectivity of major urban functions. Under this framework, transit-oriented routes have been built around each community's exclusive pedestrian roads linked to public transport

Figure 4.11. A conceptual drawing of Sejong City's bikeway network



* Source: Multifunctional Administrative City Construction Agency, *A Study on Improving Transport Measures and Building a Public Transport System for the Multifunctional Administrative City*, 2011.

corridors. In addition, multipurpose bike paths have been constructed in a way that can ensure access to various facilities in and out of the basic living communities.

Bike routes have been designed in a sophisticated manner in a way that ensures the separation of travel routes of pedestrians and cyclists. Such routes have been built along the major public transport corridors, covering the entire city. There are also pathways that connect basic living communities with BRT stations. To ensure the safety of pedestrians, the bike paths have been separated from pedestrian roads. Besides, they have been linked to integrated community centers in an effort to facilitate the use of bicycles.

Bike trips can be largely divided into utility types for everyday life and leisure types. This division has been taken into account in connecting bike paths to relevant facilities, thus maximizing user convenience. Utility bikeways connect integrated community centers, playing an important role in ensuring linkage among urban functions, along with bike paths built along the major corridors. Leisure-type bike routes are used exclusively for cyclists. They are separated from vehicle and pedestrian roads. Connected with central green spaces and riverside resting spots, these paths have been built in a way that can provide users with a maximum extent

Figure 4.12. A layout of bike paths in Sejong City



* Source: Multifunctional Administrative City Construction Agency, *A Study on Improving Transport Measures and Building a Public Transport System for the Multifunctional Administrative City*, 2011.

of convenience, comfort, seamless traffic and safety.

Some bikeways are for connections within living communities, while others are designed to ensure linkage to arterial roads. The bike paths can also be divided according to trip purposes: utility or leisure. Based on these classifications, the bikeways in Sejong City have been built along arterial roads or along collector or lower-level roads. Bikeways on the arterial roads have been constructed on the sides of vehicle roads, based on the assumption that bicycles should be regarded as a mode of transport. In contrast, bike paths on collector roads or lower-hierarchy roads have been constructed on the sides of pedestrian walkways. In central business districts frequented by pedestrians, bike paths have been placed on the sides of vehicle roads to separate pedestrian and cycle traffic.

Bike parking spots have been established near bus stations or transfer facilities

by taking into account demand for bike use. Crosswalks, traffic signals and signboards have been installed in a way that can ensure the safe and convenient use of bikes.

State-of-the-Art Bike Path Plan

Built on gentle plains, Sejong City has a geographical advantage over other Korean cities in terms of the use of bicycles. The city also shows a high level of bicycle accessibility to residential and commercial districts because these areas are just about 1 km away from the public transport corridors.

The bike paths of the city are projected to have a total length of 354 km (excluding riverside trails). Sejong City surpasses other Korean cities in terms of the ratio of bikeway length to area. The length of its bikeways per square kilometer is 4.85 km, compared to Seoul's 1.39 km and Incheon's 0.39 km. Having set the goal to increase the city's bike mode share to 20% by 2030, the city government is implementing a plan to establish 317 on-street bike storage spots and 56 off-street parking places.

For the first time in the nation, Sejong City has installed a median bike path and a bikeway installed with photovoltaic power generation facilities. The two-

Figure 4.13. A conceptual drawing of Sejong City's Transit-Oriented Roads



• Source: Multifunctional Administrative City Construction Agency homepage (<http://www.macc.go.kr/>)

Figure 4.14. Photovoltaic power generation facilities in Sejong City



* Source: Based on Korea Land & Housing Corporation's research (2011) on ways to develop Dongtan 2 New City as a model city for cycling development

way (with the width of 3.8m) median bike path was built in the middle of the 8.78 km-long eight-lane arterial road that runs between Songwon-ri (Sejong City) and Yuseong Ward in Daejeon, with investments worth 22.64 billion KRW. Iron protection fences are on both sides of the bike path, ensuring the safety of cyclists. It is called a “bike expressway” as cyclists can run continuously on the path without being bothered by traffic signals, sidewalks, speed bumps or other obstacles. The bike path installed with photovoltaic power generation facilities have exist and entry roads at five locations along the way. The exist-entry roads are all built underway to prevent accidents such as crashes with cars. The photovoltaic facilities installed in the form of a canopy serve to increase user convenience by forming shades and helping cyclists to avoid rain.

About 400 solar panels have been installed along the 4.6 km bike road section with an investment of 6.5 billion KRW. The facilities generate 5851MW of electricity a year, an amount that can meet the power needs of about 1,699 households. In terms of effects, it corresponds to the reduction of 2,642 tons of greenhouse gases.

Public Bike Project in Sejong City

The number of Korean cities operating public bike systems is gradually increasing. The most prominent example of a public bike program is “FIFTEEN” in Goyang City. Goyang was built in the 1990s for the purpose of distributing the population

in Seoul and the capital region. In this regard, it is different in nature from new towns built to be developed into an eco-friendly city with energy-saving features.

To effectively operate its public bike system, Sejong City needs to make the most of its special nature as a multi-functional administrative city, increase the safety and convenience level, and enhance the awareness of its citizens and tourists about the use of bikes. A bike insurance system needs to be implemented to ensure the safety of citizens. Additionally, bike racks need to be installed near the destinations of users, such as BRT stations, entrances of apartment complexes and public organizations so that public bikes can be available to all, from students to seniors.

To prevent the public bikes from being stolen and damaged, the city is planning to introduce GPS monitoring and real-name rental systems. It has also decided to strictly enforce compensation regulations against persons responsible for the loss or damage of public bikes. To cope with unexpected accidents and consequential damages, a bike insurance compensation system will be initiated for the public bike system members. The municipal government has also devised a plan to establish public bike rental stations in commercial districts and residential areas frequented by people so that citizens can use the bikes more readily. Additionally, it is developing a plan to ensure the distribution of bikes in the right time and right places through surveillance and monitoring throughout the day as well as communication with citizens via a website.



SECTION 05.

Achievements and Implications of the New Town Bike Project

1. Achievements of the New Town Bike Project

Establishing a transportation plan is an essential element in urban development. When developing such a plan, cycling assumes increasing importance because of the trend toward pursuing a policy to develop green growth-oriented environment-friendly cities. Dongtan 2 and Sejong cities have been playing leading roles in promoting the use of bicycles by establishing pertinent facilities and introducing new systems as manifested by their opening of bike community centers, operation of public bike systems and construction of bike paths that combine state-of-the-art technologies.

In Dongtan 2 New City, the indirect benefits from the implementation of the bike road project is projected to reach 58.3 billion KRW a year in terms of money value. Of them, about 55.7 billion KRW worth of benefits are expected from the reduction of about 371,600 tons of CO₂. In this regard, Dongtan 2 is being cited as a model case showing the realization of a low-carbon green city. Sejong City is attracting attention with regard to its bike road installed with photovoltaic power generation facilities as well as its median bike path. With such achievements, Sejong is referred to as a prominent example of a new town promoting cycling

through the use of new-concept leading-edge technologies

These efforts have helped lay the groundwork for ensuring a status shift for bicycles. Bikes have come to be regarded not just as a tool for leisure but as a mode of transport that can be used in association with public transportation for commute and utility purposes. The efforts have led to an increase in the bike utilization rate, which in turn improved the level of comfort and safety, eventually enhancing the prospects of realizing sustainable urban development. Additionally, they helped realize a low-carbon transport system oriented toward green growth based on a shift from car- to human-centric cities. The bike projects have also generated environmental impacts. They have led to the construction of eco-friendly cities by helping to ensure clean air quality through reduction of greenhouse gases as well as by lowering the level of noise through reduction of car traffic. Furthermore, the bike programs have contributed to building healthy cities by promoting the health of citizens and consequently, reducing medical costs and facilitating various social exchanges.

2. Implications

Bike promotion projects cannot achieve the results related to low-carbon green growth as shown in Dongtan 2 and Sejong cities, with just the expansion of bike roads and related facilities. In addition to facility expansion, implementation of comprehensive measures is needed to build environment-friendly cities filled with vitality. For example, cycling ought to be promoted in connection with public transport and through the application of innovative concepts and technologies.

There is also a need to depart from the practice of just trying to follow foreign examples. New town bike projects should be based on analysis of the conditions and bike usage patterns specific to Korea. Systematic plans must be developed through thorough research into the geographical features and the characteristics of bike users.

The implementation of the new town bike projects has led to further progress in efforts to promote cycling and develop eco-friendly cities oriented toward green transport. On the basis of these achievements, efforts should be exerted to continue to build low-carbon green cities through development of pertinent policies and technologies.



CHAPTER 05

Introduction of Public Bike Systems in Korea and an Exemplary Case



01 Overview of the Public Bike System

02 Current Conditions and Characteristics of the Public Bike System in Korea

03 Implications of Public Bike Programs in Korea

04 A Case Study: Changwon City, South Gyeongnam Province



SECTION 01.

Overview of the Public Bike System

1. Definition of the Pubic Bike System

The public bike system is a bike sharing scheme designed to ensure that anyone can use bicycles as conveniently as possible, anytime (24 hours) and anywhere (locations nearest to an unspecified number of users), and regardless of the destination.⁵⁾ Introduced by more than 300 cities worldwide, the system is expected to replace the demand for short-distance travel by car. It is regarded as a useful tool that can be used in efforts to solve or ease various urban problems such as traffic congestion, accidents and air pollution. As such, the system is expected to be adopted by a growing number of cities throughout the world.

Public bikes can be rented or returned at public bike stations.⁶⁾ A bike station has a number of bicycles, racks and kiosks for the rental and return of bikes. The entire

⁵⁾ Public bike system is also called by bike-sharing. Public bike systems can be divided into manned and unmanned systems, depending on the operating method. This paper deals with unmanned systems which are being widely used throughout the world.

⁶⁾ Public bike stations are also referred to as public bike terminals.

stations are managed comprehensively by the central management center.

2. Components of the Public Bike System

Bicycles, Racks and Stations

Bicycles are the most important basic element. Public bikes are generally used by a number of users, so they should display higher levels of strength and damage resistance than bicycles used by individual riders. Besides, they need to employ unique designs and colors so that they can execute PR functions and improve the image of a city. The bike rack is a structure from which bicycles are taken out to be used. It is also used for storing bikes being returned.

Public bike stations are places where bicycles are rented and returned. There are public bikes, bike racks and kiosks at the stations.

Kiosk

Kiosks are used for signing out and returning bikes. They send information on users and public bikes to the operation center and storage stations. They also provide

Figure 5.1. Concept of a public bike system



Figure 5.2. Various types of public bicycles and racks



* Source: Ministry of Security and Public Administration, *Public Bike Standard Operation System Manual*, 2010.

Figure 5.3. Public bicycle kiosk



*Source: Ministry of Security and Public Administration, *Public Bike Standard Operation System Manual*, 2010.

Figure 5.4. Public bike user guide homepage



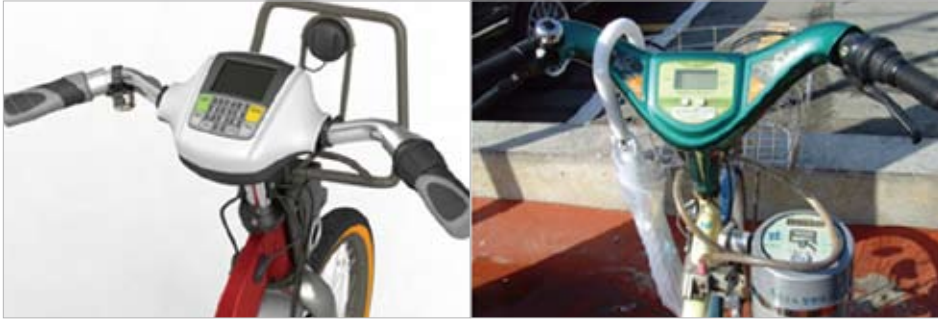
*Source: Ministry of Security and Public Administration, *Public Bike Standard Operation System Manual*, 2010.

information on the use of public bikes and related news, thus helping to increase user convenience.

User Guide Homepage

Through the user guide homepage, users can gain information on stations available

Figure 5.5. Terminals for public bikes



*Source: Ministry of Security and Public Administration, *Public Bike Standard Operation System Manual*, 2010.

for signing out and returning bicycles. The homepage also provides statistical information on public bike usage and bike rental conditions. Visitors to the homepage can also obtain various information related to public bicycles.

Public Bike Terminal

Terminals are installed on public bikes to convey information on driving speed, time and distance to the riders. Recently developed terminals are equipped with functions to provide GPS-based navigation services and register bike breakdowns.

Central Control Center

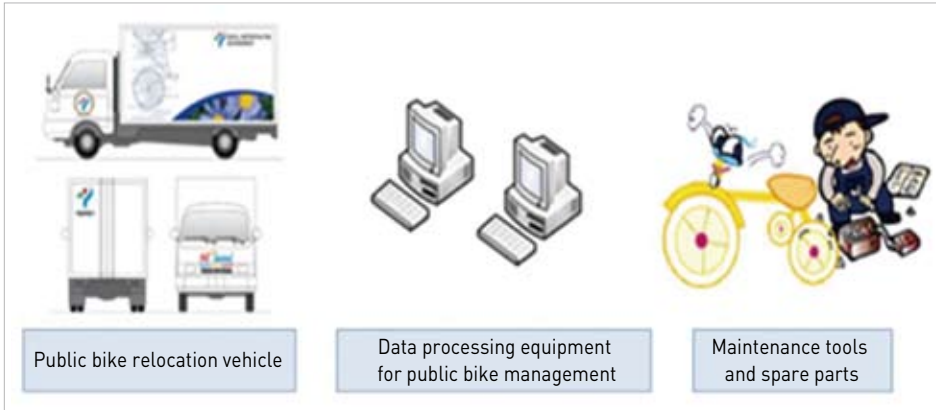
The central control center is responsible for the management of the following affairs: membership registration, user certification, bike rental and return, user fee payment and clearing, and rental system operation. It also supervises intentional damage prevention efforts, ensures bicycle repair and maintenance through connections with the repair center, and handles inquiries through linkage to the call center.

Figure 5.6. Central control center



* Source: Ministry of Security and Public Administration, *Manual on Building and Operating a Public Bike System*, 2010. The contents have been partially revised.

Figure 5.7. Public bike maintenance facilities



* Source: Ministry of Security and Public Administration, *Public Bike Standard Operation System Manual*, 2010. Some of the contents have been revised.

Maintenance and Management Facilities

Effective relocation of bikes is necessary to ensure that bikes and racks are always available for rental and return of bikes. Besides, faulty or damaged bikes should be expeditiously collected and repaired. Appropriate personnel and equipment are needed to execute these tasks.

3. Effects Expected from the Public Bike System

Transport Aspects

The public bike system helps to increase transport accessibility and expand basic transport rights. Generally installed at intervals of 300 meters, public bike stations are easily available, providing excellent transport accessibility. In particular, public bikes can provide the level of convenience close to that of passenger cars because users can ride them at any time they desire. This is an advantage that cannot be provided by public transportation. In addition, compared to passenger car use that requires spending considerable time parking cars at destinations, cycling ensures expeditious connections between starting points and destinations, even in long-distance trips, through linkage with other modes of public transport.

The public bike scheme also plays a role in providing or expanding basic transport rights. With the nature of semi-public transportation, public bicycles can provide transfer or other linkage services in relation to public transportation. The public bike program can implement a function of providing basic transport rights to captive riders by providing a new means of transport. Additionally, public bikes can help ease the problem of social polarization and inequity as they can be used easily regardless of differences in gender, age and social class, eventually increasing public benefits.

Social Aspects

The public bike system makes it possible to solve the bike theft problem, reduce storage costs, and ensure efficient utilization of resources. Bike users want bicycle storage facilities without the risk of theft, but often fail to find bike parking places with security functions. So, bike thefts have become common occurrences around the world. To resolve the theft problem, it is necessary to improve bike parking facilities and enforce relevant crackdowns. Implementing such measures requires spending a lot of expenses. However, under a public bike system, the theft problem can be solved through the operation of bike stations at specified locations as well as the installing of anti-theft equipment and video devices. In the case of Goyang City, the percentage of public bikes being lost is less than 1% of its entire bike fleet.

Privately owned bicycles need storage places both at the place of departure and the destination. In contrast, public bikes need just one storage place for one bicycle. Besides, it is generally said that one public bicycle can match 12 to 15 personal bikes in terms of their roles and functions. It shows the effectiveness of public bikes that can generate big effects with relatively small storage spaces. In particular, installing public bikes in central business districts, where it is relatively difficult to secure parking spaces, is a way to gain huge benefits in terms of expenses and space utilization.

The public bike system represents a positive way of using limited resources effectively. Recently, the consumption paradigm in society is shifting from personal possession to sharing. The consumption culture based on sharing is expanding to cover such objects as cars and bicycles. The public bike scheme can be considered

a part of such sharing culture, which can help promote the sharing of limited resources and protect the environment.

Environmental Aspects

Public bikes can function as an icon symbolizing a city. Compared to other facilities within a city, public bikes are located very close to the citizens, typically being placed on the streets that form the cityscape. In this respect, they can improve urban esthetics if designed and manufactured in a way that suits the entire city, including the streets where they are stationed. Another important feature of public bikes is that they are a trustworthy eco-friendly mode of transport. As a non-motorized, no-carbon mode of transport, public bikes can play a significant part in safeguarding the environment amid growing concerns about climate change and energy depletion. Just using public bikes in everyday life can help prevent environmental pollution. This gives the public bike system a huge advantage in terms of environmental aspects.

4. Considerations for Public Bike System

Public bikes are used by an unspecified number of people. With such characteristics, they need to be developed as a convenient and sustainable mode of transport. Achieving this objective will require efforts to meet the following conditions.

The first condition is convenience. Public bikes should be readily available to members and nonmembers alike. To ensure such a level of convenience, the public should be able to use bikes through a variety of means of authentication. Ensuring connectivity is also important. A public bike system is designed to be used primarily for travelling short distances of less than 5 km within a city. As such, it should be equipped with functions to provide not only short-haul utility travel services but connection services involving subways and other modes of public transport. To provide these services, the system should be interoperable with other modes of transport in the use of traffic cards, thereby promoting user convenience

and offering fee discounts.

Endeavors should also be made to ensure security and efficiency. It is highly likely that public bikes might be carelessly used because they are not personal property. It is essential take steps to prevent thefts or careless use causing damage to bikes. It should also be noted that a public bike project requires spending a lot of expenses. To minimize the costs, the system ought to be designed appropriately by placing the utmost emphasis on efficiency. Given the low level of financial self-sufficiency, it is particularly necessary to ensure the efficiency of public bike systems. Without such efficiency, public bikes cannot be used as a sustainable mode of transport.

Attention ought to be paid to the question of ensuring scalability as well. Public bike facilities should be built in phases, making sure to ensure scalability needed to meet future demand for expansion. There should also be scalability to allow interoperability among different systems, particularly for connections with programs of other local governments.

Figure 5.8. Status of worldwide public bike systems



• Source: map.google.com [The Bike-sharing World map], 2012.07.17.

5. Global Status of Public Bike Systems

Globally, public bike systems are being operated in more than 300 cities. The number of bicycles under municipal bike programs ranges from 720 to as many as 60,600. Lately, there is a tendency to increase the fleet size to over 10,000 bikes. As a result, cities running small-scale programs are showing a trend toward expanding their scale. Most cities are introducing third-generation bicycles, and increasing the convenience level to the extent that usage fees can be paid using mobile phones. There are a diversity of funding resources such as the financial support of the government, usage fees, and revenues from advertisement revenue, and parking fee revenue from affiliated facilities. The global status of public bike systems is shown in Table 5.1 and Figure 5.8.

Table 5.1. Major foreign cities operating public bike programs

Categories	Paris	Barcelona	Lyon	Frankfurt	Montreal	Vancouver
Operator	JCDecaux	Clear Channel	JCDecaux	DBRent	Stationnement Montreal	TBD
Population	2,153,600	1,605,600	466,400	652,600	1,039,500	578,000
Number of bicycles	20,600	3,000	3,000	720	5,050	3,800
Population/ Bicycle	104	535	155	906	206	152
Applied technology	Smart card	Smart card	Smart card	Mobile phone	Smart card	Smart card
Project type	Profit-pursuing project	Local government	Profit-pursuing project	Local government	Profit-pursuing project	Profit-pursuing project
Funding scheme	Fees and outdoor ads	Fees and parking revenue	Fees and outdoor ads	Fees and support from the city government	Fees and parking revenue	Fee revenue



SECTION 02.

Current Conditions and Characteristics of the Public Bike System in Korea

1. Operation Status

In Korea, city-level public bike systems have been actively established since the late 2000s in relation to efforts to promote cycling. As shown in Table 5.2, public bike systems were in operation in 14 cities as of 2012. Of these cities, those operating more than 200 bicycles are Changwon, Daejeon, Seoul, Goyang, Busan and Yeosu. Changwon and Goyang have the largest fleets of over 3,000 bikes. Although not listed in this table, a number of other cities are providing free bike services or operating large and small public bike rental programs.

Table 5.2. Status of unmanned public bike operation in Korea

(unit : ea)

Local governments	Names	Year of introduction	Project size		Fare scheme
			Stations	Bikes	
Seoul City	Seoul Bike	2010	43	440	one-day card (1,000 KRW), 7-day card (3,000 KRW), 30-day card (5,000 KRW), 6-month card(15,000 KRW), 1-year card (30,000 KRW) ※Basic rental period: 1 hour (repeated use possible during the rental period), After the basic one hour, 1,000 KRW is charged in extra fee every 30 minutes
Busan City	U-Bike	2010	15	300	Yearly subscription: 20,000 KRW, Monthly subscription: 3,000 KRW, Daily subscription: 1,000 KRW, Free usage for less than one hour, After the free-use one hour, 500 KRW per 30 minutes
Ongjin County, Incheon City	-	2010	1	25	Fees not imposed due to the lack of relevant ordinance
Daejeon City	Tashu	2009	20	200	Beginning in June, free usage during the first one hour, For three hours after the initial one hour, 500 KRW every 30 minutes After the three hours, 2,000 KRW per 30 minutes
Suwon City, Gyeonggi Province	Greenway	2009	2/39	30	Free
Goyang City, Gyeonggi Province	Fifteen	2010	125	3,000	Membership (one year: 60,000 KRW, 6 months: 40,000 KRW, 3 months: 20,000 KRW), As for non-members, 1,000 KRW for every 40 minutes
Danyang County, North Chungcheon Province	Taborae	2010	2	40	Membership (yearly: 20,000 KRW, monthly: 3,000 KRW, weekly: 2,000 KRW), Nonmembers (one-day card: 1,000 KRW)
Gongju City, South Chungcheong Province	Pabalma	2010	3	30	Free for up to 2 hours, After free usage, 1,000 KRW per hour, Up to 10,000 KRW can be imposed in usage fee
Asan City, South Chungcheong Province	U-Bike	2011	11	90	Not specified
Buyeo County, South Chungcheong Province	Pabalma	2010	3	90	Fees not imposed due to the lack of relevant ordinance
Yeosu City, South Jeolla Province	Yeosurang	2011	16	200	Membership (1 year: 20,000 KRW, 1 month: 3,000 KRW), Nonmembers: one-day use: 1,000 KRW
Suncheon City, South Jeolla Province	Onnuri	2009	16	226	Annual membership: 20,000 KRW, Monthly membership: 3,000 KRW, Weekly membership: 2,000 KRW, one-day card: 1,000 KRW
Changwon City, South Gyeongsang Province	Nubija	2008	230	4,630	Annual membership: 20,000 KRW, Monthly membership: 3,000 KRW Weekly membership: 2,000 KRW, one-day card: 1,000 KRW
Jeju City, Jeju Province	-	2011	6	72	Free of charge

• Note: As of February 2012.

2. Usage Status

Research was conducted into the utilization rates of public bikes, targeting Changwon and Daejeon that introduced mid-scale programs in 2009, and Goyang that initiated a large-scale system in 2010.

The research showed that Changwon recorded the largest public bike traffic volume of 9,000 rides a day. This means that one bicycle was used 4.9 times a day on average. In the category of per-bike traffic volume, Daejeon was ranked first, with 6.8 rides a day.

Table 5.3. Comparison of public bike utilization rates

Categories	Changwon	Goyang	Daejeon
Population	503,000	950,115	1,518,540
Fleet size	4,630	3,000	200
Total ridership/day	9,399	5,537	1,295
Average ridership/bike/day	4.9	3.8	6.8

* Note: Average ridership is based on the presumed operation of total bikes.

3. Comparison of Public Bike Project Types

Public bike systems in Korean cities have been mostly built with public funds. This approach was adopted because of its advantage of allowing the government to play a leading role in project implementation. Another important factor was the low profit potential of the systems, which were pursued as pilot programs or small-scale projects. The only exception is Goyang City, which has established its public bike system based on a public-private partnership. The project types of the three cities chosen for this study are shown in Table 5.4.

Public bike services in Korea can be classified into two types: publicly funded projects and those implemented with private-sector investments. Additionally, there is a case where a program is promoted by the private sector in the initial stage, eventually being tuned into a public fund project. The Korean examples can be used as preliminary data for developing a rational project type for a public bike program.

The most representative Korean city operating a public bike system is Changwon. As the first Korean city that has introduced the system, it is now running more than 4,500 bicycles, the largest in scale in the nation. The project represents a prime example of a public bike program being introduced and operated with budgetary support from the government. A number of other cities have also introduced the public bike system with support from the government.

There has been a city that has attracted private investments. Goyang City promoted its public bike scheme as a private investment project as scheduled from the planning stage. In the process of drawing private investments, the city formed an SPC led the city government as well as private companies. The SPC participants were comprised of the Goyang city government and the private-sector companies of Hanhwa S&C, Samchuly Bicycle and Innodesign. At present, Eco Bike, a company controlled by Hanhwa S&C, is running the SPC on behalf of the participants. The private sector has the right to operate the public bike services for 10 years after their initiation. After 10 years, the operation system and facilities are slated to be transferred to Goyang City. The project, which involved the construction of 125

Table 5.4. Public bike project implementation procedures and methods in Korea

Project implementation procedure and method	Case cities	Major characteristics
Direct operation by the city (public finance project)	Changwon	<ul style="list-style-type: none"> • Changwon Cycle Racing Corp. is in charge of operation on behalf of the city • Changwon City is responsible for providing the operating costs, but expenses are reduced through the help of the corporation and by using public work programs • Financial support worth about 3 billion KRW a year (from the city budget) • Pilot projects initiated in old Masan, Jinhae areas (February 2011); system expansion (number of bikes increased from 3,000 to 4,630)
Attraction of private capital	Goyang	<ul style="list-style-type: none"> • Inauguration of a consortium with the participation of the city government (SPC establishment) • Eco Bike (SPC) operates the system (Goyang City, Hanhwa S&C, Samchuly Bicycle, Innodesign) • The city's financial burden not determined yet as less than a year has passed since the system was launched (Over 4 billion KRW has been requested, but the amount is expected to be adjusted)
Turned into a public finance project after being initiated as a private project	Daejeon	<ul style="list-style-type: none"> • A pilot project is in operation with 200 bikes. The number of bikes is to be increased to up to 5,000, but the project is not making progress fast enough • Victek and Hanhwa S&C have been selected as priority negotiation partners, but it has been decided to implement the project as a public finance project eventually

* Note: Changwon Cycle Racing Corp. is a public organization established to ensure fair implementation and promotion of cycle racing and promote sound leisure activities for the people.

programs.

The Ministry of Security and Public Administration, which is chiefly responsible for bike policies, has prepared a “Manual on the Construction and Operation of Public Bike Systems.” Through the use of the manual, the ministry is trying to unify the basic elements such as bike components and operation procedures, and to build a system interoperable among various local governments.

The Korean Agency for Technology and Standards, an organization affiliated with the Ministry of Knowledge Economy, has developed “KS standards on public bike systems,” helping to ensure the technological stability of the public bike programs. In particular, the agency is trying to revise the standards to reflect the latest technological trends and keep up with the growing trend toward operating public bikes. This move represents the organization’s efforts to increase the safety level of public bikes as well as user convenience.

Public bicycles are a mode of transport used by a large number of citizens.

Table 5.5. Public bike-related ordinances

City	Legal grounds	Remarks
Seoul	Ordinance on Facilitating the Use of Bicycles	Chapter 4. Article 12-2 (Installation and Operation of Public Bicycles and Rental Stations) <ol style="list-style-type: none"> ① The mayor may secure public bikes and install and operate rental facilities in order to promote the use of bicycles. In this case, the mayor establish an unmanned rental system with interoperability among public bike rental stations. ② The mayor entrust the establishment and operation of public bike systems to public organizations or the private sector, and provide support to cover the costs within the scope of the budget. ③ Other matters such as the rental station installation and operation method and the usage fees shall be determined separately by the mayor.
Goyang	Ordinance on Facilitating the Use of Bicycles	Article 17 (Public bicycle rental business, etc.) <ol style="list-style-type: none"> ① Public bike rental business can be conducted through private or public investments and according to related laws. However, additional business is not allowed except for bike storage, rental, experience, and PR and exhibition. Provided the need arises, the mayor allow the implementation of subsidiary businesses after confirming their association with public bike system and gaining approval of the Goyang City Bicycle Use Promotion Committee. ② The bicycle usage fees should be decided through consultations between the mayor and the private operator. Changing the fees should also be subject to advance consultations. ③ Administrative support needed for the implementation of public bike loaning business as well as various incentives such as fee exemption can be provided pursuant to relevant laws and within the scope of budget. ④ When the business is implemented through private investments, the city should participate in it as a shareholder for the purpose of ensuring public services and public benefits. ⑤ When providing fee exemption incentives and providing financial support, the city may enact regulations concerning the detailed contents.

Such importance makes it necessary for the central and local government to closely cooperate in implementing public bike programs.

Pertinent Legal Grounds

Institutional support is also necessary to ensure the stable operation of public bike systems and enhance the level of relevant service. Cities operating public bicycles have enacted ordinances concerning their operation and support measures. The ordinances provide guidelines that help the local administrations operate their public bike programs in a stable manner and provide services that can meet user demand.

Application of Cutting-edge Technologies

Various state-of-the-art information communication technologies are being applied to public bicycles. Changwon City has developed a smartphone application named “Smart Nubija.” The application makes it possible to sign out and return bikes, make inquiries and report breakdowns by just using smartphones. There are also other smartphone applications that allow users to readily locate rental spots and identify the number of available bikes. These applications help to facilitate the use of public bikes by creating an environment for using bikes easily and conveniently.

Furthermore, electric public bikes are being developed. Generally, common bikes are inconvenient to use on uphill slopes or during long-haul trips. The use of electric bikes would help reduce such inconveniences to a considerable extent. With considerable progress having been made in the development relevant technologies, Changwon and Cheongju cities are planning to use electric bikes for their public bicycle programs. There is also a technology developed to reduce the inconvenience public bike users often experience when return bicycles because of the shortage of racks. This technology allows users to return bikes after connecting them to other bikes already placed in a rack. Besides, a mobile scheme is being developed to make it possible to rent and return bikes through mobile phones.

Data Collection and Utilization

For effective implementation of policies, it is important to collect and build data.

Figure 5.10. A smartphone attached to a bike and a screen shot of an application (Nubija smart)



• Source: <http://www.1mobile.com> [changwon-smartnubija] and internal data of Changwon City, 2012.

In the transport sector, various types of surveys are conducted to collect data. However, it takes time and costs money to conduct surveys. Because of these limitations, large-scale surveys cannot be conducted so often. Another drawback of such surveys is that the findings cannot be used until after a certain period of time.

Data on public bike usage are collected in real time. The central control center comprehensively collects information on such matters as rental place and time, return place and time, place and time of return, travel distance and time, and members and non-members. The collected data are used in developing public bike

Figure 5.11. A bicycle connection rack and a standard wire lock presented by the Ministry of Security and Public Administration



• Source: Korea Transport Institute, *Public Bicycle Technology Seminar*, 2012.

and general bike policies. For example, by identifying the characteristics of people using public bikes and grasping the traffic and social factors affecting the use of public bikes, relevant officials can develop various policies aimed at facilitating the use of public bikes and improving related problems.

Effective Maintenance System

Bike maintenance is one of the most crucial parts of a public bike project. Now matter how good a system is, it is difficult to facilitate its use if bicycles with punctured tires and faulty parts are not properly repaired. In this regard, a public bike system should be designed based on full consideration of the repair and maintenance question. It also needs to be operated after establishing a thorough maintenance plan to ensure user safety and convenience.

The operational organization should have a scheme to provide systematic and professional maintenance services through the use of personnel that fully understand the relevant technological and environmental aspects. Endeavors should be made to prevent bike breakdowns, and to take prompt measures when breakdowns occur, thereby ensuring the safety of users and the stable operation of the system.

For proper maintenance of bikes, public bike operators in Korea are required to conduct regular checks by using professionals and pertinent equipment. Personnel in charge of maintenance are also handling bike relocation services. In the process of relocating bikes, they can check whether any of them needs repair.

Increased Attention and Interest Regarding Cycling

Public bike programs are allowing the users to feel the benefits of cycling, thus helping to facilitate the use of bicycles as well as to develop effective bike policies. Actually, since the introduction of public bike systems, there have been a growing number of petitions and requests for improving bike roads and related facilities. This represents a favorable development initiated by the implementation of public bike programs.

Public bikes can function as a cultural element of a city. Riding a public bike can be considered a fashionable thing to do, forming an important part of urban

culture and consequently, further facilitating the use of bikes. A public bike system can also help promote the image of a city as a green city. In Korea, Changwon is most prominently known as a city pursuing an active bike policy. This reputation may be ascribable to its public bike program.



SECTION 03.

Implications of Public Bike Programs in Korea

1. Policy Implications

Car-centric urban transport systems cause various social costs related to traffic congestion, air pollution, accidents and the construction and management of road facilities. Efforts are being made to tackle this problem through facilitation of the use of non-motorized modes of transport. However, Korea has been showing very low rates of bike usage, which can be attributable, to a considerable extent, to the problems of bike thefts and the shortage of bike parking lots. The public bike system can be used very effectively to tackle these problems.

However, it is costly to introduce and operate a public bike system. Given the nation's low bike usage rate, it has been difficult to meet the required expenses with just the revenue from bike rental fees. Raising the fees could not be an effective option because it would rather generate adverse effects by causing a reduction in the number of users.

A certain level of support from the public sector was required to introduce and operate public bike programs. In this regard, there were pros and cons about the government pursuing a public bike policy. However, the government was aware

of huge social and personal benefits that would be generated from a public bike system. It also recognized the need to introduce the system in order to establish an effective and sustainable transport system. Finally, the government made a decision to implement policy measures to support the public bike system. Based on the decision, public bike programs are being operated successfully in the nation.

The commitment shown by the relevant policy makers was a decisive factor in ensuring the success. Having recognized the need to build a sustainable transport system, the policy makers conducted in-depth research on ways to effectively implement the system in the nation. Further, they made expeditious decisions to introduce the system and provided continuous support.

2. Financial Implications

Implementing a public bike system involves costs. For the system to operate in a sustainable manner, it is particularly important to ensure its financial stability. Korea has been exerting strenuous efforts to stabilize the financial status of its public bike systems. First, the government is providing a certain level of financial support. And, second, endeavors are being made to increase the revenue opportunities.

Most public bike systems in Korea are financially supported by local governments. They are programs greatly needed in society. However, without the government support, it would have been impossible to initiate the public bike services. In terms of benefits to individual persons, their effects may be inconsequential. However, by taking into account the overall benefits to the society, the government decided to provide the financial support. The public bikes are expected to be used more extensively in the future, leading to increases in revenues from their operation and eventually, decreases in the amount of the government's financial support. The public bike operators are also trying to increase revenue opportunities on their own. They are exerting efforts to ensure that the citizens can use public bikes readily and frequently. The endeavors are directed toward diversifying the fees and membership type, expanding advertisement revenue,

publicizing the system in association with credit card companies and convenience stores, and diversifying the relevant services.

3. Technological Implications

In terms of technology, the public bike systems in Korea is similar to foreign programs in many respects. However, Korea is steadily increasing user convenience through the application of its top-notch information and communication technologies. Such technologies have made it possible to ensure convenient rental and storage systems, provision of user information in connection with smartphones, and prevention of thefts. Technological stability above a specified level has been secured through the establishment of relevant technological standards and the development of operation manuals. In addition, usage data collected in real-time are being utilized to increase the efficiency of the system and ensure its systematic maintenance.



SECTION 04.

A Case Study: Changwon City, South Gyeongnam Province⁷⁾

1. Process of Introducing the “Nubija” Public Bike System

Before the introduction of the public bike system, Changwon citizens showed a tendency to perceive bicycles just as a tool for leisure and fun activities, rather than as a mode of transport. City officials felt the need to correct such an attitude, which they believed was a major barrier to the promotion of cycling. They also agreed on the need to address various difficulties involved in the use of personal bicycles. The difficulties included those related to concerns about bicycle theft, parking and maintenance. In addition, the Changwon city government became aware of the need to improve its free bike rental program, which was launched in November 2007 with a fleet of 230 bicycles. There were user complaints about the following matters: inconvenient check-out and check-in procedures, the restricted number of rental stations, the need to return bikes to original rental stations, and difficulties related to bike maintenance and repairs. Due to such inconveniences, the program

⁷⁾ Based on the data available on the Nubija homepage (<http://nubija.changwon.go.kr>), data obtained from competent Changwon City officials, and experts' views.

ended up recording a very low usage rate: each bike being rented an average of just 1.8 times a day.

The bike project in Changwon was also inspired by the successful operation of public bike systems abroad. There was a global boom in public bike systems, following the successful implementation of the Velib program in Paris in July 2007. The unmanned public bike rental system became popular worldwide to the extent that it was selected as one of the top 10 eco-friendly and clean modes of urban transport in the March 21, 2008 edition of *Business Week*. Encouraged by these international developments, Changwon City set its public bike promotion project in motion on March 31, 2008 by disclosing a “plan to introduce a public bicycle system for Changwon citizens.”

Changwon City introduced an unmanned bike rental system using ubiquitous technology that makes it possible for anybody to use bicycles freely and conveniently anytime and anywhere. By benchmarking major overseas automated bike rental systems, the city developed its own scheme featuring user-friendly services related to rental station locations, usage fees, terms of service and homepage operation.

Table 5.6. Timeline of the Nubija public bike project in Changwon

Year/Month	Project content
2008.06	• Discussed the design, functions and manufacturing unit costs for major system components
	• Selected the PBS operator (Witcom chosen based on technological evaluation)
2008.09	• Design and production of system components
	• Finalized the terms of service for public bicycles
	• Selected the term “Nubija” through a title contest (out of 309 entries)
	• Installed Nubija terminals for pilot operation (five places)
2008.10	• Removed obstacles and improved functions of system components
	• Nubija operation center opened (10 staff members in 4 fields)
2008.10	• Nubija service opening (20 terminals, 430 bikes)
	• 81 terminals, 800 bicycles added to the system
2010.01	• Change of the company commissioned for Nubija management and operation (Witcom → Changwon Cycle Racing Corp.)
2010.02	• 18 terminals, 800 bicycles added to the system
2010.06	• 31 terminals, 500 bicycles added to the system

* Source: Based on information posted on the Nubija homepage, <http://nubija.changwon.go.kr>

2. Terms of Service

Operation Scheme and Fees

People aged 13 or over can use the Nubija service, 24 hours a day throughout the year. The service fees differ depending on membership types: Those who pay the annual membership fee of 20,000 KRW can use public bikes free of charge for up to two hours after signing them out.

Table 5.7. Nubija operation scheme

Classification	Contents
Consulting service	<ul style="list-style-type: none"> Two shifts for weekdays 07:00-15:00 / 14:00-22:00 Public holidays 09:00-18:00 / Summertime (weekends) 09:00-20:00
Delivery service	<ul style="list-style-type: none"> 2 shifts - 06:3015:30 / 15:0024:00
Repair service	<ul style="list-style-type: none"> 09:00-18:00 - system A/S : 09:0020:00

* Source: <http://www.changwon.go.kr/>, Changwon City Hall internal data.

Table 5.8. Nubija service fees

Classification	Members	Tourists (non-members)
Subscription fee	Annual membership: 20,000 KRW Monthly membership: 3,000 KRW Weekly membership: 2,000 KRW	one-day card (24 hours): 1,000 KRW
Up to two hours after loaning	Free	Free
Every 30 minutes after the free usage time	500 KRW	1,000 KRW

* Source: <http://www.changwon.go.kr/>, Changwon City Hall internal data

Membership Registration

There are required procedures for the registration of Nubija members. Registration can be made online or through City Hall or local district offices by submitting the registration form. After confirming their registration at public bike stations, new members can begin using the Nubija service. The registration procedures are shown in Figure 5.12.

How to Use a one-day card (for Nonmembers)

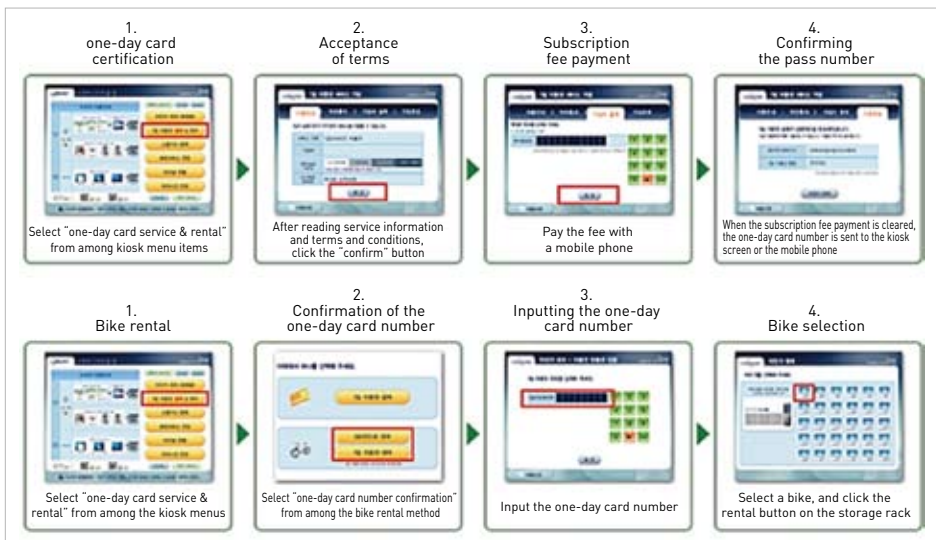
Non-members can use Nubija bikes by purchasing a one-day card ticket. They can pay for the one-day card and use it as shown in the upper and lower rows of Figure 5.13. Once the payment is made, bikes can be rented within 24 hours without paying any additional fees.

Figure 5.12. Nubija membership subscription and registration methods (upper row: online, lower row: offline)



* Source: Nubija homepage, <http://nubija.changwon.go.kr>, 2012.

Figure 5.13. Nubija service subscription (upper row) and bike rental (lower row) methods for non-members

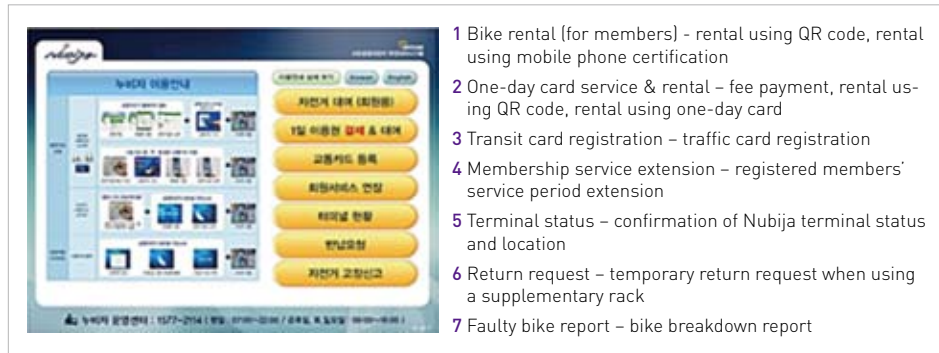


* Source: Nubija homepage, <http://nubija.changwon.go.kr>, 2012.

How to Use Kiosks

The kiosk implements various functions, particularly those for bike rental,

Figure 5.14. Initial kiosk screen



* Source: Nubija homepage (<http://nubija.changwon.go.kr>), 2012.

membership confirmation after registration, and information service. The initial screen, shown in Figure 5.14, presents seven menus: bike rental, one-day card payment and usage, traffic card registration, membership renewal, terminal status, requests for bike return, and reports on bike breakdowns. When clicked, each menu leads to detailed information. The program is designed in such a simple way that it can be used easily by even those trying it for the first time.

3. Major Features of Nubija Components

Bicycle

The Nubija system use 26-inch bikes with the down-tube type frame so that they can be used by all age groups regardless of gender. The handle cover shows a graphical description of how to loan and return a bike. It comes with a fixed speedometer, and displays the distance and average speed. It also has a self-lock supplementary device. After loaning a bicycle, the user can use the device for theft prevention. The bike has a built-in RFID tag, which helps to confirm the identification of the loaner and the driver.

Storage Rack

Racks are equipped with a bicycle frame-lock device, which locks/unlocks the

Figure 5.15. Nubija bicycle (1)



* Source: Nubija homepage (<http://nubija.changwon.go.kr>), 2012.

locking device installed on bikes. A bicycle can be loaned if the membership card and the built-in radio frequency identification (RFID) module are recognized. This scheme enables unattended processing of rental and return of bikes. The bike rental button can be used as a secondary means of loaning bicycles. If the user does not have a membership card, he or she can loan a bicycle after selecting one from the kiosk and pressing the rental button using his or her cell phone. This button is water resistant. The upper panel of the rack is 230 times as strong as the plate glass. The main body, made of metal with strong antibiotic power, has a high level of durability.

Figure 5.16. Nubija bicycle (2)



Figure 5.17. Nubija kiosk



• Source: Nubija homepage (<http://nubija.changwon.go.kr>), 2012.

Kiosk

The kiosk transmits information on customers and loaning and returning information to the control server. It also displays the current status of bike loaning/returning information by terminal in real time. It stores videos recorded via a CCTV device and displays the real-time field status. Additionally, kiosks offer advertising/promotional videos, which are updated regularly.

Figure 5.18. Nubija central control center



Central Control Center

The central control center operates monitors network conditions between terminals and the center, CCTV images, key conditions of terminals, the status of major servers, and other conditions related to the Nubija system. The control server operates dual servers for stable system operation. Anybody can receive information and membership services by visiting the homepage (<http://nubija.changwon.go.kr>). The administrator's website collects major statistics related to Nubija and handles affairs related to members.

4. Nubija Usage Status

The Nubija system has a membership of 71,947. There is no big difference in the ratios of men and women. By age, those in their 20s accounts for 34%, occupying the largest portion. By types, yearly membership accounts for 50.4%, followed by monthly membership with 46.7% and weekly membership with 2.9%. The number of nonmembers using the one-day card reaches an average of 114 a day.

There is a seasonal difference in usage, but the bikes are used 3,000 to 9,000 times a day on average. Compared to the initial days, the number of bikes has increased, and the utilization rate has been showing an upward trend.

Table 5.9. Nubija membership status

Number of members	Gender		Age groups					
	Male	Female	Teens	20~29	30~39	40~49	50~59	60 and over
71,947 (100%)	36,477 (50.7%)	35,470 (49.3%)	8,666 (12.0%)	24,432 (34.0%)	13,903 (19.3%)	16,117 (22.4%)	7,338 (10.2%)	1,491 (2.1%)

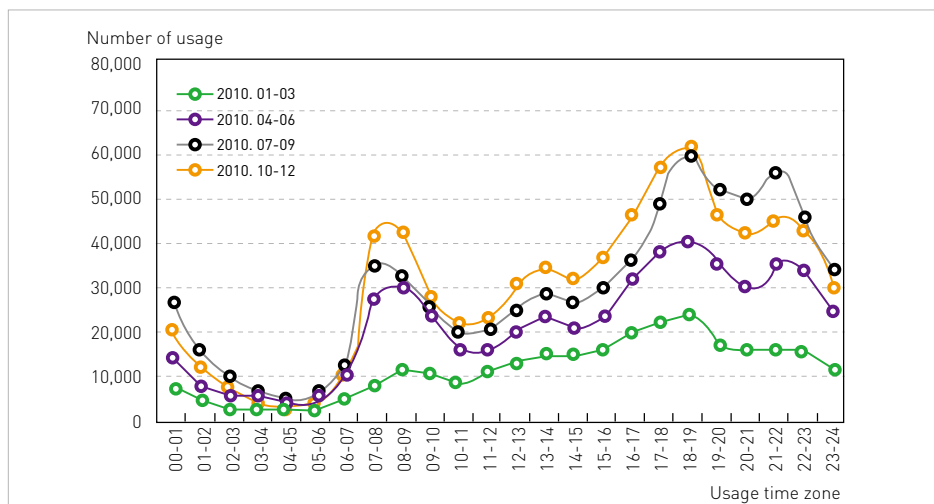
* Source: Nubija homepage, <http://nubija.changwon.go.kr>, 2012.

Table 5.10. Nubija monthly usage status

Classification	Total	2008	2009	2010
Ridership (daily average)	3,793,723 (4,396)	17,190 (241)	1,543,619 (4,229)	6,893,762 (6,118)
Average time spent per ride	31 minutes	37 minutes	31 minutes	32 minutes

By hours of the day, the morning and afternoon peak hours showed higher

Figure 5.19. Nubija usage status by season and hours of the day



* Source: Nubija homepage, <http://nubija.changwon.go.kr>, 2012.

utilization rates than other periods. This is similar to the general characteristics of urban traffic, suggesting that public bikes are functioning as a mode of urban transport.

5. Impacts of the Nubija System

Since its introduction in the latter half of 2008, Nubija was estimated to have generated 4.1 billion KRW worth of environmental effects through 2009 and 2010. Carbon dioxide reductions achieved during this period, which was just a little over two years, amounted to 5,823 tons. These statistics demonstrate the environmental impacts of the public bicycle system.

Table 5.11. Environmental effects of Nubija

Classification	Total	2008.10-12	2009.1-12	2010.1-12
Energy saving (million KRW)	4,157.9	22	1,667	2,468.9
CO ₂ reduction (ton)	5,822.8	30.8	2,335.0	3,457.0

The Nubija system was also found to be effective in increasing the benefits

of individual citizens. First of all, it helps promote the users' mental and physical health by making it possible to exercise amid daily activities. Besides, by serving as a personal mode of transport, it can save transport expenses of individual households by more than 80%. Socially, the public bike program can reduce oil consumption and reduce energy imports, ease traffic congestion by establishing a green public transport system, and induce the development of the bicycle industry using cutting-edge technologies. In addition, Nubija can facilitate regional economic growth through expansion of bike-related industries and job creation, thereby invigorating the overall community activities. It also contributes to expanding exports and developing new tourism sources as well as to spreading the cycling boom at home and abroad.

6. Level of Citizen Satisfaction with Nubija

To measure user satisfaction levels, a survey of 1,470 Nubija members (835 men, 635 women) was conducted from Oct. 4 through Oct. 17, 2010 (14 days). The survey found 75% of the respondents to be “very satisfied” or “satisfied” with Nubija, and the remaining 25% to be “dissatisfied” or “very dissatisfied.” The percentage of people who expressed satisfaction with the overall service went up by 7% from two years earlier.

Table 5.12. Nubija satisfaction survey results

Classification	Color	Design	Operation	Overall
2009	Satisfaction level of 82.7%	Satisfaction level of 82.9%	Satisfaction level of 66.1%	Satisfaction level of 79%
2010	Satisfaction level of 93.4%	Satisfaction level of 91.8%	Satisfaction level of 89.2%	Satisfaction level of 86.3%

7. Success Factors of Nubija

Creation of a New Cycling Environment

To create an environment favorable for cyclists, Changwon City overhauled its

bike infrastructure. It refurbished bike lanes as well as roads for combined use of pedestrians and bicycles, fostered biking paths for ecological excursions, and installed road markings for cyclists. In addition, the city implemented pilot road dieting programs, renovated crossroad sections, repaired bike facilities, and installed bicycle racks.

The city government also established institutional arrangements for cycling. First of all, it enacted ordinances for facilitating the use of bicycles, and lowered its road speed limit for motorized vehicles by 10 km/h. Besides, the municipal cycling culture center implemented a variety of measures to promote cycling. They included free bicycle repair services, the provision of waste disposal bags to citizens visiting public agencies by bike, and the creation of a bike insurance scheme.

Development of an Unmanned Bike Rental System

Changwon City developed an unmanned bike rental system by benchmarking major public bicycle programs overseas. In particular, Korea's technological prowess in the IT sector played a part in the development of the system, helping to introduce a location tracking scheme based on an anti-theft GPS module as well as other new functions such as the provision of various information services through kiosks. In addition, the situation room secured the ability to control terminals in real-time through the utilization of an ultra high-speed Internet network.

Consistent Project Implementation

The first of its kind in Korea, the Nubija project encountered various problems that arose from the lack of relevant experience and know-how. The city government experienced difficulties securing project budget and enlisting help from relevant organizations. It also had to deal with complaints from citizens. However, the top policy-maker's full support for the project and decisive action made it possible to resolve the problems and implement the system at an early date. The Velib system of Paris took three years to develop its plan, build the facilities and launch the service. In Changwon, the same process was completed in just six months.

Swift Action on Various User Complaints

Membership rules have changed to abolish the deposit system for members and to allow the registration of membership at community and civil petition centers in each district. Information service functions on the Nubija homepage have been improved, and the auxiliary key lock storage system has been introduced to address the problem of users facing difficulty returning bikes because of the shortage of racks. Other improvements include the opening of a repair center in the eastern area of the city, and the expansion of operation personnel and bike-carrying trucks.

Offering of Various Incentives to Users

As part of its marketing efforts for Nubija, Changwon City provides various incentives to every 10,000th member, every millionth user, persons who have used Nubija bikes 365 times or more, and most frequent yearly users by gender and age.

Active PR Campaigns and Information Sharing

Changwon City has publicized its successful operation of Nubija by holding an international event titled “Eco-mobility” and participating in an international bike event, “Velo-city.”

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Bicycle Transport Policy in Korea

Korea is not a bicycle-oriented country; Its modal share of bikes reached just 2.1% as of 2010. However, the Korean government is actively trying to promote cycling, considering the low level of bike usage as an opportunity. Through a diversity of government-initiated efforts, the number of bike users in the nation is rising rapidly. This book describes four major policy measures the government has implemented to facilitate cycling — the master plan for national bike roads, four-river bike paths, the new town bicycle project, and, the introduction of public-bike sharing systems.

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