ISSUE KOTI Knowledge Sharing Report

08

Korea's Best Practices in the Transport Sector

Korea's Transport Database and Investment Strategies

THE KOREA TRANSPORT INSTITUTE

Korea's Best Practices in the Transport Sector

Korea's Transport Database and Investment Strategies

The Korea Transport Institute (KOTI):

KOTI is an official research agency for the government of the Republic of Korea (South Korea) and a leading think tank for Korea's transport policies. It has been committed to building a safe, convenient, efficient and environmentally sound transport system for the nation since 1987. It is a pioneer in providing new ideas and future perspectives about transport issues in Korea, while positioning itself as one of the world's leading transport research institutions.

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Issue 8: Korea's Transport Database and Investment Strategies

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• Preface

Korea strode toward the miracle on the Han River for the past 40 years with consistent provision of transport SOCs such as roads, railways, airports and ports and the introduction of the Five-Year Economic Development Plans and the Special Account for Transport Facilities (SATF). Such an efforts and achievement attracted attention of the world.

Particularly, transition from a recipient country to a donor country after 1990s promoted its public image to developing countries and inspired Korean people to have pride in their homeland. Its aid recipient countries has been gradually expanded from Asian countries to African, Middle East and South American countries and types of aid has been diversified from economic development planning consulting to new town construction, infrastructure construction, and technical assistance.

Recently, developing countries pay strong interest on Korea's transportation development. Their main points of interest are domestic KTX production technology, world's best international airport operation knowhow and transportation reform which is represented by intelligent transport systems (ITS) based on top-notched information and communications technology (ICT), compatible transportation card use systems over the nation and bus rapid transit (BRT).

Knowledge sharing program (KSP) to share Korea's development knowledge and experience was started in 2004 and has shown outstanding performance in the transport sector. This was because of its nature—a backbone of the economy. For this reason, many developing countries ask KOTI to offer training programs to share Korea's knowledge and experience.

This report deals with Korea's urban railway development history and relevant policies in detail as well as coping strategies used against difficulties.

I believe that sharing knowledge and experience on transport development will offer us an open platform on which we can establish sustainable transport policies and cope with climate change, resources depletion and many other common global issues. I expect that KOTI knowledge sharing reports will be a channel for all readers to find useful information and knowledge.

Lastly, I appreciate Ministry of Land, Infrastructure and Transport (MOLIT), Ministry of Strategy and Finance (MOSF) and Korea Development Institute (KDI) to allow us to republish this book.

Gyeng Chul Kim
President
The Korea Transport Institute

Part - Ⅰ

[2011 Modularization of Korea's Development Experience]

National Transport Survey and DB Construction Project

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Contents

Summary 1

Chapter 1. National Transport Survey and DB Construction Project : Background 5

1. Domestic and International Circumstances 5

2. Problems with Absence of National Transport DB 7

2.1 Random Individual Transport Surveys 7

2.2 Transport Investment Evaluation's Validity Decline 8

2.3 Lack of Transport Policy and Plan-Supporting DB 11

3. Beginning of National Transport DB 12

Chapter 2. Promotion Basis and System of National Transport Survey and DB Construction Project 14

1. Basis for Pushing Forward the Project 14

1.1 Legal Basis-Integrated Transport System Efficiency Act 14

1.2 Institutional Basis 21

2. System and Procedure of Project Promotion 27

2.1 Promotion System 27

2.2 Implementation Procedure 29

3. Roles of Promotion Agents 31

3.1 Central Government: Ministry of Land, Transport, and Maritime Affairs 31

3.2 Municipal Governments 31

3.3 Substitute Agency: the Korea Transport Institute 32

Chapter 3. National Transport Survey and DB Construction Project: Details 34
1. Project Objectives 34
1.1 Details on Pushing Forward the Project 34
1.2 Project Objective and Anticipated Effects 35
2. Project Details 38
2.1 Passenger Sector Survey and Research 38
2.2 Freight Sector Survey and Research 43
2.3 Survey and Research in Transport Statistics Sector 47
2.4 Transport Network Sector Survey and Research 50
2.5 DB System Implementation and Operation Sector 53
2.6 Project Operation and Management Sector 54
3. Project Value and Utilization 54
3.1 Project Outcomes 54
3.2 National Transport DB Utilization 61

Chapter 4. Project Evaluation and Values 67
1. Problems and Resolutions in Project Implementation 67
1.1 National Transport DB Foundation Stage (1998~2003) 67
1.2 Reliability and Utility Enhancement of Transport DB (2003~2007) 68
1.3 Extension and Reliability Enhancement of Transport DB and Procurement of Professionalism in Project Implementation (2008~) 69
2. Evaluation and Values in Project Promotion 70

Contents

Chapter 5. Future of Korean National Transport DB Construction Project 73

1. Recent Evaluation on National Transport DB Construction Project 73

1.1 Positive Aspects 73

1.2 Insufficient Aspects 74

2. Recent Cooperation between the Ministry of Land,Transport and Maritime Affairs and the National Transport DB 74

2.1 Current Changing Directions of National Transport DB 74

2.2 Detailed Cooperative Items 75

3. Future Necessary DB in the Central Government 77

3.1 Fundamental Questions regarding Future DB Construction 77

3.2 Detailed Examples 78

4. Departmental Future of National Transport DB Center 83

4.1 Korean-styled HPMS (Highway Performance Monitoring System) Development 83

4.2 Urban Mobility Analysis System Development 87

4.3 Development of Passenger Transport Demand Analysis Improvement System 89

4.4 Development of Domestic and International Cargo Distribution Map System 89

4.5 Development of Public Transport Service Evaluation System 91

4.6 Development of National Transport Statistics Creation Guidelines 91

4.7 Transport Demand Analysis except Trip-based Demand Analysis 92

5. Promote Strategies and Anticipated Effects 93

References 95

Contents _ List of Tables

<Table 1-1> Economic Situation before and after IMF Foreign Exchange Crisis 9
<Table 1-2> Trend of Congestion Costs and National Distribution Costs 9

<Table 3-1> Major Detailed Projects in Each Sector 38
<Table 3-2> Yearly Outcomes of Main Projects (1998~2010) 55
<Table 3-3> National Transport Survey and Related DB Construction Situations 59
<Table 3-4> Comparison of Transport Facility Investment Evaluation System and Preliminary Validity system 62
<Table 3-5> Utilization of National Transport DB in Yearly Validity Analysis 64

Contents

Contents _ List of Figure

<Figure 2-1> National Transport Survey and DB Construction Project Promotion System 28
<Figure 2-2> National Transport Survey and DB Construction Project Implementation Process 30

<Figure 3-1> Objective and Directions of National Transport Survey and DB Construction Project 36
<Figure 3-2> Types of Passenger Survey 40
<Figure 3-3> Household Travel Survey Form 40
<Figure 3-4> Interzonal Passenger O/D Construction Process 42
<Figure 3-5> Interzonal Freight O/D Construction Process 47
<Figure 3-6> Statistics in KTDB 48
<Figure 3-7> Trip Generation Rate Survey 50
<Figure 3-8> Transportation Facilities Examination 51
<Figure 3-9> Transportation Thematic Map & Network 52
<Figure 3-10> Flowchart of Transport Infrastructure Development Project Investment Evaluation 64
<Figure 3-11> National Transport DB Utilization Objective Analysis 65
<Figure 3-12> National Transport DB Utilization Method Analysis 65
<Figure 3-13> National Transport DB Utilization Rate by Sector 66

<Figure 4-1> Project Development Steps 72

<Figure 5-1> Korean Vehicle Use Survey 82
<Figure 5-2> Results of Vehicle Miles of Travel from HPMS 84
<Figure 5-3> Concept of Data Mining 86
<Figure 5-4> Example of Datawarehouse Construction 86
<Figure 5-5> Example of Traffic Monitoring 87
<Figure 5-6> Example of Freight Vehicle Traffic Distribution 90
<Figure 5-7> Contract for Memorandum of Understanding with the University of Hasselt in Belgium 93

Summary

Many countries in the world are implementing DB through routine national transport survey to effectively make investment for transport infrastructure and establish transport policy. In Korea, the Transport Investment Evaluation Program was used as basis for the validity of investment and remained as nominal until the 1990s due to the lack of investment on transport infrastructure. After 1999, however, policies for supplying transport infrastructure were planned and executed excessively, which raised concerns on potential overinvestment in the absence of improvements in relevant systems and institutions. This brought about a strong necessity for collection and analysis of standardized and systematic preliminary data. In this regard, the government of Korea elucidated the National Transport Demand Survey and DB Construction Project in the Integrated Transport System Efficiency Act, the law of highest authority in transport, and institutionalized the project. The project was initiated in 1999 at the central government's level (Ministry and Land, Transport, and Maritime Affairs) and the DB Construction Project is being conducted by the Korea Transport Institute, as government's agency.

In case of Korea, it is necessary to look into the system for transport investment projects before and after 2000. The investment project system in the past utilized the transport demand prediction data based on the individual survey to each transport investment project. This resulted in the adverse consequence of overestimating the demand, due to the absence of standardized survey and analysis as well as validation procedures. Improved investment project system after 2000 institutionalized the implementation and use of data required for demand analysis in the National Transport Demand Survey and DB Construction Project. The investment projects have been managed through the guidelines for survey, analysis and transport infrastructure investment evaluation, standardized for the National Transport Demand Survey and DB Construction Project. Since 2000, a minimum of 50 cases has been analyzed per year for determining the business value of projects related to transport infrastructure investment, which include roads, railways, airports and

harbors. This implies that random, overrun surveys could be prevented with savings in the related costs, and also the efficiency of demand analysis and the reliability of the analysis outcomes were enhanced.

The essential details of the National Transport Survey and DB Construction Project is elucidated in the Integrated Transport System Efficiency Act (legislated in 1999), in which it is stated that this project is conducted to achieve scientific movement of transport administration by collectively and systematically surveying and analyzing statistics and policy information, etc. related to land, sea and air sectors, and implementing them into a national transport DB. A representative national transport survey is the survey on the O/D transport volume of passengers and freights, through which current year's transport table representing travel of passengers and freights is analyzed and coming year's travel is predicted, which is then implemented into DB. In addition, national road and railway network databases are drawn up as electronic maps, and future networks are also implemented. More than 50 transport demand analyses are carried out based on this kind of transport DB, in which business value of a new road/railway project is evaluated by way of cost-benefit analysis. In case the analysis indicates that there is business value in a particular project, then budgetary support from the government is considered. Up to now, approximately 7B won has been invested per year for the budget for the DB Construction Project, 40%-50% of which has been used as survey costs.

The reliability of national transport planning and policy has been significantly improved by securing preliminary data needed for establishment and evaluation of effective transport policies via national transport survey and DB Construction. Besides, it also provided a leading framework for integrated transport policy, including establishment and execution of 20-year national backbone transport network planning as well as validity evaluation of transport infrastructure projects. Moreover, it also contributed to minimize the source of wasted government budget by preventing overlapping and piecemeal transport planning and project surveys through improved transport survey efficiency and minimized overlapping surveys, and procuring professionalism and consistency via standardization of survey and analysis. In order to carry out the DB construction project effectively, mechanisms for consultation and collecting opinions between the government and related agencies and departments, through which medium- and long-term project plans were

established and performed. Furthermore, although the DB construction project is supported fully by the national budget due to its government-driven nature, some projects, depending on the nature and need of transport survey and transport DB, are pushed forward via the cooperation with municipal governments by way of sharing budget ann tasks.

The Transport DB Construction Project was not seamlessly progressed from its intial stage. Rather, a variety of difficulties and conflicts occurred in the course of the project and were resolved. The most significant difficulty was the problem associated with the reliability of the implemented DB. To resolve this issue, researchers, scholars and consulting firms all participated to make common efforts for a long period of time. In addition, the government constituted the "National Transport DB Inspection Team" as a separate organization, in order to monitor the project in general, from the project planning to the final DB construction. Recent challenge is the advancement and specification of the demand analysis. The current DB implements the whole country at the city/district/borough level (249), whereas the future DB aims at implementing the whole country more specifically, at the town/township/dong level (3500). A large change in survey and analysis schemes is expected according to this shift. In addition to this challenge, workforce expansion and education were another big difficulty. Continuous effort was made towards the investment in educating workforce to train experts due to the lack of workforce qualified for transport DB construction project.

The case of Korea, in which transport investment projects are carried out via national transport survey and DB construction at the national level, can be an important example for those countries conducting national SOC foundation projects including transport infrastructure. It can be relevant for the government-driven developmental countries which aim at preventing redundant surveys and carrying out a number of transport investment projects in a short time frame by prioritizing projects based on assessments with reliable data. It is anticipated that the effort of the Korean Government to standardize transport investment evaluation programs and also to establish, conduct and apply legal basis for transport survey, DB construction and investment evaluation guidelines for government-driven transport infrastructure investment can provide excellent implications to the countries experiencing similar problems or establishing related plans.

Chapter 1.

National Transport Survey and DB Construction Project : Background

1. Domestic and International Circumstances

The Korean government has made tremendous investment on the expansion and management of transport SOC. The reason is that it is the fundamental basis for economic development and national welfare together with the enhanced industrial competitiveness, and it is also the ground for providing elementary service in production and distribution. Therefore, it is reasonable to state that adequate degree of SOC investment is an ideal policy means for a nation to provide public service.

Korea has started systematic SOC investment to support industrial production since 1962 when the 5-Year Economic Development Plan was established. The SOC investment is also backed up by the Comprehensive Territory Development Plan initiated in 1972 and the medium- and long-term plans such as the recent National Backbone Transport Network Plan. To secure and manage budget for transport-related SOC investment, a lot of effort has been made, such as managing the Special Accounts for Transport Facilities from 1994. By virtue of all these efforts, Korea's SOC investment was significantly increased since 1990s.

During the initial phase of the 5-Year Economic Development Plan, the SOC investment was mostly made to the railway sector. However, the focus was shifted to the road sector, which constituted 80% of the total SOC investment by the 6th 5-Year Economic Development Plan. Transport-related investment was significantly increased after the Special Transport Facilities Account was set up, which amounted to 13.5T won in 2005. Besides, even in the 「National Budget Management Plan

for Years 2006-2010」, the investment budget for transport sector during this period is also planned to be 15T won per year, and the infrastructure investment has been made accordingly.

Due to the foreign exchange crisis in 1997, the management system by the IMF was set in force and Korea started to experience a serious unemployment problem. Before 1998, the Korea maintained very low unemployment rate of 2% (corresponding to 0.4M-0.5M unemployed workforce) for 10 years. However, the unemployment rate increased up to 7%, which amounts to 1.5M unemployed workforce. To overcome the adverse domestic economic situation due to the resulting decrease in household income and employment freeze, the government proposed employment plans based on its financial functionality, one of which is the National Informatization Project, a ground for this National Transport DB Survey and Implementation Project.

Informatization projects are being conducted at each of the government departments according to the Informatization Promotion Act (legislated in 1995, reinforced in 1996). As a part of this Informatization Project, the National Transport Survey and DB Construction Project was initiated as a public employment project that relates employment measures to informatization of public sectors. The aim was to support the reemployment of the unemployed workforce as well as to implement the national transport DB via surveying preliminary data required to establish transport plans effectively.

Together with the government's investment on transport sector, private capitals have participated in SOC investment as well. However, in spite of its contribution to the procurement of the government's financial soundness, increase in national competitiveness by way of expanded SOC investment, increase in citizenry convenience, offering of productive investment and development of financial market, there have been numerous criticisms that performance-driven impractical projects have been forcefully pushed forward without thorough consideration of their validity. As a consequence, there has been an increasing negative impression that these projects have resulted in the financial burden as well as failure in drawing social consensus. In particular, it has been pointed out that the reliability of evaluating a project's validity before 2000 was very low because of unavailability

of a DB implemented based on systematic transport volume survey and research analysis. Due to these reasons, the necessity arose as to the survey of preliminary data and implementation of DB with which reasonable and accurate transport demand analysis can be performed at the national level.

2. Problems with Absence of National Transport DB

2.1 Random Individual Transport Surveys

Data required for transport policy are collected using transport surveys. The history of transport survey in Korea is relatively short compared with that of developed countries. Thus, it experienced inefficiency problems in the absence of systematic establishment of transport survey. The most serious problem was the overlapping surveys. Since individual surveys were enforced fragmentarily and repeatedly according to the plans and projects of central government and municipal governments, budgetary waste inevitably occurred due to the lack of professionalism and consistency. Besides, the issues related to the effectiveness of surveys and the utilization of results were also brought up, which resulted from the waste of budget as well as the inability to systematically and comprehensively organize the survey data obtained from random individual surveys.

In addition, issues were brought up in regards to securing the objectivity of the transport survey results, which stems from the absence of standardized methods for survey and analysis. In fact, it was difficult to exchange data and establish objectivity among different surveys, due to different survey and analysis methods used in different investment bodies. As a representative example, classification of vehicles used in transport volumes on freeways and highways was not consistent, and classification of vehicles itself was different for different municipal governments, which altogether led to difficulties when it comes to numerically deriving national transport volumes. Problems like what mentioned above is a typical example in which it becomes extremely difficult to achieve objectivity and consistency of survey results in the absence of legislation and enforcement of standardized transport survey guidelines.

Finally, there are problems related to the absence of government's comprehensive plan on national transport survey. The master plan set by the central government, such as medium- and long-term survey plan, was not reflected into the budgetary and business planning of central government and municipal governments as well as related organizations to make opportunities to effectively manage national transport surveys. This contrasts against the practice of foreign countries, which enact and execute either large-scale survey on airliners and freight planes every 5 years or small-scale survey on a yearly basis.

Therefore, the government of Korea was required to perform renovations on various systems to prevent waste and inefficiency caused by sporadic and unsystematic individual transport surveys and to commonly share a range of survey results.

2.2 Transport Investment Evaluation's Validity Decline

Since the 1990s, the Korean government has made continuous investment on transport facilities with the aim of enhancing national competitiveness. As a result, SOC stock level in Korea increased significantly; for instance, freeway increased by 26.6% between 1980 and 1990, and also increased by 143% between 1990 and 2009. This resulted mostly from the expansion of financial investment by the central government to vitalize the economy and save the distribution cost. Municipal governments, public enterprises and private sector also made SOC investment of approximately 10T won per year on top of the central government's contribution. In particular, the contribution from the private sector increased dramatically (0.5T won in 1998 → 2.1T won in 2003). By virtue of all these investments, the net SOC investment in Korea has largely expanded; from 22.8T won in 1998 to 30T won in 2003, 26.3T won in 2007, and 27.3T won in 2008.

Expansion in the investment of government and private sectors made significant contributions to business recovery such as early conquest of IMF crisis and expansion of national backbone transport network. The investment by the public sector during the IMF crisis took the lead in domestic business recovery, raising the net rate of GDP increase of –6.7% in 1998 to approximately 10% in later years.

<Table 1-1> Economic Situation before and after IMF Foreign Exchange Crisis

Classification	'97	'98	'99	'00
Net GDP Increase Rate (%)	5.0	Δ 6.7	10.9	9.3
Construction Order (T won)	88.2	52.8	58.1	56.1
- Domestic Order	74.9	47.1	47.2	49.9
(Public)	(33.3)	(29.6)	(27.2)	(26.8)

* Reference : National Financial Management Plan (2004)

In addition, opening of the Incheon International Airport in 2001 as well as the expansion of main roads and the completion of the 1st phase of the Gyeongbu High Speed Railway and the electrification of the Honam Line Railway shrunk Korea into a half-day life zone. As well, expansion of the capacity of transport facilities led to smooth treatment of transport demands.

Despite the continuous SOC investment by the government, however, the distribution cost and the congestion fee are yet too high. The distribution cost has been steadily increasing since 1997. In particular, the freight fee exhibits drastic increase; it increased by 163% over the past 10 years, reaching 140T won in 2008. Similarly the congestion fee is under steady increase and it was estimated to be 26.9T won in 2008.

<Table 1-2> Trend of Congestion Fee and National Distribution Cost

(Unit: T won, %)

Classification	GDP (Current Cost)	National Distribution Cost		Congestion Cost	
		Cost	Weight w.r.t. GDP	Cost	Weight w.r.t. GDP
1993	290.7	41.2	14.2	8.6	3.0
1998	484.1	74.2	15.3	12.2	2.5
2000	603.2	94.1	15.6	19.4	3.2
2008	1,026.4	178.5	17.4	26.9	2.6

* Reference: Korea Transport Institute, 「2010 National Principal Transport Statistics」, 2011

In order that the government to determine transport infrastructure investment, a project must go through a pre-evaluation phase. Once the government lays down an investment plan, it goes through the preliminary validity survey and the full validity survey (transport infrastructure investment evaluation). Then, the project is executed by establishing and designing basic plans. Among these surveys, preliminary

validity survey is conducted for financial projects exceeding 50B won, where the Ministry of Knowledge and Economy serves as the main agent and the survey evaluation is carried out by the Korea Development Institute (Public Investment Management Center) and related researchers as well as service company. The full validity survey is led by the ministry in charge of the relevant infrastructure, and the institution responsible for each individual project performs survey and evaluation management together with service agents. However, this way of road infrastructure investment evaluation has revealed many shortcomings in demand prediction. For instance, the actual transport volume of the New Airport Private Sector Investment Freeway is only 41.4% of the predicted volume, and the actual transport volume of the Cheonan-Nonsan Freeway is only 47.1% of the prediction, resulting in the continuous government expenditure of 105B won and 49B won, respectively, to aid the operation revenue. Up to 2009, this kind of expenditure amounts to 1T and 425.5B won for the 7 projects under jurisdiction of the Ministry of Land, Transport, and Maritime Affairs, so the validity problems with assessment results toward investment plans are brought up.

The problem of insufficient reliability in investment evaluation stems mainly from the lack of fundamental statistics data, difference in demand prediction methods, negligence in investment evaluation management and so forth.

First, it is the lack problem of transport statistics and standardized unit requirement data. In Korea, the amount of fundamental statistics data useful for transport infrastructure investment evaluation was not sufficient. There was no standardized survey method, and therefore, it became a hard situation to systematically equip the fundamental unit requirement data which are useful for each business evaluation. This resulted from that each individual project conducted data collection for required regions and times as needed by applying its own standards, and as a result, this ultimately yielded insufficiency in fundamental transport statistics data because a system that can put together these data as a control tower did not exist.

Second, it is the problem that the transport demand prediction results did not outcome consistently. Since regarding the fundamental traffic data collection and DB-making, criteria and systems were not prepared, each individual transport demand estimation result yielded different results per input data. Furthermore, in

particular, during transport demand estimation, especially when the evaluator's subjectivity could be intervened, analysis method could be differently applied, and with this, different results could be drawn.

Third, it is the absence problem of expert workforce and evaluation management system related with the evaluation of transport facility investment. Currently, except some, domestic transport evaluation related agencies are mostly small sized, and expert workforce capable of conducting reliable relative research and investment evaluation could not be procured. Furthermore, toward the validity analysis results performed by each business, a system to perform post evaluation on each individual validity analysis result was not prepared, which acted as a hindrance against comprehensive analysis/management of evaluation results and comparative evaluation management.

Fourth, in case of private sector investment projects, hasty induction of systems and impractical push of performance-oriented project constituted a reason for poor investment. Private sector investment systems worked as means to supplement insufficient government budget regarding deficient transport facility investment at the initial stage of system induction, and the private sector investment system application to resolve some projects requiring political settlement caused problems as well.

2.3 Lack of Transport Policy and Plan-Supporting DB

Many countries establish and evaluate long-terms plan on comprehensive, medium- and long-term transport policies and investment. Korea also establishes and evaluates a variety of comprehensive transport plans, including 20-year national backbone transport network plan, 20-year national railway network plan, validity evaluation of transport infrastructure projects that is performed every 5 years and so forth. Measures like the transport apportionment rate, one of the most important policy objectives in comprehensive plans of transport field, are the most fundamental and important measures. Besides, after the Climate Change Convention, transport sector's energy consumption and greenhouse gas emission, mileage, etc., necessary for sustainable transport distribution policy against recent climate change, are also working as indispensible fundamental data.

The Korean government experienced the deterioration of reliability in policy because there were problems of transport facility investment results, due to the absence and/or lack of transport fundamental data needed for effective establishment of transport policies, and thereby appreciated the importance of measures against these problems. In other words, data collection systems that can be directly utilized for primary policy objectives were insufficient, and reprocessing achievements such as policy index production by researching and analysing fundamental data could not be estimated and accumulated. With this, policy-making and national plan establishment, and directly utilizable base toward actual policies such as demand prediction and validity evaluation, etc. could not be sufficient, and in particular, the lack of fundamental data was acutely appreciated in regards to recent intermodalism policies, redundant inter-means investment, sustainable transport distribution policies and so forth.

Also in regards to transport price policy, the Korean government continuously suffered from the problems associated with the underpricing for the use of transport infrastructure, since social cost was not considered in the investment and operation of transport infrastructure. As the approach to determine investment on transport infrastructure via evaluating efficiency of different means in large-scale transport infrastructure investment policy gained more and more attention, the need for related costs was brought up. As a consequence, problems related to the absence of the statistics on the transport external cost, such as congestion fee and accident fee, were raised.

3. Beginning of National Transport DB

Even before the National Transport DB Construction, there have been various transport surveys and analyses in Korea. However, there were many self limitations such as performance according to individual project features, and they could not establish methodology consistency applied for survey and analysis. Moreover, as they were frequently conducted per case, the meaning of time series statistics could not be sufficiently obtained, and regarding similar projects, areas, contents, etc., survey overlapping happened, showing the performance limitation without overall consistency and system.

Therefore, the Korean government started to perceive the necessity of systematic DB as policy base data such as the transport facility investment evaluation and so on. DB construction for transport demand analysis and prediction such as O/D transport volume, network for transport analysis, etc. was the priority, and by applying nationally consistent survey technique and analysis methodology, the standardized DB was intended for. In particular, in order to prevent the investment distortion caused by surveys specialized in individual projects and analysis results, projects were accomplished with the national budget in order to retain independence and objectivity. Starting with the nationwide travel condition survey toward passengers and freight, they realized the necessity of that the nationwide transport DB should be managed with the government as the center, so planned the project for the national transport DB construction.

Accordingly, the Korean government started a project for implementing transport DB in 1998, via conducting transport survey at the national level and collecting fundamental transport data. At that time, under domestic circumstances, this project started with public works were later carried forward as a national informatization project. At the same time, it legislated the Transport System Efficiency Act (currently the Integrated Transport System Efficiency Act, legislated in February 1992, and enforced it in August 1992), regulated the regular and nonscheduled survey's items, and stipulated the national transport DB management, etc. so as to conduct transport survey continuously, implement and manage DB with a basis, and specified to arrange essentially utilizing the national transport DB when there is a government's investment project evaluation.

Chapter 2.

Promotion Basis and System of National Transport Survey and DB Construction Project

1. Basis for Pushing Forward the Project

1.1 Legal Basis-Integrated Transport System Efficiency Act

1.1.1 Integrated Transport System Efficiency Act

This project is being executed based on the Integrated Transport System Efficiency Act and its enforcement ordinance. The Integrated Transport System Efficiency Act was legislated as <Transport System Efficiency Act> in 1999 in order to pursue intelligence in investment plan on transport infrastructure, investment evaluation and transport system to strengthen comprehensive adjustment of transport policy, and also prepare economic resources for expansion and management of transport infrastructure via 'Transport Infrastructure Special Accounting Act.'

This law enforces that <National Backbone Transport Network Plan>, <Transport Infrastructure Investment Plan>, <Basic Plan for Intelligent Transport System>, etc. should be established in order to strengthen capability for comprehensive adjustment of transport policy and implement efficient transport system across transport infrastructure. In March 1998, the government selected the National Backbone Transport Network Plan as a national project, in February 1999, founded the National Backbone Transport Network Project (2000~2019), a major transport plan of Korea, through the legislation of act and consultation of relevant authorities, and subsequently, established the National ITS Basic Plan (2001~2020), the Phase 1 Medium-Term Transport Infrastructure Investment Plan (2000~2005), and the Phase 2 Medium-Term Transport Infrastructure Investment Plan in 2000, 2001, and 2005, respectively.

The Integrated Transport System Efficiency Act is a law concerning the implementation of comprehensive national backbone transport network. The National Backbone Transport Network Plan suggests the goal of implementing the national backbone transport network and the phase-by-phase strategy, sets up, expands and maintains the national backbone transport infrastructure, and implements linked transport systems. It is the highest-priority law that supercedes wide-range transport plans in the metropolitan areas and other transport-related plans. Besides, it is the highest-priority law at the national level in regards to transport sector. It also aims at harmony with other laws by reflecting transport infrastructure investment plan to other national plans.

This law prescribes that transport survey be carried out in order to effectively perform national backbone transport network plan, medium-term investment plan and so forth. In addition, the law also elucidates comprehensive management of individual transport surveys. Based on this law, national transport DB is utilized in planning and evaluating domestic infrastructure investment in transport sector.

In July 2001, the Transport System Efficiency Act was partially revised. Partial amendment was made to the current system, e. g. guidelines on transport survey were set to more efficiently implement and manage national transport system, national transport DB was implemented and managed, and basis for establishing special transport measures under a sudden increase in transport demands e. g. holidays was arranged. The gists are as follows.

A. In order to secure the transport survey's objectivity and unity, the Minister of Construction and Transportation establishes transport survey guidelines standardizing methods and criteria of transport survey, and accordingly, promotes the cooperative share of transport volume survey results by virtue of constructing implemented transport survey results into transport data DB (Article 9, Section 2 to Article 9, Section 4, a new law).
B. In case there are serious problems in national transport management by such natural disasters and holidays, in order to effectively cope with these, the special transport measures with the content of transport vehicle run control, substitute route designation, etc. are established and implemented (Article 11, Section 2, a new law).

Since then, an overall revision was made in December 2009, following minute changes. The aim is to implement integrated link system among land, sea and air transports and to actively cope with climate changes in transport and distribution. Additional amendment was made such as strengthening connected transport system by designating locations with large-scale connected transport of passengers and freights as transport distribution bases, setting up basis for developing complex transfer centers that combines connected transport among transportation means and commercial functions, etc. From this point, it was retitled to the <Integrated Transport System Efficiency Act>.

1.1.2 Integrated Transport System Efficiency Act Enforcement Ordinance

With the legislation of the Transport System Efficiency Act, items and their enforcement entrusted by this law, such as implementation of transport survey, are defined in the enforcement ordinance of the law. Among these, items related to transport survey are as follows. The body of the law prescribes that regular national transport survey be conducted every 5 years, and that transport means, status of transport infrastructure utilization, transport volume, type of freight transport, etc. be surveyed as well.

Article 6 (Transport survey implement)

① Under Article 9, Section 1, the Minister of Construction and Transportation should implement transport survey according to the next each clause's classification. In this case, the times considering marine transportation survey should be discussed with the Minister of Fisheries and Oceans in advance.

1. Transport survey over the nation : every 5 years
2. Transport survey over the specific areas : frequently implement if necessary

② Transport survey under Article 1 should includes the following next items.

1. Management and use realities of transport means and transport facilities
2. Transport volume of each transport means and transport facility
3. Transport congestion expense and energy consumption of each transport means
4. Passenger and freight transport types
5. Other necessities for transport related policy and plan establishment

Later, the enforcement ordinance was also revised according to the revision of the law itself. The main objective was to additionally define items required to delegate and execute the law in regards to the consultation procedure, etc. with the Minister of Construction and Transportation (currently, the Ministry of Land, Transport and Maritime Affairs) for enforcement of national and individual transport surveys. National transport surveys were classified into the routine survey over the nation and the spot survey over specific areas and on specific purposes (Article 6, Section 1), and after the routine survey, the national transport survey was supposed to be published (Clause 6.4). In addition, in case of individual transport survey implementation by a public agency, it provided an institutional strategy to discuss with the Minister of Construction and Transportation in advance (Clause 6.3), and also provided to prepare transport survey guidelines for the purpose of transport survey standardization (clause 6.2).

Amendments were accomplished again in November, 2008. The big difference is that the range of national transport survey was expanded, and it was included that for the national transport DB construction and transport survey related discussion, <National Transport DB Council>, which related public agencies would participate in, could be composed. The national transport survey range included the survey over each transport expense, greenhouse gas, energy consumption, etc. to cope with domestic and international environment changes (enforcement ordinance 6).

1. Registration and utilization reality by every means of transport
2. Supply and management reality such as routes, transport volume, mileage, etc. by every transport means and by every transport facility
3. O/D transport volume of passenger and freight by every transport means and by every transport facility
4. Transport and distribution cost of traffic use and transport facilities' investment, management and administration
5. Transport-related social external costs such as traffic congestions, traffic accidents, environmental pollution, greenhouse gas emissions caused by traffic distribution activities
6. Energy consumption and efficiency by every means of transport
7. Greenhouse gas emissions by every means of transport

8. Transportation record and division rate by every transport means and by every transport facility
9. Additional necessary details for transport-related policies and plans' establishment, transport facilities' investment analysis and evaluation

The National Transport DB Council is ranging from the enforcement ordinance 6.5 to 6.8, and composed of within 30 members among officials of the related central and local government agencies, public agencies' members, related specialists, and so forth, and is supposed to discuss national DB construction and management through routine and temporary meetings. The main discussion issues are as follows (enforcement ordinance 6.7).

1. Connection and cooperation of transport survey and data collection
2. Connection system between national transport DB and collected data from public agency's individual transport survey results
3. Efficient supply and share plans of transport survey data
4. Task improvement such as the standardization of transport surveys and national transport DB establishment methods
5. Improvement plans of national transport DB's utilizability
6. Overlap prevention plans among transport surveys
7. Additional necessary facts to establish and manage national transport DB

In January 2012, the enforcement ordinance was retitled to the Integrated Transport System Efficiency Act Enforcement Ordinance according to the revision of the law. It prescribes that central government and municipal governments can conduct transport survey together, in case overlap between individual and government transport surveys are recognized or the chief of the municipal government asks for participation in collaborative national transport survey with subsidization of partial cost. On this legal basis, collaborative surveys were carried out in the capital area and megalopolis area in 2010. Also, central government and municipal governments are conducting together the analysis of survey results and O/D transport volume implementation project in 2011.

1.1.3 Sustainable Transport Distribution Development Act

The Act of Sustainable Transportation Distribution Development establishes the fundamental direction and the necessary items for its forwarding in order to change the existing transport distribution system into the environment-friendly and energy-saving law carbon transport distribution system. Namely, it establish and conducts the sustainable transport distribution development of every 10 years, systematically manages the transport distribution system through transport distribution areas' assignment and sustainable management index set-up, and at the same time, prepares support methods to promote the shift to sustainable transport distribution system, and so on; therefore, for the present and future generations, it regulates items regarding the fundamental policy direction, establishment and promotion for the sustainable transport distribution system construction. Hereby, it is aiming to build the transport distribution's sustainable development basis and contribute to the public economy development and welfare improvement.

Except establishing the fundamental plan of sustainable national transport distribution development, this law regulates plenty of items, and expecially, suggests diverse items to set up index and criteria for the sustainability management (Article 14, Section 1 and 2). The National Transport Survey and DB Construction Project include and perform transport survey and research analysis to estimate related items such as transport distribution's greenhouse gas emission status, traffic congestion degree, energy consumption, etc. in the project contents.

Article 13 (Sustainability Management Index and Criteria)

① The Minister of Land, Transport and Maritime Affairs should establish and announce the index to estimate, evaluate and manage the transport distribution system's sustainability (from now on, "sustainability management index") and the criteria (from now, "sustainability management criteria").

② When establishing sustainability management index and sustainability management criteria, the Minister of Land, Transport and Maritime Affairs should consider transport distribution's greenhouse gas emission status, traffic congestion degree, energy consumption, auto traffic, transport facility capacity, transport labor structure and other items under the law of the Ministry of Land,

Transport and Maritime Affairs.

1.1.4 Fundamental Law of Distribution Policy

This law is aiming for the distribution to the public economy development by establishing the fundamental items regarding domestic and international distribution policy and plan's establishment, performance and support for the purpose of distribution system efficiency, distribution industry's competitiveness enforcement and distribution's advancement and internalization. In the stage of early establishment, this law includes the contents of setting up the items including distribution standardization such as unifying the freight circulation related equipment size, etc. in order to promote the freight circulation. In particular, it is a feature to establish and perform the fundamental plan of freight circulation related with freight circulation anticipation, freight terminal organization and improvement, etc. every 10 years.

Later, this law underwent a number of revisions, and especially in Article 7, regarding distribution's synthesization and adjustment, it specifies to conduct a distribution status survey when it is necessary for national distribution policy and plan establishment and alteration. Survey items are suggested such with the occurrences and routes of cargo volume, the status and usage examples of logistic facility and equipment, the status of work force and distribution system, the distribution costs, the status of distribution industries and international logistics, and so on.

Moreover, in order to conduct efficient distribution status surveys, the distribution status survey guidelines should be composed (the same law, Article 8 distribution status survey guidelines), and regarding survey period, type, method, and etc., the contents are suggested in the same law enforcement ordinance, Article 4. The items that should be included in guidelines are as follows.

1.2 Institutional Basis

1.2.1 National Transport Survey Plan

A. Basis for Establishing National Transport Survey Plan

National Transport Survey and DB Construction Project are institutionally based on 'the National Transport Survey Plan' under Article 12, Section 2. At the beginning, by virtue of the 5-year 2nd stage project completion, the national transport DB's foundation was laid and real practical application was made, but in accordance with the interior and exterior demand to establish the project's mid and long term performance systems and development directions, National Transport Survey was reviewed. Accordingly, in March, 2008, the related content was founded at the transport system efficiency law (Article 9, Section2), and the national transport survey plan establishment was launched. The following is the legal provisions with regard to national transport survey plan.

Under Clause 16.1, for the efficient transport survey's implementation such as individual transport survey overlap prevention and the survey results' cooperative utilization, the Minister of Land, Transport and Maritime Affairs should establish the national transport survey plan considering the national transport survey's objectives and strategies by 5 years, detailed survey's contents and methods, through the deliberation of national transport council.

Under the premise of establishing medium- and long-term visions and objectives of DB project, systematic transport survey plan was required for O/D transport volume survey, transport patterns, sustainability survey and evaluation and DB construction. In 2009, the 「Phase 1 National Transport Survey Plan (2009~2013)」 was established, which was motivated and required by creating basis for land, sea and air transport policy and investment projects based on transport demand prediction and economic/political validity evaluation, as well as significantly enhancing the accuracy and utility of national transport DB that is obliged to be used for transport policy, etc. according to its status, functions and users' requirements.

This plan is a national plan providing effective directions on national transport survey and DB construction for land, sea and air transport sectors on 5-year basis. It is characterized as superordinate plan on individual transport survey-related plans such as road transport volume, public transport status, municipal governments, etc. Accordingly, the national transport DB can be characterized as national transport "database" having status and capacity as fundamental data on establishment, execution, evaluation, etc. of transport plans, policies and projects; transport "information" with reinforced scientific analysis/evaluation capability and data/model/policy-to-policy connections; and national transport "statistics" whose quality and execution system as national statistics is secured and whose roles are well defined.

B. Outline and Objective of Plan

<National Transport Survey Plan> consists of "Outcome Analysis for National Transport Demand Survey and DB Construction Project," "Objective and Strategies for National Transport Survey Plan," "Sector-by-Sector National Transport Demand Survey and DB Construction Plan, Investment Plan and Directions for Budget Procurement."

The project outcome analysis sector looked back the 2 phases of the past 10 years' project status and outcomes as well as identified problems and improvements. It also suggested new project objectives and strategies by inspecting past outcomes, based on which it inspected sector-by-sector projects' detailed contents and elucidated plans such as yearly contents and schedules. It also inspected budget required for yearly projects and proposed options to secure the budget.

The National Transport Survey Plan specified the following goals with the vision of "implementation of national transport survey and analysis system with standard comparable to developed countries." First, comprehensively and regularly survey and analyze national transport demands in land, sea and air sectors, such as O/D transport volume of passengers and freights between regions, transport infrastructure, transport volume delay functions, transport cost and performance, greenhouse gas emissions and so forth, and amend/revise DB. Second, Secure the reliability of national transport demand survey and DB construction results, to the

level in which the users require and the society agrees, e. g. secure the accuracy of O/D transport volume of passengers and freights, with respect to general national roads, to 80% and 70%, respectively, and continuously enhance the precision of network for transport analysis and transport volume delay functions. Finally, expand the range of utilization of national transport DB so that recent intermodalism as well as complex connected transport analysis network and policy indices related to sustainable transport policy can be effectively supported.

Strategies to achieve the aforementioned goals are as follows.

Methods and items of survey must be reformed to enhance the reliability and utility of national transport DB. Specify the survey unit (transport zone) in the country from the city/district/borough classification (249) to the town/township/dong classification (3500). Switch the main survey method from roadside interview to household transport status survey. This can also allow assessment of intra-zone transport volume, which was an important drawback of current transport demand prediction. Besides, change survey methods based on involving large workforce towards transport survey methods that maximally utilize cutting-edge data such as PDA, RFID, pass cards, navigation and ITS data. Also utilize population census data to implementation and validation of national transport DB. At the same time, steadily and harmoniously survey fundamental data for transport demand prediction including O/D transport volume, network, transport volume delay functions, etc. and implement them to DB. Second, extend fragmentary transport survey/analysis system based on single mode to methods relevant to large-scale complex connection system. Third, promote independence in organization, human resources, budget systems of private sector institutions in order to enhance performance appraisal capability of legal government business agencies. Besides, keep supporting strengthening of project agents' internal capacity, e. g. fostering continuous participation of academia in research/development of theory and models in regards to transport survey, analysis and DB. Finally, make efforts for stable procurement of relevant project budget so as to conform to the aforementioned objectives and strategies.

C. Establishment State-of-the-Affair and Future Plans

The <Phase 1 National Transport Survey Plan> set 2009~2013 as its temporal scope, the whole country as its spatial scope, and the overall items related to transport survey, analysis, processing, and DB construction/management/utilization of the items regulated by the Integrated Transport System Efficiency Act such as operation status and transport volume in regards to transport infrastructure and transport means in road, aviation, and marine sectors as its contextual scope. The establishment of National Transport Survey Plan was initiated in September 2007 together with review and revision of the laws related to its foundation, which went through business consultation with related authorities, expert consultation, circulation to target institutions and final amendment, and was finalized on August 28, 2009 via deliberation and vote by the National Transport Council.

Starting from 2009, yearly projects have been carried out according to this plan. However, changes were inevitably made to the original plan as the project progressed. The main reason was the difficulty with securing appropriate budget. Therefore, changes were made to the project plans within the Phase 1 plan period, which affected the National Transport Survey Plan thereafter.

To reflect these circumstances, the Phase 2 National Transport Survey Plan will be established between 2011 and 2012, which will be more realistic and reasonable plan than its 1st phase counterpart by comparing and reviewing outcomes of the 1st phase survey in contrast to the survey plans.

1.2.2 Transport Survey Guidelines

Some portion of the Transport System Efficiency Act was amended in July 2001. It prescribes that guidelines for transport be determined in order to perform the national transport survey to secure superior objectivity and unity, thereby constructing and operating the transport system more efficiently (Article 15 Transport Survey Guidelines). The Korea Transport Institute prepares the proposal, which is finally settled by the Ministry of Land, Transport and Maritime Affairs through consultation with related agencies such as administrative agency and then applied to national transport survey and individual transport survey. The scope of application, filing

system, inclusion data and so on are prescribed by the Article 9 of the enforcement ordinance of the Act (Contents of Transport Survey Guidelines, etc.) as follows.

Article 9 (Contents of Transport Survey Guidelines)

① The transport survey guidelines by the clause 1 , article 15 (the rest, "transport survey guidelines") should include the following each fact.

1. The kind, item and period of transport survey
2. The object, method and process of transport survey
3. The system of transport survey
4. The total, analysis, distribution, DB construction and management of transport survey results
5. Any other necessary items for efficient transport survey

② In the event of National Transport Survey, individual transport survey pursuant to the item 1, Article 16 or cooperative transport survey pursuant to the item 1, Article 11, the head of public agency should enforce according to the transport survey guidelines.

1.2.3 Investment Evaluation Guidelines for Public Transport Facility Development Project

The Act prescribes that transport survey be performed in order to rationally carry out plan for the key national transport network and intermediate-term investment plan, etc. In addition, it also specifies the general management of individual transport surveys. On the basis of these regulations, the Act dictates that the validity of each individual plan and/or project be evaluated before key national traffic network plans and intermediate-term investment plans including new establishment, expansion and maintenance of domestic public transport facility are established, or public transport facility development projects are initiated (Article 18 Validity Evaluation, Clause 1).

These guidelines for investment evaluation are enforced in order for the rational and objective investment analysis and evaluation of transport needs, cost and benefits of public transport facility development projects. Also, the Act dictates that

the contents of the investment evaluation guidelines be specified as a Presidential decree (Article 18, Clause 2).

The items on the contents and applications of the investment evaluation guidelines are prescribed as follows in the enforcement ordinance article 18 (contents of investment evaluation guidelines, etc.).

Article 18 (Contents of Investment Evaluation Guidelines, etc.)

① The investment evaluation guidelines according to the article 18, clause 2 of the Act (referred to as "investment evaluation guidelines" below) must include the items in the following.

1. Subject and delivery system of the investment evaluation
2. Methods and procedures of investment evaluation at each individual stage of intermediate-to-long-term plans
3. Methods and procedures of transport demand prediction
4. Item and methods for the prediction of cost and benefits
5. Analysis methods for economic validity
6. General evaluation methods, such as investment priority
7. Analysis methods for financial validity
8. Miscellaneous items necessary for transport demand prediction and investment evaluation

② Minister of the Land, Transport and Maritime Affairs can develop and distribute relevant computer programs for validity analysis and evaluation in order to enhance the efficiency and ease of validity evaluation on public transport facility development projects.

③ The chief of government office, when establishing transport-related plans and/or organizing the related budgets, must consider first those projects which complete the validity evaluation in accordance with the investment evaluation guidelines.

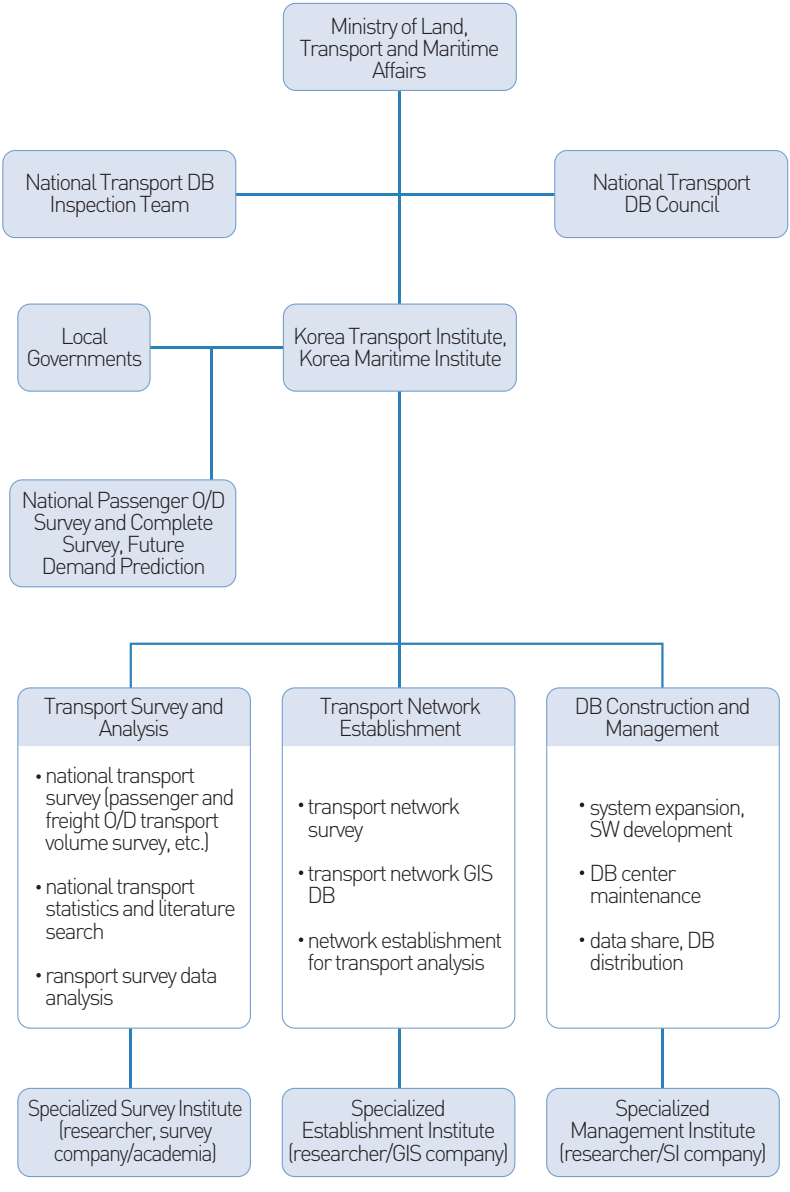
2. System and Procedure of Project Promotion

2.1 Promotion System

This project is supervised and performed by a central government agency (the Ministry of Land, Transport, and Maritime Affairs), and the Korea Transport Institute, a government-supported research institute, acts as a proxy considering the task specialty and project performance efficiency (Integrated National Transport System Efficiency Act, Article 114). Moreover, that is towards the whole country due to the national transport survey and DB construction's characteristics, so it is necessary for the cooperation with local governments. That is, the three main agents to implement national transport survey and DB construction project are the Ministry of Land, Transport, and Maritime Affairs representing a central government agency, the Korea Transport Institute as a non-governmental agency and each local government.

The Ministry of Land, Transport, and Maritime Affairs establishes the medium- and long- term project plans, secures the budget, and manages and directs the National Transport DB Council and the National Transport DB Inspection Team. The local governments, from the individual transport survey plan to the result, revise and utilize transport DB through the mutual cooperation with the Ministry of Land, Transport, and Maritime Affairs, and during the national transport survey, maintain the cooperative system with the central government agency. Agencies (the Korea Transport Institute, the Ministry of Land, Transport, and Maritime Affairs) take charge of practices of the project plan and promotion, make detailed survey plans, analyze the survey results, and establish DB with results for the foundation of cooperative utilization. More detailed each agent roles are explained in [III-2. Each agent's roles].

This project's system among main agents is like the following <Fig. 2-1>.



<Figure 2-1> National Transport Survey and DB Construction Project Promotion System

2.2 Implementation Procedure

This project's implementation procedure is roughly divided into preparation, performance and utilization phases.

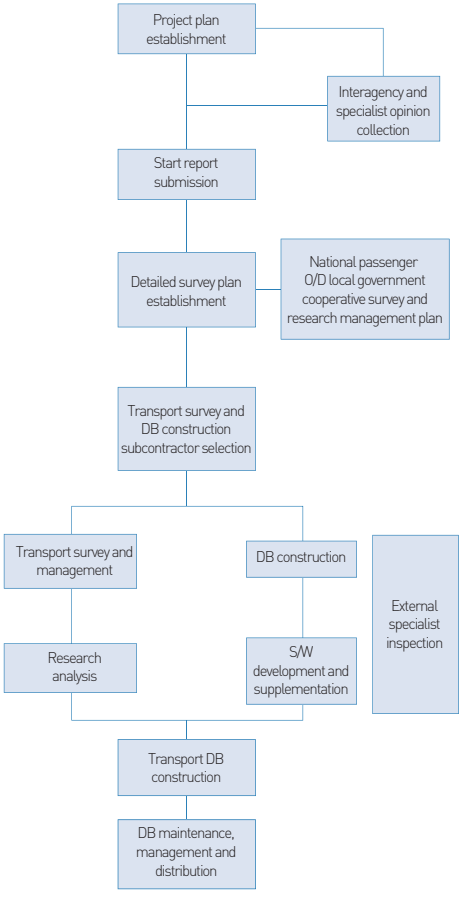
In the project preparation phase, the national transport survey plan is devised as medium- and long-term project implementation planning. This national transport survey plan is established which is based on the National Transport System Efficiency Act, on the basis of yearly project plan within the main survey plan, its content and scale of detailed project are decided for the next year, and discussion with budget-related government departments is fulfilled to secure the related budget. Once the budget scale is decided, project plan is written focusing main business, and opinions of civilian proxy agency, government, interagency, and outside specialist group (national transport DB inspection group) are collected and adjusted so that this yearly project plan is finally settled. According to the settled project plan, the civil proxy agency and the Ministry of Land, Transport and Maritime Affairs make an agreement about the project performance and launch a new business.

In the next phase, project performance, the Korea Transport Institute submits the start report with project details, and at the same time, establishes detailed plans of the transport survey and research analysis year to date. Real survey scale and supply, survey pool and methods are fixed here, and according to the detailed plans, if necessary, a survey contractor is selected and the duties are split. Especially, passenger O/D transport volume survey and analysis study (complete survey, Future Demand Prediction and so on) have been implemented by sharing the budget burden through the cooperation with the capital area and five megalopolis local governments since 2010 national transport survey. Once a cooperative institute or agency for transport survey is decided, practical transport survey is processed, and the research makes process of the related study including statistics or reference collection, and fundamental data collection, etc. In order to make expected transport surveys and research analysis results into DB, the system field secures saving space at the server, and supplements and manages the DB system.

When transport survey and study analysis are completed, the performances of O/D transport volume, transport network, any transport statistics and indicators will be

made into electronic files and documents. The electronic files are made into DB and saved in the server, and become open to public through this project website. And the publications including the final report are distributed to government agencies and interagencies.

This whole implementation process is under the system of verification by the assigned expert adviser of each field such as passenger, freight, etc. at the external inspection agency , <National Transport DB Inspection Team> regulated in the Integrated National Transport System Efficiency Act from project planning to final achievement.



<Figure 2-2> National Transport Survey and DB Construction Project Implementation Process

3. Roles of Promotion Agents

This project is implemented by the substitute agency, the Korea Transport Institute led by a central government (the Ministry of Land, Transport, and Maritime Affairs). And according to the project content, the cooperation with local governments is achieved. These three promotion agents's roles are like the next following.

3.1 Central Government: Ministry of Land, Transport, and Maritime Affairs

To the central government, the Ministry of Land, Transport, and Maritime Affairs, project plan establishment and task process management are performing the medium- and long-term, and also short term project plan establishment and the management/supervision toward the project progress. In addition to the annual implementation plan of national transport survey and DB construction project, the national transport survey plan as five year unit medium- and long-term design is established and managed. And the cost is entirely supported by government funding, so in order to secure the proper project budget, the consultation and cooperation with related agencies is processed. By composing and managing the National Transport DB Council as a law consultative organization of the central government, local governments and interagencies, there should be a regular consultation window among agencies in order to smoothly perform national transport survey and research analysis. Moreover, a national transport DB inspection team should be composed of external specialists in transport field academia and industry, should examine substitute agencies' implementation situations over the whole project practices, and at the same time supervising the inspection team's management, should make the substitute agencies revise and supplement the project content and plan on the basis of the inspection results. In addition, to secure the objectivity and unity of transport survey, the Ministry should write and notify transport survey guidelines (the Integrated National Transport System Efficiency Act, Article 15), and should perform the revision through the discussion about a public agency's individual transport surveys beforehand (the same law, Article 16).

3.2 Municipal Governments

The National Transport Survey defined in related laws intends to cover the whole

country, and as such, collaboration with municipal governments is essential. In the case of passenger transport status survey, which is a regular survey, the survey is performed in the form of visiting and interviewing individual households. Thus, it necessitates the administrative power of municipal governments of each region. Moreover, cooperation with related departments is needed because sometimes part of transport infrastructure must be occupied whenever necessary. Therefore, municipal governments get to collaborate with central government at the level of actual work from survey planning stage. If a self-limited individual transport survey is performed, municipal government follows a consultation procedure in advance according to related laws, and it also consults with the Ministry of Land, Transport and Maritime Affairs regarding whether or not the individual transport survey data can be implemented and managed as national transport DB.

3.3 Substitute Agency: the Korea Transport Institute

The National Transport Survey and DB Construction Project is carried out by the agent government's performance on public projects or by the private substitute agencies. In order to improve the specialty and efficiency of survey and research duties specialized in transportation field, the government prepared and implemented a legal basis for the Korea Transport Institute, a government-supported research institute to substitute for the duties of the transport survey and DB construction. Hereunder, the Korea Transport Institute takes full charge of and proceeds the national transport survey and DB construction duties with the Ministry of Land, Transport, and Maritime Affairs. The Korea Transport Institute establishes the detailed implementation plan of annual surveys, and if necessary, chooses a cooperative agency or company and performs the survey and research in cooperation. And it analyzes survey results, does the separate research, and implements and manages the results with DB. Moreover, it should constantly strive to raise the reliability of transport survey, and implements the revision and maintenance of HW and SW so as to improve the efficiency of national transport DB construction and management. The Institute seeks for data supply system improvement plans to expand transport DB's cooperative use, and supplements the utilization system by frequently progressing user demand analysis. It takes charge of actual work as a member about the national transport DB council's management, and should actively help inspection tasks over the entire project under the direct supervision

of national transport DB inspection team. The Institute carries out the drawing up and revising work of transport survey guidelines as legal guides of transport survey, and is in charge of project promotion work through all sorts of events and material publishment.

Chapter 3.

National Transport Survey and DB Construction Project: Details

1. Project Objectives

1.1 Details on Pushing Forward the Project

The DB project started in 1998 as public employment project, which was part of the government's financial investment project aimed at economic recovery during the IMF foreign exchange crisis. With the goal of implementing electronic government (E-government), it started as the national passenger/freight transport volume survey project in 1998 with a budget of 3.139B won in order to procure fundamental transport-related data at the national level. The project progressed in 1999 by conducting national transport infrastructure survey, 5 megalopolis transport survey, transport induction unit requirement survey, etc. by putting increased budget of 10.908B won.

The laws relevant to legally support the execution of DB project were prepared in February 1999. The Transport System Efficiency Act (currently the Integrated Transport System Efficiency Act) aims at contributing to promote the convenience of people's living and national economy by comprehensive adjustment of transport policy, implementation of efficient transport system and procurement of system efficiency. Especially, in regards to this DB project, methods and standards of transport survey were standardized to secure objectivity and consistency of national transport survey, which was subsequently drawn as guidelines. Also, it was also required that foundation for implementing transport survey results into DB and utilizing it be constructed. Since then, the Transport System Efficiency

Act was revised several times in response to change in social circumstances, which made changes to the contents and scope of the National Transport Survey and DB Construction Project. In addition, Korea Transport Research Institute and Korea Institute of Maritime and Fisheries Technology, which are private sectors, were appointed as acting agencies to conduct this project, thereby securing professionalism and efficiency of survey and analysis. The details will be dealt with in the section on Legal Basis.

The 1st phase of the project was planned to be for 5 years, from the initial transport volume survey project initiated in 1998 to 2002, which was completed with the goal of creating groundwork of national transport DB. This prepared the current transport DB system including national passenger/freight O/D transport volume, network for transport analysis and transport statistics and so forth, thereby starting the utilization service through internet and direct delivery. Later, the 2nd phase of the project was set up to be the 5-year project from 2003 to 2007, which pursued the expansion of national transport DB and provision of high-class service by improving system for transport DB collection and aggregation, designing user-oriented internet service, expanding and vitalizing transport information distribution, reinforcing utilization analysis in transport DB, and improving inter-agency cooperation system on transport survey and transport data through each annual projects.

After the completion of its 2nd phase, the National Transport Survey and DB Construction Project has got into its stride, being conducted steadily on the yearly basis. The project is seeking for boosting the reliability and utility of the national transport DB by performing regular national transport survey and related research and analysis, finding measures to improve reliability, collecting users' opinions, and expanding transport DB.

1.2 Project Objective and Anticipated Effects

1.2.1 Project Objective

The objective of the National Transport Survey and DB Construction Project is to implement transport DB required for national transport policy decisions and to establish its support systems. For this purpose, the project improves the reliability of transport DB via enhancement of transport survey and analysis, develops transport

policy-pioneered indices, and strives to get link with decision making support systems.

Objective	•Implementation of the transport DB and support systems required for national transport policy decision
Thrust Direction	•Reliability enhancement via improving transport survey and analysis •Development of transport policy-pioneered indices and link with decision making support systems
Details Direction	•Performing systematic, enhanced and state-of-the-art transport surveys based on national transport survey plans
	•Developing various transport-policy-driven statistics, implementing transport account system and extending it to national transport statistics
	•Developing various indices supporting transport policy and establishing decision making system

<Figure 3-1> Objective and Directions of National Transport Survey and DB Construction Project

Major contents of the 「National Transport Survey and DB Construction Project」, enforced based on the Integrated Transport System Efficiency Act, is to conduct national transport survey and implement them into DB for comprehensive and standardized survey, analysis and management of fundamental data and statistics required in establishing policy and plans, and its objective is in line with the objective of the Integrated Transport System Efficiency Act. In particular, the objectives of this project can be summarized as follows.

First, it enhances the reliability of evaluation on various transport infrastructure investment projects by setting up foundation for implementing standardized and consistent time series of fundamental transport statistics data and commonly utilizing them. It fulfills transport statistics collection system whose quality is comparable to foreign developed countries. It prepares transport DB release that can be utilized not only by the government but by academia and general public. Also, it prepares internal and external inspection systems to improve accuracy and reliability of transport DB, so that the results utilizing the DB become reasonable.

Second, it implements a system that can systematically survey, analyze and manage a variety of fundamental data in regards to the travel of passengers and freights required to establish transport plan. The O/D transport volumes of passengers and

freights, transport records, etc. are data directly related to transport demand analysis, transport infrastructure investment and operation policy. Standardized and scientific calculation and prediction methods must be adopted for these data. As well, these data must be managed by the government to secure reliability.

Third, it researches and produces various transport indices that can lead and support national policy, and establish linking system with national decision making support systems. It develops and creates various transport indices that can support anticipatory policy proposal and prompt decision making.

1.2.2 Anticipated Effects

The following effects can be anticipated as a result of the National Transport Survey and DB Construction Project.

The national transport DB can be utilized for a variety of project sectors by relating it to the purpose of the projects. It can be used as preliminary data for effective establishment and execution of transport-related policy and plans of central government and municipal governments. It can also be used for various analysis in conducting transport-related research by industry, academia and research institutes. IT can also be propagated to general public via various GIS-T information, statistics data, internet, publications and so forth, general public can always procure and utilize the necessary data, which is thereby enhancing the information accessibility of general public.

In the transport sector in particular, it is possible to save part of service project cost when ordering projects such as national backbone transport network plan, medium-term transport infrastructure investment plan, validity of transport infrastructure projects, various fundamental plans in transport sector and so forth. By utilizing transport DB implemented via this project, it is possible to cut down budget for administrative tasks including transport survey and research analysis costs, which used to represent majority of the service costs of the individual projects such as validity analysis, etc. In addition, there will be an advantage of more solid basis to establish effective transport policy and plans for the reduction of transport congestion fee and national distribution fee by enhancing the reliability of transport survey data through standardization of transport survey techniques and survey tables.

2. Project Details

The National Transport Survey and DB Construction Project is executed by splitting it into sectors, including passenger survey and analysis, freight survey and analysis, transport net work survey and implementation, national transport statistics implementation, DB system management and operation, and project management. Major detailed projects in each sector are summarized in the following table.

<Table 3-1> Major Detailed Projects in Each Sector

Sector	Major Detailed Projects	Comment
Passenger Demand Survey and Analysis	National passenger O/D transport volume survey, complete survey of national passenger O/D and prediction of future demands, supplementation and renewal of national passenger O/D, road traffic cost function research, etc.	Sea included
Freight Demand Survey and Analysis	National freight O/D transport survey, complete survey of national freight O/D and prediction of future demands, supplementation and renewal of national freight O/D, distribution network implementation, etc.	Sea included
National Transport Network Implementation and Analysis	Transport network survey, implementation of transport network GIS DB, network implementation and analysis for transport analysis	
National Transport Statistics Survey and Analysis	Transport induction unit requirement survey, national transport statistics survey, survey of transport outcome and division rate, transport cost and greenhouse gas emission survey and DB construction, special transport status survey	
DB System Implementation and Management	DB system implementation and management, improvement of DB management system and homepage.	
Project Management and Operation	DB project management, project promotion, operation of national transport DB council, support in operation of national transport DB inspection team	

2.1 Passenger Sector Survey and Research

2.1.1 Basic Directions

The passenger sector aims at expanding the domain of transport survey and DB to be implemented to be able to cope with increased reliability and basic demand of the

users including the government. It diversifies passenger O/D survey methodology, standardize demand prediction and validation methods, and steadily improves network and transport volume delay functions for transport analysis. It also enhances the reliability of passenger DB by actively performing a series of feedback process in which problems associated with projects are accepted and improved via experts who are experienced with demand analysis and/or validity evaluation on transport infrastructure development projects. In addition, it surveys the required items specified in regulations such as「Integrated Transport System Efficiency Act」and「Distribution Policy Basic Act」and so forth, and performs adjustments on passenger transport survey and DB domain, e. g. adjusting transport survey items by carrying out requirement analysis (demand survey) on persons in charge of transport policy and analysts. Finally, introducing and utilizing user satisfaction as an index for the degree of improvement in the reliability of passenger transport DB is being considered. For this purpose, it advances and systematizes survey and analysis to enhance the reliability of passenger transport DB, e. g. change from roadside interview survey to household transport survey, introduction of state-of-the-art survey techniques and the use of state-of-the-art survey data, zone specification, transport volume delay function analysis and so forth.

2.1.2 Transport Survey

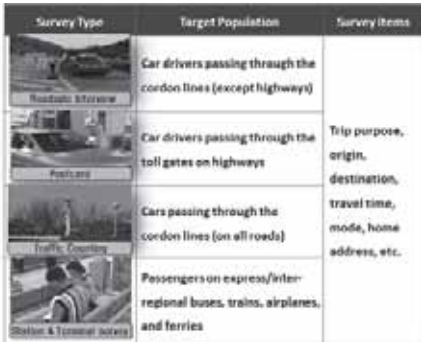
The surveys conducted in the passenger sector are Preliminary Survey on National Passenger Transport Status, National Passenger Transport Status Survey, Transport Volume Delay Function Survey, Transport Panel Survey, and so forth.

○ Nationwide Preliminary Survey on Passenger Transport Status

Nationwide Preliminary Survey on Passenger Transport Status is a preliminary survey before the main survey that aims at seamless survey and error prevention. It establishes methodology on the selection of survey target and survey locations and so forth, designs respective survey tables for inter-/intra-region and traffic-related transport status survey of target households, transport volume survey, passenger transport infrastructure status survey and so forth, establishes appropriate survey methodology and detailed plans for the main survey, and makes survey manual.

○ National Passenger Transport Status Survey

Followed by the preliminary survey, the National Passenger Transport Status Survey conducts survey on passenger transport for classified sectors. First, it conducts the 'Household Transport Status Survey' to understand household characteristics, O/D, aim of transport, transport means, departing times, transport time, etc. It also performs 'Transport Volume Survey' using imaging equipment in diverge/merge sections of 249 city/district/borough units to validate transport volume after implementing DB. Moreover, it carries out 'Public Transport Infrastructure Use Status Survey' which understands departure and arrival points and access means of airport, harbor, railway station and bus terminal users, to construct O/D of public transportation users. It also performs the 'Average In-Car Head Count Survey' to understand the number of users of major transport means such as passenger cars, buses, and taxis at important city/district/borough-level locations, in order to construct parameters to convert objective O/D to method O/D.



<Figure 3-2> Types of Passenger Survey

<Figure 3-3> Household Travel Survey Form

○ Transport Volume Delay Function Survey

The Transport Volume Delay Function Survey selects optimal survey locations by type of transport cost functions, by way of re-correcting road hierarchy by regions and selecting proper survey locations by hierarchy, thereby carrying out national survey on the fundamental data such as road hierarchy, crossroads, capacity, transport volume, etc. including road condition survey on representative locations by road hierarchy, transport status survey, etc. The aim is to implement VDF that can most realistically reflect real roads and transport conditions.

○ Transport Panel Survey

The Transport Panel Survey is a survey for enhancing reliability of demand prediction and analyzing effect of transport policy. It is a periodic survey targeting at approximately 3,000 households residing in large major cities in order to survey number of transport, transport locations, transport cost, etc. and to deduce related transport indices.

2.1.3 Research Sector

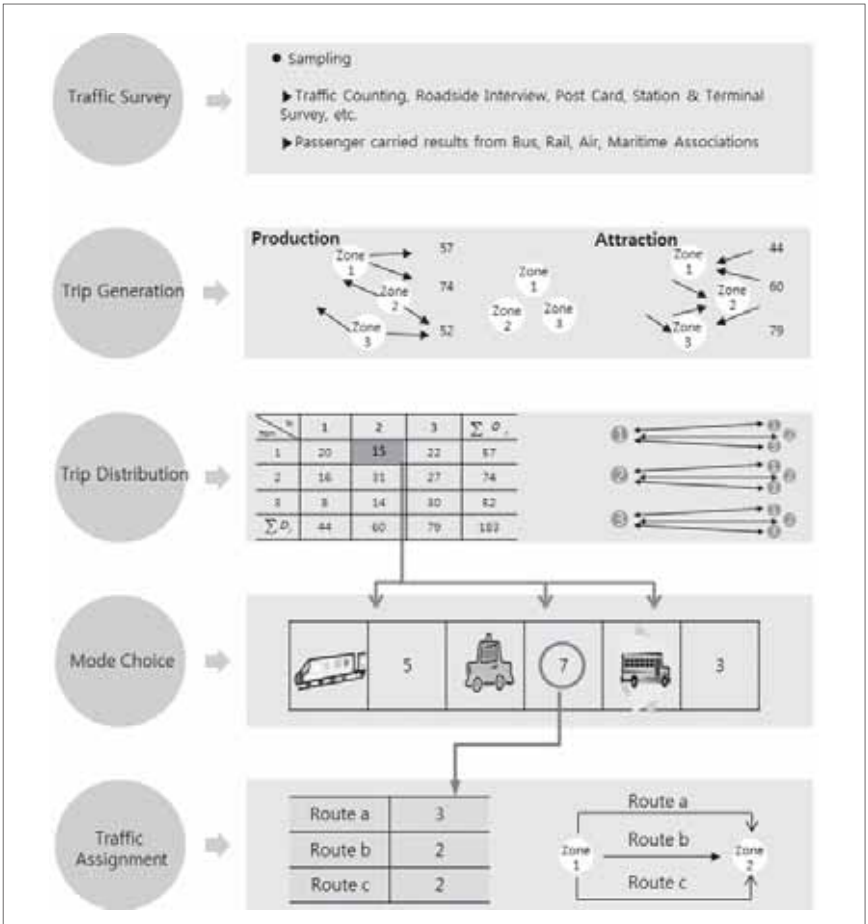
In the passenger sector, research and analysis focused on passenger O/D transport volume by using fundamental data, various literature data and state-of-the-art fundamental transport data collected through transport survey.

○ Amendment and Renewal of Passenger O/D Transport Volume and Validity Improvement Study

First focus is the Amendment and Renewal of Passenger O/D Transport Volume, which is fundamental to establish, execute and evaluate transport plans and transport infrastructure investment plans including the National Backbone Transport Network Plan. Every year, current and future predicted passenger transport volume is newly amended considering changes in social-economic indices and transport infrastructure investment. Also conducted are classification of transport volume according to transport objective and transport means, analysis of division rate by means, transport characteristics analysis, research on improving reliability for regular transport survey, time series analysis, etc. Moreover, often, the study to review ways for various O/D passenger validity consideration are processed.

○ Cutting-edge Transport Data Utilization Research

In addition, there is research on implementing O/D transport volume by using various transport information data arising from operation of state-of-the-art transport systems. This research understands cutting-edge transport information such as pass cards and TCS data and so forth, amends passenger O/D transport volume and validates its reliability by reviewing domestic and international research cases on utilization options, identifies utilizable cutting-edge transport information, and develops and proposes methodology.



<Figure 3-4> Interzonal Passenger O/D Construction Process

2.2 Freight Sector Survey and Research

2.2.1 Basic Directions

The objective is to carry out survey and analysis reflecting domestic and international status changes in distribution sector, secure reliability of freight DB, and to implement and manage freight transport status data that can play a central role in domestic freight analysis with the aim of enhancing its utility for setting up domestic distribution policy. To achieve this objective, regular and non-scheduled freight survey, distribution route analysis, improvement of freight demand estimation methodology, etc. are carried out. Also, in addition to the large scaled business survey, non-scheduled survey is performed to implement detailed data to be used for analyzing specific freight in addition to the regularly conducted large-scale business survey. Moreover, surveys that can reflect total quantity of goods transported, not just freight flows, are conducted, and besides, optimal freight demand analysis methodology is reviewed, for which additional data survey and implementation of collaboration system for freight O/D survey are set up as strategies and various survey and research are being conducted.

2.2.2 Survey Sector

Survey related to freight is being conducted in 8 main categories.

○ National Pre-Survey on Freight O/D Transport Volume

Identically to the passenger sector, the National Pre-Survey on Freight O/D between Regions for seamless freight main survey establishes methodology for selection of survey targets and survey locations and so forth, design of survey table by survey type and proper survey methodology. It also establishes detailed plan of main survey and creates survey manual. Also, it surveys freight concentration points such as newly opening harbor, distribution centers, etc. in advance, thereby creating basis to perform efficient main survey.

○ National Survey on Freight O/D Transport Volume

It performs the Freight O/D Transport Volume Survey to implement comprehensive DB related to freight transport in order to survey the transport pattern of freight in the country and apply it to transport policy and project analysis. This survey

includes distribution infrastructure status survey, unit requirement survey, sea freight O/D survey, coastal freight O/D survey. The distribution infrastructure status survey surveys status and operation characteristics of distribution infrastructure. The distribution infrastructure unit requirement analysis surveys unit requirement (freight's volume of business per employee, land area and floor area) dealing with freight at major distribution centers. It also conducts sea freight O/D survey against trade ports, ICD, ODCY, etc. to understand freight O/D, transport path, transport time, freight items and so forth, and coastal freight O/D survey to understand freight O/D, transport path, transport time, freight items , etc. between coastal harbors, between coastal harbors and trade ports, and between coastal harbors and inland areas.

○ Survey on Freight Vehicle's Run Reality

Freight vehicle pass reality survey and freight genesis middle base survey are performed with Freight Vehicle's Run Reality which is to comprehend characteristics of freight vehicles, forming an absolute part of domestic freight transport, and freight vehicle run features' seasonal change, weekly change, etc. are inspected at most.

○ Distribution Channel Survey of Freight by Item

There is the Distribution Channel Survey of Freight by Item to perceive freight flow from a view of enterprise freight flow based on the travel route information of freight by item. In this survey, towards major trade freight or domestic freight having a significant effect on national economy, regarding that the freight features are changed in the manufacture and processing process, from domestically to internationally, it is inspecting the whole freight flow of use channel from the place of origin to the last consumer.

○ Survey of Freight by Item

In 'the freight unit requirement survey' to analyze freight relay features through routine freight's unit requirement renewal and improve the reliability of freight and freight vehicle demand prediction, it researches freight pass occurrence and arrival unit requirement about distribution base facilities such as freight terminal, airport terminal, wholesale and retail market, train station, and so on.

○ Hazardous Materials Transport System Survey

In times of the transport accidents of hazardous materials such as flammable freight, radiation freight, the hazardous materials transport system survey for the special management to minimize widespread damage establishes the basic data by virtue of studying transport route and methods of hazardous materials such as petrochemicals, industrial gas products, nuclear fuel, chemicals.

○ Freight Expense Survey

By actively utilizing as basic data for mode choice analysis in freight, this survey is to be applied toward the analysis of spread among freight ways and effects through complex ways during SOC project analysis, and focusing on more microscopic and detailed each means' freight transport expense, for each means' quantification of O/D door to door expense, item definition of expense data and each item's expense computation plan are established and the survey is implemented.

○ Port Congestion Reality and Expense Survey

The port congestion reality and expense survey which is to secure the detailed basic data in regards to transshipment containers' flow, port congestion reality and expense are surveyed, and transshipment's international transport network is researched.

2.2.3 Research Sector

The following various research and analysis are made using fundamental data collected via the previously mentioned freight surveys.

○ Freight O/D Amendment and Renewal

It secures timeliness by renewing national freight O/D data between regions with respect to the year to date. Statistics related to transport and social economic indices are reflected to renew freight O/D between regions for the base year and the future year, and truck O/D is deduced and implemented to DB so that it can be linked to passenger O/D by car. Besides, freight transport by freight tons and by items as well as the transport status are also analyzed.

○ Freight Panel Survey and Analysis

Freight Panel Survey and Analysis, which is to enhance the reliability of freight

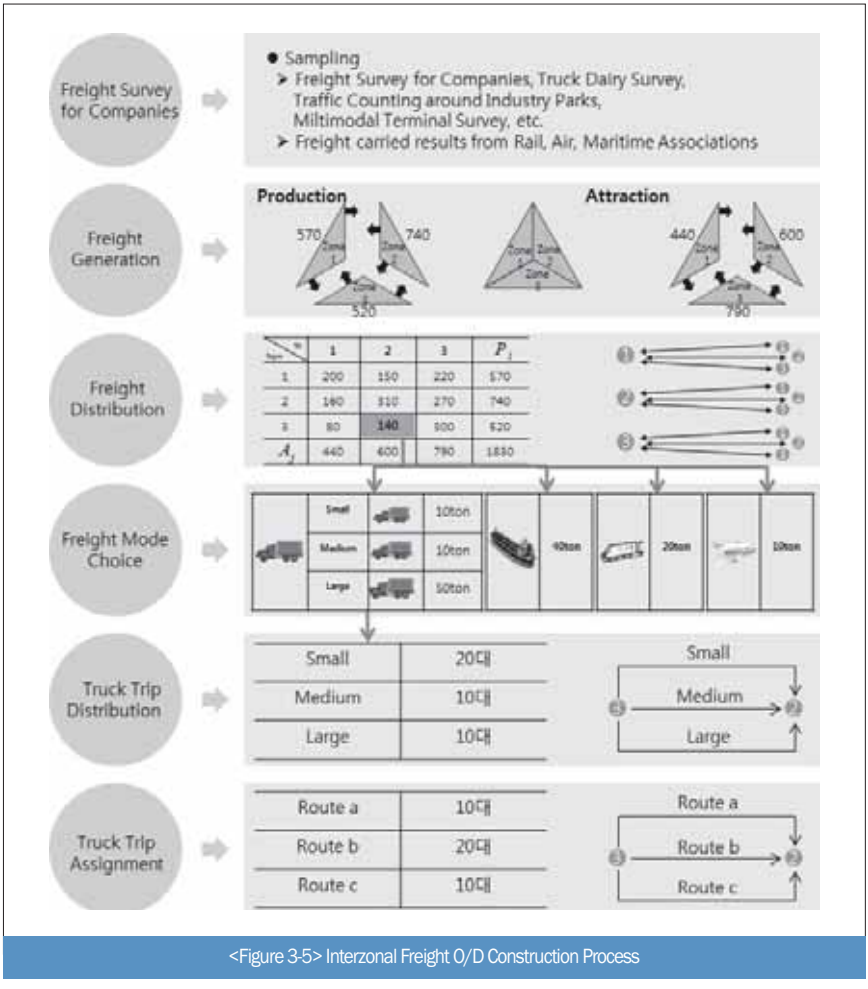
transport behavior/freight demand prediction analysis and to perform analysis of the effect of freight and transport policy, surveys quantity of goods transported, truck transport status, freight cost, etc. and deduces related transport indices by making regular annual survey over approximately 1,500 representative companies.

○ Freight Demand Analysis Guidelines Research

The Freight Demand Analysis Guidelines Research seeks possible analysis structure from current data system, and makes guidelines for freight demand analysis between regions including systematic freight demand analysis and implementation methodology considering freight characteristics under the background of establishing index system required for ideal future freight analysis, develops freight demand validation methodology and provides measures of implementing survey data for it. In addition, it develops urban freight transport demand analysis models and collects necessary data for this purpose, thereby reviews the results of model applications via case analysis.

○ State-of-the-Art Survey Data Collection and Utilization Research for Freight

The State-of-the-Art Survey Data Collection and Utilization Research for Freight is conducted to seek for a variety of options to construct dynamic freight O/D transport volume data together with the use of real-time cutting-edge survey data in the future, in which type of transport-related cutting-edge survey data are determined, status in regards to the utilization of cutting-edge techniques are understood, and studies collection options and utilization methods of cutting-edge survey data.



<Figure 3-5> Interzonal Freight O/D Construction Process

2.3 Survey and Research in Transport Statistics Sector

2.3.1 Basic Directions

The transport statistics sector collects transport statistics and literature DB calculated from individual statistics production agents and implements them as DB, provides users with convenience, and calculates reliable transport outcomes and division rates using transport survey data including cars. It also collects and organizes important transport statistics and literature data produced in a variety of sectors, newly constructs and adjusts statistics data to cope with changes in

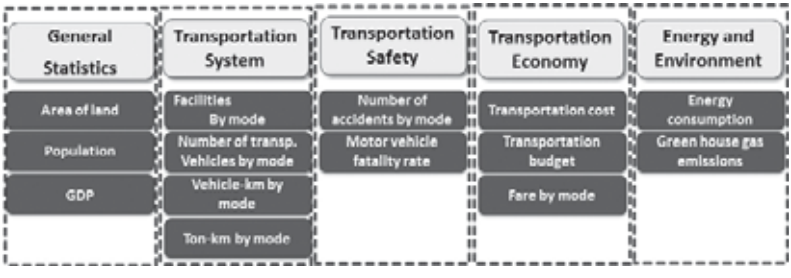
user requirements, and promotes production of processed statistics and its DB construction using survey data. Through these activities, it aims at the role of hub for transport statistics and literature data. As well, it enhances efficiency, accuracy and convenience in the use of statistics and literature data.

2.3.2 Survey and Research Sector

In the statistics sector, the following data survey and DB construction are being conducted.

○ Statistics and Reference Survey

Problems were raised on the lowered utility of data and the efficiency in its use, due to the lack of information on whereabouts of data, implementation details, possibility of procurement and its procedure that was caused by the lack of computerization and systematics management in the production of statistics in the domestic statistics and literature sectors. This project sector aims at improving this problem. It maintains the timeliness of data by continuous renewal and implementation of many transport statistics and literature data, and implements additional new items by coping with the changes in transport data requirements. Furthermore, it expands the utilization support via processing and analysis of collected data as well as connecting data between related agencies.



<Figure 3-6> Statistics in KTDB

○ Transport Record and Transport Division Rate

Transport record and transport division rate by transport means and region is the most important data for reference. However, transport record provided by the

statistics chronology does not include cars as well as has many limitations such as fidelity. To improve the timeliness and fidelity of transport record and division rate that are fundamental data for establishing transport policy and plans, the 'Transport Record and Transport Division Rate Survey' is being conducted. This survey defines the requirements for transport record and transport division rate data, reviews survey and analysis system of major developed countries for data related to transport record, establishes computation methodology for domestic transport-related data, and calculates transport performance data through transport record and transport division rate survey.

○ Transport Cost Survey

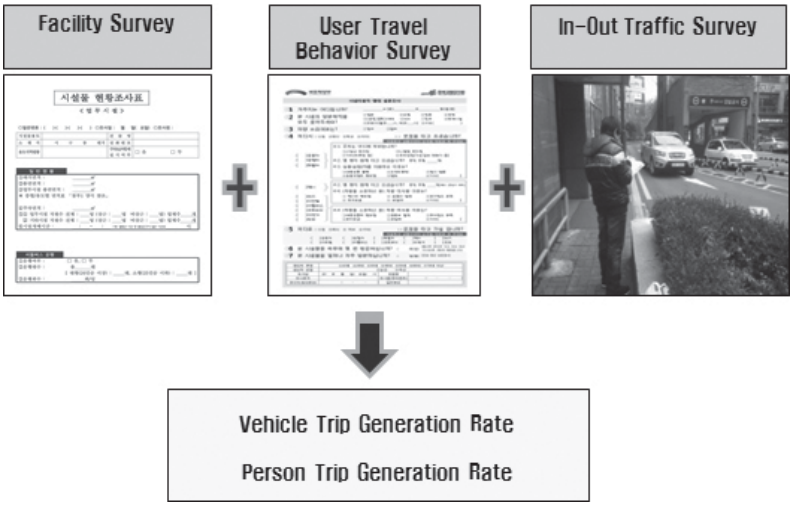
This is a detailed project aiming at unifying cost items, calculation methodology amendments, calculation reference year and the tie of announcement to enhance their degree of utility in policy, and at providing standardized information on transport sector's social total cost and total revenue including all transport means. Currently, external transport cost calculated individually in the Korea Transport Research Institute is adjusted from total transport cost's perspective, and all costs related to transport are being surveyed and analyzed.

○ Transport Sector Greenhouse Gas Emission Survey DB Construction

The 'Transport Sector Greenhouse Gas Emission Survey' is being conducted to set up basis to utilize systematic and comprehensive statistics calculation methodology to establishment and effect evaluation of transport policy in regards to the green transport that is becoming influential recently. In this, green traffic related indicators such as transport sector related pollutants and greenhouse emission, etc. are organized, surveyed and analyzed.

○ Trip Generation Rate Survey

This is to understand transport volume and transport characteristics of passengers and vehicles with its aim of calculating transport generation rate requirement, and this calculates transport induction volume that serves as fundamental data required to carry out prediction of transport induction volume owing to transport policy establishment, city planning and development and so forth, transport effect evaluation, transport induction allotment system etc.



<Figure 3-7> Trip Generation Rate Survey

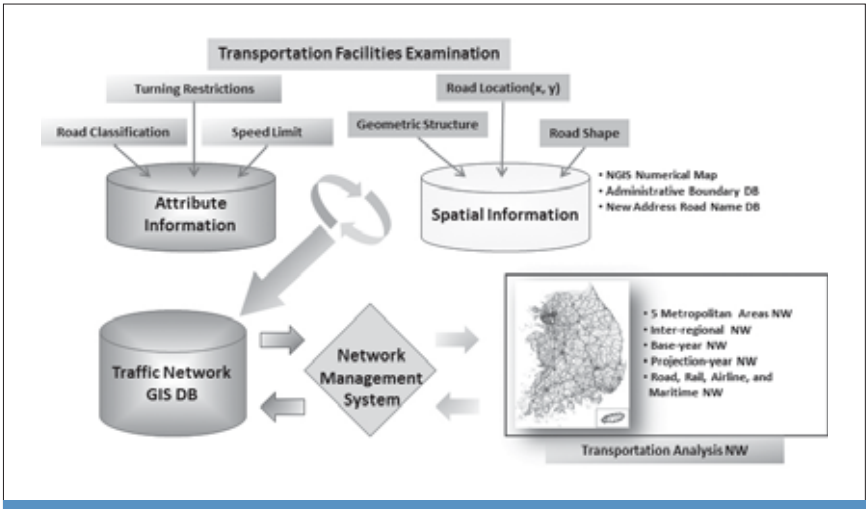
○ Special Transport Status Survey

The Special Transport Status Survey, whose aim is to support establishment of efficient transport policy by predicting transport demands during special holiday periods such as summer vacation and holidays, performs pre-questionnaire survey before New Year's Holiday, summer vacation period, and Thanksgiving Holiday every year, thereby understanding transport plans and characteristics of citizens and support the government in setting up special transport measures.

2.4 Transport Network Sector Survey and Research

2.4.1 Basic Directions

The transport network survey and analysis is to basic electronic map of transport sector via survey of transport infrastructure including roads and railways, and to implement fundamental data that can be utilized in a variety of areas such as public informatization projects. Under this objective, its strategy is to construction of fundamental data and implementation of DB with diversified layer system for expansion of transport infrastructure survey scope and analysis of complex transport network including public transportation.



<Figure 3-8> Transportation Facilities Examination

2.4.2 Survey Sector

○ Transport Network Sector

The transport network sector performs field survey on transport infrastructure including roads and railways, etc. to implement transport electronic map and network for transport analysis. Over the whole country, it acquires fundamental data on newly constructed and modified infrastructure and then collects characteristic information on relevant infrastructure by field survey. The infrastructure mainly considered currently are roads and railways. In case of roads in particular, the survey targets those roads over the country that are capable of more than 2-line car traffic.

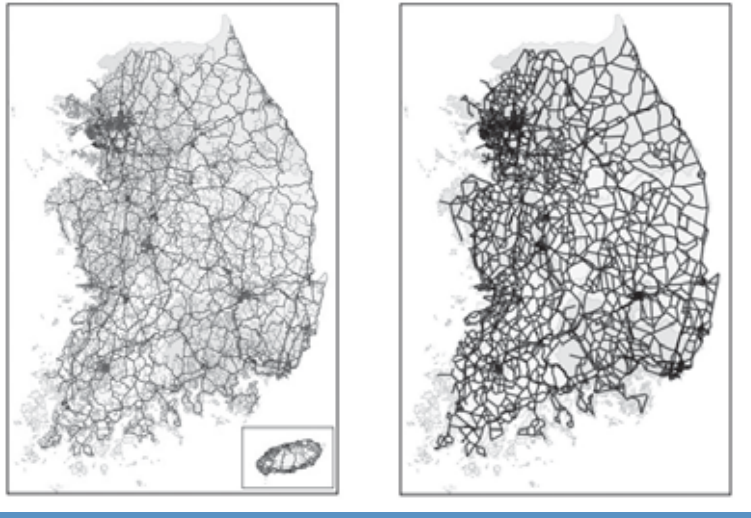
The transport infrastructure survey is being conducted under the background of necessity for more detailed and expanded transport infrastructure survey, which is due to the steady increase in the use of the acquired data to implement transport map and network for transport analysis. It understands the spatial locations and characteristics of transport infrastructure such as roads, and performs renewal of pre-built infrastructure DB and new survey of newly constructed and modified transport infrastructure.

2.4.3 Research Sector

The project implements transport electronic map by utilizing transport infrastructure survey data and continuously renew network for transport analysis.

○ Transport Thematic Map Implementation

Transport thematic map is directly connected to transport infrastructure survey and implements into electronic map the characteristic information acquired for major transport infrastructure such as road and railway. This map complies with the standardized electronic map format and can be utilized in various areas.



<Figure 3-9> Transportation Thematic Map & Network

○ Network Implementation for Transport Analysis

Sector of implementing network for transport analysis constructs simplified electronic map that contains elementary characteristics required for transport demand analysis, etc. based on transport thematic map. Literature data were mostly used to implement network in the initial stage of the project, but its observability and accuracy were significantly improved as transport thematic map became precise, which was subsequently converted to network and then was used. The thematic map is constructed only for the present year. However, network for transport analysis is constructed up to future 30 years by referring to various national transport plans,

because it is utilized in transport investment evaluation. In particular, with surge of interest in the national distribution sector, freight sector implements distribution network for national/metropolitan distribution infrastructure and infrastructure dealing with freights such as airports, harbors and train stations.

2.5 DB System Implementation and Operation Sector

The system sector is not directly related to transport survey and research/analysis. However, it is responsible for implementing and managing transport DB using the results of survey and analysis.

First, it implements and manages the homepage of the National Transport Survey and DB Construction Project. It performs DB design, data conversion and DB construction of transport survey analysis data including passenger/freight O/D transport volume, etc. and provide DB service via internet. And it implements statistics data DB, provides additional service on new items, and provides electronic book conversion and service for existing and newly implemented literature data. It also deducts/reflects items requiring revision and amendment in regards to national transport DB homepage and management system, and performs improvement and management of homepage for stable data supply service. Besides, it continuously develops and implements statistics data display service using transport thematic map such as transport data and geographic information.

Second, it performs system maintenance and management for stable national transport DB supply service, such as stable operation and service of national transport DB system, reinforcement of web and server security, hardware monitoring, security management, network management, data backup, etc.

Third, it develops management system for various surveys in general, from preparation stage through progress status to post-survey data arrangement and so forth, and develops and manages transport survey support system that is capable of survey personnel commitment plan and management.

2.6 Project Operation and Management Sector

The project operation and management sector is responsible for support to efficiently conduct the National Transport Survey and DB Construction Project.

Its main tasks are project promotion and foreign cooperation. It conducts hosting events/participating in external events that can promote national transport DB, and pushes forward planning and progressing of related events so as to broaden the utilization of national transport DB via various workshops and outcome presentations.

Second, it operates the National Transport DB Council. The National Transport DB Council was organized based on the Integrated Transport System Efficiency Act, and progresses regular as well as unscheduled consultations with related institutions. Its main agenda aims at adjustment of individual transport surveys, cooperation on analysis and DB construction of survey outcomes, opening and management of regular cooperation channels to seamlessly carry out regular and unscheduled national transport surveys.

Third, it organizes and operates the National Transport DB Inspection Team. It organizes committee with external experts on each sectors of the project, with the aim of enhancing reliability of the National Transport Survey and DB Construction Project, and continuously inspects/submits reviewed opinions in regards to the entire course of the project by part, from planning through progression status, and business value and calculation.

3. Project Value and Utilization

3.1 Project Outcomes

3.1.1 Outcomes

Currently, national transport demand survey and DB construction project are fulfilled focusing on 5-year national transport survey annually. Through the 5-year project from 1998 to 2002 (1st stage), the foundation of national transport DB was

created, and the basic DB provision service started.

Since then, it set from 2003 to 2007 as the 2nd stage, and propelled national transport DB expansion and service head north though transport DB collection and accumulation system improvement, user centered internet service plan, transport information distribution's expansion and vitalization, transport DB use analysis reinforcement, and related agencies' cooperative system improvement considering transport survey and transport data.

Presently, national transport demand survey and DB construction project is started along right lines, and through national transport survey's routine performance and related survey data's detailed analysis and research, is implemented as a continuous project for the purpose of national transport DB's reliability and utilizability improvement. Annual main projects' outcome achievements are as follows.

<Table 3-2> Yearly Outcomes of Main Projects (1998~2010)

Year	Main Project Outcomes	Note
1998 (3.2B won)	- Passenger and freight transport survey implement of a public work service as a countermeasure against unemployment during IMF (2,733 places over the nation etc.)	
1999 (10.9B won)	- Transport survey : transport facilities (14,028 partitions), passenger (238,853 households) and freight (7,531 vehicles) pass reality, public transport use reality (729 bus routes), transport induction unit requirement survey (871 buildings), etc. - survey analysis and research : basic and detailed analysis implementation while utilizing survey results - transport thematic map and analyzing network preparation, DB system maintenance and management, etc.	
2000 (7B won)	- transport survey: transport statistics (190 items) and transport facilities (14,028 partitions), public transport (733 bus routes) use reality, transport induction unit requirement survey (543 buildings), major area transport (291 places), etc. - survey analysis and research: 5 megalopolis passenger and freight transport volume analysis, etc. - transport thematic map and analyzing network preparation, DB system maintenance and management, etc.	
2001 (7B won)	- transport survey: passenger (161,251 households near 5 megalopolis) and freight (10,884 companies) pass reality, transport induction unit (small- and medium-sized base cities, 355 buildings), and marine passenger and freight (28 ports, 31 coast terminals), etc. - survey analysis and research: passenger and freight transport volume and capital area unit requirement analysis, etc. - transport thematic map and analyzing network preparation, DB system maintenance and management, etc.	

Year	Main Project Outcomes	Note
2002 (3.8B won)	- transport survey: facility survey (capital area and 5 megalopolis 2,056 partitions' renewal survey, new city 2,550 partitions' attribute survey, new road 1,543 km sector survey), transport statistics and literature research (statistics, international literature 6,800 items, etc.) - survey analysis and research: passenger and freight O/D supplementation and renewal and unit requirement analysis, etc. - transport thematic map and analyzing network preparation, DB system maintenance and management, etc.	
2003 (4B won)	- transport survey: facility survey (except capital area and 5 megalopolis, at the nation level 14,092 partitions, new city 1,606 partitions' attribute survey, new road 700 km sector survey), transport statistics and literature research (6,800 items, etc.) - survey analysis and research: between regions, passenger and freight O/D supplementation and renewal and unit requirement analysis as the current, household travel survey results' detailed analysis of capital area and megalopolis, marine freight's transport volume and travel pattern analysis, etc. - transport thematic map and transport analysis' network supplementation and renewal - DB system S/W and H/W expansion and application system development	
2004 (3.5B won)	- transport survey: transport facility survey (16,620 partitions' supplement and renewal, 3,421 partitions' new survey), transport statistics and literature research (statistics : 7 classifications and 289 items, literature : 5 classifications and 10,000 items, etc.), vehicle speed survey (local 5 metropolitan areas), passenger and freight O/D preliminary survey - survey analysis and research: passenger and freight travel between regions in the nation and metropolitan areas as the current, travel features analysis during special holidays, analysis of marine transport network in Northeast Asia, survey system establishment research for O/D data's reliability improvement, etc. - transport thematic map and transport analyzing network supplementation and renewal (reflection of new survey supply in thematic map, and transport analyzing network preparation on 2003 basis - DB system S/W and H/W maintenance and management, application system development, etc.	
2005 (6.5B won)	- transport survey: including Jeju-do, national passenger and freight travel reality and distribution condition survey implementation - transport statistics and literature research (307 statistical items, 16,000 literature items, reference supply form improvement), transport facility survey (new NGIS 3,768 partitions survey and new change road survey, survey manual improvement) - passenger and freight O/D data between regions in the nation and metropolitan areas as the current (on 2004 basis), survey analysis method research for O/D data reliability improvement, marine trade freight transport network survey and analysis - transport thematic map and transport analyzing network supplementation and renewal (facility survey resultsreflected thematic map and network renewal, national network renewal and future network construction on 2004 basis, public transport route construction) - DB system maintenance and management, and website reorganization and online analysis function, DB reconstruction - national transport DB council organization and management start	

Year	Main Project Outcomes	Note
2006 (6.7B won)	- transport survey : each metropolitan area's passenger travel survey implementation (survey: 55 city and county, 142,000 households, transport volume and the number of people survey for the second time : 3,089 places) - transport statistics and literature research (310 statistical items, 18,500 literature items, etc.), transport facility survey (new NGIS partitions and 76,938 km renewal, permanent survey system construction) - through national transport survey results' detailed analysis and waiting method in 2005, passenger and freight O/D data between regions in the nation as the current (on 2005 basis, 248 zones), marine trade freight transport network survey and analysis - transport thematic map and transport analyzing network supplementation and renewal (facility survey results-reflected thematic map and network renewal, national network renewal and future network construction on 2005 basis, permanent survey system equipment) - DB system maintenance and management, and national transport DB construction project website reorganization and management system development, application S/W function improvement - national transport DB council management and national transport DB construction project informatization strategy plan (ISP) establishment	
2007 (5.7B won)	- transport survey : national transport facility survey (national new and changed roads 3000km survey, already constructed network of roads 80,000km renewal survey) - transport statistics and literature research (323 statistical items, 22,000 literature items, etc.), metropolitan area passenger travel supplement survey, legal survey (energy consumption and representative product freight channel survey) - research analysis :'metropolitan area passenger travel survey results' detailed analysis and new O/D construction through weighting method, passenger and freight O/D data supplement and renewal between regions in the nation, advanced survey techniques' application pilot project implementation toward Jeju-do, transport industry service index computation and announcement - transport thematic map and transport analyzing network construction : national facility survey results reflected in thematic map, and thematic map and network analyzing network construction on a basis of December, 2005 - DB system maintenance and management, transport statistics analysis website and related application system reorganization, etc. - national transport DB council management, project support, and maintenance	
2008 (5.9B won)	- transport survey : national passenger and freight O/D supplementary survey, transport facility survey - transport statistics and literature research (330 statistical items, 22,000 literature items, etc.), new VDF establishment through road pass expense function survey, each major product's distribution channel survey, transport part greenhouse gas emission quantity and transport expense survey, etc. - research analysis :'national passenger and freight O/D supplement and renewal (2007 basis), transport information data's DB use plan research, national transport investment model development and research, freight supply chain outcome quality analysis research, etc.	

Year	Main Project Outcomes	Note
2008 (5.9B won)	- facility survey results transport thematic map establishment (2007 basis), and transport analyzing network construction - DB system maintenance and management, new DB reflection, transport statistics analysis website and related application system reorganization, etc. - national transport DB council management, project enhancement support, national transport survey publishment, project management and maintenance, 1st national transport survey plan establishment -national transport DB inspection team management support	
2009 (5.3B won)	- transport survey : national passenger travel survey's preliminary survey for 2010 regular survey, transport panel survey, transport statistics and reference data survey, transport record and transport share structure (rate), transport record unit requirement survey, freight unit requirement survey and distribution channel survey, traffic jam use and transport expense survey, etc. - research analysis : passenger and freight O/D supplementation renewal betweennational regions (2008 basis), special transport countermeasure data survey, transport sector greenhouse gas and air pollutant survey analysis, advanced survey data, such as transportation card, collection and use plan research, transport DB's reliability and utilizability improvement plan, marine O/D detailed analysis, supplement renewal, etc. - according to the transport facility survey, on the late 2008 basis, national transport thematic map supplement renewal, current and future transport analyzing network preparation - system maintenance, management and new, renewed DB reflection and construction, and transport statistics analysis website renewal, etc. - national transport DB council management, project enhancement support, national transport survey report publishment, project management, and national transport DB inspection team management support, etc.	
2010 (7.6B won)	- transport survey : 2010 regular national transport survey (national passenger plane destination transport volume survey) implementation with local governments, transport statistics and reference data survey, transport induction unit requirement survey, etc. - research analysis : passenger and freight O/D supplement and renewal between national regions (2009 basis), special transport countermeasure data survey, transport sector greenhouse gas and air pollutant survey analysis, O/D transport volume reliability improvement study, marine O/D detailed analysis, supplement and renewal, etc. - transport facility survey, transport thematic map supplement and renewal on the late 2009 basis, current and future transport analyzing network construction - DB system maintenance and management, DB project management, DB council management, etc.	passenger survey implemented with local governments

3.1.2 Transport DB Construction Situations

As national transport survey and DB construction project have been constantly implemented since 1998, all kinds of transport DB of major surveys is accumulated and constructed. At the beginning, in accordance with the then conditions, it was collected and constructed focusing on necessary DB for transport demand analysis such as transport investment evaluation, and since the demand for transport DB was changed according to the domestic and international circumstantial changes, national transport DB's construction content and range were extended as well. Especially, due to the amendment of Integrated National Transport System Efficiency Act in November, 2008, national transport and DB construction range were greatly changed, and since then, the project has been implemented as embracing related surveys and the whole DB items.

<Table 3-3> National Transport Survey and Related DB Construction Situations

Survey/Field	DB Construction Content
National passenger O/D transport volume survey	- each way's and purpose's passenger O/D transport volume in current year - each way's and purpose's passenger O/D transport volume prediction for 30 years in future - respondents' basic data such as O/D, travel purpose, and travel method
Transport volume survey	- every city and county's visible diverge and merge areas' transport volume - major main roads's individual transport volume
National freight O/D transport volume survey	- freight O/D transport volume per item, ton, and method in current year - freight O/D transport volume prediction per item, ton, and method in future year - basic survey data · current distribution data of business : general current status of business, freight vehicle use situation, the quantity of goods transported for the past 1 month, survey data of the quantity of goods transported for 3 days · freight vehicle travel situation data : freight vehicle features, travel features · freight occurrence's transit base situation : diverge and merge area situation per business, vehicle type and facility · freight vehicle situation on the industrial complex's neighboring roads : freight vehicle's transport volume and transport reality data per vehicle type and time
Freight unit requirement survey according to the distribution base	- living-in company situation of distribution base facilities : survey over general company situation, the quantity situation of goods transported, and connection situation - freight vehicle transport volume and spread reality of distribution base facility's entry and exit
Freight circulation route survey	- case data using container's intermodal on circulation route - railway and freight vehicle's transport conduct data considering freight transport

Survey/Field	DB Construction Content
Transport network	- level 2 new and changed road, railroad network thematic map · road junction (crossway title, crossway type) · road center-line (road class, road title, speed limit, number of lanes, one-way road existence, drive way existence, bus lane existence, etc.) · spin limit (spin limit type, etc.) · railroad intersecting point (train station title, train station type, etc.) · railroad center-line (route title, route type, etc.) - airport, port, passenger and freight terminal related transport thematic map · facility location and behind link road, railroad network - transport analyzing network · transport analyzing network including basic attributes toward road, railroad (current and future 30 year object)
Transportation cost survey	- transport congestion expense, traffic accident expense, transportation environment expense, etc.
Greenhouse gas emission survey	- greenhouse gas emission by regions and methods
Special transport measure data survey	- special transport measure period travel behavior survey · special transport measure period preliminary survey : survey 20-30 days before special transport measure period · special transport measure period simple enumeration : survey 10 days before special transport measure period · special transport measure period post enumeration : survey within 10 days after special transport measure period (addendum in 2009 project) · special transport measure period demand estimation and countermeasure preparation - special transport measure period survey results DB · transport record data (monthly, special transport measure period) · survey result table (special transport measure period) · demand prediction result (special transport measure period)
Transport statistics and literature research	- total statistics such as passenger and freight transport record, accident data, transport industry service index - road, railway extension and current route status, port and airport's current facility status and processing power, vehicle registration number, etc. - transport economy expense such as congestion expense, distribution cost, accident cost, pollutant expense, and transport sector government economy expense, and energy consumption, air pollutant material emission, etc. - international transport sector statistics
Unit requirement survey	- personnel induction unit requirement, vehicle induction unit requirement - current general facility status and current transport status - time-based transport induction features
Others	- transport survey guidelines, transport trend information, annual final report, all sorts of specialist workshops and seminar result data, etc.

3.2 National Transport DB Utilization

The national transport DB is used as fundamental data for effective establishment and execution of transport policy and plans in central institutions and local governments. It started external service for public utilization in April 2001, and it is used as a variety of analysis data for industry and academia as well as government. Its geographic information and a variety of transport statistics data are also accessible by general citizens via internet.

The transport DB was used as two forms in the past: online provision through internet and detailed analysis data direct provision. However, in order to reduce civil complaints by the complication of application and acceptance process for detailed analysis data use and extend the share use range of transport DB, the data provision system (2009 project) is currently improved and managed on the project website so as to fulfill the direct data application and reception. Moreover, each sector's implemented project result DB such as transport statistics and literature data, transport survey result's analysis study is presented through the website, and online basic analysis function is realized so as to help user's use convenience.

National transport DB's largest demand place is the evaluation field considering transport facility investment plan. National transport DB is utilized in a lot of transport facility investment evaluation and validity analysis, and besides, national transport DB is extending its use place into various fields. It presents extensive use fields such as public transport management plan, accident management system, wildlife animal habitat space establishing study, and so on.

3.2.1 Comprehensive Government Plan such as National Mainstay Transport Network Plan

As transport DB construction project is stated in the law, Integrated National Transport System Efficiency Act, Article 4 should establishes national mainstay transport network plan. The National Mainstay Plan is the government's 20-year plan, which is a national plan that provides an efficient direction for implementing integrated transport system including road, sea, and air transport. This plan is the highest-priority plan that is related to transport infrastructure and dictates investment

plans by sector and by region.

This plan was first established in 1999 together with the Transport DB Construction Project, and a revised plan was established in 2007. National transport DB was utilized to set up scenarios of various investment plans for 20 years and to deduct the optimum method.

As another comprehensive government plan, national transport DB is used in the plans such as national railroad network construction plan, road regeneration basic plan, the 3rd port basic plan, the 4th airport development mid and long-term plan.

3.2.2 Individual Transport Facility Investment Evaluation

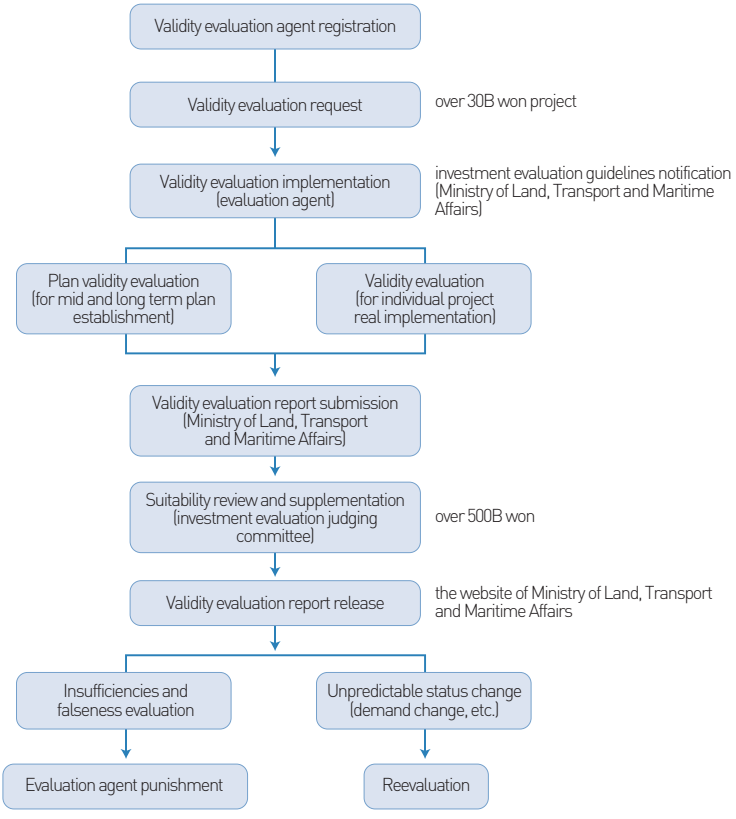
The government establishes investment evaluation guidelines for rational and objective investment analysis and evaluation considering public transport facility's foundation, extension or redevelopment project (Integrated National Transport System Efficiency Act, Article 18), and in case of evaluation, it is stated that public transport institute utilize national transport DB when establishing transport related policy and plan or carrying forward, and in case of preliminary validity survey performance, it is equally applied (same law, Article 17).

<Table 3-4> Comparison of Transport Facility Investment Evaluation System and Preliminary Validity System

Classification	Transport Facility Investment Evaluation System	Preliminary Validity Survey System
Department in charge	- Ministry of Land, Transport and Maritime Affairs	- Ministry of Strategy and Finance
Based law	- Integrated National Transport System Efficiency Act	- National Finance Law
Purpose	- national transport policy achievement such as national transport system's efficient construction - transport facility investment efficiency such as investment priority adjustment	- finance management such as efficient budget compilation
Application time	- mid and long term plan establishment stage - this validity evaluation stage	- budget compilation stage
Evaluation target	- over 30B won investment project	- over 50B won investment project

Classification	Transport Facility Investment Evaluation System	Preliminary Validity Survey System
Analysis level	- synthetic and specialized detailed analysis using a transport plan model	- preliminary validity analysis
Transport demand analysis	- national transport DB utilization	- national transport DB utilization
Evaluation Method	- single business: focusing on economical validity evaluation but including policy validity evaluation - various businesses within a vehicle and between vehicles: investment priority integrated assessment · economy, local economy ripple effect, transport network effect, etc.	- single business: economical validity, policy validity evaluation (AHP method) - various businesses within a vehicle and between vehicles: not implemented yet
Evaluation agency	- evaluation task agent · one with specialists (engineering company, transport research institute)	- Korea Development Institute (KDI)

The following shows the investment evaluation's task flow considering transport facility development project. In this, at the validity evaluation stage, through the analysis based on national transport DB, evaluation is accomplished. After the evaluation, in case of the project with validity, by adding finance evaluation, private investment possibility is reviewed.



<Figure 3-10> Flowchart of Transport Infrastructure Development Project Investment Evaluation

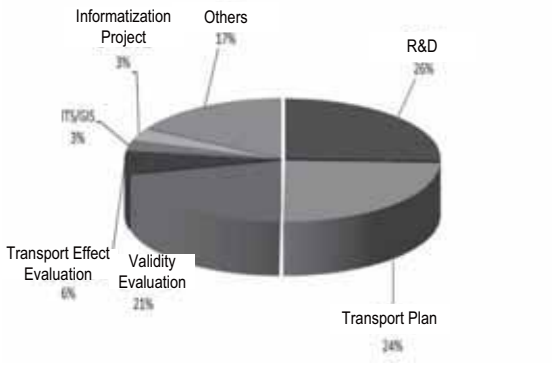
In these kinds of project validity analysis, a lot of national transport DB was utilized, at the first onset with 'Territory extension project's preliminary validity survey' between Miryang-si and Cheongdo' in April, 2001 in which transport DB started to be provided, this has constantly increased with 5 cases in 2003, 15 cases in 2004, and even reached 56 cases in 2010.

<Table 3-5> Utilization Frequency of National Transport DB in Yearly Validity Analysis

Year	2001	2003	2004	2005	2006	2007	2008	2009	2010	Total
Number of Cases	1	5	15	22	32	27	40	37	56	235

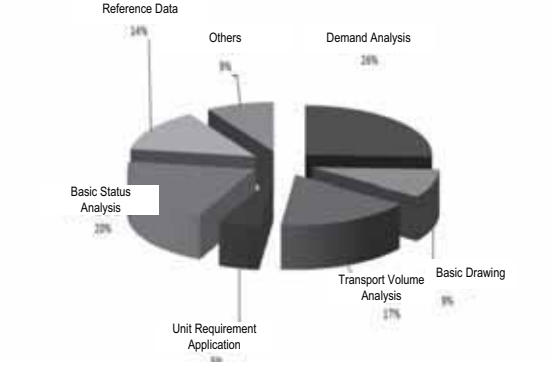
3.2.3 Other Utilization

The national transport DB is used in a variety of sectors in addition to validity evaluation. Examples include academic research such as papers, research and development projects, ITS projects, transport effect evaluation, and so on. Fig. 2-3 shows a summary of DB utilization examples by objectives up to 2010. It mainly consists of research and development including academic research, followed by transport plan and validity evaluation.



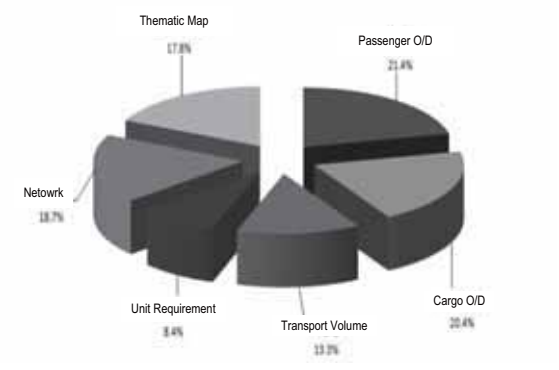
<Figure 3-11> National Transport DB Utilization Objective Analysis

Fig. 2-4 shows the classification on the utilization type of national transport DB. It mostly consists of transport demand analysis, basic status analysis and transport volume analysis.



<Figure 3-12> National Transport DB Utilization Method Analysis

Next Fig. 3.5 shows which of national transport DB are largely utilized. Since it considers detailed analysis data as targets, basic statistics via homepage, etc. were not aggregated. Since majority of detailed analysis data are used in transport demand analysis, passenger O/D transport volume, freight O/D transport volume and network for transport analysis take large portion. According to the recent growth of space information projects, the use of transport thematic map as basic data for those projects is also shown to be high.



<Figure 3-13> National Transport DB Utilization Rate by Sector

Chapter 4.

Project Evaluation and Values

1. Problems and Resolutions in Project Implementation

1.1 National Transport DB Foundation Stage (1998~2003)

During the initial stage of transport DB Construction project, problems arose as to deteriorated efficiency caused by the absence of workforce and medium-term/long-term plans. Since this project was performed as informatization employment project as part of unemployment measures until 2000, most of the project budget was used as personnel expenses due to its nature as a public employment project. As a result, enough effort could not be made to increase accuracy and reliability of data in the initial project period, and the overall project operation efficiency was also lowered somehow. Moreover, low efficiency of unemployed workforce and employment limit on technical professionals incurred low quality and reliability of data surveyed during the intial phase of the project. Later as the survey was continued a lot of efforts were made to amend this problem, which in turn caused problems on the overall efficiency of the project. Despite these efforts, the limitations associated with initial survey data could not be completely overcome, and a sharp improvement was requested in a regular survey in 2005.

Next, the project plans and directions were not sufficient and the basis for continuity of the project was also lacking due to the absence of medium- and long-term plans on transport DB project. Therefore, due to the difficulty of securing and specializing research human resources and the DB project products, there has been a tendency of too much emphasis on O/D transport volume table and network. As a

solution for this, national transport DB's informatization strategy plans and mid and long term national transport survey plans have been acutely required.

Finally, the reliability problem about DB project's products has been brought up. During the initial project stage, the O/D transport volume table and network as transport DB project's main results achieved the early outcome while stably utilized as basis materials for the survey project of preliminary feasibility study, but not only this year's reliability problem but also the next year's reliability problem has been posed.

1.2 Reliability and Utility Enhancement of Transport DB (2003~2007)

In the project development stage, the survey was performed as a public labor service and the reliability problem of primitive materials was posed; therefore, in the regular survey in 2005, the survey was implemented as enough prearranged plans were made and survey professionals were sufficiently utilized. During this stage, the transport survey guidelines for survey standardization were established, and the survey materials could have the coherent form, so the foundation for cooperative utilization was arranged.

In this stage, the foundational direction and plan were established by devising the informatization strategy plans of national transport DB (2006). Moreover, the first national transport survey plan (project in 2008, settlement in August, 2009) as the mid and long term plan was prepared, so the project became systemized and the outline of continuity reservation was arranged.

Since the beginning of project, there has been a problem that the national transport DB construction project's range and the local self-governing agency's task range were not clearly set up. In the case of capital area, it was not included in the rage of national transport DB project, so the problem that the figures of capital area and national transport DB project were not agreed was pointed in the inspection of the Board of Audit and Inspection (2009). Moreover, except the capital area, other local self-governing agencies' O/D policy-making project was not continuously implemented, so this caused the inconvenience of utilization. In order to resolve these problems, in 2010, from survey to analysis in association with local self-

governing agencies including the capital area through the matching fund, it resulted in the cooperation with local self-governing agencies. In addition, the grounds to sequentially cooperate and implement the policy-making project was established in this period.

Nevertheless, the reliability problem has continuously recurred in this period as well. In response, a external separate agency, the national transport DB inspection team was composed of industry-university-institute experts. The inspection team sent inspection members into every field of passenger survey, freight survey, network, statistics, system and project management, and prepared a system closely inspecting the whole process from national transport survey to DB construction. This inspection system has been applied since 2008.

1.3 Extension and Reliability Enhancement of Transport DB and Procurement of Professionalism in Project Implementation (2008~)

While the transport DB project has been developed for ten years, the posed problem was that the transport DB project was stamped as O/D construction project, and as a result, there was a comment that the utilizability of DB construction project was limited. The national transport survey materials' free-of-charge release, the press release discovery approaching to the public, the DB construction result specification, etc. have been brought up in the utilizability enhancement stage. Since the materials' free release is a constantly posed problem in the past, it is being positively considered in the utilizability enhancement stage. As the press release approaching to the public, the cases such as "how have Koreans passed for ten years?" are expected to be frequently found and released. Besides, the expectation in the utilizability of analysis results is growing bigger, and from the existing city-county-borough analysis level to the town-township-street level, the analysis specification is being required. This kind of demand requires that DB construction project becomes a notch above the others.

Finally, there are difficulties of high-quality research human resources securement and specialization. To improve DB project's reliability and utilizability, it is necessary to have a foundation that high-quality human resources can securely work. So far, a significant portion of human resources from transport DB project have

been covered with temporary workers. In case of an appointment job, the position is unstable and they should change jobs. There is a difficulty that workers should be trained for a while to demonstrate a certain level of work capacity. The stable secureness and specialization of research human resources are an important issue, and they should steadily strive in future.

2. Evaluation and Values in Project Promotion

As examined so far, Korea's national transport DB is reliably tramping its foundation. This is based on central government's solid will for implementation and active cooperation of local governments and related institutions, by virtue of which the DB construction project is being pushed forward more aggressively. It can be seen that the implementation of projects to establish national transport DB is contributing to the advancement of Korea's transport sector, e. g. establishing collection system for fundamental transport statistics, constructing basis for reasonable transport policy evaluation, etc.

The project established collection system for fundamental statistics data in national transport sector, together with implementation of national transport DB. As a result of performing numerous regular and unscheduled surveys on domestic passenger and freight sectors for more than 10 years starting from the government's public employment project in 1998 to 2011, basis for fundamental statistics on transport characteristics, etc. of passengers and freights stated to be prepared. Later changes in the contents and scope of transport survey was required in response to changes in domestic and international circumstances such as green development. To cope with these changes, the government reflected related survey items such as green indices, energy, environment, etc. into related laws, so that relevant data could be collected. The project also improved the compatibility of survey data by dictating through creating and publishing transport survey guidelines that various individual transport survey including national transport survey follow standardized survey method. It also established 5-year national transport survey plans (Phase 1, September 2008), thereby tramping the collection system for fundamental survey data based mainly on regular surveys.

A reasonable evaluation basis for transport policy was arranged via the implementation of national transport DB. The government sets up and enforces pre- and post-evaluation system such as validity analysis, etc. to establish transport infrastructure investment evaluation and other transport policy. The primary objective of this project is to provide fundamental data required for these evaluations from the national transport DB. As such, it keeps producing passenger/freight O/D transport volume including future predictions, network for transport analysis, and social economic statistics data. It also improves survey and analysis methods by continuing research on enhancing the reliability of data and sets up and opens to public data sharing system via internet, so that data can be utilized for research/analysis in private sector as well as public sector. Through these efforts, it fosters public-private transport investment research and analysis including research on transport sector in academia, and as well enhances the validity of evaluation results.

The main reason of that national transport DB have steadily developed for the last ten years and enlarged its utilization range was the government's active endeavor above all things. As the starting point of existing problem perception caused by transport DB absence, national transport DB construction plan was established, and through the first five year plan, transport DB foundation was formed, and then through the second five year plan, DB reliability improvement has been promoted. Moreover, the government's budget secureness through national informatization progress played a great role as well. Hereafter, although there are assignments such as domestic transport performance's statistical data organization and transport analysis methodology's constant revision, the systematic endeavors such as survey implementation from the planning stage for national transport DB construction, legal and administrative supports for project promotion, specialized agency appointment management for research analysis, and cooperative use through DB release are evaluated as they geared up for the current national transport DB and henceforward prepared a foundation for the constant development.

<Figure 4-1> Project Development Steps

Chapter 5.

Future of Korean National Transport DB Construction Project

1. Recent Evaluation on National Transport DB Construction Project

Up to Chapter 4, they were focused on preventing the enormous loss on Transport SOC expansion and management field which Korean government highly values, and constructing and utilizing transport demand analysis centered national transport DB which are necessary for efficient forwarding. Recently, the Korean government decided that the importance of new investment toward SOC would decrease, and instead changed the concern direction toward the efficient management of SOC. Therefore, in future, DB survey construction on traffic volume and speed to monitor happening situations in transport network, related congestion index, and each city's traffic service indicator development technology are becoming important. In this respect, the central government, as a DB project implementation agent and large user, tried to categorize the national transport DB survey and construction project into positive and negative aspects. In addition, the Korea Transport Institute will suggest what recently has been endeavored in order to overcome this deficient aspect, and introduce the future of National Transport DB regarding what and how to contribute to the central government's transportation field with these data while Korean society is leading IT industry over the world.

1.1 Positive Aspects

With the policies on the past SOC project implementation-related issues such as demand increases and local government business overissues, for recent 10 years, the KDI's preliminary validity evaluation and the Ministry of Land, Transport and Maritime Affairs' transport facility investment evaluation system have been steadily

settled down, so as a result, there have been no additional problematic cases. Among diverse strata such as research centers, academia and the central government, it is positively recognized that the transport demand analysis plays an important role toward the preliminary validation assessment and the key national traffic network plan. However, by accumulating qualified fundamental data and analysis technologies due to the constant investment, the desire for higher-than-present validation of transport demand is regarded as a positive evaluation.

1.2 Insufficient Aspects

It is agreed that there are positive aspects toward transport demand analysis which are necessary for SOC investment, but the government for the National Transport DB Construction is spending billions of won every year, and it is actually concerned that they are not suggesting any clear answers for the question of what sort of assistance is offered for the government including the Ministry of Land, Transport and Maritime Affairs. In other words, it has been constantly criticized in common about what exists except the transport demand prediction by the main customers such as executives or deputy director administrators of the Ministry of Land, Transport and Maritime Affairs. There exist various divisions related with transportation sectors in the Ministry of Land, Transport and Maritime Affairs, but other divisions, except the Comprehensive Transport Policy Division which performs the financial support and direct management of National Transport Survey and DB Construction Project, have increased complaints that they cannot perceive what tasks the Korea Transport Institute performs and what contributions they offer. In the next part, 2.1, the endeavors to improve these complaints will be introduced.

2. Recent Cooperation between the Ministry of Land, Transport and Maritime Affairs and the National Transport DB

2.1 Current Changing Directions of National Transport DB

The key point of what the Ministry of Land, Transport and Maritime Affairs recently expects from National Transport Survey and DB Construction is to play

roles such as increasing the validity of transport demand prediction compared with the past, improving (reorganizing) the main statistics as transport results of the land, transport and maritime statistical chronology by the Ministry of Land, Transport and Maritime Affairs, intensifying publicity activities, collecting opinions from diverse divisions in the Ministry of Land, Transport and Maritime Affairs, and expanding cooperations (suggesting contents on DB project and enlarging support tasks) and so on.

2.2 Detailed Cooperative Items

The National Transport DB Center has kept cooperative relationships with diverse divisions within the main department, the Ministry of Land, Transport and Maritime Affairs, and when necessary, responded to the task support demands of each division, so expanded supports beyond the original tasks of its own project. The followings are introducing several recent cooperative cases like these.

○ The investment evaluation team of the Ministry of Land, Transport and Maritime Affairs (the first half year of 2012)

The preliminary screening tasks toward preliminary validation check object enterprises related with transport facility investments performed by the local government were supported. It was intended to do the followings; each local government's business demanded to perform as a preliminary validation survey project was excessive and the businesses with extremely low performance validity were screened beforehand, so the enterprises with appropriate investment possibilities were selected through the preliminary validation. To achieve this, previously constructed national transport DB's origin and destination traffic load and network DB were used to derive the analysis results.

○ Urban and Metropolitan Division in the Ministry of Land, Transport and Maritime Affairs (2011-2012)

In order to revise problems in the current system which is imposing traffic cause charges on traffic facilities over a certain size due to the purpose of relieving traffic congestion, it was collaborated in such various views as surveying the traffic causing basic unit and preparing the improvement plan of related systems. In addition, in 2012, according to the city traffic modification area change, the traffic zone revision

supporting task was performed.

○ Public Transport Division in the Ministry of Land, Transport and Maritime Affairs (2012)

Related with the duty efficiencies of intercity buses, chartered buses, and taxis, which are mainly promoted in the public transport division, most of all, computer network construction for intercity bus routes was supported, and in future, the DB construction for an improvement of taxi transport results is supposed to be discussed.

○ Motor Vehicles Policy Division in the Ministry of Land, Transport and Maritime Affairs (the first half year of 2012)

This project researchers participated in and supported the analysis for the issue to predict the car ownership number from 2020 to 2030. The foreseen results of the automobile and car ownership considering diverse social and economic variables were reflected on the basic medium- and long-term automobile plan which is a fundamental plan of Motor Vehicles Policy Division.

○ Logistics Policy Division, Logistics Facility Division and Logistics Industry Division (2012)

There was a request to include and promote the task of Korean logistics map preparation in this project. Accordingly, after consulting the logistics map framing plan and schedule with the section chief of Logistics Policy Division at the end of April, 2012, it was discussed to have a meeting review over the constructed draft in October, 2012. There was an offered opinion that it should be carried forward as a constant project in the Logistics Policy Division and logistics-related divisions.

Finally, Comprehensive Transport Policy Division in the Ministry of Land, Transport and Maritime Affairs suggested that as future discussion issues, it should be regarded that the range of the National Transport DB Construction Project needs a redirection of policy supporting DB discoveries in the Ministry of Land, Transport and Maritime Affairs, and the publicity toward the public is significant.

3. Future Necessary DB in the Central Government

3.1 Fundamental Questions regarding Future DB Construction

With the central government, governmental policy research centers should consider if there are any prepared mid- and long-term plans regarding what kind of DB is necessary, who will utilize the DB, and how it will be used for transport policy establishments and evaluations.

For example, it is a question that they perceive how the DB, using installed IT equipments in the cities of population over 200 thousand, is utilized, if the DB is deserted or wasted, and how the DB should be used in future and so on. In fact, there is a case that critical data are thrown away; in case of a city with ITS enterprise completion, each city street's speed data are not accumulated, and the entire analysis is not performed. In the aspect of DB, this is a serious loss. Moreover, there is an example of that the central government or DB-related experts misconceive; there is a perception that as a result of ITS enterprise performance, plenty of CCTVs were installed over the nation, and through this, the data of traffic volume are collected, but this is untrue.

The data of traffic volume and speed are gathered in various divisions. However, there is no road map centering around the Ministry of Land, Transport and Maritime Affairs, which is to induce mutual cooperations among each local governmental ITS information center, Traffic Information Center, the Korea Highway Corporation, Korea Transportation Safety Authority, the National Transport DB and etc. This kind of DB will be able to largely contribute to societies by preventing overlapped investments through future standardization, sharing system establishment and so on, and by causing synergy effects.

The questionable inquiry is regarding the relationship establishment by the Ministry of Land, Transport and Maritime Affairs with local governments. It is necessary for the Ministry of Land, Transport and Maritime Affairs to ask back considering if it is neglecting its role as a central government in respect of "the local government's role" in the transport policy direction. They must be doubtful if the monitoring results over the local governmental traffic situations should be statistically computed and announced, and if there is a concern of the control tower

role. If they need to play a control tower role, they should actively intervene over the current and future DB by local governments, and should distribute the analysis results as a central government. It will be of help if the cases of the U.S. are consulted.

Lastly, it is necessary to examine if there are any missing important contents among fundamental plans established by the Ministry of Land, Transport and Maritime Affairs. There are various principal plans founded over 5 years, 10 years or 20 years, but some are not like this; for example, the representative one is the Public Transportation Master Plan. In this plan, it is surprising that each main city's current public transportation route conditions, present sunning situations, service levels (route overlapping rates, running intervals, and service coverages) are not included. It is regarded that this was not intentional, but was rather impossible to include because there was no related DB at that time of the relevant design establishment.

3.2 Detailed Examples

A. Is it possible to know how much of the traffic volume has decreased even with the oil price increase?

Including the Ministry of Land, Transport and Maritime Affairs, researchers, professors and every citizen were concerned about the traffic volume increase and decrease at that time of high oil prices in the first half of 2012 (gasoline price over 2000 won per liter). However, no one could perceive whether the price increased or not, and even could not answer the question of how to know the price increase and decrease. It is possible to solve this sort of problem if in future, the traffic information toward many points is obtained. In other words, there should be HPMS (Highway Performance Monitoring System) construction like in the U.S. This system's basis is to induce the traffic volume statistics by regions and road types (Vehicle Miles Traveled) with sample traffic volume.

Currently, about how much is the degree of traffic volume information collection in Korea? The traffic volume collection in the central area is manually performed, and the traffic volume data are unreasonably deficient. The preparation for alternatives is in urgent need to overcome these problems with central area traffic volume DB

deficiency.

B. Is the computation level of transport result and transport share rate at the level in advanced countries?

Many countries are distributing the statistics by estimating each transportation's transport result and transport share rate throughout the nation. If so, who should compute and manage in Korea and how should it be done? There are a lot of problems pointed out; what is the level of transport result and transport share rate of Korea?; what about the transport result and transport share rate considering seasonal features? The U.S., the U.K., and OECD countries have composed the quarterly statistics lately for many years.

In case of Korea, the National Transport DB Center only just received the approval from the National Statistical Office in order to play the role for the transport record production in vehicle sector, so there is plenty of room for improvement in the nation. For the higher level of transport result estimate, in the road section, HPMS should be immediately organized.

C. Is it possible to evaluate and manage the congestion level of cities with over 200,000 Korean population (55 cities)?

Currently, in Korea, IT industry is leading the world. Public transport management systems with IT equipments such as BIS/BMS are installed in many cities, but metropolitan congestion managements and level evaluations are not performed. It is impossible to conduct them at present, but will be possible once ITS data are organized.

For example, at the present, the Korea Transport Institute is generating traffic congestion costs, but this is extremely deficient comparing with the U.S. TTI report's details. As a basic question, in the aspects of that in what extent, traffic (speed) data are collected and what are performed with the speed data, there are currently excellent data in both quantity and quality, but they are integrated. Data rich, information poor (No pains, no gains).

D. Is it possible to perform the public transport service level test in cities with over 200,000 Korean population (59 cities)?

Currently, it is hard to be performed, but it will be possible if BIS/BMS data get integrated. Through the DB organization, The central government will be able to compare and evaluate high rank cities with the best public transport system (overlapping, coverage) and low rank cities with the most inconvenient public transport system. This kind of work can be utilized as a very precious indicator in Urban and Metropolitan Transport Division of the Ministry of Land, Transport and Maritime Affairs.

E. In the aspect of full cost, is it thoroughly compared with other countries?

How different are the traffic fare, service level and external cost in Korea comparing with those in other countries? Enough comparisons are necessary over the inside and outside cost differences such as the whole nation, corridor, passenger and freight, but there is still a comment that inside and outside cost items and content quantification are not sufficient.

F. Is the transport field's life quality sufficiently compared with those of other countries?

Even a basic question like how urban spatial structure, time consumption, and activities are different from those of other countries will be important in future transport policies. The intercity differences in the country regarding traffic life and quality and the international differences regarding traffic life and quality will become more important that in the past. Recently, in the Korean and Japanese transportation fare comparison by the Ministry of Land, Transport and Maritime Affairs, it was verified that KTX fare was not cheaper than in Japan with the fare index considering Bic Mac index, price index and economic size.

G. How could the transport demand analysis technology be improved?

It is a critical issue of how to improve the validity of transport demand analysis than in the past. Does the National Transport DB Center possess appropriate

employment size and level at the present? How much they are endeavoring to reinforce the inside competence? Is there enough cooperative relationship with the inside research group or with other research groups? In addition, is there sufficient relative infrastructure level for the validity improvement? Regarding these issues, they should ask themselves. Meanwhile, DB project has been focused more on survey than on analysis, and the personnel and material infrastructure construction of analysis-related DB has been insufficient, so it is going to be necessary to improve these issues.

H. Is the previous 4-step transport demand representing the entire transport demand?

Even if many countries are performing the demand analysis using OD, isn't there any other analysis method except OD? There is Full cost approach, and this suboptimal method should be considered as an alternative of the previous OD centered demand analysis. So far, OD has played a key role in the main transport demand, but the demand analysis should be considered in broader perspective. It should be perceived that in the meantime, the National Transport DB has been too much focused on OD and could not have broad perspectives.

I. Transport demand model development considering original traffic characteristics

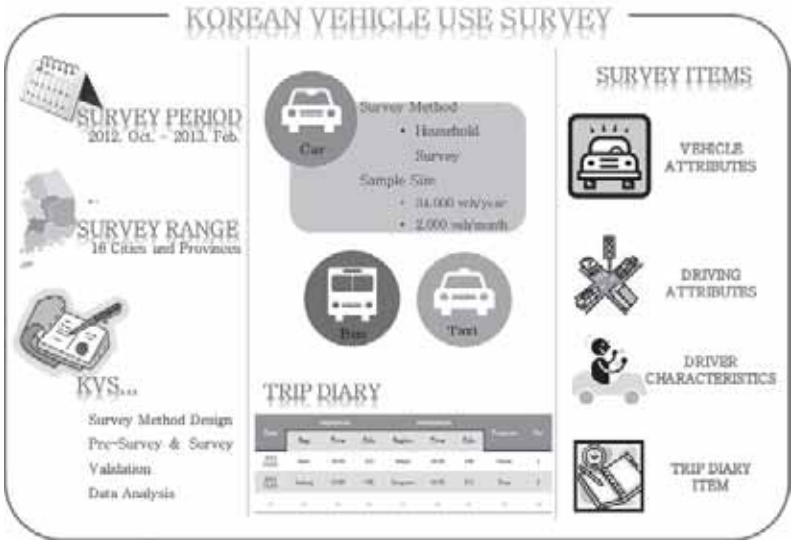
As pointed out before, the erstwhile model was a trip based OD-centered model with plenty of limits. Advanced countries of transport demand are endeavoring to overcome the existing trip based model's limits, but National Transport DB in Korea is at an early stage. In case of recent activity-based model, the validation consideration standard has been extended to be similar to the 4-step verification standard in techniques and contents. This kind of improvement trend must be worthy of attention.

In December, 2011, the National Transport DB Center made a contract for memorandum of understanding (MOU) with the University of Hasselt in Belgium, and in October, 2012, the collaborated research results are supposed to be introduced at an international conference in Korea.

J. The statistics related with transport economy is insufficient

There has been no clear answer for the question, if it is possible to compile a precious automobile-related statistics such with monthly milage and energy consumption quantity in Korea. In Australia and New Zealand, the National Statistics Office is directly conducting the survey task concerning this statistics' importance, but in Korea, since 2012, the Korean Vehicle Use Survey has been performed.

Moreover, the transport accounts statistics, an arrangement of the transport income and expense, is deficient, too. Presently, there are domestic cases organized in some respect of mean cost, but it has been unsatisfactory yet in view of marginal cost, so the investment toward this will be necessary as well.



<Figure 5-1> Korean Vehicle Use Survey

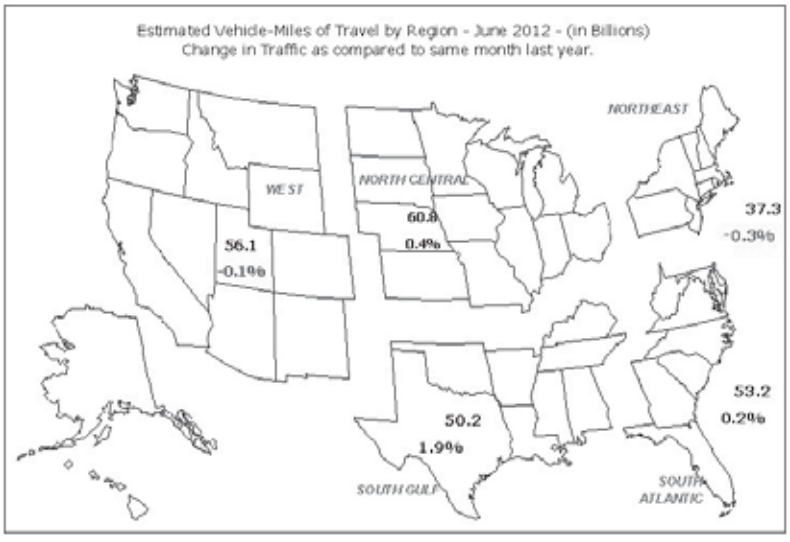
4. Departmental Future of National Transport DB Center

4.1 Korean-styled HPMS (Highway Performance Monitoring System) Development

4.1.1 Anticipated Effects

If this HPMS system is constructed, the previous question, if the traffic volume increases or decreases, when the oil price is 2000 won, will be answered. Moreover, high reliability results on each city's greenhouse gas exhaustion will be offered, which is mainly done by the Comprehensive Transport Policy Division in the Ministry of Land, Transport and Maritime Affairs. This is currently one of none inconsiderable concerns in the Comprehensive Transport Policy Division in the Ministry of Land, Transport and Maritime Affairs. This kind of system construction is not only utilized in quarterly transport report, but enabling this year's record quickly to be formed early next year, this will also suggest the latest information by overcoming the current OD's involved problem, which is at least two to three years' time difference occurrence problem.

A noticeable part in the expected effect aspects is the HPMS (Highway Performance Monitoring Systems) of the U.S., which is generating the mileage from the weekly data of each road type's main traffic volume points. Through this system which was developed in 1933, the U.S. has estimated mileage statistics by regions and by road types, and utilized that extensively in state governments, local governments, schools and businesses. In addition, the EPA (Environmental Protection Agency) of the U.S. has utilized HPMS data to calculate greenhouse gas exhaustion by regions, road types, and daily time periods (the Korea Transport Institute, 2012). This is rather generating information than simply managing history of traffic volume itself.



<Figure 5-2> Results of Vehicle Miles of Travel from HPMS

4.1.2 Core Contents and Schedules

With the Comprehensive Transport Policy Division in the Ministry of Land, Transport and Maritime Affairs, a contract was made to conduct VMT (Vehicle Miles Traveled) estimate methodology development in 2012. Within the National Transport Survey and DB Construction Project, VMT (Vehicle Miles Traveled) extension stage 1 will be performed in 2013, and VMT (Vehicle Miles Traveled) completion stage is aimed to be between 2014 and 2015. It seems going to be possible to develop a similar system with American EPA greenhouse calculation method between 2014 and 2015, which is an important issue in the Ministry of Land, Transport and Maritime Affairs. Therefore, this project should be conducted as an yearly business, the input data become the traffic volume by regions, road types and daily time periods, and the expected results are the VMT by regions, road types and vehicle types, and the greenhouse gas exhaustion. Additional outputs will be able to be utilized in quarterly transport results.

In the Korea Transportation Safety Authority, they are calculating the VMT as well,

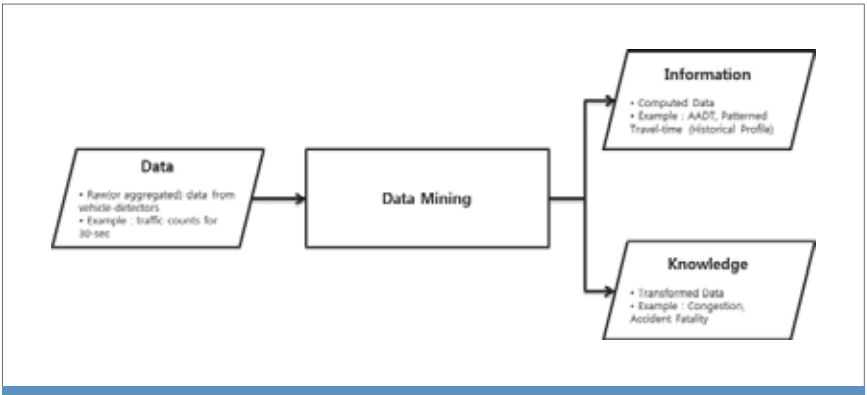
but this is basically different from what the National Transport DB performs with the following. The statistics by the Korea Transportation Safety Authority is registration place centered and yearly, which does not reflect vehicles' actual movement features. On the other hand, the VMT of the National Transport DB is actual movement focused, and is possibly quarterly, monthly and daily time period statistics.

4.1.3 Essential Data and Methodology

At present, in case of Korea, interregional traffic volume is abundant, but city center traffic is very deficient. To serve out the shortage, the method using CCTV information is being considered, or the investment for some traffic volume gathering is necessary. VMT's estimation principle is offering the fundamental direction with HPMS of the U.S., and the core principle is to apply statistical methods. For reference, if there are plenty of data, conception arrangements for Data Mining and Data Warehouse will be required.

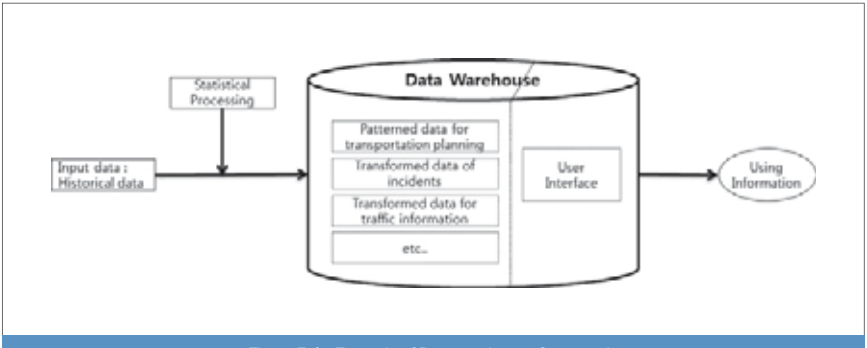
"Data Mining" means a process finding the traffic data appropriate for diverse record data analysis functions from the massive volume of traffic data (Raw data) collected by the detector system. In other words, it is a process to abstract the previously unknown useful information or knowledge from extremely bulky data.

Data mining technique is generally classified into Supervised technique (decision tree, artificial neural net, discriminant analysis, regression analysis, case base reasoning, etc.) and Unsupervised technique (OLAP: On-line Analytical Processing, cluster analysis, etc.). In addition, data handling techniques using various traffic flow theories are often included in the data mining technique.



<Figure 5-3> Concept of Data Mining

Data warehouse is an aggregate of integrated analysis information in the purpose of decision-making support and user's task dealing support. Namely, it is not a simple data warehouse, but on the basis of relational database, is a software side information handling technique to deal with a lot of data multidimensionally and quickly. Data warehouse should avoid file repetition, suggest security of storage and preservation, be accessible easily by users, reserve various types of information transferred by diverse data mining techniques, and need user interface enabling users to access easily. Hereafter, for VMT and speed statistics production, the mining technique and the warehouse technique should be applied.

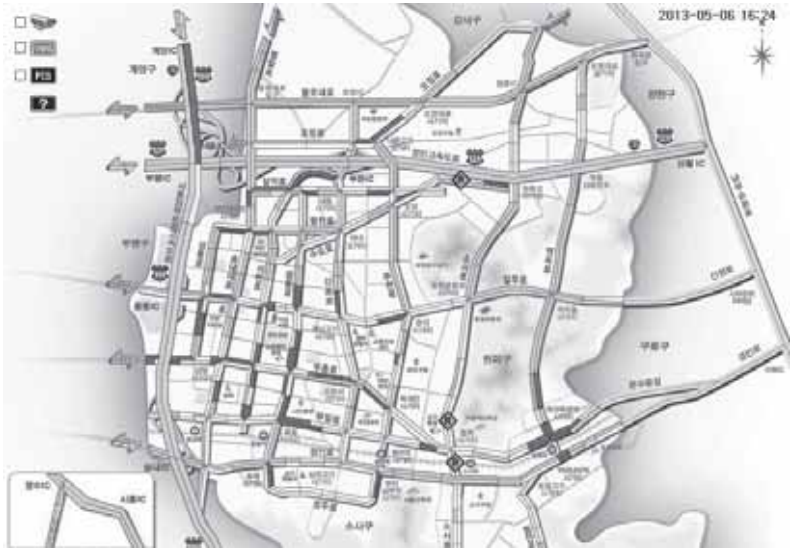


<Figure 5-4> Example of Datawarehouse Construction

4.2 Urban Mobility Analysis System Development

4.2.1 Expected Effects

If this analysis system is developed, it will be possible to produce more “enriched information” than the traffic congestion expense calculation currently published by the Korea Transport Institute. In other words, since it is almost possible toward the regionally completed cities with ITS projects, it will be from existing metropolitan area, regional zones and interzonal focused one to rather subdivided one. Since from existing yearly statistics to quarterly or monthly record, it will be possibly produced, and because the year, 2012’s computation result will be rapidly produced around the early January in 2013, the limitation of at least 2 to 3 years’ time difference occurrence, which was pointed out when the previous congestion cost was calculated will be overcome. Originally, there is an advantage to be able to monitor traffic situations like the following figure.



<Figure 5-5> Example of Traffic Monitoring

4.2.2 Core Content and Schedule

Core methodology should be referring to the Urban Mobility Report published yearly by Texas Transportation Institute (TTI) of the U.S. The National Transport DB Center is supposed to conduct the 2012 Prototype Case Study toward one city (Gwacheon or Goyang) which completed ITS project, and take aim at the Mobility Report Development and Extension Stage 1 as in 2013, and the Mobility Report Completion Stage as between 2014 and 2015.

This task should be a continuous project, and for the input data, regional, traffic typed, time-based traffic and speed data are necessary, and Data mining and Data warehouse technique are essential.

4.2.3 Essential Data and Methodology

Recently, the American government is monitoring the traffic level from HPMS system, quantifying the congestion degree into monetary value, and distributing out this. For this purpose, in TTI (Texas Transportation Institute), they are annually publishing Urban Mobility Report (2011), and in 2011, they are publishing the monitoring results of American major cities' congestion level, considerably different from the past, based on the produced speed data by HPMS data and ITS construction.

In Korea, in order to improve the utilization of traffic and speed data, quantitative scale securement, data quality securement and sharing system should be preferentially made. In connection with quantitative scale, it is judged that speed data, the traffic indicator, are sufficient, but traffic volume data are insufficient. For example, traffic DB, classified by vehicle types, time slots, road types and regions, are extremely insufficient in the aspect of the size, especially in case of city centers.

So far, there has been no in-depth discussion over the data quality yet in Korea. Meanwhile, in other countries, they are constructing traffic monitoring systems which are efficiently collecting, storing, and utilizing traffic data for Quality Control (DOT & FHWA of the U,S,, 2004) system securement regarding the national transport control system and for other diverse purposes. In Korea, the entire data quality diagnostics is preferentially necessary on the basis of 5 days' data collected

by the National Transport Information Center from February 1 to 5 in 2011, as analysed in accordance with Federal Highway Administration (FHWA)'s QC (Quality Control) regulations.

Finally, the data sharing system is an issue. Currently, in Korea, through diverse transportation management systems by each transport management institution, real-time traffic data of massive material are only collected and stored partially, and data utilization and intermodal transportation system are extremely underperformed as well. Namely, traffic data are utilized for limited purposes such as traffic information supply and adjustment, and in the previous connection system, the record data are not even shared. As a result, the speed data for traffic are treated as considerably abandoned data.

From now on, in order to improve the utilization of traffic volume and speed data, at government-wide level, quantitative scale, data quality and sharing system by usage purpose should be systematically organized.

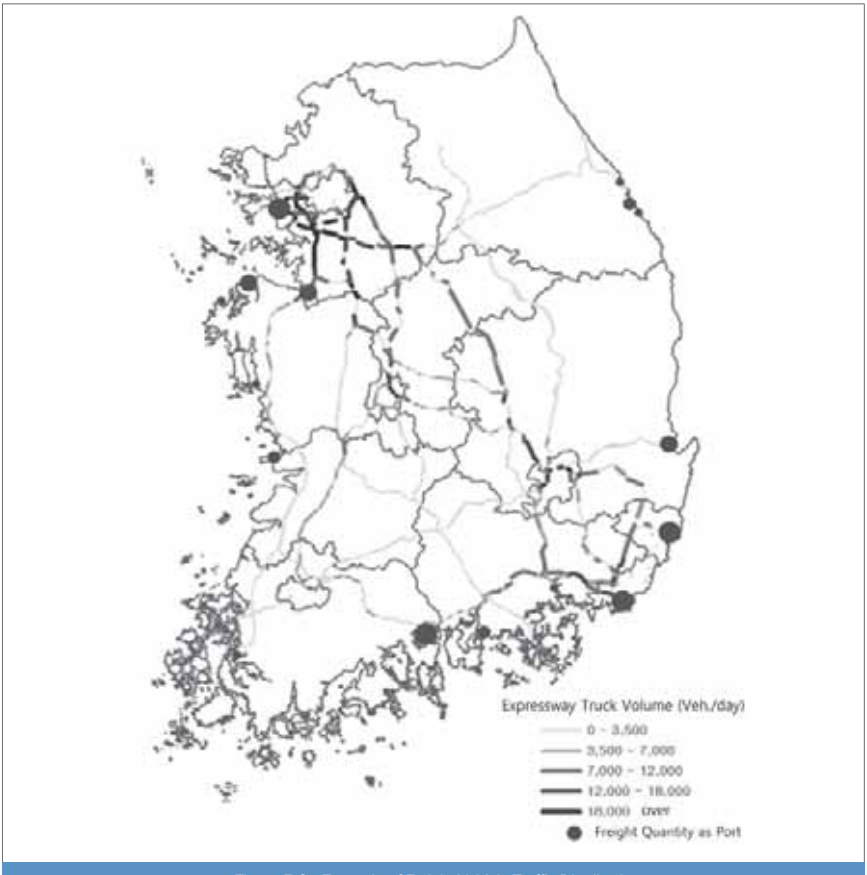
4.3 Development of Passenger Transport Demand Analysis Improvement System

First of all, record management must be performed for the technologies constructed over last 10 years. This effort is planned to happen through the computerization of the passenger demand analysis task in 2012-2013. Included items are the development of transport demand analysis verification system (2012, contract to VDF, acquisition of cutting-edge data, etc.), the development of public transport demand analysis guidelines (currently, demand analysis is conducted in the absence of network dedicated to public transport), and the meaningful task of documenting the record management related to the achievement of efficient analysis task and the development process for transport demand model.

4.4 Development of Domestic and International Cargo Distribution Map System

The cargo transport market in Korea is much more complicated than that of passengers. The motivation for this effort is to collect diversely scattered

information in order to create a map necessary for distribution policy. In this regard, collaborative research is being strengthened with the key departments in the Ministry of Land, Transport and Maritime Affairs related to distribution, such as the department of distribution policy, the department of distribution facility and the department of distribution industry, etc. Currently (as of 2012), the topics for making distribution maps supporting the key distribution policies are the top 10 distribution policies and map that must be clearly understood. For example, (i) should the cargo network in Korea be constructed with hub and spoke, and must it be persistently invested? (ii) are the majority of Korea's cargo cars trucks? (iii) on what types of roads are the Korean cargo cars operated the most frequently? The following figure provides answers to the above questions.



<Figure 5-6> Example of Freight Vehicle Traffic Distribution

4.5 Development of Public Transport Service Evaluation System

4.5.1 Anticipated Effects

Currently, the Ministry of Land, Transport and Maritime Affairs is not capable of properly evaluating the services of the local self-governing bodies relevant to public transport. Constructing a DB becomes more and more necessary in order to enable city-by-city evaluation. Projects like this must be carried forward as yearly project in order to makes it easier for the Ministry of Land, Transport and Maritime Affairs' departments of metropolitan cities and general transport policy to evaluate cities, and the outcomes of these projects should be utilized in distribution of budget.

4.5.2 Key Contents and Schedules

It is possible to create a variety of DBs for policy support purposes by analysing route information and route operation information in the BIS-installed cities with population more than 200,000. To this aim, the National Transport DB will perform pilot projects in 2012 and expand them to most cities in 2013. Service evaluation projects like these must be carried forward as yearly projects for constructing statistics.

4.5.3 Necessary Data and Methodologies

Similarly to the aforementioned traffic volume and speed information concepts, these projects can be enabled by harmonizing data collection from the cities installed with BIS/BMS for local self-governing bodies. It is anticipated that data mining and data warehouse techniques are required.

4.6 Development of National Transport Statistics Creation Guidelines

4.6.1 Anticipated Effects

Alike the Korea Development Institute performing transport demand analysis on individual transport projects according to other guidelines, it is necessary to develop a creation manual for key transport statistics of the Ministry of Land, Transport and Maritime Affairs' national land and marine statistical year book, such as transport performance. Developed countries have developed and utilized guidelines, but in

Korea, efforts to improve this field are needed.

4.6.2 Current Progress Status

For the purpose of improving the problems in creating national transport statistics, the National Transport DB Center held a public hearing in April 2012 on measures to improve the scoring criteria for national transport statistics. In addition, a contract research on improvement of scoring criteria for national transport statistics, conducted by the department of general transport, has been complete.

Recently, the final approval was given to the change of the statistics approved in 1975 for the private-car-based transport performance field (which has been excluded from the Ministry of Land, Transport and Maritime Affairs' land and marine statistical year book) by filling it up with the outcomes of the research of the national transport DB. It is anticipated that the contents will become more faithful once congestion statistics, VMT statistics etc. are included through the above constructed systems.

4.7 Transport Demand Analysis except Trip-based Demand Analysis

The mainstream of domestic demand analysis market is traditionally researches based on OD. In this part, it is judged that a second best methodology development is necessary as well.

Most of all, the existing OD is a model hard to explain the fundamental causes of passage, so an alternative model development is essential. Developed countries are spurring to the development of Activity based modeling approach to overcome this limitation, so the National Transport DB needs this kind of endeavor. In terms of this endeavor, in December, 2011, there was a visit the University of Hasselt in Belgium in order to make a research exchange agreement. The next picture is an example of the achievement of this endeavor, there will be a field to discuss collaborated research results in October, 2012.

(Left: Professor Geerts Wets from the University of Hasselt in Belgium, Right : Chansung Kim, the Chief of the National Transport DB Center)

<Figure 5-7> Contract for Memorandum of Understanding with the University of Hasselt in Belgium

In succession, it is necessary to develop case studies to apply the gross cost approach domestically instead of existing OD based demand analysis regarding corridors as in the Levinson case study of the U.S. As the case study (1), it is necessary to apply the gross cost approach toward the Gyeongbu line axis or the Honam line axis, or as the case study (2), essential to apply the gross cost approach toward the recently discussed GTX project.

5. Promote Strategies and Anticipated Effects

In this chapter, it was discussed regarding the future of the National Transport DB Construction Project. So far, the National Transport DB Construction Project was focused on transport demand analysis, but in order to promote the previously suggested projects, it is necessary to use the existing organizations and secure the budget for essential field addition. Moreover, the previously suggested various projects are medium- and long-termed works which are hard to be completed within several months, so the National Transport DB Center with project budget, project

continuity and professionalism should perform these. However, it is needless to say that researches such as HPMS, Urban Mobility System, and Public Transport Assessment System might have additional cost occurrence possibilities in accordance with the system connection when sharing and collecting data for local government unit's CCTV, public transport schedule, public transport network data, and so on.

It is desirable to include a more concrete plan with this content in the second medium- and long-term National Transport DB Construction Plan and utilize in the budget-charged division in the Ministry of Land, Transport and Maritime Affairs and the Ministry of Strategy and Finance. Furthermore, it should be used for the data to collect opinions of many divisions in Ministry of Land, Transport and Maritime Affairs.

If the previous projects stably settle, it is expected that the policy utilization rate and the satisfaction rate in the Ministry of Land, Transport and Maritime Affairs will improve much more than at present.

- Perfect contentment in the Comprehensive Transport Policy Division in the Ministry of Land, Transport and Maritime Affairs (traffic statistics part, etc.)
- Urban and Metropolitan Transport Division (each city's traffic congestion, public transport service level diagnostics)
- Improvement of Taxi Transport Record Computation in the Public Transport Division in the Ministry of Land, Transport and Maritime Affairs, and that of intercity bus-related DB
- Possible to publish the traffic congestion report collaboratively with the ITS and Road Environment Division and the New Transport Development Division in the Ministry of Land, Transport and Maritime Affairs (traffic volume and speed data, public transport network data collection in the Comprehensive Transport Policy Division in the Ministry of Land, Transport and Maritime Affairs)
- Korean styled HPMS utilization in the Road Management Division in the Ministry of Land, Transport and Maritime Affairs
- Expansion of distribution map utilization toward distribution policies in Logistics Section 3 in the Ministry of Land, Transport and Maritime Affairs

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※ Reference : National Transport Demand Survey and DB Construction Project–Related Provisions

Integrated National Transport System Efficiency Act	Integrated National Transport System Efficiency Act Enforcement Ordinance
Article 12 (National Transport Survey) ① In order to efficiently establish and accomplish national transport policies such as national mainstay transport network plans and middle investment plans, the Minister of Land, Transport and Maritime Affairs should do research on national level transport survey (the rest, "national transport survey") by presidential decree. ② For national transport survey and for the efficient transport survey's implementation and share of the results to prohibit the duplication of individual transport survey under the item 1, Article 16, the Minister of Land, Transport and Maritime Affairs should establish national transport survey plans considering national transport survey's objectives and strategies, detailed survey's contents and methods and all that sort of things after the deliberation of national transportation board every five years. ③ For the good of national transport survey or the purpose of national transport survey plans establishment under the item 2, the Minister of Land, Transport and Maritime Affairs may ask the submission or support of necessary data. In this case, a head of public institution should follow this except by special reasons.	Article 8 (National Transport Survey Enforcement) ① As stated by the first clause of Article 12, the Minister of Land, Transport and Maritime Affairs should do research on national level transport survey (the rest, "national transport survey") according to the each following provision section. 1. Routine checkup : towards the whole country every five years 2. Unscheduled checkup : implement for the purpose of supplementing routine checkup of item 1 or in case of need to investigate on specific areas or specific items ② In national transport survey, the following items should be included. 1. Registration and utilization by every means of transportation 2. Supply and management reality such as routes, transport volume, mileage by every means of transportation and by each facility of transportation 3. O/D transport volume of passenger and freight by every means of transportation and by each facility of transportation 4. Transport and distribution cost of transport use and transportation facilities' investment, management and administration 5. Transport-related social external costs such as transport congestions, traffic accidents, environmental pollution, greenhouse gas emissions caused by transport distribution activities 6. Energy consumption and efficiency by every means of transportation 7. Greenhouse gas emissions by every means of transportation 8. Transportation record and division rate by every means of transportation and by every facility of transportation 9. Additional necessary details for transport -related policies and plans' establishment, transportation facilities' investment analysis and evaluation

Integrated National Transport System Efficiency Act	Integrated National Transport System Efficiency Act Enforcement Ordinance
Article 13 (Transport Run's Temporary Halt Measures, etc.) ① When performing national transport survey, the Minister of Land, Transport and Maritime Affairs may make officials take a step of one of the following items. 1. Temporary halt of vehicles' run such as cars 2. Current status study on passenger or freight in transportation such as cars 3. Access toward transportation facilities, temporary utilization and installation of transport survey equipment 4. Access to or utilization of others-owned land besides transportation facilities (in case with approval of landowner, land possessor or manager) 5. Beside that, any measure for transport survey determined by presidential decree ② The official who takes measures under the item 1 should hold a token to indicate authority and show this to whom it may concern	
Article 15 (Transport Survey Guidelines) ① In order to ensure transport survey's objectivity and unity, the Minister of Land, Transport and Maritime Affairs should prepare and notify the guidelines concerning transport survey (the rest, "transport survey guidelines"). ② So as to establish the transport survey guidelines, the Minister of Land, Transport and Maritime Affairs should discuss with the head of relevant administrative agency in advance. ③ The application range, methodology, included basic facts and any other necessary details of transport survey guidelines are determined by presidential decree.	Article 9 (Contents of Transport Survey Guidelines) ① The transport survey guidelines by the clause 1, article 15 (the rest, "transport survey guidelines") should include the following each fact. 1. The kind, item and period of transport survey 2. The object, method and process of transport survey 3. The system of transport survey 4. The total, analysis, distribution, DB construction and management of transport survey results 5. Any other necessary items for efficient transport survey ② In the event of National Transport Survey, individual transport survey pursuant to the item 1, Article 16 or cooperative transport survey pursuant to the item 1, Article 11, the head of public agency should enforce according to the transport survey guidelines.

Integrated National Transport System Efficiency Act	Integrated National Transport System Efficiency Act Enforcement Ordinance
Article 16(Consultation of Individual Transport Survey) ① In order to perform an individual transport survey (the rest, "individual transport survey") for the task fulfillment of jurisdiction, the head of public agency should prepare and discuss individual transport survey plans according to the transport survey guidelines (the rest, "individual transport survey plans"), and consult the Minister of Land, Transport and Maritime Affairs in advance. However, that is unnecessary in case of slight individual transport survey by presidential decree. ② In case that an individual transport survey plan is recognized as it harms the efficient transport survey overlapping the national transport survey or other transport surveys, the Minister of Land, Transport and Maritime Affairs may request measures for the improvement from the relevant head of public agency. In this case, the head of public agency should follow except by special reasons. ③ As an individual transport survey is complete, the head of public agency should notify the results to the Minister of Land, Transport and Maritime Affairs within thirty days of the completion. ④ The items included in individual transport survey plans, the submission date and the requirements for consultation with the Minister of Land, Transport and Maritime Affairs are determined by the decree of the Ministry of Land, Transport and Maritime Affairs.	Article 10(Slight Individual Transport Survey) ① Under Clause 16.1, "the slight individual transport survey by presidential decree" implies one of the following transport surveys. 1. Transport surveys performed in one city(which excludes an administrative city by 「the special law for Jeju Special Self-Governing City establishment and Free International City development」 (the rest, "administrative city", metropolitan city and megalopolis. The same in the rest.], in a county or in a jurisdiction of autonomous district. Only the transport reality survey on O/D between other cities, counties or autonomous districts will be excluded. 2. Transport surveys enforced so as to prepare urgent transport measures ② The Minister of Land, Transport and Maritime Affairs should inspect the head of public agency's obligation duty performance considering the prior consultation over individual transport surveys under Clause 16.1 (the rest, "individual transport survey") and over individual transport survey follow-up results submission under Clause 16.3 by half year, and should recommend the improvement if necessary.
	Article 11(Cooperative Transport Survey) ① The Minister of Land, Transport and Maritime Affairs and a head of Local Self- Government may carry out a cooperative transport survey making an agreement considering cooperative transport surveys (the rest, cooperative transport survey) in any case of the following items. 1. In case of acknowledging each other that the periods, objectives and methods between National Transport Survey and individual transport survey are similar or the same, so there is a need to integrate and enforce 2. In case of asking the joint participation in national transport survey on condition that a head of local self-government bears partial expenses of national transport survey 3. Besides, in case that the Minister of Land, Transport and Maritime Affairs admits a cooperative survey is necessary

Integrated National Transport System Efficiency Act	Integrated National Transport System Efficiency Act Enforcement Ordinance
	② In a cooperative transport survey agreement, each of the following items should be included. 1. A cooperative transport survey plan 2. Cost sharing facts necessary for the cooperative transport survey 3. Report and use of cooperative transport survey results 4. Change and cancellation of the cooperative transport survey agreement 5. Measures considering the violation of cooperative transport survey agreement 6. Any additional necessities for the cooperative transport survey ③ According to the cooperative transport survey agreement, the related head of local self-government should regularly report current status of cooperative transport survey to the Minister of Land, Transport and Maritime Affairs. ④ If necessary, the Minister of Land, Transport and Maritime Affairs may inspect to see if the items determined by the cooperative transport survey agreement are carried out or not.
Article 17(Total Management of Transport Survey Data) ① In order to systematically and synthetically collect, analyze, and suggest the data and information on national transport survey and individual transport survey, the Minister of Land, Transport and Maritime Affairs should establish and manage National Transport DB, and periodically publish and announce National Transport Survey by presidential decree. ② When establishing and managing the individual transport survey data as National Transport DB, the Minister of Land, Transport and Maritime Affairs should synthetically examine survey data's relevance and connectivity with national transport survey data, and if necessary, may additionally do an in-depth analysis and discuss and revise through national transport DB conference by the clause 5. ③ As promoting any transport-related policy, plan, and service, the head of public agency should utilize national transport DB under the item 1 and national transport survey as a foundational reference. ④ In order to establish reliability and objectivity of national transport DB, the Minister of Land, Transport and Maritime Affairs may let a relevant expert or a specialized agency inspect toward national transport DB by decree of the Ministry of Land, Transport and Maritime Affairs.	Article 12(Total Management of Transport Survey Data) ① By the clause 1, article 17, the Minister of Land, Transport and Maritime Affairs should draw up National Transport Survey based on the results, announce this in the official gazette or publish and publicly announce through a computer network, a computerized medium or a publication whenever carrying out routine checkup by the clause 1, item 1, article 8. ② When implementing a nonscheduled survey under clause 8.1.2, the Minister of Land, Transport and Maritime Affairs may prepare national transport survey and publish and announce it in a way under the item 1. ③ In National Transport Survey under clause 1.2, the next following facts should be included. 1. The objective and direction of National Transport Survey 2. The scope, periods, facts and methods of National Transport Survey 3. The contents, results and utilization planning of national transport survey 4. In addition, the items which need to be included in national transport survey

Integrated National Transport System Efficiency Act	Integrated National Transport System Efficiency Act Enforcement Ordinance
⑤ So as to smoothly build up national transport DB, the Minister of Land, Transport and Maritime Affairs may organize and manage national transport DB meeting in which related public agencies participate by presidential decree. ⑥ Necessities for national transport DB establishment and management are determined by presidential decree.	④ In case that is recognized as necessary for national transport DB establishment and management under article 17, the Minister of Land, Transport and Maritime Affairs may ask a head of public agency for already established transport-related data submission such as transportation's management and use reality In this case, the requested head of public agency should follow except by special reasons. ⑤ For national transport DB's efficient establishment and use, the Minister of Land, Transport and Maritime Affairs may promote or support one of the following cooperation programs with domestic and foreign colleges, research laboratories, and additional agencies, organizations and specialists. 1. Research and investigation in transport survey and transport DB fields 2. People and information exchange in transport survey and transport DB fields 3. Standardization and technical development in transport survey and transport DB fields 4. Seminar and exhibition held in transport survey and transport DB fields 5. Additional services recognized as necessary for domestic and international cooperation in transport survey and transport DB fields
	Article 13(National Transport DB Council Organization) ① National DB Council under Clause 17.5 (the rest, "National DB Council") consists of no more than thirty members including a chair and a vice-chairman. ② The chairman of National Transport DB Council is appointed by the Minister of Land, Transport and Maritime Affairs among public and senior officials in the Ministry of Land, Transport and Maritime Affairs, and the vice-chairman is appointed by the Minister of Land, Transport and Maritime Affairs among forth-level and higher level officials tin the Ministry of Land, Transport and Maritime Affairs. ③ National Transport DB Council chairman represents National Transport DB Council and directs the duty. ④ In National Transport DB Council, there will be an assistant administrator who deals with National Transport DB Council's office work, and the assistant administrator will be recommended among the staff members of the Korea Transport Institute according to 「the Law Considering the Establishment, Management and Development such of a Government-Supported Research Institute」 and nominated by the chairman of National Transport DB Council.

Integrated National Transport System Efficiency Act	Integrated National Transport System Efficiency Act Enforcement Ordinance
	⑤ National Transport DB Council's members will be appointed by the Minister of Land, Transport and Maritime Affairs while corresponding to the next following items. 1. A person who is appointed by the head of public agency, among forth-level and higher level officials in related government agencies, metropolitan city, megalopolis, province, or special self-governing province 2. A person who is recommended by the related head of public agency and appointed by National Transport DB Council's chairman under Clause 2.18, among the public agency staffs from Article Ga to Article Da 3. A person who has specialty and experience in transport survey or transport-related data's DB establishment, and who is recommended by the National Transport DB Council's chairman ⑥ Under Clause 5.3, the appointed member's term is two years. Article 14(Meetings) ① The chairman of National Transport DB Council calls National Transport DB Council's meetings and becomes the chair. ② The National Transport DB Council's meetings are classified into annual regular ones and extraordinary ones held in case the chairperson admits the necessity. Article 15(Agenda) National Transport DB Council discusses and adjusts the next each following item. 1. Connection and cooperation of transport survey and data collection 2. Connection system between national transport DB and collected data from public agency's individual transport survey results 3. Efficient supply and share plans of transport survey data 4. Task improvement such as the standardization of transport surveys and national transport DB establishment methods 5. Improvement plans of national transport DB's utilizability 6. Overlap prevention plans among transport surveys 7. Additional necessary facts to establish and manage national transport DB Article 16(Rules for Operation) In addition to the regulations in this, any other necessary facts for National Transport DB Council's organization and management are determined by the chairman of National Transport DB Council through National Transport DB Council's meetings.

Part - Ⅱ

[2011 Modularization of Korea's Development Experience]

A Case Study on the Legal Framework and Financing of Transport Infrastructure

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Contents

Summary 1

Chapter 1. Background of Transportation Investment 3

1. Historical Transportation Trends 4

1.1 Before 1960s 4

1.2 After 1960s 8

2. Transportation Infrastructure Trends by Sector 15

2.1 Trends in Roadway Sector 15

2.2 Trends in Railroad Sector 26

2.3 Transportation Infrastructure Trends and National Comprehensive Development Plan 28

Chapter 2. Transportation Investment Strategy 33

1. National Transportation Infrastructure Investment Plan 33

1.1 Transportation Infrastructure Renovation Master Plan 33

1.2 Relevant Acts 34

2. Organizational Structure by Sector 36

2.1 Roadway Sector 36

2.2 Railroad Sector 37

3. Relevant Acts and Policies by Sector 39

3.1 Roadway Sector 39

3.2 Railroad Sector 43

4. Transportation Infrastructure Financing 45

4.1 Transportation Infrastructure Costs Allocations by Authorities 45

4.2 Transportation Infrastructure Investment Financing by Sector 45

Chapter 3. Policies Led to Successful Transportation Investment 50
1. Establishment of Korea Highway Corporation 53
2. Railroad Reform and Korea Railroad Corporation 59
3. Transportation Infrastructure Special Fund 62
4. National Comprehensive Transportation System Master Plan 70
4.1 National Comprehensive Transportation System Background and Need 70
4.2 National Transportation Network Plan 71
4.3 Midterm Transportation Infrastructure Investment Plan 79
4.4 Long-term Transportation Infrastructure Investment Plan by Sector 90
5. National Integrated Transportation System Efficiency Act 96
5.1 Background and Progress 96
5.2 Major Requirements 97
6. Urban Transportation Maintenance Facilitation Act and Metropolitan Transportation Management Special Act 101
6.1 Urban Transportation Maintenance Facilitation Act 101
6.2 Metropolitan Transportation Management Special Act 105
7. Policy and Technology Support for Efficient National SOC Investments 111
7.1 Development and Implementation of National Transportation Database 112
7.2 Development and Implementation of Investment Efficiency Evaluation System 116
7.3 Transportation Infrastructure Investment Evaluation Policy 122

Contents

Chapter 4. Outcomes and Conclusions 125
1. Outcomes 125
1.1 Increased Investments in Roadway and Railroad 125
1.2 Increased Roadway and Railroad Facilities 128
1.3 Enhancement of Transportation Sector Competitiveness 132
2. Conclusions and Recommendations 137

References 144
Appendix 146

Contents _ List of Tables

<Table 1-1> Road Overview during the Japanese Colonial Rule 5
<Table 1-2> Transport Overview at the Time of Korea's Liberation 6
<Table 1-3> South Korea's Economic Indices until the 1980s 9
<Table 1-4> Urbanization Trends (Until the 1980s) 13
<Table 1-5> Gradual Changes in the National Public Land (Until the1980s) 13
<Table 1-6> Transportation Policy by Period (Until 1980s) 15
<Table 1-7> Road Length Changes under the 1st Five-Year Socioeconomic-Development Plan (1962-1966) 16
<Table 1-8> Road Length Changes under the 2nd Five-Year Socioeconomic-Development Plan (1967-1971) 17
<Table 1-9> Road Length Changes under the 3rd Five-Year Socioeconomic-Development Plan (1971-1976) 18
<Table 1-10> Road Length Changes under the 4th Five-Year Socioeconomic-Development Plan (1977-1981) 18
<Table 1-11> Road Length Changes under the 5th Five-Year Socioeconomic-Development Plan (1982-1986) 19
<Table 1-12> Road Length Changes under the 6th and 7th Five-Year Socioeconomic-Development Plans (1987-1996) 20
<Table 1-13> Road Length in the Second Half of the 1990s 20
<Table 1-14> Carriage Share of Railroads 26
<Table 1-15> Modernization Trends of Railroad Construction 27

Contents

<Table 2-1> Mid- and Long-Term Transportation Facility Plans 34
<Table 2-2> Laws Pertaining to Transport Implementation 35
<Table 2-3> Road-related Law System 43
<Table 2-4> Financing Ratio between Central Government and the Municipality 45
<Table 2-5> Road Account Revenue Details 46
<Table 2-6> Investment Ratios by Transport Mode in the Five-Year Socioeconomic Development Plan Periods 48
<Table 2-7> Transport Investment in the Last Five Years 49

<Table 3-1> Revenues and Expenditures under the Transportation Facility Special Account (Road, Railroad, and Metropolitan) 64
<Table 3-2> Gradual Strategies of the Key National Transport Network Plan 74
<Table 3-3> Index Goals of the Key National Transport Network Plan (2nd Revised Plan) 76
<Table 3-4> Investment Size of the 1st Midterm Transportation facility Investment Plan (2000-2004) 82
<Table 3-5> Facility Development Achievements of the 1st Midterm Transportation Facility Investment Plan (2004) 84
<Table 3-6> Transport Prospects after the Completion of the 2nd Midterm Transportation Facility Investment Plan (2005-2009) 84
<Table 3-7> Transport Prospects after the Completion of the 3rd Midterm Transportation facility investment Plan (2011-2015) 85
<Table 3-8> Road Length Changes under the Master Plan for Road Improvement (1999-2011) 92
<Table 3-9> Road Length Changes under the Revised Master Plan for Road Improvement (2006-2010) 93

<Table 3-10> Investment Plan under the 1st National Railroad Network Development Plan 95
<Table 3-11> Overview of the South Korean Transport DB Development 115
<Table 3-12> Total Project Cost Management Procedure of the Ministry of Planning and Budget 117
<Table 3-13> Categorization of Policy Analysis Items 120

<Table 4-1> Transportation Facility Investment Percentages of the GDP 127
<Table 4-2> Transportation Facility Investment Trend after 2000 128
<Table 4-3> Trends in Road and Railroad Transportation Facility Expansion 129
<Table 4-4> Road Length Trends by Class 130
<Table 4-5> Railroad Facilities by Year 130
<Table 4-6> Road Length Trends by Year 131
<Table 4-7> Railroad Length Trends by Year 132
<Table 4-8> Railroad Double-tracking and Electrification Ratios by Year 132
<Table 4-9> Inter-Region Mode Split by Category 134
<Table 4-10> Domestic Inter-Region Passenger Carriage Ratio Prospects by Category 134
<Table 4-11> Traffic Congestion Cost Trends 135
<Table 4-12> Logistical-Cost Trends 137
<Table 4-13> Transportation facility Expansion Trends and Prospects 140

Contents

Contents _ List of Figures

<Figure 1-1> The Location of Industry on the 2nd Land Development Masterplan 11
<Figure 1-2> Road policy trends 22
<Figure 1-3> Key National Road Network Plan
(under the 2nd Master Plan for Road Improvement) 23

<Figure 2-1> Road-related organizations 37
<Figure 2-2> Railroad-related Organizations 39
<Figure 2-3> History of Railroad-related Laws 44

<Figure 3-1> Success Factors of Transport investment 53
<Figure 3-2> Project Investment Evaluation Procedure. 124

<Figure 4-1> Transport Network Plan (Road Network, 2011~2020) 142
<Figure 4-2> Transport Network Plan (Rail Network, 2011~2020) 143

Summary

The country's transport infrastructure is ranked above the mid-level among the OECD countries. South Korea has drastically developed its transport infrastructure in a very short time since the second half of the 1960s. This drastic transport system development has boosted the capacity of carrying passengers and cargo, further propelling the country's economic growth.

Korea's remarkable transport system development contributed greatly to the country's economic growth by expanding the passenger and cargo carrying capacities of the nation's transport facilities. Such drastic transport infrastructure development is attributed to efforts to develop a comprehensive transport system closely integrating all modes of transport. For transport development, the fundamental transport plan, known as the Twenty-Year Key National Transport Network Plan, and its execution and five-year plans were formulated. To achieve the goals and strategies stipulated in these plans, master transport development plans for roads and railroads are devised, upon which the implementation of transport investment is based.

This study aimed to determine the successful projects and policies involving roads and railroads so as to provide references for the future implementation of transport policies. Towards this end, the study focused on presenting examples of successful laws, systems, organizations, financing, and plan implementations with regard to the expansion of the country's transport facilities. To determine the background of the country's SOC implementation, changes in South Korea's country's historical context and various categories of transport were examined. And the administrative systems, laws, and financing systems related to roads and railroads were also presented to evaluate how the development of the transport was carried out in the country.

The success factors driving the drastic development of roads and railroads were

determined. For the success of the transport development, various factors should be closely harmonized, including the related organizations, laws, systems, and financing. Seven success factors were determined, and their backgrounds and achievements were examined.

First, in terms of organizations, the establishment of KEC and railroad companies was examined. In terms of legislation, the Transport System Efficiency Act, the Urban Transport Improvement Promotion Act, and the Special Act on Large-City and Metropolitan Transport Management were assessed, and their role in the development of a road and railroad was analyzed. In terms of plans, the roles and contents of the Twenty-Year Key National Transport Network Plan and its execution plan, the Five-Year Midterm Transport Facility Investment Plan, were presented. Moreover, the basic road improvement plans-the Midterm Plan for Roads and Railroads and the National Railroad Network Development Plan-were examined. To efficiently expand transport facilities, the supply of transport infrastructure should be timely developed, which further underscores the importance of securing stable investment finance. To secure the needed finance, South Korea established a transport facility special account in the 1990s, which it has been successfully running since then. In this study, the transport facility special account was determined to be a success factor in terms of finance, and was thus discussed in further detail. Lastly, diverse technologies were developed and diverse policies were implemented to efficiently pursue SOC development. This study determined and examined three success factors in this regard including the following: the development and operation of the South Korean Transport DB, the development and operation of the investment project efficiency evaluation system, and the formulation of guidelines for transport facility investment evaluation.

Compared with other countries, South Korea achieved fast economic growth and experienced various economic and political changes since the 1970s. Diverse laws, systems, and financing methods that were introduced at that time were formulated and implemented in line with such domestic circumstances. Thus, these measures and systems-if intended to be applied to other countries-should be reviewed in terms of the relevant country's politics, economy, geography and space, and the people's sentiment. Also, it should be noted that these Korean cases of measures were implemented in the past, so they should be revised and adjusted if they are to be applied in other countries.

Chapter 1.

Background of Transportation Investment

South Korea achieved rapid economic development through industrialization for 40 years since the 1960s. Through its economic-development plans and comprehensive public land development plans, roads and railroads as important SOCs have provided important foundations for economic development. Until the 1990s, transportation policies focused on the expansion of transportation facilities for economic growth. In the second half of the 1970s, urban transport emerged as a new problem. Diverse efforts to ease urban congestion were carried out.

As of 2010, the country's total road length amounted to 105,565 km, and the total railroad length stood at 3,558 km. 3,859 km of expressways had been constructed, while the high-speed railroad extended 369 km. These transportation networks have turned the entire country into a half-day life bloc. The country's transport infrastructure is ranked above the mid-level among the OECD countries. South Korea has drastically developed its transport infrastructure in a very short time since the second half of the 1960s. This drastic transportation system development has boosted the capacity of carrying passengers and cargo, further propelling the country's economic growth.

This chapter deals with the changes in the transportation sector in the period spanning the 1960s, when the development of the country's transport began in earnest, to the 1980s, when the implementation of the 4th Economic-Development Plan was completed. It also examines how these changes influenced the transport development system, which has been seriously implemented since the second half of the 1980s.

1. Historical Transportation Trends

1.1 Before 1960s

1.1.1 Transportation Conditions in the Last Joseon Period and During Japanese Colonial Rule

During the final Joseon period 100 years ago, the country's transportation system developed without guided planning. As horse- and ox-driven carriages were the main Transport modes, road development was meager. Influenced by Japan's railroad development, railroads were established in Korea beginning in the early 1900s. The Gyeongin Line was opened in 1899, followed by the Gyeongbu Line in 1905 and the Gyeongui Line in 1906. This marked the beginning of the systematization of the country's transport infrastructure.

The railroad development had large economic and social impacts. The national public land structure was reformed, the country's local economies were developed, and changes to the mindsets, lifestyles, and culture of the Korean people followed. New commercial cities were constructed alongside the railroad networks. This drastically changed the conventional road-based national public land structure. Although the railroads greatly influenced the national public land structure and the people's lives and culture, the public land development driven by Japanese capital was unbalanced.

While roads had been less developed than railroads, Japan began to construct roads for security and military purposes. 25,500 km of roads were constructed during a thirty-six-year time period. In 1905, Japan sent engineers from its Interior Ministry to Korea to inspect the nationwide road situation. In 1906, Japan devised a seven-year road renovation program and constructed roads, particularly through the Road Management Bureau. In the first stage, four roads with a total length of 255.9 km were constructed. During the second stage, eighteen roads totaling 553.7 km in length were constructed.

With the construction of modern roads, automobiles were introduced to Korea beginning in 1903. By 1945, there were 7,326 automobiles in the country. In 1910, Chongdokbu, the Japanese Governor-General of Korea, enacted and promulgated

the Road Act and devised and implemented road plans. In the first road construction period (1911-1917), 36 roads spanning 2,690 km were constructed. Roadways and sidewalks were divided into major road segments, main roads were paved with asphalt, and a bridge was constructed across the Han River. The second road construction periods lasted from 1917-1938, although the plan was postponed from 1922 to 1938 due to financial constraints. Twenty-six roads with a total length of 1,880 km were constructed. By the end of the 1930s, of the total projected 24,538 km of roads, 18,910 km or 77% had been constructed. Japan constructed minimal narrow roads for the purpose of governing its colony. In 1938, the Joseon Road Enforcement Decree was enacted, which classified roads into four types: national, local, provincial roads. Moreover, road numbers, road names, junctions, ending points, major stopover points, and relational maps were established for the ninety-two designated roads.

<Table 1-1> Road Overview during the Japanese Colonial Rule

(Unit : km)

Year	National roads	Local roads	City, provincial roads	Total Length
1921	2,014		1,673	3,687
1925	2,357		1,999	4,351
1930	2,906	7,335	8,674	18,915
1935	2,981	8,880	11,771	23,679
	National roads	Local roads		
1940	11,490	15,008	-	26,498
1942	11,731	15,259	-	26,990
1945 (Korea's iberation)	5,263	9,997	8,770.8	24,030

Note: (1) Japan intensively developed northern, southwestern, and southeastern Korea for the exploration and invasion of Korea as well as for its benefit.
(2) In 1945, paved roads (mainly congested roads) accounted for 45% of the total roads in South Korea.
Source: Road Work Handbook, Ministry of Land, Transport and Maritime Affairs (MLTM), 2011

1.1.2 Transport Conditions after Korea's Liberation

After its liberation, Korea was embroiled in political and social chaos, which disabled the proper management of even the existing transportation facilities constructed by the imperial Japanese. Furthermore, the Korean War wrought great havoc on the facilities, which were mainly intended for military purposes, creating

major regional imbalances. Amidst these dire circumstances, Korea nationalized eight private railroads, including the Chungbuk Line, in 1946, and constructed an electric railroad between Jecheoon and Punggi in 1947. However, these projects suffered from financial difficulties and poor operation.

<Table 1-2> Transport Overview at the Time of Korea's Liberation

Category	Railroads		Public Roads	
Description	Operating distance (km)	6,362	National roads (km)	5,263
	No. of stations	762	Local roads (km)	9,997
	No. of locomotives	1,167	City, Provincial roads (km)	8,771
	No. of passenger rolling stocks	2,027	No. of automobiles	7,326
	National roads	15,352		

Source: "Transport Annals"(Transport Newspaper, 1976), "Korea Road" (KEC, 1981)

Though road projects were hindered by financial difficulties, road and bridge improvement projects were activated in 1945. The Seoul-Gangneung, which traversed Gangwon Province, and Seoul-Busan national roads were paved in 1946. 60% of the nation's roads and most of its bridges were destroyed during the Korean War. After the war truce, the Korean government asked its allies for assistance in restoring the provincial road infrastructure. The country obtained aid from ICA and AID from 1954 to 1962. Korea was able to complete the restoration the Han River sidewalks in 1958 begin paving the Seoul-Busan National Road in 1957.

The total length of operating railroads immediately following liberation was 6,362 km. Railroad construction commenced right after the Korean government was established in 1948. Under the Five-Year Economic Revival Plan formulated in 1948, Korea constructed three railroads: the Yeongam Line, the Hambaek Line, and the Mungyeong Line. The existing railroad networks and facilities, however, were destroyed during the Korean War, which made the proper operation of railroads incredibly difficult. Most of the railroads in Seoul were destroyed during the Korean War, except the areas south of Jicheon for the Gyeongbu Line, south of Gyeongju for the Donghae Line, and south of Haman for the Jinju Line. With the support of the UN Armed Forces and the ten-year-long efforts after the Korean War truce, the railroads were restored.

Foreign Borrowings for Transportation Sector Projects

1. Foreign Borrowing-supported Project-Road Sector (A White Paper on Roads, 2003, the Ministry of Construction and Transportation)

After the Korean War ended with the signing of a truce agreement, the South Korean government negotiated aids for war-damage restoration measures with friendly nations that participated in the war. As a result, South Korea began to receive aid from International Cooperation Administration (ICA) in 1954. The country also received from UNKRA (United Nations Korean Reconstruction Agency) and other donors a total of USD 236.7 million in aid in 1955, USD 326.7 million in 1956, and USD 382.8 million in 1957. This assistance continued until 1962. On the other hand, for the road and bridge aids from ICA and AID, a benefaction of USD 15 million and 76,623 was received from 1954 to 1962, thus enabling the country to secure such construction materials as steel, cement, bars, wood, and asphalt. Corresponding labor costs were covered by the government's or municipalities' taxes. In May 1958, the Han River walkway bridge restoration was completed. By 1962, local road pavement and local road bridges restoration were nearly completed. A remarkable ingenuity in restoration work happened in 1952. That was the time when no war-damage restoration aids from the USA were yet received, making it impossible to procure restoration materials domestically. Hence, old railroad tracks were then used in restoring some large and long bridges including the Nakdong River's Goryeong Bridge. It was a stopgap but a highly ingenious idea. In line with restoration projects, Seoul-Busan national road pavement work was planned, and thus pavement work was conducted in Seoul, Daejeon, Daegu, and Busan beginning in 1957. Road expansion and pavement work was conducted in Seoul-Incheon and Busan-Masan segments as well, and large and long bridges such as Naju Bridge, Munmak Bridge, Sunsan Bridge, and Dalcheon Bridge were constructed. Also, according to the Commercial Industry's coal mine comprehensive development plan, large-scale coal mines in Yeongwol, Samcheok, and Jeongseon in Gangwon Province, as well as Hwasun coalfield in Honam were actively developed. To that end, industrial road network construction plans in consideration of railroads, roads, and coal blocks were formulated and implemented year by year, thus proliferating coal and creating the foundation for the development of coal mines. Hence, the country's war-damage restoration work was successfully carried out thanks to ten years of aids from ICA and others involving huge finance and technical teams, enabling a modernization of

various affected structures.

2. Foreign Borrowing-supported Project-Railroads (South Korea's history and development of railroads, co-authored by Lee Yong-sang et al., 2011)

Most of railroad facilities were destroyed during the Korean War, and steam locomotives, which were mobilized to carry war supplies during the war, were dilapidated, making it difficult to properly transport cargoes and people until 1960.

With the aid from FOA, 1,540 rolling cargo stocks were acquired in February 1955. Passenger rolling stocks began to be manufactured locally on February 27, 1959, and their launching ceremony was held on August 20 of that year.

On March 15, 1956, the Busan locomotive factory and the Jecheon factory were established, beginning the inspection and operation of diesel locomotives. Thus, concerted efforts were made to introduce diesel locomotives to modernize powered rolling stocks.

Due to the state financial difficulty caused by war-damage restoration work, the country depended on borrowings from ICA for its most of finances.

Also, as a part of the five-year economic development plan, the country acquired 15 diesel locomotives with a loan from AID, and another 157 trains gradually by July 1967.

In 1963 the lender changed from AID to EXIM BANK and IBRD. In 1968-1978, 100 trains with the borrowings from EXIM and 50 trains with the borrowings from IBRD were acquired, bringing the total of diesel trains to 410.

Diesel trains were imported until 1979 when Hyundai began to manufacture them, spreading locally manufactured diesel trains.

1.2 After 1960s

1.2.1 Growth of National Economy

South Korea achieved an average 8.8% real annual economic growth from 1962 to 1971. From 1972 to 1981, a high economic growth rate was reported at 7.7%. The GNP in terms of current prices rose from KRW 716 billion in 1964 to KRW 105.6 trillion in 1987; hence, the per-capita GNP rose from USD 103 to USD 3,098. The balance on current account also shifted from deficit to surplus in 1986.

<Table 1-3> South Korea's Economic Indices until the 1980s

Category	Unit	1964	1971	1987
GNP	Current price (KRW 1 billion)	716	3,295	105,630
Per-capita GNP	Current price ($)	103	278	3,098
Balance on Current account	Current Market price (USD100 million)	Δ 0.3	Δ 8.5	98.5

Source: Economic Planning Board (EPB), "Major Economic Indices," various years

This economic development greatly changed South Korea's industrial structure. The industrialization policy under the economic development plan shifted from the country's traditional agriculture-oriented industrial structure to an advanced industrial structure in the second half of the 1980s. From 1961 to 1987, the secondary industrial sector, led by the manufacturing industries, and the SOC and service sector, posted average annual growth rates of 29.5 and 27.1%, respectively. The secondary industrial sector's share in the country's GNP more than doubled from 15.3% in 1961 to 32.2% in 1987.

For South Korea, the economy and transportation system are closely related and have grown alongside one another. In line with the expanding economic scale and production volume, demand for transportation increased as national income rose. The number of passengers increased from 6.79 million in 1961 to 12.01 million in 1986, and the domestic cargo volume increased from thirty-two million tons to 259 million tons. This increase in transport volume further accelerated the economic growth. After 1960, the transportation sector increased its share of the GNP from 2.7% in 1962 to 4.8% 1971 and 6.8% in 1981.

1.2.2 Industrialization

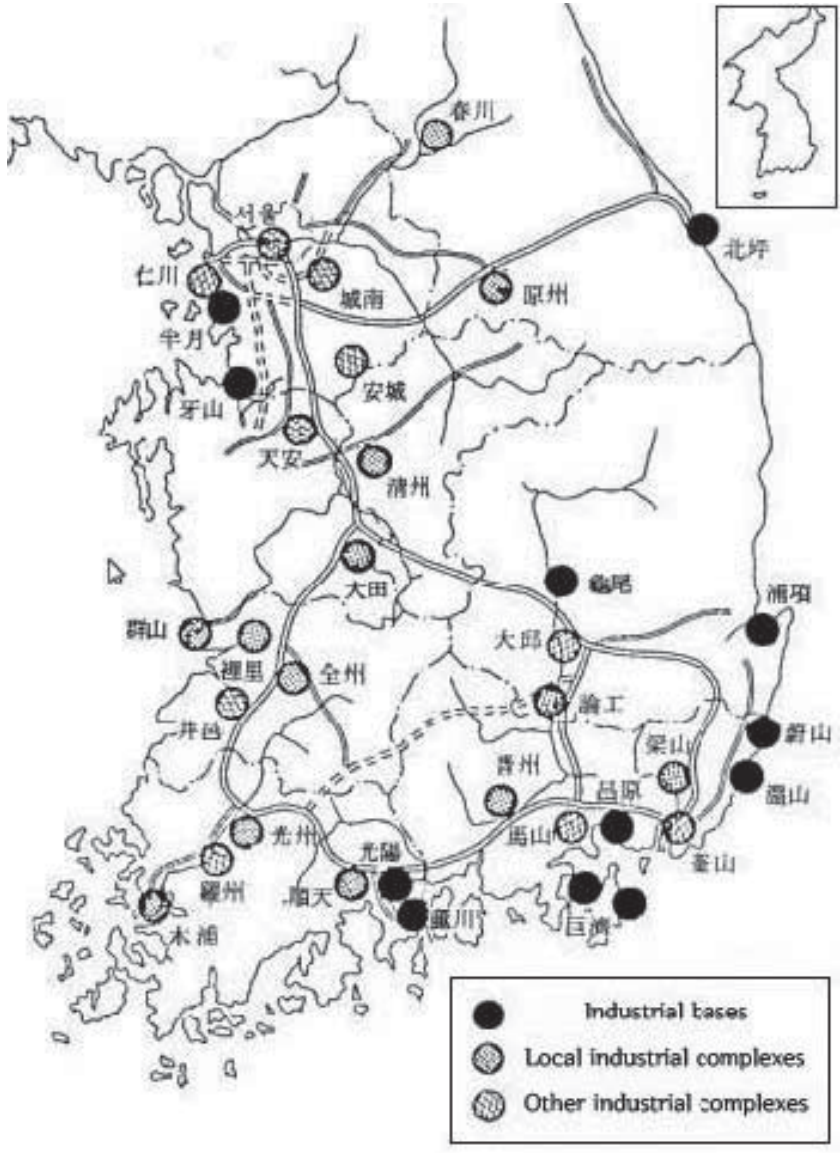
In the first implementation stage of the economic development policy, transport infrastructure and necessary financing sources for its investment were very limited. Moreover, the transportation facilities, which are a base for industrialization, were poor. The railroads were only centered on transporting to/from Seoul, and most of the national roads were unpaved. Railroads were the main means of transport. Industrial-siting policies were implemented to reduce SOC investment costs by clustering

relevant industries and developing industrial sites mainly in the Seoul metropolitan and southeastern coastal areas. The country's transport conditions therein greatly influenced the industrial siting. During the early 1960s, the Seoul metropolitan housed Incheon Port, which facilitated the transport of raw materials.With access to railroad services, unlike the other regions, it was a favorable industrial site.

The development of the southeastern coastal industrial-belt region began in the 1960s with growth focused on steel production, petrochemicals, and other key industries requiring imported raw materials. This region was adjacent to the only double-track electric railroad then available, the Gyeongbu Line, and to Busan Port, thus enjoying a favorable location. The region, which became the country's industrial belt due to the policy fostering the heavy-chemical industries, was better able to connect to the Seoul metropolitan. Further development was made possible with the construction of the Gyeongbu Expressway.

In the 1970s, the industries were distributed to the provincial areas, resulting in increased carriage demand greater than the railroad facility capacity. This led to the construction of expressways to and from the Seoul metropolitan. These expressways increased interregion accessibility and further promoted industrial development. Notably, the Gyeongbu Expressway, which connected the Gyeongin axis and southeastern coastal industrial belt, boosted this region's development as well as the country's economic growth.

In the 1980s, this industrial-hub development brought about an imbalance in regional growth that had to be corrected. The public land development paradigm was shifted to facilitate more balanced development. This changed the investment in transportation strategy from the supply of facilities driven by economic-growth to balanced regional growth.



<Figure 1-1> The Location of Industry on the 2nd Land Development Masterplan

1.2.3 Urbanization

In the early 20th century, the country's public land development was begun by the imperial Japanese, who intended to use Korea as a logistics depot for making inroads onto the Chinese continent. Afterwards, full-fledged public land development began in the 1960s under the country's economic-development plan with a focus on infrastructure expansion that reinforced economic growth. Likewise, transport development was implemented as such.

Together with the economic development plan, a ten-year comprehensive public land development plan was devised and implemented to efficiently use, develop, and preserve public land resources beginning in 1971. Comprehensive socioeconomic development region was planned and implemented in the first development stage, which lasted from 1972 to 1981, which encompass roads, railroads, water, electric power, and communications reinforced economic growth. Moreover, large-scale economic projects were implemented, with priority placed on projects supporting industrialization. This scheme brought about corresponding ripple effects across the board. Among the projects, expressways were developed most prominently, reaching a total length of 1,225 km, which enabled travel across the entire nation within a day. A dense population in Seoul and other large cities ensued with unbalanced regional development. Up until the third plan, the term "development" was used and emphasized, though beginning with the fourth plan; the term "comprehensive public land plan" has been used instead to divert attention away from an image of environmental destruction towards one in harmony with the environment. The fourth plan was recently revised to cover the period from 2011 to 2020.

Due to this push for public land development, the country has experienced rapid urbanization since the latter half of the 1980s. Urbanization was driven by migration in the wake of the Korean War due to political and social changes rather than by industrial development that took place in the years following the country's liberation until the 1960s. True urbanization occurred as many people migrated to the cities from the rural areas as active economic growth presented opportunities for low-wage labor in urban areas. If defining a city by the standard of a county with a population of over 20,000, the urbanization ratio increased from 39.15% in 1960 to 77.9% in 1985, while the number of cities increased from twenty-seven in 1960 to sixty-one in 1986.

<Table 1-4> Urbanization Trends (Until the 1980s)

(Unit: 1,000 people, %)

Category	1960	1966	1970	1975	1980	1985
Total	24,989	29,193	31,435	34,679	37,449	40,432
Urban population	9,784	12,440	15,750	20,480	25,738	31,496
Rural population	15,205	16,753	15,685	14,199	11,711	8,936
Urbanization ratio	39.15	42.61	50.10	59.06	68.73	77.90

Source: Home Ministry, "South Korea City Annals"
Note: Urban population refers to the population of a county-grade city with over 20,000 inhabitants.

The country's urbanization was characterized by rapid urbanization and concentration of population in large cities, especially in the Seoul metropolitan. Until the early 1980s, the investment in transportation focused on the expansion of key roads to reinforce economic development rather than on addressing the urban problems, thereby leading to the creation of serious present-day transport problems in large cities. The gradual changes in the national public land are outlined in <Table 1-5>, from the perspective of public land development, urban development, and transportation facility development.

<Table 1-5> Gradual Changes in the National Public Land (Until the1980s)

Category	1950s	1960s	1970s	1980s
Public land development	Restoration of public lands Consumer goods industry	Economic construction Light-industry development	Expansion of industrial infrastructure Heavy-chemical industries	Balanced regional development Technology-intensive industries
Urban development	Urbanization Restoration and improvement	Concentration in large cities Land readjustment	Large city improvement New industrial city construction	Development of metropolitans Construction of satellite cities
Transportation facility development	Public land improvement	Construction of industrial railroads Electrification of railroads	Expressways Subways	Framework of the entire national public land Expansion of the inter-region road networks

Source: Modern Society Research Institute, National Development and Policies, 1984

1.2.4 Transportation Policy

After the 1960s, the mainstream transportation policy focused on facility investment under the national economic development plans and comprehensive public land development plans. The 1960s, during which the implementation of the Five-Year Economic-Development Plan began, is a growth base creation period for the promotion of the heavy-chemical industries after the light-industry development period. Intensive investments were made in the transport infrastructure, such as railroads and roads. Under the initial plan, the transportation sector aimed to efficiently connect the raw-material production areas, factories, and consumers so as to maximize the production activities. Industrial railroads were electrified to carry coal. In the first-plan period, a budget of KRW 21.5 billion or 4.6% of the state coffers was allocated for railroads, while investment in roads amounted more than five times that for railroads. After the second half of the 1960s, with the increase in number of automobiles, demand in road carriage rose, in response to which large investment in roads was made. During the 2nd Five-Year Economic-Development Plan period, the public road investments represented 62% of investments for the entire transportation sector.

The implementation of a comprehensive public land development plan began in the 1970s public land. Significant socioeconomic growth was achieved during the 1970s, and the expansion of urbanization and sharp rise in the number of automobiles greatly changed the transportation policy. The transportation policy was implemented not as part of the economic plan but rather the public land plan, which focused on strategies for fostering the export industries and for developing hub areas. Specifically, more investments were made for the expansion of harbors and expressways. Road investments represented 50% of total investment in transportations, while the investments in railroads accounted for a significantly lesser share, resulting in the continuous reduction of its carriage share. Urban transport problems following the rapid urbanization intensified in the 1970s, especially in the Seoul metropolitan. To alleviate some of these problems, requiring investments were made in the construction of subways and electric railways.

Urban transport problems worsened in the 1980s as increasing use of automobiles in the country caused parking and congestion problems. The 2nd Comprehensive

Public land Development Plan was under implementation during the 1980s. The GDP was increasing and the number of automobiles rapidly increased. Accordingly, transport policies focused on enhancing access to underdeveloped areas and addressing urban traffic congestion. National, local, city and county roads were paved, and the 88 Olympic Expressway was constructed to promote movement and exchange between the southeastern and southwestern regions of the country. Moreover, the special account for road improvement projects was established to secure a substantial road construction budget. It became the prototype of today's special account for transportation facilities.

<Table 1-6> Transportation Policy by Period (Until 1980s)

Category	1960s	1970s	1980s
Major policies	· Initial investment focus on railroads · Road investment and road network strengthened after mid-period · Expanded licensing of transportation operators and increased number of automobiles country's transport capacity · Protection and foster of initial automobile industry	· Expansion investment in harbors and expressways · Automobile industry fostered · Subways and electric trains constructed in the Seoul metropolitan	· SOC expansion, including expressways and airports · Continued development of automobile industry · Expansion of national and local roads to increase daily-life convenience. · Urban transportation measures devised

Source: A Study on the Transportation Policy for Advanced Industries, KOTI, 1993

2. Transportation Infrastructure Trends by Sector

2.1 Trends in Roadway Sector

As mentioned earlier, road planning and construction projects began in the Joseon and Japanese colonial periods, beginning with road improvement projects. Road construction began full-swing with socioeconomic development. Under the 1st Five-Year Socioeconomic-Development Plan (1962-1966), which was called Economic Development Plan until 1982, a total road budget of KRW 14 billion was allocated. 431 bridges, as well as industrial roads totaling 73.7 km in length were constructed to develop coalmines. With the support of the National Defense Ministry and the 8th

U.S. Armed Forces, roads totaling 488 km in length were paved. In addition, 120 km of roads were improved (e.g., road expansion, road line improvement). Moreover, with the enactment of the Road Act in 1963, special-city roads were created. Increases in the road network during this period are outlined in <Table 1-7>.

On the other hand, during the 1st Five-Year Socioeconomic Development Plan period, the demand-supply imbalances in the transportation sector slowed the economic growth. IBRD investigated this problem upon request of the Transport Ministry. The study determined the details of the investment factors and transportation facilities, and recommended an increase in road construction investment and reduction in railroad investment in order to promote economic growth. Moreover, the study recommended that the term expressway be used, the term Road Section should be upgraded to Road Bureau, and toll-based roads would be inappropriate for some time if foreign loans were unavailable.

<Table 1-7> Road Length Changes under the 1st Five-Year Socioeconomic-Development Plan (1962-1966)

(Unit: km, %)

Year	National Roads			Local Roads	Special-City Roads	City, County Roads	Total	Paving Ratio
	1st-Grade	2nd-Grade	Total					
1962	-	-	5,743	10,542	-	10,884	27,169	4.1
1966	3,135	5,501	8,186	10,395	1,862	14,003	34,476	5.8

Source: Road Work Handbook, MLTM, 2011
Note: In line with the 1963 Road Act amendment, the national roads were classified into 1st and 2nd-grade national roads and special-city roads were created.

IBRD's Survey of Transport

1. Background

· In the first five-year economic development plan period, an imbalance in demand for transportation occurred, hurting economic growth.
· The Transport Ministry and the Construction Ministry led efforts to write research reports based on surveys.
  - IBRD's survey report on South Korea's transport
  - The Ministry without portfolio formulated future transport network measures
  - Korean Industry Management HQ made research reports on public roads and public road transport projects.

2. Outline of IBRD's Transport Survey (Jan 1965-June 1966)

· The Transport Ministry requested IBRD to conduct research

· A foreign consulting firm defined details on nationwide transportation facilities and investment requirements.

· The firm recommended reducing investment in railroads and instead expanding road investment to further boost the country's economic growth.

· The firm also recommended expanding the Road Section into Road Bureau.

· The firm concluded that the construction of toll-pay roads would be negative for some time unless the country seeks to earn foreign borrowings.

· The term expressway was first used in the country.

Source: Road Work Handbook, MLTM

Under the 2nd Socioeconomic Development Plan (1967-1971), the main Transport modes shifted from railroads to roads, and road pavement and maintenance were conducted as a part of the nationwide road improvement projects. Moreover, the Road Improvement Promotion Act and the Special Account Act for Road Improvement were promulgated (1968), enabling the investment of fuel taxes and driving taxes in road construction. The budget thus drastically increased from KRW 30 billion to KRW 68.7 billion, leading to the fundamental reform of the road policy. In 1967, construction of the Seoul-Incheon Expressway began and a ten-year expressway construction plan was devised. The road length changes in this period are outlined in <Table 1-8>.

<Table 1-8> Road Length Changes under the 2nd Five-Year Socioeconomic-Development Plan (1967-1971)

(Unit: km, %)

Year	Express-ways	National Roads	Local Roads	Special-City Roads	City, County Roads	Total	Paving Ratio
1966	-	8,186	10,395	1,862	13,033	33,476	5.8
1971	655	8,146	10,760	5,661	15,413	40,635	14.2

Source: Road Work Handbook, MLTM, 2011

Note: In line with the 1970 Road Act amendment, expressways were established, and the 1st and 2nd-grade national roads were changed into general national roads.

In the 3rd Socioeconomic-Development Plan period (1972-1976), expressways were constructed, turning the entire country into a one-day life bloc. Notably, the

construction of the Gyeongbu Expressway drastically increased the carriage share of public roads. The ratio of paved national roads significantly increased from 23.7% to 70.2%, and the construction of the Honam, Namhae, and Yeongdong Expressways was implemented. Moreover, with loans obtained from IBRD, key roads began to be paved. The National Road Maintenance Office was established to perform maintenance work of national roads. The road length and paved road ratio changes in this period are outlined in <Table 1-9>. South Korea began to borrow money from IBRD in 1972 to construct roads. With loans amounting to USD 764.5 million obtained on six occasions, 571 km of expressways were constructed, 300 km of national roads were expanded, and 2,968 km of national roads were paved. The expressways contributed greatly to the country's economic development.

<Table 1-9> Road Length Changes under the 3rd Five-Year Socioeconomic-Development Plan (1971-1976)

(Unit: km, %)

Year	Express-ways	National Roads	Local Roads	Special-City Roads	City, County Roads	Total	Paving Ratio
1971	655	8,146	10,760	5,661	15,413	40,635	14.2
1976	1,142	8,232	10,854	7,291	17,995	45,514	24.0

Source: Road Work Handbook, MLTM, 2011
Note: With acquired foreign loans, the ratio of paved roads increased from 28.3% in 1971 to 45.5% in 1976.

During the 4th Socioeconomic Development Plan period (1977-1981), road development focused on linking expressways with major industrial locations to increase the efficiency of key roads, on the paving national roads and major local roads, and on the expansion of congested roads into four lanes. The Daegu-Masan Expressway and Busan-Masan Road were expanded into four lanes. The ratio of paved national roads improved from 45.5 to 55.4% in 1981. Changes in the total road length and paving ratio in this period are outlined in <Table 1-10>.

<Table 1-10> Road Length Changes under the 4th Five-Year Socioeconomic-Development Plan (1977-1981)

(Unit: km, %)

Year	Express-ways	National Roads	Local Roads	Special-City Roads	City, County Roads	Total	Paving Ratio
1976	1,142	8,232	10,854	7,291	17,995	45,514	24.0
1981	1,245	12,247	11,013	9,043	17,428	50,336	34.1

Source: Road Work Handbook, MLTM, 2011

In the 5th Socioeconomic-Development Plan period (1982-1986), 47 segments, including Gyengju-Pohang, spanning 1,233 km were constructed under the fourth IBRD-loan-based project. Much progress was particularly made in 1983. In 1986, for the fifth ADB-loan-based project, segments including Jeonju-Ulju, which spanned 380 km in length, were expanded and paved. In addition, the Daegu-Gwangju, Hoedeok-Nonsan, and Nonsan-Gwangju expressway segments were expanded, while dilapidated roads were repaired and narrow bridges improved. The road connectivity and road-paving ratios increased. Additionally, defective roads were improved, and projects focused on enhanced security were carried out. The national-road-paving ratio reached 77.1% in 1986. The changes in the total road length and paving ratio in this period are outlined in <Table 1-11>.

<Table 1-11> Road Length Changes under the 5th Five-Year Socioeconomic-Development Plan (1982-1986)

(Unit: km, %)

Year	Express-ways	National Roads	Local Roads	Special-City Roads	City, County Roads	Total	Paving Ratio
1981	1,245	12,247	10,013	9,043	17,428	50,336	34.1
1986	1,415	12,258	10,313	10,724	18,942	53,654	54.2

Source: Road Work Handbook, MLTM, 2011

In the 6th Socioeconomic-Development Plan period (1987-1991), expressway construction and expansion were intensified. The Singal-Ansan, Pangyo-Guri, and Yangjae-Cheongwon segments as well as Yeongdong Line were expanded. The Special Account for Road Projects Act was promulgated in 1988. By 1991, 92% of national roads had been paved. The 3rd Comprehensive Public land Development Plan (1992-2001) was devised during the 7th Socioeconomic-Development Plan period (1992-1996), Public land. Under this plan, the three following strategies were implemented: strengthening of the country's industrial competitiveness; increasing social equality, balanced development, globalization, and autonomy; and creating the foundations for reunification foundations. A plan to construct 7×9-lattice-type key road networks with a total length of 6,000 km was devised, and the Special Account for Road Projects Act was incorporated into the Special Account for Transportation facilities Act, ensuring a stable funding source. The changes in the total road length and paving ratio in the 6th and 7th Socioeconomic-Development Plan periods are outlined in <Table 1-12>.

<Table 1-12> Road Length Changes under the 6th and 7th Five-Year Socioeconomic-Development Plans (1987-1996)

(Unit: km, %)

Year	Express-ways	National Roads	Local Roads	Special-City Roads	City, County Roads	Total	Paving Ratio
1986	1,415	12,258	10,313	10,724	18,942	53,654	54.2
1991	1,597	12,114	10,643	12,717	21,016	58,088	76.4
1996	1,886	12,464	17,147	14,857	35,989	82,342	72.7

In the second half of the 1990s, a master plan for road improvement was formulated, thus expanding roads systematically. The master plan for road improvement, which was formulated in December 1998, was implemented to equalize access distance to promote a balanced development of national public lands by 2020. The road improvement master plan was implemented to address congested segments, strengthen regional connection, develop major national roads into trunk roads and multi-function roads, and remodel road networks in consideration of road functions. Afterwards, the master plan was revised in December 2005 and again in June 2011. The road length after the second half of the 1990s is outlined in < Table 1-13>.

<Table 1-13> Road Length in the Second Half of the 1990s

(Unit: km, %)

Year	Express-ways	National Roads	Local Roads	Special-City Roads	City, County Roads	Total	Paving Ratio
1999	2,040	12,418	17,145	17,892	38,039	87,534	74.7
2006	3,103	14,224	17,677	17,738	49,319	102,061	76.8
2009	3,776	13,819	18,138	18,749	50,501	104,983	79.2

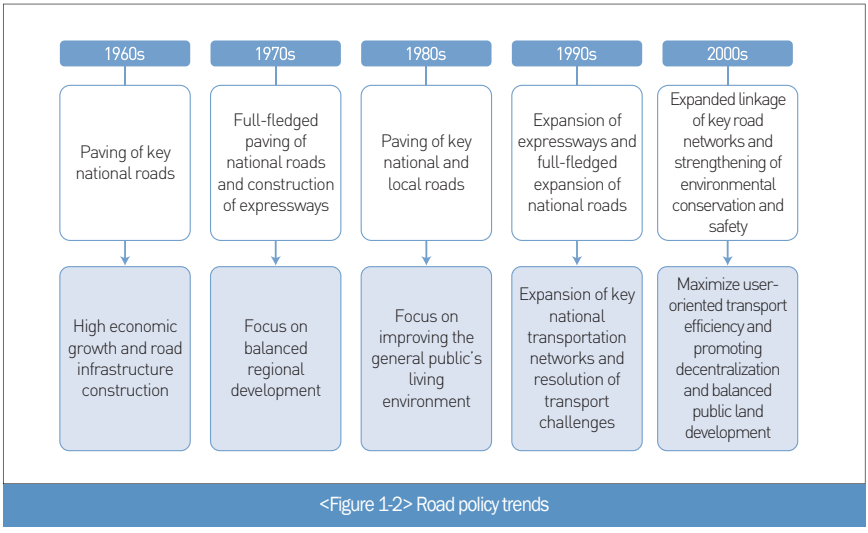
The full-fledged construction of expressways, which played a pivotal role in the country's economic growth, began with the 2nd Five-Year Socioeconomic Development Plan (1962-1966). Though expressways were considered necessary, construction was considered impossible up until 1966 due to limited circumstances. Ulsan Oil Refinery was constructed on May 7, 1964 during the 1st Five-Year Socioeconomic Development Plan period, enabling the mass production of asphalt. Moreover, cement production facilities were expanded, and construction technologies

were somewhat improved by undertaking overseas road projects. Following the successful implementation of the first plan, cargo volume rapidly increased between Seoul-Incheon and Seoul-Busan among the major Seoul port segments. Moreover, the 2nd Five-Year Socioeconomic Development Plan, which aimed at fostering South Korea's high-growth and heavy-industries, shifted focus from railroads to public roads in the country's surface transportation system.

To attain industrialized status, the government decided to construct an expressway connecting Incheon, Busan, and Seoul under the 2nd Five-Year Socioeconomic Development Plan (1967-1971). The Seoul-Incheon Expressway construction scheme was determined on March 24, 1967 and implemented on May 1 of the same year. The construction of the Gyeongbu Expressway (Seoul-Busan) was also decided in the second-plan period. The project was tested by constructing the first 30km Seoul-Suwon segment. The model project commencement ceremony was held on June 1, 1968. This marked the beginning of the fullfledged expressway construction era.

The President and Construction Minister frequently visited the Gyeongbu Expressway construction sites to check on the work progress and to encourage construction workers. The expressway opened earlier than planned. After eleven months of construction, the Seoul-Suwon segment was opened on December 21, 1968. The Suwon-Osan segment was opened on December 29 of the same year. In 1969, the Osan-Cheonan, Cheonan-Daejeon, and Daegu-Busan segments were opened. The Daejeon-Daegu segment, which entailed the most difficult work, was opened on July 7, 1970. By 1970, the entire 428km-long Gyeongbu Expressway was opened. The Gyeongin and Gyeongbu Expressway prompted the country to make advancements in all sectors, including society, economy, culture, military, and technology. They also turned the country into a one-day life bloc, promoting regional and economic development. Transfer of human and material resources across multi region was made possible. The expressways balanced the development of the public land and improved the quality of life for the Korean people.

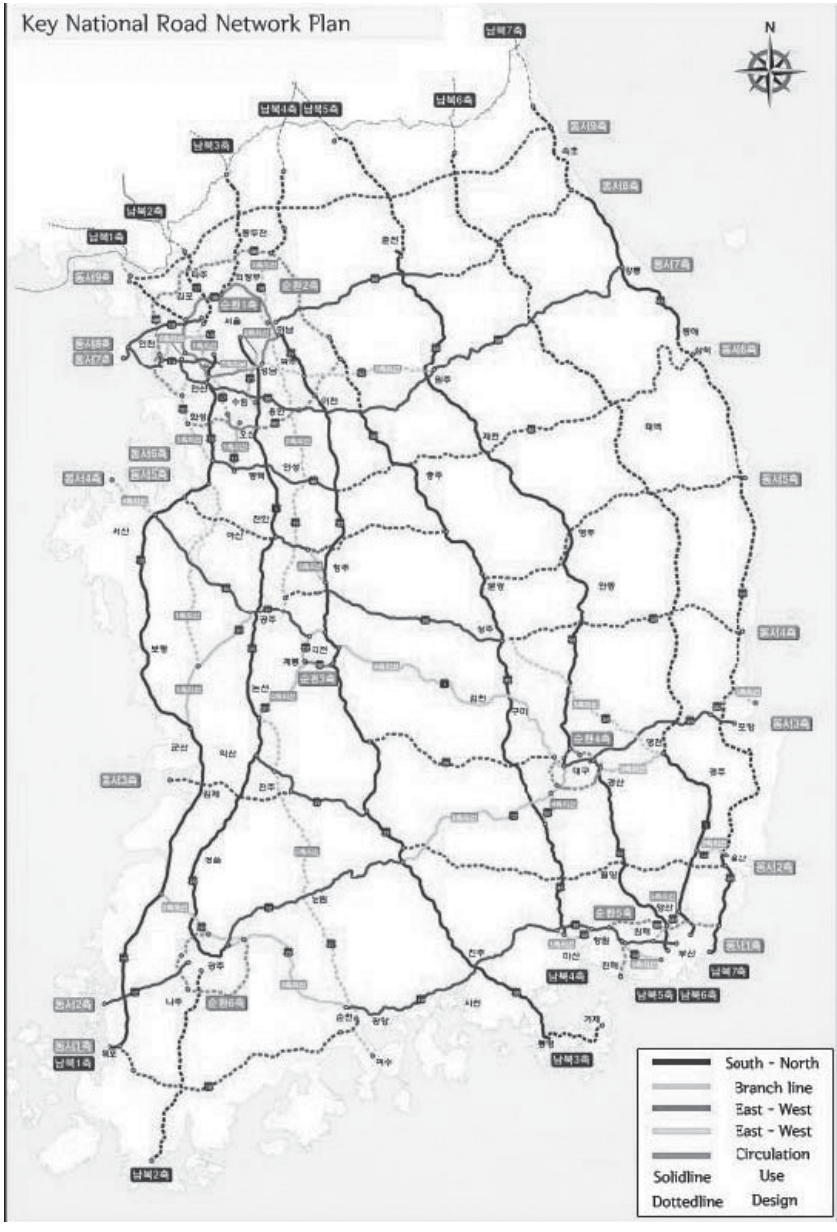
The road policy trends from the 1960s to the 2000s are outlined in the following diagram.



<Figure 1-2> Road policy trends

In conclusion, the construction of road facilities was driven by the creation of largescale industrial complexes and the increased distribution demands despite the economic difficulties. The implementation of policies fostering heavy industries continued for the advancement of the industrial structure. Large-scale industrial facilities were constructed in locations ideal for increasing operational efficiency. For example, in 1964, Ulsan Oil Refinery was constructed. The construction of large-scale industrial complexes such as the Ulsan Petrochemical Industrial Complex, Onsan Nonferrous Complex, Changwon Machinery Complex, and Banwon Industrial Complex continued, drastically increasing the carriage demand. The construction of expressways and improvements in road networks continued. Expressways totaling 1,415 km in length, including the Gyeongin Expressway, were constructed in 1968, and the 88 Olympic Expressway was constructed in 1984. Expressway expansion has continued until today, reaching a total length of 3,859 km by 2010. A ubiquitous expressway is being realized in line with the ever-developing information technology and the convergence of life, culture, and information.

<Figure 1-3> shows the country's trunk roads and their plans as stipulated in the second revised master plan for road improvement in 2011.



<Figure 1-3> Key National Road Network Plan (under the 2nd Master Plan for Road Improvement)

Overview of Gyeongin Expressway Construction

Construction of the country's first expressway, Gyeonggin Expressway, began on May 1,1967. Scheduled for completion in 1969 at a cost of KRW 2 billion, Gyeonggin Expressway had a projected length of 32 km and a width of 31 m (six lanes). The Construction Ministry established a construction work office and contracted with Saman Co. for the project. On February 28, 1968, however, the Ministry changed the plan's target completion date to the end of 1968, a year earlier than planned, in a bid to prepare for the increasing traffic volume and to promote the Gyeongin region development, according to The Blue House Memorandum No. 4 concerning the Gyeongin Expressway construction. To raise the needed funds, the government stipulated that three privatesector builders, Hyundai E&C, Daelim, and Sambu, establish Gyeongin Expressway Co., which would undertake the construction and management of the project. Gyeonggin Expressway Co. took over the project from Saman Co., and began the construction work on March 24, 1968 by dividing the remaining works into three segments, allotting one segment to each of the three builders. The projected six lanes and 31 m width were changed into four lanes and width of 20.4m. The total budget increased from KRW 2 billion to KRW 3.38 billion. The cost was financed by a KRW 1.47 billion government investment, a KRW 1.28 billion private-sector capital, and a KRW 630 million ADB loan.

The initially completed 23.5km segment of Gyeongin Expressway was opened on December 21, 1968. The 6km soft-ground segment was later completed by KEC, formerly known as KHC, on July 21, 1969 after the completion of its surface construction work. The 0.484 km Incheon Port second-dock segment was completed on April 19, 1973, thereby marking the construction of the whole Seoul-Incheon route, which spanned 29.984 km in length. The expressway shortened travel time between Seoul and Incheon from forty-five minutes to twenty-four minutes, thereby reducing transport costs and contributing to the development of the Gyeongin region and its industries. Satellite cities were also constructed, dispersing the population of the Seoul metropolitan.

Overview of Gyeongbu Expressway Construction

The Gyeongbu Expressway was the country's one of the largest civil-engineering project ever. The Gyeongbu Expressway sprang from a joint meeting of the ruling

party and the government at the Blue House on November 7, 1967. In the meeting, the Construction Minister reported on the progress of the expressway construction in the country, and President Park Chung-hee proposed the construction of Gyeongbu Expressway. In the same year, Park Chunghee, who ran for a second presidential term, proposed the Gyeongbu Expressway construction as his election campaign pledge. He predicted that the projected rapid economic growth would result in traffic congestion tantamount to a transport war. The Gyeongbu Expressway project was incorporated in the expressway project plan involving seventeen routes and a length of 1.760 km, under the Great Public land Construction Plan.

On November 22, the Presidential Guideline on Gyeongbu Expressway Construction, involving four lanes and a design speed of 80-120 km, etc., was announced. In addition to the already-ongoing Gyeongin Expressway made possible by an ADB loan, the Gyeongbu Expressway proposal met with strong opposition and criticism from the opposition parties. Critics claimed that it was impossible to construct an expressway on the Gyeongbu route as the country had already procured loans from IBRD to construct the Daejeon-Mokpo, Busan-Sucheon, Seoul-Gangneung, and Mokpo-Samcheok expressways, and paving of national roads had yet to be finalized. To meet the minimum construction budget of KRW 30 billion, a reduction in the road layer by 10 cm was planned, and the gradual-paving method was adopted. Moreover, pieces of equipment were introduced from the military engineering units and the U.S. Armed Forces' engineering units. Various efforts were exerted (Construction Economy Newspaper, July7). In part due to such efforts, a milestone construction commencement ceremony was held on February 1, 1968, and the 31.3km Seoul-Suwon test segment was opened on December 21 of the same year. The opening of the 14.2 km-long Suwon-Osan segment followed on December 30 of the same year. The 38.1 km-long Osan-Cheonan segment was opened on September 29, 1969, followed by the 68.8 km-long Cheonan-Daejeon segment on December 10, 1969 and the 122.8km-long Daegu-Busan segment on December 29. The 152.8 km-long Daejeon-Daegu segment, the most difficult construction segment, was opened on July 7, 1970. Finally, the whole Seoul-Busan Gyeongbu Expressway, with four lanes and a length of 428 km, was opened.

2.2 Trends in Railroad Sector

In the 1st Five-Year Socioeconomic-Development Plan period (1962-1966), heavy investments were made in the traverse connection of railroads for the development of economic foundations. Railroad expansion connecting resources and production through industrial railroads also took place. The following lines were opened in the 1960s: Neugui Line in 1963 (Neunggok-Uijeongbu, 31.9 km), the Donghaebukbu Line in 1962 (Bukpyeong-Gyeongpodae, 50.3 km), the Gyeongbuk Line in 1966 (Gimcheon-Jeomchon, 58.6 km), the Gyeongjeon Line in 1968 (Samnangjin-Songjeongni, 80.5 km), and the Gyeongin Double-Track Line in 1965 (Juan-Yeongdeungpo, 23.3 km). From the second-plan period to the 3rd Five-Year Socioeconomic Development Plan period (1967-1980), IBRD conducted a feasibility study, after which the establishment of new railroad lines, railroad improvement, and railroad electrification projects were implemented. In this period, the Yeongdong Line, the Mungyeong Line, the Yeocheon Line, and the Chungbuk Line were converted to doubletrack lines, while the Jungang Line and the Taebaek Line were electrified.

Until the mid-1960s, railroads represented high share of the transportation sector. However, with the construction of expressways and other roads, the competitiveness and role of railroads diminished in the 1970s. While railroads represented the largest portions of the total passenger and cargo carriage in 1961 with 53.0% and 88.3%, respectively, figures declined to 20.9% and 37.8%, respectively, by 1986.

<Table 1-14> Carriage Share of Railroads

Category			1961	1966	1971	1976	1981	1986
Passenger	People carriage (1,000 people)		88,291	138,299	128,159	248,699	411,129	518,956
	Carriage share (%)	People (People-km)	13.0 53.0	8.3 42.5	4.1 27.1	4.7 24.4	4.8 23.6	4.3 20.9
Cargo	Carriage amount (1,000 tons)		15,373	24,064	31,955	43,629	48,761	58,238
	Carriage share (%)	Ton (Ton-km)	47.9 88.3	46.6 86.9	27.3 49.6	28.9 49.5	27.8 41.8	22.0 37.8

Source: MTLM, Transport Statistical Annals

Nonetheless, railroads played a pivotal role in the economic development process. Notably, railroads carried cargo and resources for industrialization, such as cement and coal. Until 1971, inlet lines connecting railroads and industrial complexes were actively constructed. In the 1970s, the industrial railroads reached their carrying capacity, and the demand for construction materials increased as the Seoul metropolitan grew. Industrial railroads in the Seoul metropolitan and in the Taebaek region were electrified to increase capacity. In addition, the double-track construction continued to enhance the railroad carrying capacity, increasing the capacity share from 15.1% in 1961 to 24.5% in 1985.

<Table 1-15> Modernization Trends of Railroad Construction

(Unit: km, %)

Category	1961	1966	1971	1976	1981	1985
Railroad facilities	4,630	5,049	5,582	5,653	6,045	6,280
Double-tracking ratio	15.1	14.9	16.8	18.3	22.9	42.5
Electrification ratio	-	-	-	13.2	13.7	13.8

Source: MTLM, 6th Five-Year Socioeconomic Development Plan (Transportation Sector), 1986

Though railroad construction and improvement were implemented to increase the carrying capacity of railroads, less investment was made in railroads compared with roads, which contributed to the reduced mode share of railroads. The railroad unit separated from the Transport Ministry in 1963, and the National Railroad Administration, a governmentinvested corporation was launched. Bureaucratic operation and inefficient management have been cited as factors of the diminished railroad mode share and.

While South Korea's economy continued to grow and quality of life for the general public increased in the 1990s, the erstwhile minimal railroad investment was identified as a problem. The population had reached 42.87 million people in 1990, indicating a 170% increase from 1960. The number of automobiles reached 3,395,000. In stark contrast, the operating length of railroads had slightly increased by 59 km of railroad track between 1962 (3,032 km) to 1990 (3,091 km) while the railroad network had been extended from 4,696 km of tracks in 1962 to 6,435 km in 1990, a mere 137% increase.

Following the intense economic development, population figures and the distribution of goods increased in the cities with the emergence of traffic congestion as a serious national issue in the 1980s. Full-fledged urban railroad construction began in the 1970s and focused on the electric-train network in the Seoul metropolitan. The construction of the Ansan Line, the Guro Triple-Track Line, the Bundang Line, the Gwacheon Line, and the Ilsan Line began. The era of high-speed-rail era was ushered in during the 1990s, prompting a turnaround in the transportation system. The importance of eco-friendly railroads was recognized in line with the adoption of a low-carbon and green-growth strategy as a response to climate change after 1990.The most noticeable growth from the 1990s to the present was laying the foundation for high-speed rails as a means of green transportation. When the Gyeongbu segment reached its full carrying capacity in the early 1970s, domestic and overseas research institutes proposed the construction of a new railroad as a solution. Diverse construction methods were discussed, and a feasibility study was carried out. The Gyeongbu High-Speed Rail began construction in 1992, and its first segment (Seoul-Daegu) was opened twelve years later. In addition, full-fledged construction of the Honam High-Speed Rail (targeted for completion in 2017) and the Seoul Metropolitan High-Speed Rail (targeted for completion in 2014) are being carried out.

2.3 Transportation Infrastructure Trends and National Comprehensive Development Plan

The country's transportation sector contributed not only to the rapid economic development of economy after the 1960s but also the productive use of public lands, industrial development, and increase in population. After the 1960s, the transportation sector was developed with the intent of boosting economic development rather than general public land development, in the case of the country's construction of the Gyeongbu and the Gyeonggin Expressways. Due to limited investments in implementing industrial policies, however, less investment was allotted to the transportation sector.

Planning and implementation of transport projects was not carried out for a long time, although comprehensive measures for the efficient development of public land were required. For this reason, the transportation agenda was incorporated into

the comprehensive public land development plan beginning in the 1970s and has continued since.[1)]

The 1st Comprehensive Public land Development Plan was carried out from 1972 to 1982. The transportation agenda were incorporated into the plans of industrial institutes as well as those for urban development, living environments, water resources, and public land conservation, thereby greatly contributing to SOC expansion while mainly supporting the country's economic development. In this first plan period, investment focused on the construction of expressways, Seoul metropolitan's electrified railways networks, and subways as well as on facilities coping with the increasing demand for transportation in line with rapid industrialization and urbanization. Investment for the transportation sector represented 16.9% of the total investment budget for the first half of the public land plan 15.7% in the second half, both of which were relatively high portions. The most investment was devoted to public roads, which represented 62.1% of the total transportation sector in the first half and 54.5% in the second half of the period.

In the 2nd Comprehensive Public land Development Plan period (1982-1991), transportation agenda items were incorporated into plans in accordance with population policies, resource development, environmental conservation, and citizens' living environment, in a bid to construct the country's infrastructure framework. Moreover, transport development focused on resolving the gap between poorly paved road and well maintained roads present across the regions, which was a byproduct of the country's rapid economic growth. In the 2nd Comprehensive Public land Development Plan period, transportation sector investment only accounted for 9.5% of total investments during the first half of the period.

During the periods of the 1st and 2nd Comprehensive Public land Development Plan, significant achievements and shortened travel time were attained in the transportation sector. Interregional accessibility was improved, and travel from one end of the country to the other was possible within one day. Moreover, transportation expansion improved the spatial connection for regional development and facilitated the development of industrial complexes and tourist resources, among other items

1) The long-term comprehensive transport policy research for the 2000s (KOTI, 1998) is summarized.

pertaining to regional growth. Until the implementation of the second plan, the goal of balanced regional development had been somewhat neglected, leading to polarized public land development that was centered on the Gyeongbu Line axis linking the northwestern region and southeastern regions together. Moreover, from the 1960s-80s, the development focused on roads, boosting the road carriage share of the Transport modes.

Following the economic development of the 1960s that resulted in increased incomes and industrial changes, demand in passenger and cargo transportation rapidly increased within cities and between regions. Moreover, the unbalanced regional development that occurred as an outcome of industrialization policies also led to subsequent concentration of employment opportunities and population in urban areas. A perpetual cycle appeared beginning with population concentration in large cities, followed by increased aggravation of the country's transport and housing urban problems. To address these issues, increased investment in large cities was made. Further population concentration in large cities would lead to the creation of gigantic cities, which would contribute to acceleration in transport problems in large cities. As mentioned earlier, the transportation sector investment until the 1980s focused on key roads to support economic development. However, reduced investment in transportation in anticipation of urbanization further worsened the problems of large cities. Thus, the implementation of the transportation policy until the 1980s was limited by the state's economic policy.

The 3rd Comprehensive Public land Development Plan was formulated to address the above shortcomings. This plan intended to develop the provincial areas while containing the concentration of development in the Seoul metropolitan in order to balance regional development. Comprehensive high-speed transport and communication networks were developed, facilitating the logistical flows of passengers and cargoes, while the expansion of international airports and seaports helped the country to globalize. During the 3rd Comprehensive Public land Development Plan (1992-1999), efforts focused on the decentralized development of public lands, the use of public lands to preserve production resources, the improvement of national welfare, the conservation of the public land environment, and the creation of public land foundations, in preparation for the unification of South and North Korea.

The 4th and current Comprehensive Public land Development Plan (2000-2020) aims to realize the integrated management of public lands in the 21st century. This encompasses regional integration, integration of the environment and development, integration with Northeast Asia, and integration of South and North Korea. The plan seeks to create an open-type integrated public land axis to emphasize environmentally friendly public land management and to create foundations for exchange and cooperation between South Korea and North Korea. The plan was revised in 2005 and 2011 to include the construction of an administrative complex city and the relocation of some public agencies to the provincial areas in an effort to achieve balanced regional development. Further revisions included the opening of high-speed rails and the pursuit of sustainable development of public land that take socioeconomic changes into consideration, such as an increasingly aging society. In accordance with this plan, Incheon International Airport was constructed in 2000 and the full-fledged construction of Gyeongbu High-Speed Rail was implemented. The era of expressways spanning 2,000 km began and construction of expressways with private sector financing was implemented in hopes of efficiently developing the key national transportation networks. The fourth plan factors changing socioeconomic conditions following the 1997-1998 financial crisis, expected accelerated globalization, knowledge informatization, and a progressive public land strategy in line with the decentralization policy. Moreover, the plan aims to reduce huge social costs incurred by traffic congestion, high population density, and environmental pollution due to the population concentration in the Seoul metropolitan area. Furthermore the plan includes efforts to address unresolved imbalance in regional development, which has worsened despite the implementation of the third plan, as well as infrastructure shortages along the east-west axes of the Korean peninsula. Towards these ends, the planned public land development includes the division of public lands into three axes resembling an upside down pi symbol (π) consisting of the east, west, and south coastal areas. Additional efforts to balance regional development includes the "7+1" specialized regions, which consist of the Seoul metropolitan and blocs of Gangwon Province, Daegu, Busan, Chungcheong Provinces, Jeonbuk Region, Gwangju, and Jeju Island. The government has set five goals for public lands as listed: ① Mutual benefit; ② Competitiveness; ③ Welfare; ④ Sustainability; and ⑤ Prosperity and Unity.

In the 3rd and 4th Comprehensive Public land Development Plan periods,

automobile ownership surged among Korean people as urban areas expanded, which caused a surge in traffic demand. This called for a policy of efficient, comprehensive traffic demand management. That emphasized the importance of public transportation. Various demand management measures were devised and implemented, including increase in traffic taxes, limited use of parking areas annexed to facilities, and first priority to public transport first-priority. To promote public transportation, an automatic fare collection system and integrated fare structure that would allow the use of one transport card to access and transfer multiple modes of public transportation was established. A discounted transfer fare system for public transportation was also implemented to encourage greater use of public transport and mitigate the demand for private automobiles.

Revised in 2011, the 4th Comprehensive Public land Development Plan has multi-pronged goals, including shifting the transport infrastructure focus onto railroads and marine transport; developing green Transportation modes, such as electric vehicles and hybrid automobiles; and promoting bike riding and pedestrian activity in the urban areas. This paradigm shift is in stride with realizing a low-carbon, energy-saving future and re focusing the country's transportation policy from efficiency to environmental friendliness.

Chapter 2.

Transportation Investment Strategy

1. National Transportation Infrastructure Investment Plan

1.1 Transportation Infrastructure Renovation Master Plan

In the second half of the 1990s, the separate, individual expansion of transport by category (e.g., railroads, airports, ports) was criticized for not efficiently achieving national transportation policy goals. Based on results of feasibility studies conducted under the different modes, this became an object of concern for hindered intermodal connectivity and duplicated functions and routes. Furthermore, balanced budgeting by region and category were difficult to achieve. In response, the government formulated a 20-year master plan for the key national transportation networks striving towards to developing an efficient national transportation system in accordance with the Transportation System Efficiency Act (currently Transportation Efficiency Act). A corresponding five-year midterm transportation facility investment plan was prepared as an execution plan. In addition to the Key National Transport Network Plan, mid- and long-term plans as well as basic plans by transport mode were devised. The most prioritized plans by category included the Master Plan for Road Improvement and the National Railroad Network Construction Plan. Their legal grounds, formulation periods, and responsible authorities are outlined in <Table 2-1>.

<Table 2-1> Mid- and Long-Term Transportation Facility Plans

Plans	Legal Grounds	Formulation Period (Year)	Authority
Key National Transport Network Plan	Article 4, Transportation Efficiency Act	20	MLTM
Third Midterm Transportation Facility Investment Plan (2011-2015)	Article 6, Transportation Efficiency Act	5	MLTM
Basic Plan for Road Improvement	Article 22, Road Act	10	MLTM
Five-Year National Road Construction Plan	Article 23, section 2, Road Act	5	MLTM
Five-Year State-supported Local Road Plan	Article 23, section 2, Road Act	5	MLTM, special- or metropolitan-city mayors responsible for surveys and designs concerning special- or metropolitancity segments
Plan for Improving the Congested Roads in Large-City Blocs	Article 23-2, Road Act	5	MLTM
National Railroad Network Development Plan	Article 4, Railroad Construction Act	10	MLTM

Source: National Law Information Center, Ministry of Government Legislation

1.2 Relevant Acts

The construction of Key National transportation facilities, such as roads and railroads, is implemented under the fundamental Key National traffic network plan and the midterm transportation facility investment plan. The plan is implemented in accordance to the Construction Technology Management Act (Construction Technology Act), the National Finance Act, and the National Integrated Transportation System Efficiency Act (Transportation Efficiency Act). The Construction Technology Act stipulates a process whereby the processes of construction work execution processes, such as the plan, design, execution, supervision, and maintenance, are executed in close relationship. The National

Finance Act stipulates that a preliminary feasibility study be conducted to set budgets for large-scale projects followed by a second feasibility study for projects with a specific amount of costs for the purpose of managing project costs. In addition, the Transportation Efficiency Act stipulates the formulation of a Key National Transport Network Plan and a Midterm Transportation Facility Investment Plan as well as specific SOC project implementation measures, such as feasibility studies and second feasibility studies. Moreover, the Fund Management Act, under the control of the Ministry of Planning and Budget, stipulates the conduct of prior feasibility studies to review project implementation right before the budget execution.

<Table 2-2> Laws Pertaining to Transport Implementation

Ministries	Laws	Relevant Clauses	Description
Ministry of Construction and Transport	Transportation Efficiency Act	Article 3	Key National Transport Network Plan
		Article 5	Midterm Transportation Facility Investment Plan
		Article 8	Evaluate implementation of Midterm Transportation Facility Investment Plan
		Article 10	Investment evaluation guidelines and commissioned evaluation of feasibility studies
	Enforcement Ordinance of the Construction Technology Act	Article 38	Basic scheme–feasibility study–design –construction–completion–evaluation –maintenance
Ministry of Planning and Budget	Fund Management Act	Article 8	Preliminary feasibility study
		Article 8	Total project cost management
	Enforcement Ordinance of the Budget and Accounts Act	Article 9	Budget for large-scale development projects
	Total Project Cost Management Guidelines	-	Project scheme–preliminary feasibility study–feasibility study and formulation of a basic plan–basic design–execution design –ordering and contracting–construction

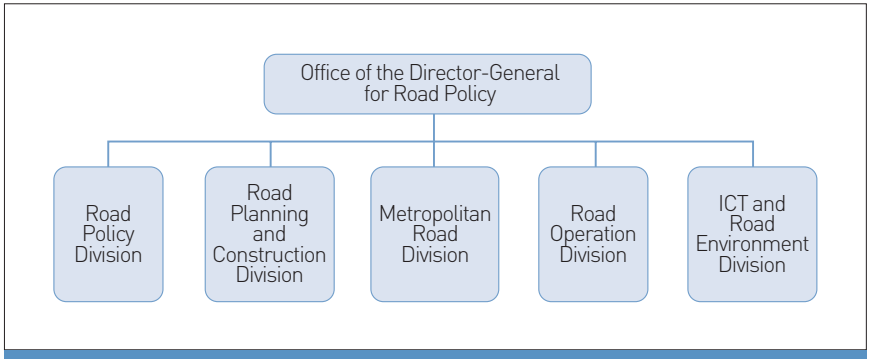
2. Organizational Structure by Sector

2.1 Roadway Sector

The history of road administration and responsible authorities began in 1943 with the establishment of a transport bureau under the control of the Japanese Governor-General of Korea that integrating all categories of transportation facilities, including public roads. In 1947, the Civil Engineering Ministry was established to take responsibility for road construction and improvement projects. The Restoration Ministry was responsible for road construction right before and after the Korean War. In May 1961, the Restoration Ministry was replaced by the Construction Ministry, and the Public land Construction Bureau under its control was responsible for roads. In July of the same year, the Construction Ministry was dissolved, and the Public land Construction Administration was installed to undertake transport work. In 1962, the Public land Construction Administration was disbanded, and the Construction Ministry was reestablished. In 1968, to cope with ever-increasing traffic demand, the Road Section under the control of the Construction Ministry was promoted to the Road Bureau to strengthen its road construction function, such as the development of Key National road networks. In 1969, KEC was established to consistently implement road construction and management as well as relevant projects. As such, road administration further development as it underwent many changes. The Construction Ministry was incorporated into the Transport Ministry according to the December 3, 1994 amendment of the Government Organization Act. The Ministry of Construction and Transport (MCT) was established to reduce the size of bureaucracy, address traffic congestion, and efficiently invest in and operate SOC. MCT continued operations until it was reshuffled into the Ministry of Land, Transport and Maritime Affairs (MLTM) when its functions were merged with some of the functions of the Maritime Affairs and Fisheries according to the 2008 amendment of the Government Organization Act. The road-related institutes under the control of MLTM include the Seoul, Wonju, Daejeon, Iksan, Busan, and Jeju branches as well as KEC, Korea Research Institute for Human Settlements (KRIHS), Korea Institute of Construction Technology (KICT), and the Korea Transport Institute (KOTI).

Today, MLTM manages all road work in Korea. The existing road-related organizations include the Office of the Director-General for Road Policy, which

controls the Road Policy Division, the Road Planning and Construction Division, the Metropolitan Road Division, the Road Operation Division, and the ITS & Road Environment Division. These divisions perform road administration, planning, construction, and maintenance works, and supervise KEC. The first road-related organization, the Road Division of the Construction Bureau, which is under the control of the Home Ministry, was established in 1948. In 1968, the Road Division was promoted to the Road Bureau. Since then, it has undergone reorganization twelve times.



<Figure 2-1> Road-related organizations

2.2 Railroad Sector

The country's railroad history first began during the Japanese colonial period when the Railroad Bureau, the first railroad administration organization, was established in 1894 under the Public-Road Division of the Agriculture and Industrial and Commerce Ministry. In 1899, the West Railroad Bureau was established, under the control of the Royal Household Affairs Ministry. The same year, the Seoul-Jemulpo Railroad was constructed by Gyeongin Railroad Joint Venture. Gyeongbu Line was opened in 1905, followed by Gyeongui Line a year later.

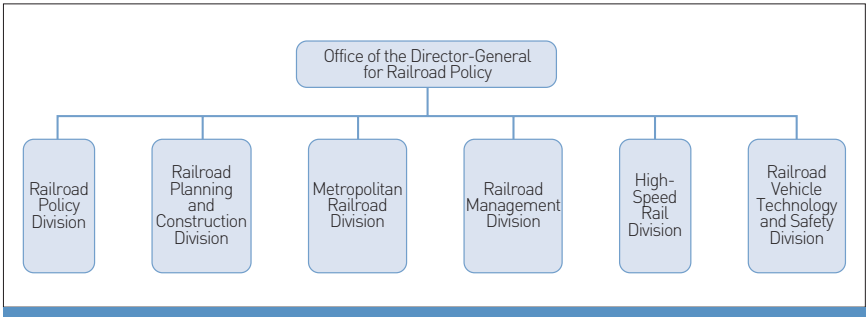
In 1900, the Bureau was promoted to the Railroad Agency per government policy enabling independent railroad management. Under this integrated agency, the Railroad Management Bureau was established in 1906, which operated several railroad companies. After the forced annexation of Korea by Japan in 1910, the Railroad Agency's function was transferred to the Railroad Bureau of the Japanese Governor-General of Korea, which continued to operate until 1943 when

it was reorganized into the Transport Bureau. During Japanese colonial rule, the Hamgyeong and Jungang Line were constructed under the Japanese Governor-General of Korea in 1928 and 1942, respectively. After Korea's independence, some private railroads were nationalized, and the Transport Ministry controlled the railroad business.

After Korea's liberation in 1945, the Transport Division of the U.S. Army Military Government in Korea took over the management of railroad operations. The division was later placed under the Railroad Transport Bureau. In 1948, the Transport Division and the agencies under its control were transferred to the Transport Ministry, which incorporated public roads, marine transport, and aviation affairs under one department and six bureaus. The Local Railroad Transport Bureau was reshuffled into a railroad bureau. To operate railroads more professionally under an independent unit system, the Railroad Agency was launched in 1963 independent of the Transport Ministry. The Railroad Agency had five bureaus and twenty-four sections. Also included were logistical offices, heavy equipment offices, and hotels as well as local branches in Seoul, Busan, Daejeon, Yeongju, and Suncheon. In 1973, to effectively implement the train electrification project, the Engineering Bureau was reshuffled into the Electricity Bureau and the Rolling-Stock Bureau, and the Material Procurement Bureau was incorporated into the Accounting Bureau. In 1974, the local railroad bureaus were renamed local railroad agencies. In 1985, the railroad hospital was privatized, thereby annulling the railroad hospital organization.

As of January 2010, railroad organization was headed by MLTM, under the control of which is the Office of the Director-General for Railroad Policy, the Railroad Policy Division, the Railroad Planning and Construction Division, the Metropolitan-Railroad Division, the Railroad Management Division, the High-Speed Division, and the Railroad Vehicle Technology and Safety Division. The Railroad Policy Division has a number of responsibilities, including the coordination and overseeing of railroad policy implementation, railroad management improvement support, and planning of national railroad network construction, and supervision of KEC and Korea Rail Network Authority. The Railroad Planning and Construction Division is responsible for the implementation of all railroad construction-related laws and decrees, the establishment and operation of relevant systems and criteria as well as feasibility studies for general railroad construction projects, technical surveys, and

approval of basic plans and execution designs. The Metropolitan-Railroad Division is responsible for the implementation of policies and systems for metropolitan and urban rails, financial support, and light-rail and magnetic-levitation train projects. The Railroad Management Division is responsible for railroad business licensing and other approval systems, transport and railroad logistics improvement, and maintaining order and devising anti-crime measures within the railroad areas. The High-Speed Rail Division is responsible for the high-speed rail construction projects and for the coordination thereof, and for the operation of the SOC Construction Impulsion Committee. Lastly, the Railroad Vehicle Technology and Safety Division is responsible for formulating railroad safety policies, operating railroad safety systems, and conducting R&D on railroad industry technologies as well as formulating measures against rail accidents, reports on railroad accidents, and recovery works.



<Figure 2-2> Railroad-related Organizations

3. Relevant Acts and Policies by Sector

3.1 Roadway Sector

The first conceptual modern road law was the Road Rule enacted and promulgated by the Japanese Governor-General of Korea in 1911. It consisted of eleven clauses stipulating the types and management of roads and cost shouldering. Road conservation- and traffic safety-related laws were also enacted and implemented, such as the 1913 Road Regulation and the 1921 Automobile Regulation.

In 1938, the Joseon Road Enforcement Decree and Joseon Private Road Rule

were enacted, stipulating road management and facility conservation as well as the construction, management, and use of private roads. In 1961, the existing Road Enforcement Decree was expanded and the Road Act was enacted and promulgated effecting rational road management and the democratic sharing of public costs. In 1967, the Road Improvement Promotion Act was enacted, stipulating the formulation of a long-term road improvement plan to achieve balanced improvement in the nationwide road network. In 1970, the Express National Road Act was enacted and promulgated, designating express national roads and stipulating the management and conservation of road structures.

The current road-related laws include the Road Act, Express National Road Act, Toll Road Act, Private Road Act, and KEC Act. The Road Act defines road improvement and management that contributes to the development of the national transportation system and the improvement of public welfare. The aforementioned act, which is a basic law for public roads, has three enforcement decrees, including the Enforcement Decree of the Road Act. This enforcement act defines the types of roads (seven types, including express national roads) and the pertinent administrative agency as well as the construction procedure, criteria for, and the management of roads. This act also defines the types and grades of roads including the following: express national roads, general national roads, special- and metropolitan-city roads, local roads, city roads, county roads, and district roads. The current road administration agencies are MLTM for national roads, provincial governors and special-autonomous-province governors for state-supported local roads, and administrative agencies for other roads acknowledged by them. Administrative agencies are to devise a Master Plan for Road Improvement every ten years and must conduct a feasibility study thereof every five years. They are mandated to undertake road construction works, including renovation, repair, and maintenance. They must also keep records of books. For roadrelated costs, MLTM-managed roads are to be financed by the state, while the other roads should be financed by the municipalities to which the managing administrative agencies belong. The corresponding taxes are to be borne by those parties responsible for losses, and compensation for losses will be acknowledged.

The Express National Road Act aims to define all important matters concerning express national roads so as to improve such roads and to contribute to the

development of automobile transportation networks. This act has two enforcement decrees stipulating the special regulations on express national roads in addition to the Road Act. This act designates routes, intersection methods, road adjacent areas, and traffic limits, and delegates the works of the related administrative agencies (e.g., KEC). Express national roads are designated by presidential decrees, specified by road number, road name, starting point, end point, and major intermediate points. The administrative agency for express national roads is the Ministry of Construction and Transport, which may delegate some of its authority to KEC. When an expressway, a road, a railroad, a track, and/or a passage intersect, a threedimensional connecting facility must be built without any exceptions allowed. The Ministry of Construction and Transport may designate expressway access areas. No one shall pass or enter express national roads unless using automobiles. The Ministry shall install signs banning or limiting passage at the entrances of expressways or at other necessary locations.

The Toll Road Act aims to define matters concerning toll roads so as to promote transport convenience and to contribute to national economic development. This act has two enforcement decrees stipulating the road construction criteria, toll road construction, approval and management, and toll collection to secure the needed finances and to promote road improvement. The road administrative agency may collect tolls if the users will remarkably benefit from them, although an exemption is granted when a road is the only available transport route in the vicinity. Regardless of such requirements, tolls may be charged for express national roads, tourist roads, roads connecting land and islands, and islands. If a road is under the control of a local road administrative branch and is closely related to public land development, tourism promotion, and the convenience of the residents, and if the aforementioned requirements are met, the Ministry of Construction and Transport may then construct or renovate such roads and collect tolls. Entities other than the concerned road administrative agency, subject to the approval of such road administrative agency, may construct or renovate a road and collect tolls. For the linkage of a toll road and a different road, approval must first be obtained from the Ministry of Construction and Transport. The toll road agency may establish toll road management rights to collect tolls and occupation fees for the relevant toll road. The toll road management right is considered a real estate right, and unless otherwise stipulated in this act, the realty regulation of the Civil Act shall apply, with modification when deemed

necessary. The toll road management right with a mortgage established shall not be disposed of without the agreement of the mortgagee. Tolls are collected according to the automobile types. The toll road agency shall not collect tolls whose total revenues exceed total road construction costs. The tolls and additional tolls collected by the Ministry of Construction and Transport shall belong to the state coffers, and the tolls collected by a local road agency shall belong to the municipality. Such tolls shall not be used for purposes other than the repayment of the principal of the road construction and renovation, and the payment of the road management costs. The state and municipalities should establish a special account for toll roads, and should manage the related revenues and expenditures.

The Private-Road Act defines the criteria for the construction and management of private roads not subject to the Road Act. The establishment of a private road requires the approval of the concerned mayor or county governor. The owner of a private road may, to increase its utility, request the mayor or county governor to improve the segment connecting the private road with the pubic road. A private road shall be managed by its owner, who shall not, except for the road structure conservation or the prevention of passage danger, limit or ban general public passage through the road, and who may collect a service fee for the use of the road. If a private-road owner intends to limit or ban passage through the road or to collect a service fee for the use of the road, he/she must first obtain approval thereof from the mayor or county governor. The regulation on acts banned for road conservation under the Road Act shall apply to private roads, with modification when deemed necessary.

The KEC Act defines the establishment of KEC as well as the construction and management of roads. KEC's tasks include constructing, renovating, maintaining, and repairing toll roads and roads that are necessary for promoting the use of toll roads and toll express national roads, as determined; establishing and managing toll parking lots; constructing and managing service areas and refueling stations in line with toll roads; acquiring and managing realty necessary for road projects; surveying, designing, and supervising construction works together with overseas highway agencies; carrying out development projects for areas adjacent to toll roads; and making investments and carrying out equity participation in projects related to its works.

<Table 2-3> Road-related Law System

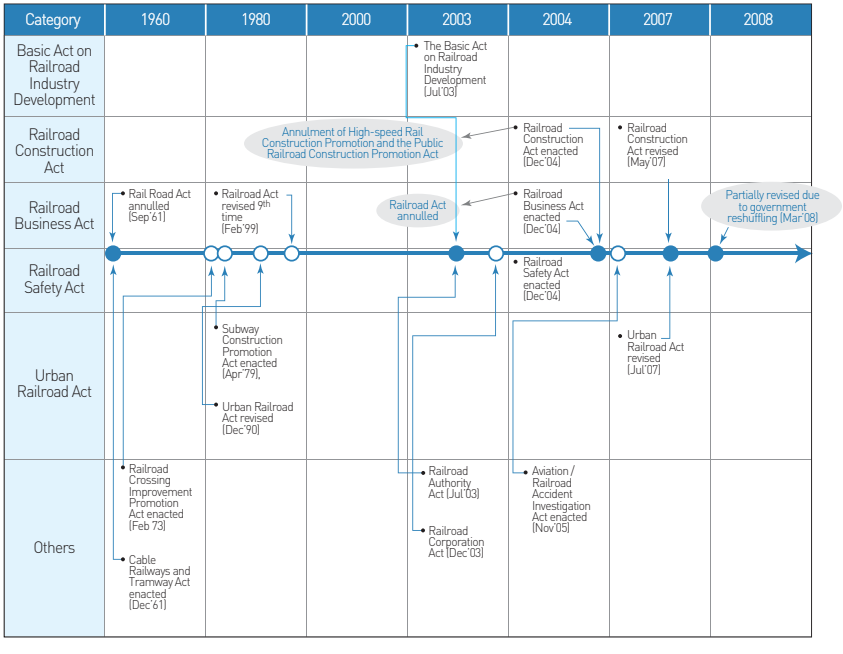
Road Act	Basic act on public roads · Seven types of roads (express national roads, etc.), and designation of relevant agencies · Road construction procedures and criteria, and management thereof, etc. * Construction procedure: Designate route (presidential decree)→Determine road area→Implement construction work→Complete construction→Open road
Express National Road Act	Special provisions on Express National Road Act in addition to Road Act · Designation of road routes, intersection methods, road access areas, and passage limitations · Delegation of road agency works (MLTM→KEC), etc.
Toll Road Act	Defines establishment, approval, and construction of toll roads to secure road funds and to promote road improvement. · Establishment criteria (benefits and alterative roads) · Collection of tolls (within total principal of construction and administrative costs for sake of user benefits)
Private Road Act	Provisions on criteria for construction and management of private roads not subject to application of Road Act · Criteria for private roads · Structure and use of private roads · Approver of road establishment: mayors and county governors · Other: Banning passage of general public and limiting collection of tolls (roads for public use)
KEC Act	Provisions on KEC establishment, and establishment and management of roads · Matters concerning capital, stock issuance, and registration · Works, disposition of revenues and losses, issuance of debentures, subsidies, etc.

3.2 Railroad Sector

The country's first railroad-related law was the Domestic Railroad Rule, which was enacted and promulgated in 1896. It stipulated physical requirements such as the track width, and administrative details such as the establishment and operation of railroad companies. To enhance its colonial reign, imperial Japan enacted the Joseon Private Railroad Decree in 1920 and the Joseon Private Railroad Supplementation Act in 1921, thereby focusing on the construction of private railroads. Railroad improvements were difficult after Korea's liberation due to social disturbance, the separation of the South-North Korean railroads following the division of public lands, and war-ravaged situation. In line with the formulation of the 1961 Socioeconomic Development Plan, the Railroad Act was promulgated to facilitate

the operation of railroads and paved the way for railroad development. In December 2004, the Railroad Act was superseded by the Railroad Industries Act, which has been amended five times since. The railroad industry was restructured and divided into the railroad facility sector and the operation sector. Moreover, the launching of high-speed rail, the diversification of user requirements, and other market changes has prompted the country to efficiently manage its railroad businesses and to develop a healthy railroad development infrastructure.

As of 2010, there were ten railroad-related laws in the country as listed: the Railroad Industry Development Basic Act, Railroad Construction Act, Railroad Business Act, Railroad Safety Act, Railroad Crossing Improvement Promotion Act, Urban Railroad Act, Tramway Transport Act, Korea Rail Network Authority (KR) Act, KEC Act, and Act on the Development and Use of Railway Station Spheres. In addition, there are ten railroad-related presidential decrees and nineteen MLTM decrees.



<Figure 2-3> History of Railroad-related Laws

4. Transportation Infrastructure Financing

4.1 Transportation Infrastructure Costs Allocations by Authorities

Financing for transportation facility investment are shared by the central government, municipality, public corporation, and private sector, and financing distribution vary according to the project characteristic and scale. The ratios by category among the central government, municipality, and implementer are summarized as follows.

<Table 2-4> Financing Ratio between Central Government and the Municipality

Category	Shared Financing	Implementer
National road	Central government (CG)-100%	MLTM
Expressway	CG-50%, KEC-50%	KEC
State-supported local road	CG-70%, municipality-30%	Municipality
Metropolitan road	CG-50%, municipality-50%	Municipality
Subway (Seoul)	CG-50%, municipality-50% (CG-40%, Seoul City-60%)	Municipality
Metropolitan railroad	CG-75%, municipality (KNR)-25%	Korean National Railroad (KNR)
High-speed rail	CG-45%, KHRA-55%	Korea High-Speed Rail Authority (KHRA)
General railroad	CG-100%	KNR

Source: Jeong, Il-ho et al., "CG-Municipality Cooperation for Activating the SOC Supply and Operation for the Road Category," KRIHS, 2004

4.2 Transportation Infrastructure Investment Financing by Sector

4.2.1 Roads

Road construction projects were financed by a general account until 1988, after which a special account was used for more stable and efficient road project financing from 1989 onwards. The special account has been financed by the gasoline special-consumption tax (90%), diesel special consumption tax, and a special consumption tax for private automobiles, so that users bear the costs. Shortages have been supported by the general accounts.

Gasoline and diesel taxes were established in 1994 as a stable and efficient funding source for the transportation sector. The road project special account was expanded into the transportation facility special account to include not only the road account but also the urban railroad, high-speed rail, airport, and harbor accounts. In 1996, the gasoline and diesel special consumption taxes were changed from price-dependent taxes to quantity-dependent taxes.

Under the 2010 transportation facility special account, road account revenues included operating revenues, 53.0% of the transfer from transport, energy and environmental taxes (railroad, 24%; public transport, 10.0%; harbor, 13.0%), 100% of passenger automobile special-consumption tax revenues, the expressway construction financing principal and the interest on it, and road occupation tax revenues.

To address the road facility shortages resulting from inadequate road investment in the 1980s, a special road account was introduced in the late 1980s, which increased the budget remarkably. As land acquisition and other construction costs have risen, however, road expansion has been limited, further aggravating road traffic congestion and resulting in greater losses. This negatively impacts the national industrial competitiveness. To address these problems and to strengthen the country's sustainable growth potential, the important SOC road network must be expanded, and diverse financing measures are needed.

<Table 2-5> Road Account Revenue Details

(Unit: KRW 100 million)

Category	2010 Budget	
	Amount	Description
Total	77,817	94,069 (2009)
▣ Road	77,281	90,634 (2009)
· Transport special account ("TSA") (road account)	76,630	
· Operating revenue	2,133 (2.8%)	· Land-lending fees (157) · Government investment revenue (dividend: 734) · Other interest (KEC) and asset revenues · Current transfer revenue (98) · Goods and service sales revenues (2) · Land and other sales revenues (39) · Recovery of the road-financing principal (810)

Category	2010 Budget	
	Amount	Description
· General account transfer revenue - Transport, energy, and environmental taxes - Passenger automobile special consumption tax - General account additional transfer	66,306 (86.5%) 49,111 (64.1%) 15,142 (19.7%) 2,053 (2.7%)	· Transport, energy, and environmental taxes - Gasoline: KRW 529/l - Diesel: KRW 375/l · Passenger automobile individualconsumption tax - Under 2000 cc: 5%; above 2000 cc: 10%
· Carryover from the previous year	2,269 (3.0%)	
· Transfer from another account (e.g., airport)	5,922 (7.7%)	
☐ TSA (inter-account transaction)	Δ10,154	· Metropolitan roads (2,472), industrialcomplex access roads (7,682)
☐ TSA (inter-account fund transaction)	Δ141	· Advance principal (127), advance interest (8.3), public-officials pension (5.3)
☐ TSA (road account)	Δ30	· Provincial and new town access road construction support (30)
☐ Metropolitan special account (MSA) (metropolitan development account)	8,333	· Metropolitan roads (2,742), local roads (5,861)
☐ MSA (provincial development account)	1,405	· Private capital (1,405)
☐ MSA (Jeju special account)	1,238	· Old national roads (762), old national road management (156), local roads (320)
▣ Others (logistics, etc.)	536	· Advance principal, etc. (141) · Congested roads (335), metropolitan BIS support (60)

Source: MLTM, Road Handbook 2010, 2010

4.2.2 Railroads

The railroad sector experienced drastic reductions in investment for thirty years from the 1st Five-Year Socioeconomic Development Plan in 1962 to the 6th Five-Year Socioeconomic Development Plan in 1991. Moreover, the investment priority was placed on the construction and operation of urban railroads and trains rather than on the expansion purchase of train cars to increase the carrying capacity and facility improvements rather than the expansion of key inter-regional railroads, which

resulted in a regional imbalance in railroad facilities. From 1971, when expressways were first opened, to 2001, the railroad networks increased by 17% in length while the expressway network increased by a high 225%. This lowered the railroad carriage share.

During the 1988-1998 decade, the road investment represented 62.42% of total SOC investment, while railroad investments, including that for high-speed rails, represented 9.55% of total investment. In terms of the distribution of the eleven-year investment monetary amount, road investment represented KRW 30.7 trillion, which was 6.5 times more than the KRW 4.7 trillion railroad investment. Excluding high-speed rail, road investment amounted to twelve times the value as general railroad investment. The investment was based on the transportation system concept rather than on the construction concept. Although railroad transport is a more efficient mode of transport than road transport, intensive investment has been devoted to roads, resulting in increased numbers of vehicles and worsened environmental pollution among multiple negative impacts. From the perspective of the transportation system and its efficiency, investment ratios by mode of transport should be reconsidered.

<Table 2-6> Investment Ratios by Transport Mode in the Five-Year Socioeconomic Development Plan Periods

(Unit: %)

Mode	1st Plan (1962-1966)	2nd Plan (1967-1971)	3rd Plan (1972-1976)	4th Plan (1977-1981)	5th Plan (1982-1986)	6th Plan (1987-1991)
Railroad road harbor/ airport subway	48.4 30.6 21.0 -	18.5 54.0 27.5 -	15.3 46.9 35.2 2.6	15.8 54.8 16.4 13.2	16.9 47.2 15.1 20.8	20.9 57.8 20.2 1.1
Transportation sector ratio of GNP	-	-	1.3	2.1	2.4	2.1

Source: EPB, Budget Plan, 1992

Under the five-year socioeconomic development plans after Korea's liberation, the railroad construction project was implemented as a key national industry. In the 1st Five-Year Socioeconomic Development Plan period (1962-1966), the transportation sector investment ratio was relatively high at 60.0%. From the 2nd Five-Year Socioeconomic-Development Plan period, however, the road sector investment ratio

rose to 50% while railroad investment decreased. Moreover, railroad investments were focused on the purchase of train cars to increase the carrying capacity and facility improvements rather than the expansion of railroads and railroad networks. This contributed to a supply shortage of railroad facilities.

<Table 2-7> Transport Investment in the Last Five Years

(Unit: KRW 100 million)

Category	2006	2007	2008	2009	2010
Road	73,567	75,330	79,259	92,736	77,281
Railroad	32,941	34,625	40,345	51,838	42,020
Urban railroad	12,953	12,845	14,108	16,143	11,492

Railroad account revenues consist of the following: transfers from general accounts, state revenues under Article 33 of the KR Act, transfers and deposits received from different accounts, local and foreign loans under the Act on the Introduction and Management of Public Foreign Loans, deposits received from the public funds under the Public-Fund Management Act, sales revenue of state-owned assets (under the control of and as designated by MLTM according to Article 39 of the State Property Act), and other revenues. Expenditures consist of the construction, improvement, and management costs of general-railroad and highspeed rail infrastructures, and for the modernization of facilities and equipment; investment costs in, support for, and financing in KR for the aforementioned purposes; relevant R&D and technology development costs, repayment of deposits received, borrowing principals, and foreign loans; and other account-operating costs.

Chapter 3.

Policies Led to Successful Transportation Investment

Full-fledged SOC investment began in the 1960s and expanded through the 1970s under the Five-Year Socioeconomic Development Plan. SOC investment continued during the 1980s in line with economic development efforts, though there were reductions due to increased financing of other categories. Heightened SOC investment need prompted investment and changes in the 1990s. The Korea Expressway Corporation (KEC) was established in 1969 to efficiently establish, expand, and manage key roads. More systematic investment was achieved in the 1990s and thereafter.

Transportation projects were able to be successfully implemented because of the government's huge efforts and consensus for such necessity, among many factors. This study examines major policies and measures to appropriately respond to the changing times and circumstances after the 1960s.

A great change in transportation, especially in the road category, is the establishment of KEC in 1969. KEC enabled a systematic construction and management of the country's toll-pay roads, including the construction of the key road networks involving expressways. In 1993, a special account for transportation facilities was established, thus stably financing the investment in transportation facilities. This is a representative financing example. After the 1990s, diverse systems were established to efficiently implement transport projects, along with the enactment of the Transportation System Efficiency ActTransportation System Efficiency Act aimed at dealing with overall transport. Diverse laws were enacted to effectively cope with ever diversifying transport problems. Examples of these laws

aimed at handling urban transport problems were the Urban Transport Improvement Promotion Act and the Special Act for Large City-Metropolitan Transport Management, which were enacted in 1996. This study examines these three laws.

In addition, in the second half of the 1990s, a mid- and long-term master plan began to be formulated to secure the transportation investment efficiency. The Key National Transport Network Plan, the so-called top-tier master plan in the transportation sector, was formulated in 1998, and also the corresponding action plan, namely, the mid-term transportation facility transportation facility investment plan, was formulated, enabling a systematic implementation of Key National transportation facility transportation facility projects with connectivity made possible between Transport modes. The Key National Transport Network Plan includes a 20-year project implementation plan for the whole Key National transportation facilities involving land, sea, and air transport. This plan therefore examines roads, railroads, and airports. The Plan includes a 10-year comprehensive project plan for roads and railroads to enhance the connectivity between plans and sectors, as well as implementation efficiency.

In addition to these legal mechanisms, diverse policies and measures were formulated in the 2000s to implement transport projects, and this study examines the building of national transport DB, the development of investment project evaluation system, and the formulation of transportation facility investment evaluation guidelines. The national transport DB was developed to encompass and manage all national transport data in order to reduce individual transport survey costs and to secure the unity and standard of transport data analysis. Previously, whenever individual investment in transportation projects were implemented, individual surveys on relevant areas were conducted to create basic data such as OD and networks, and this wasted budgets and created errors in forecasting demand. After the 2000s, when the DB was built, standard transport data started to be utilized, thus saving expenses in implementing transport projects, and determining with objectivity and fairness whether to implement transportation investment projects or not. To build and manage the national transport DB, the government operates the National Transport DB Center within the government-invested KOTI.

The country's investment project evaluation system can manage the lifecycle

of investment in transportation projects transparently and systematically-from conceptualization to selection to implementation to maintenance and management-to boost the efficiency of transportation investment projects. This study examines the country's systematic evaluation and management system for the whole process from preliminary feasibility study to feasibility study to follow-up evaluation. Lastly, it examines the transportation facility investment guidelines aimed at enhancing the objectivity and fairness of determining transportation investment projects. The guidelines concern the methods of evaluating the economic feasibility of transportation facility investment projects. These guidelines offer basic assumptions for evaluating economic feasibility as well as standard demand forecasting methods, standard cost calculation methods, etc. so as to be able to minimize human errors in evaluating projects. The guidelines are managed and regularly updated by the MLTM.

After the 2000s, to ensure efficient operation in the railroad sector, public corporations for railroads were established, and this study examines the Korea National Railroad, which was divided into Korea Rail Network Authority and KORIL. Cases of indicated examples are chronically outlined as follows.

- ○ 1969: Establishment of Korea Expressway Corporation (KEC) (organization)
- ○ 1993: Establishment of the transportation facility special account (finance)
- ○ 1996: Enactment of the Urban Transport Improvement Promotion Act and the Special

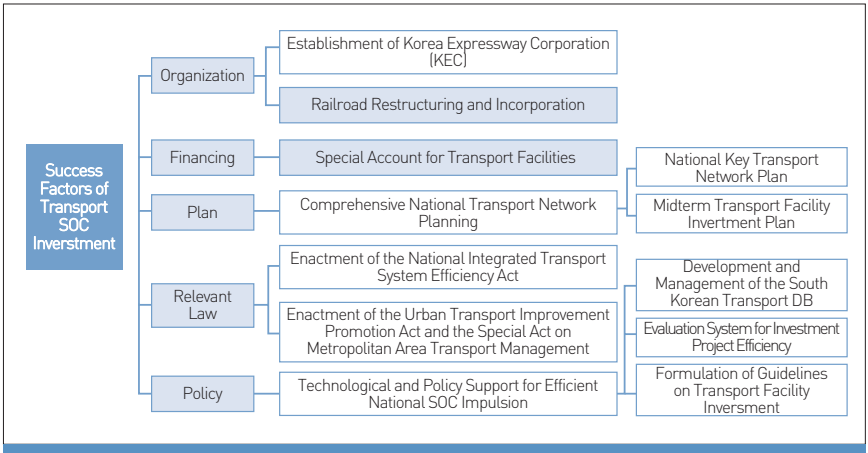
Act on Large-City and Metropolitan Transport Management

- ○ 1998: Formulation of the Comprehensive National Transport Network Plan
- ○ 1999: Enactment of the Transportation System Efficiency Act
- ○ After 2000:

  Restructuring of railroad sector through public incorporation (organization)
  Provision of support for technology development and policymaking to efficiently implement transport (policy)
  Development and management of a South Korean transport DB
  Development and operation of investment project efficiency evaluation system
  Formulation of the Transportation Facility Investment Evaluation Guidelines

The aforementioned success factors are classified into legal systems and financing. Specifically, they are classified into organizations, financing, planning, legal systems,

and support policies. These cases are outlined in <Figure 3-1>.



<Figure 3-1> Success Factors of Transport investment

1. Establishment of Korea Highway Corporation

Korea Expressway Corporation (KEC) is South Korea's quasi-market-oriented public corporation that was established to construct and maintain expressways and to conduct relevant businesses for the promotion of road improvement and development of road transport.

Since 1967, the Construction Ministry pushed to establish Korea Expressway Corporation (KEC) to respond to ever increasing demand for transportation. The government enacted a KEC Act bill to allow KEC to use a capital of KRW 2 billion in ① establishing and managing toll-pay roads, ② collecting tolls for pay-based roads, and ③ engaging in road construction and improvement works, as well as to issue road bonds aimed at raising the finances.

KEC was established on February 15, 1969, according to the KEC Act (Law No. 2083) and the Enforcement Decree of the KEC Act (Presidential Decree No. 3745), which was enforced in January 1969. KEC's duties include feasibility study evaluation and basic design according to expressway construction plans; implementation of expressway construction projects; maintenance of expressways;

management of paving, structures, and road facilities; maintenance and repair of expressways and intelligent expressway businesses such as intelligent traffic information systems, traffic information centers, and hi-passes.

In accordance with the complete revision of the KEC Act in 1986, its capital was set at KRW 5 trillion, consisting of investments by the central government and municipalities as well as by Korea Development Bank. As deemed necessary, up to half of the capital can be raised by issuing stocks.

KEC was established to take over the management of toll expressways such as Gyeonggin and Gyeongbu Expressway once opened. Several revisions of the act added more duties to KEC's responsibilities, such as the supervision of overseas projects beginning in 1976 and toll-free road management starting from 1977. Upon its establishment, KEC took over the management of Gyeongin Expressway and the 45.5 km-long Seoul-Osan segment of the Gyeongbu Expressway Line. It also constructed and took over major local expressways such as Honam, Yeongdong, Donghae, and Guma, which is a feeder line of the current Jungbu Inland Expressway. In June 1984, KEC took over the management of 88 Olympic Expressway, and in April 1985, it began the construction of Jungbu Expressway. As such, it played a decisive role in modernizing the provincial road networks after the mid-1960s as well as road expansion, road improvement and overall development of road transport in Korea. In 1994, KEC implemented a comprehensive mechanized toll collection system. In 1997, it increased its capital to KRW 10 trillion. In 1999, it expanded the Gyeongbu, Yeongdong, Guma (currently a feeder line of Jungbu Inland Expressway), Jungang, and Gyeongin expressways as well as Seoul Express Beltway.

In 2002, Expressway Information and Communication Co. and Expressway Management Authority were privatized, and the Cheonan-Nonsan Expressway (currently the Nonsan-Cheonan Expressway) was constructed. In 2004, KEC took over the construction management of the Donghae and Jungbu Inland expressways, and established Hi-pass offices nationwide in 2007. Hi-pass, a wireless expressway toll payment system, was first tested in June 2000 on six roadways at the following three toll gates: Seongnam, Cheonggye, and Pangyo. In October 2008, the average Hi-pass use rate nationwide surpassed 30%. In June 2009, Hi-pass users reached 2.5 million after the introduction of the pay-later Hi-pass card system, expansion of Hi-

pass lanes, and provision of a Hi-pass fee discount system. The history of KEC is outlined as follows:

- ○ July 17, 1969 Promulgation of the KEC Act (Law No. 2083)
- ○ January 28, 1969 Promulgation of the Enforcement Decree of the KEC Act (Presidential Decree No. 3745)
- ○ February 15, 1969 Inauguration of KEC with a capital of KRW 50 billion
- ○ December 30, 1972 Increased its capital to KRW 150 billion
- ○ November 28, 1973 Completion of the construction of the new KEC building
- ○ March 2, 1976 Launched branches (Suwon, Daejeon, Gwangju, and Daegu)
- ○ June 27, 1984 Took over management of 88 Olympic Expressway (the 175.3km Okpo-Damyang segment)
- ○ May 12, 1986 Increased capital to KRW 700 billion
- ○ December 31, 1990 Increased capital to KRW 1.5 trillion
- ○ June 11, 1993 Increased capital to KRW 5 trillion
- ○ March 1, 1994 Implemented across-the-board mechanized toll collection system
- ○ August 10, 1995 Implemented a regional-division-head system (six branches→six regional divisions)
- ○ May 10, 1999 Implemented a pilot Hi-pass system
- ○ June 30, 2000 Began to operate the Hi-pass system (Seongnam, Pangyo, and Cheonggye offices)
- ○ December 2, 2002 Privatization of Expressway Management Authority (currently KR Industry)
- ○ March 6, 2003 Ranked second in 2002 Public-Corporation Innovation Evaluation (of 214 agencies)
- ○ February 14, 2007 Promulgated new CI
- ○ December 13, 2007 Developed a Hi-pass system across its offices nationwide

KEC currently has a headquarters office, six regional divisions, thirty-three provincial branches, and 146 offices, as well as the Road Research Institute, Paving Office, and sixteen construction offices. Its workforce consists of 4,534 people. As of December 29, 2009, it managed twenty-nine road routes with a total length of 3,511 km. KEC's history of expressway construction is outlined as follows:

- ○ 1960s

1966	Devised expressway construction plan in line with 2nd Five-Year Socioeconomic Development Plan
May 1967	Began construction of Gyeongin Expressway
February 1968	Began construction of Gyeongbu Expressway
December 1968	Simultaneously opened some segments of Gyeongin Expressway and Gyeongbu Expressway
○ 1970s	
July 1970	Opened entirety of Seoul-Busan Gyeongbu Expressway (428 km)
December 1970	Opened Daejeon-Jeonju Honam Expressway (79.5 km)
December 1971	Opened Singal-Saemal Yeongdong Expressway (104 km)
November 1973	Opened Jeonju-Busan Honam and Namhae Expressway (348.8 km)
October 1975	Opened Saemaul-Gangneung Yeongdong Expressway (97 km) and Gangneung-Donghae Expressway (30 km)
December 1977	Opened Daegu-Masan Expressway (84.2 km)
○ 1980s	
September 1981	Opened Busan-Naengjeong Namhae feeder line (20.6 km)
June 1984	Opened Okpo-Damyang 88 Olympic Expressway (175.3 km)
December 1987	Opened Seoul-Nami Jungbu Expressway (123.6 km)
December 1988	Opened Yeongdong-Donghae Expressway (12.5 km)
○ 1990s	
November 1991	Opened Pangyo-Guri Seoul Express Beltway (23.5 km) and Singal-Ansan Expressway (23.2 km)
December 1993	Opened Guri-Toegyewon Seoul Express Beltway (2.7 km)
July 1994	Opened Incheon-Ansan Seohaean Expressway (27.6 km) and Seochang-Gwangmyeong Second Gyeongin Expressway (10.8 km)
July 1995	Opened Pangyo-Hakui Seoul Express Beltway (8.8 km)
August 1995	Opened Daegu-Andong, Jecheon-Wonju, and Hongcheon-Chuncheon Jungang Expressway (139 km)
December 1995	Opened Pyeongchon-Hakui Seoul Express Beltway (5.3 km), the Iljik-Ansan segment of Seoul-Ansan Expressway (9.1 km), and Gwamyeong-Seoksu Second Gyeongin

	Expressway (4.7 km)
June 1996	Opened Daedong-Daejeo segment (8.8 km) of Busan-Daegu Expressway and the Yangsan-Daedong segment (7.5 km) of Busan-Daegu feeder line
December 1996	Opened Ansan-Anjung Seohaean Expressway (42.7 km) and West Jinju-Jinju segment (7.8 km) of Daeejon-Tongyeong Expressway
November 1997	Opened the Gimpo-Sinpyeong segment (3.5 km) of Seoul Express Beltway
July 1998	Opened Jangsu-Seoun segment (8 km) of Seoul Express Beltway
August 1998	Opened Muan-Mokpo Seohaean Expressway (23.2 km)
October 1998	Opened Hamyang-West Jinju segment (50.2 km) of Daejeon-Tongyeong Expressway and Seocheon-Gunsan Seohaean Expressway (22.7 km)
November 1998	Opened Seoul-Iljik segment (5.2 km) of Seoul-Ansan Expressway
July 1999	Opened Gupo-West Busan segment (3.9 km) of Busan-Daegu Expressway
September 1999	Opened Andong-Yeongju segment (25.5 km) of Jungang Expressway and Panam-Biryong segment (2.4 km) of Daejeon Nambu Express Beltway
November 1999	Opened Anyang-Jangsu and Seoun-Gimpo segments (29.1 km) of Seoul Express Beltway
○ 2000s	
June 2000	Opened Yeongju-Punggi Jungang Expressway (9.5 km)
November 2000	Opened Anjung-Dangjin Seohaean Expressway (18.8 km)
December 2000	Opened West Daejeon-Panam segment (18.4 km) of Daejeon Nambu Express Beltway and the Daejeon-Muju segment (43.6 km) of Daejeon-Jinju Expressway
August 2001	Opened Wongju-Hongcheon Jungang Expressway (42.5 km)
September 2001	Opened Danjin-Seocheon Seohaean Expressway (103.7 km), Sinpyeong-Ilsan segment (2.1 km) of Seoul Express Beltway, and Sangju-Gimcheon Jungbu Inland Expressway

(32.1 km)

November 2001	Opened Changwon-Sanin segment (16.2 km) of Masan Express Beltway, Muju-Hamyang segment (59.4 km) of Daejeon-Tongyeong Expressway, and the Gangneung-Jumunjin segment (20 km) of Donghae Expressway
December 2001	Opened Punggi-Jecheon Jungang Expressway (50.5 km) and Gunsan-Muan Seohaean Expressway (113.3 km)
December 2002	Opened Pyeongtaek-Anseong segment (28 km) of Pyeongtaek-Eumseong Expressway, Yeoju-Chungju Jungbu Inland Expressway (42 km), and Cheonan-Nonsan Expressway (81 km) (privately financed)
January 2004	Opened Sangju-North Sangju Jungbu Inland Expressway (12.7 km)
July 2004	Opened Chungju-Goesan Jungbu Inland Expressway (14.9 km)
November 2004	Opened Gangneung-Donghae segment (40.7 km) of Donghae Expressway
December 2004	Opened Daegu-Pohang Expressway (68.4 km) and Chungju-Sangju Jungbu Inland Expressway (50.3 km)
December 2005	Opened Jinju-Tongyeong segment (48.8 km) of Tongyeong-Daejeon Expressway
December 2006	Opened Jangseong-Damyang segment (27.3 km) of Gochang-Damyang Expressway
August 2007	Opened West Anseong-Namanseong segment (10.1 km) of Pyeongtaek-Eumseong Expressway
November 2007	Opened Muan Airport-Naju segment (30.6 km) of Muan-Gwangju Expressway, Cheongwon-Sangju Expressway (80.5 km), and Hyeonpung-Gimcheon segment (62.0 km) of Jungbu Inland Expressway
December 2007	Opened Iksan-Jangsu segment (59 km) of Iksan-Pohang Expressway and Gochang-Jangseong segment (17.2 km) of Gochang-Damyang Expressway
November 2008	Opened Anseong-Eumseong segment (21.2 km) of Pyeongtaek-Eumseong Expressway

○ 2010s

July 2010	Marked 40th anniversary of Gyeongbu Expressway opening
September 2010	Opened Yeoju-North Yeoju segment (17.6 km) of Jungbu Inland Expressway
December 2010	Opened Jeonju-Suncheon segment (113.5 km) of Suncheon-Wanju Expressway

2. Railroad Reform and Korea Railroad Corporation

The country's railroad business was put under the control of the government with the installation of the Transport Ministry in 1948. In 1960, the Transport Business Special Account Provisional Action Act introduced a corporate accounting system to this sector. In 1963, the railroad work was removed from the Transport Ministry and was assumed by the Railroad Agency, an independent corporation, for the purpose of improving railroads alongside economic development, and to utilize a more autonomous accounting system for public corporations rather than a controlled one under the Budget and Accounting Act, which enabled more flexible operation. The Corporate Budget and Accounting Act, which was promulgated on December 31, 1961, were applied to five special accounts (railroad, communication, monopoly, grain, and procurement), under which a corporate accounting method was implemented. Requirements included the drawing up of balance sheets and profit statements as well as cost calculation accounting based on transactions.

Though railroads dominated the long-distance carriage of passengers and cargoes up until the 1990s, their management conditions worsened during the 1970s with the increasing use of expressways and automobiles as a result of improvements in public-road conditions. Railroad losses exceeded KRW 70 billion at one point in the early 1980s. Though the railroad business adopted the corporate accounting system, it suffered losses each year due to its use of non-corporate management methods. The country's railroad management was limited in its ability to respond quickly to new changes because of centralized decision making process, inflexible management, irrational organizational expansion associated with a stable increase in demand, and an unclear chain of command. Therefore, the government restructured national railroad management by through divisions into facilities and operation in

order to address chronic losses and improve overall railroad services. KNR suffered heavy operating losses from large construction projects, and its services worsened because of its rigid operation as a public agency. To address these problems, the government changed the construction division-which required significant amounts of finance-into an authority that was responsible for facilities and construction in order to reduce its financial burden. Moreover, the operations division was converted into a public corporation with the goal of creating a more rational management system. The new public corporation was now able to conduct advertising, marketing, and various supplementary businesses on its own.

Efforts to convert KNR into a railroad authority were made in the mid-1980s. The Transport Ministry, which controlled KNR, began to review a railroad authority measure in 1985. It drew up the Korea Railroad Corporation (KORAIL) Act in 1988 and promulgated it the following year. Typical of structural shifts, the corporation launching was delayed by KNR's debts, financial support, conversion of manpower layoffs into other functions, and possible railroad strikes. This idea was shelved at the end of 1995.

Efforts improve the sluggish railroad operation and to privatize the maintenance and operation of the railroad facilities picked up more momentum by March 1999 with the decision to combine the construction division of KNR with KHRA to create a new railroad construction authority. The operation division restructuring was targeted for completion in 2001. The privatization plan was delayed due to policy inconsistencies. In July 2003, railroad restructuring legislation, such as the Basic Railroad Industry Development Act, KR Act, and KORAIL Act were promulgated. Accordingly, KNR's tasks were divided between KR (facilities) and KORAIL (operation). The 100%-government-invested KORAIL would undertake the responsibilities of attracting customers, ticket sales, and commercial activities such as carriage and automobile maintenance. Ownership of railroad facilities, including SOC infrastructure like roads, airports, and harbors, remained in the hands of the state. KR, on the other hand, undertook the construction of railroads and the management of facilities. KR was launched on January 1, 2004 when the Construction Division and the High-Speed Rail Construction Authority were integrated under the control of KNR. KORAIL, on the other hand, was launched on May 1, 2005 when it took over the other divisions of KNR. The history of railroad

restructuring in South Korea is outlined as follows:

○ 1980s	Railroad restructuring discussions began.
○ 1989-1995	KORAIL Acts promulgated. Plan delayed twice despite efforts to establish Railroad Corporation, twice. And Act eventually dissolved in 1995 (enacted in 1993)
○ May 1999	Government decided to privatize railroad sector and to create railroad authority
○ October 1999 -June 2000	Study on railroad-restructuring measures conducted by Samil Accounting Corporation
○ February 2001	Regulation on the Railroad Restructuring Reform Committee (Presidential Decree No. 17131) enacted
○ March 2001	Railroad Restructuring Preparation Group launched
○ February 27 -March 19, 2001	Public notice regarding proposed Railroad Restructuring Basic Act issued
○ August -November 2001	Hearings held on bill (the plan failed due to the union's opposition)
○ December 17, 2001	Bills submitted to National Assembly (Railroad Industry Development and Restructuring Act and KR Act)
○ December 26, 2001	Railroad Restructuring Center launched (one division staffed with nine people)
○ December 28, 2001	Railroad Restructuring Basic Plan confirmed
○ February 25-27, 2002	Railroad union strike
○ April 15, 2002	Railroad restructuring bills submitted to relevant committee of National Assembly
○ October 21, 2002	Bill on Korea Railroad Corporation submitted to National Assembly
○ January 28, 2003	Presidential Transit Committee announced railroad restructuring adjustment measure
○ June 2-30, 2003	Bills on railroad development and restructuring prepared (Basic Railroad Industry Development Act, KR Act, and KORAIL Act)
○ January 1, 2004	KR established
○ January 1, 2005	KORAIL established

KR consists of four divisions, two departments, three centers, a research institute,

and five regional divisions. Its duties include the following: railroad construction facility asset management; the development and management of railroad facility technologies and provisional support; development and operation of railway station spheres in line with the construction of railroads; railroad safety management anti-disaster measure implementation; and construction of overseas railroads, railroad connecting South Korea and North Korea, Northeast Asian railroad networks.

KORAIL consists of official headquarters, twelve regional divisions, and affiliates. Its headquarters houses five divisions, nine departments, and sixty-three bureaus, with a total of 2,678 staff. In addition, KORAIL affiliates include the following: a research institute, an information technology center, an accounting integration center, a human resources development institute, a railroad traffic control center, a special multiple-unit operation center, a rolling-stock maintenance center, and other offices.

3. Transportation Infrastructure Special Fund

Stable funding sources are essential to increase the efficiency of transportation facility investment. South Korea's economy more than doubled in scale during the decade (1983-1992), and the number of vehicles increased fivefold. However, the transport infrastructure, including railroads, roads, harbors, and airports, expanded by slightly less than 20% and exceeded their respective capacity limitations. This severely limited the country's industrial development and also fueled increases in socioeconomic costs. Traffic congestion threatened further economic growth, which prompted drastic improvement measures beginning in the 1990s.

The government enacted the Transport Tax Act in 1993 to provide a stable supply of transportation facilities, while the Transportation Facility Special Account Act was enacted in 1994 to facilitate transportation facility expansions and to create an efficient investment system. This act was first named Road and Other Transportation Facility Special Account Act, but it was renamed Transportation Facility Special Account Act in 1995. These two acts formed the legal bases for establishing the transportation facility special account. The road and other transportation facility special account was established by incorporating the road project special account and the urban-railroad-project special account together as well as absorbing the

high-speed rail, airport, and harbor project accounts supported by the general accounts. Pursuant to the Special Act on Large City and Metropolitan Transport Management promulgated in 1998, the metropolitan transportation facility account was additionally established to stably raise the project costs for the construction and improvement of metropolitan roads, metropolitan electric railroads, and other metropolitan transportation facilities under the act.

In December 2006, the expiration date of the Transportation Facility Special Account Act was extended from December 31, 2006 to December 31, 2009, provided that the ratio of transferring transport, energy, and environmental tax revenues to the transportation facility special account changed from 0.858 to 0.800.

The ratios for sharing transport tax revenues for each account were stipulated in the Enforcement Rule of the Transportation Facility Special Account Act under the MLTM Decree. The transportation facility special account had four accounts: the road, airport, metropolitan, and reserve accounts. Of the special account finance, the Enforcement Rule specified the distribution of the special account as follows: road account, 65.5%; railroad account, 18.2%; airport account, 4.3%; metropolitan account, 2%; and the remainder, 10%. The revenues and expenditures for the road and railroad categories are outlined in the following table.

Transportation facility special account revenue sources are classified into transport and other taxes, non-tax revenues such as facility use charges, and transfers from general accounts. Of these, the largest revenue item is the transport tax, 85.8% of which is transferred to the special account. As such, this portion represents about 70% of the total special account. The transport tax refers to gasoline and diesel special-consumption revenues. In addition to the transport tax, the transportation special account revenue also comprise of the passenger automobile special consumption tax, automobile import tariff, the deposits received from financial investment and loan special accounts, airport service charges, and transfers from general accounts. Of these, the next largest portion is the passenger automobile special consumption tax, which represented 13.4 and 11.6% of the total transportation facility special account revenue in 1995 and 1997, respectively.

With the transportation facility special account, investment in transportation

increased with stability to expand the country's SOC, which was driving force of national economic growth. The government extended the year of the special account from the end of 2003 to 2006 by revising the Transportation Facility Special Account Act. In March 2004, the said act was amended to establish an urban railroad account and to revise the Environment Rule of the Transport Account Act, which enabled flexible readjustment of the transport tax sharing ratios for each account.

The special account greatly helped secure much needed investment in transportation finance. With its major revenue source being the gasoline special consumption tax, which followed the principle of having users assume the costs of the transportation service provided. The said special account raised KRW 5 trillion in 1994, KRW 12.4 trillion in 2000, and KRW 14.2 trillion in 2004. The percentage of the GDP devoted to transportation facility investment increased from 1.56% in 1994 to 2.4% in 2000 and 2.1% in 2004.

<Table 3-1> Revenues and Expenditures under the Transportation Facility Special Account (Road, Railroad, and Metropolitan)

Account	Revenue	Expenditure
Road account	- 65.5% of transport tax - Passenger automobile special consumption tax - Transfers from general accounts - Revenue from investment and stake participation in, and loaning to, government-invested agencies - Deposits received and transferred from other accounts - Local and foreign loans - Deposits received from state management funds - State portion of toll road revenues - Revenue from road management and operation	- Road construction, management, operation, survey and research, and technology development - Investment and stake participation in, and loaning to, government-invested agencies for road project support - Principal repayment for deposits received and local and foreign loans acquired for road projects
Railroad account	- 18.2% of transport tax - Tariff on automobiles, parts, and components, except those for railroads and tracks - Transfers from general accounts - Payment to state coffers for construction of high-speed rail - Loans for construction and operation of urban railroads and high-speed rail - Deposits received and transferred from other accounts - Local and foreign loans - Deposits received from government bond management funds - Other deposits received	- Construction, improvement, and modernization of general railroad infrastructure facilities and equipment - Subsidies and loans for urban railroad construction and operation - Investment in and loans for high-speed rail construction - Survey and research on and technology development for railroad construction and operation - Repayment of principals for deposits received and foreign and local loans

Account	Revenue	Expenditure
Metropolitan transportation facility account	- 20% of transport tax - Transfers from general accounts - Loans for construction and operation of metropolitan transportation facilities - Deposits received and transferred from other accounts - Local loans - Foreign loans - Deposits received from government bond management funds - Other revenues	- Construction, operation, survey and research, and technology development for metropolitan transportation facilities - Subsidies and loans for construction and operation of metropolitan transportation facilities - Repayment of principals for deposits received and loans acquired * Metropolitan transportation facilities: metropolitan roads, metropolitan railroads, transfer parking lots, etc.
Reserve	- 10% of transport tax	- Allotted to necessary accounts according to budget

Source: Hong Gap-seon, Estimation of the Transportation Facility Investment Scale and Finance Expansion Measures, KOTI, 1998

Transportation Facility Special Account Act

• Background and Overview

- This act aims to facilitate the expansion of roads, railroads, airports, and harbors, and to ensure the efficient management and operation of these facilities by establishing the transportation facility special account.
- The account is classified into the road, railroad, public transport, airport, Metropolitan transportation facility, and harbor accounts. These are managed and operated by MLTM.
- Revenues for each account come from transfers from general accounts, state transfers from road tolls, airport service charges, and local and foreign loans, varying from one count to another. Moreover, the expenditures consist of the management and operation and the survey and research costs for the management and operation of roads, railroads, and airports; repayment of principals for foreign and local loans; various investments; and operation costs for other accounts.
- Transfers from general accounts consist of entire transport tax revenues under the Transport Tax Act; the passenger vehicle special consumption tax under the Special Consumption Tax Act; and the tariff on automobiles, parts, and components, except those for railroads and tracks, under the Tariff Act.
- The Enforcement Rule of the Transportation Facility Special Account Act was also

promulgated.

• History

- In December 1993, the Road, Etc. Transportation Facility Special Account Act was promulgated to stably secure the investment finance for SOC facilities, which are crucial for national economic development, and to incorporate various relevant accounts, thereby efficiently managing and operating the relevant budget.
- In December 1995, the said act was renamed Transportation Facility Special Account Act. Moreover, transport tax sharing ratios for each account were allowed to be determined under MLTM decrees instead of presidential decrees, and other provisions were improved. Adjusted sharing ratios adjustment was intended to stabilize the investment for transportation facilities such as roads, railroads, airports, and harbors, and to boost the account operation efficiency.
- In line with the Special Act on Large City and Metropolitan Transport Management promulgated in April 1997, the metropolitan transportation facility account was added to the transportation facility special account to stably finance the costs for the construction and improvement of metropolitan roads, metropolitan subways, and other metropolitan transportation facilities.
- In July 2005, the urban railroad account was changed into the public transport account, creating the bases for stably supporting the finance for fostering and supporting the public transportation system, including buses, in addition to urban railroads. Moreover, transferred to the fisheries development fund stipulated in the Special Act on Support for Fishermen, Etc. and the Fisheries Industry in Line with the Conclusion of the Fisheries Accord were the occupation and use charges imposed on the collection of stone and sand from the Exclusive Economic Zone out of those imposed on the use of public waters (belonging to the current harbor account tax revenue), under the control of MLTM, or on the collection of minerals, under the Mining Act.
- In December 2006, the validity term of the Transportation Facility Special Account Act was extended from December 31, 2006 to December 2009, provided that the ratio of transferring the transport, energy, and environmental tax to the transportation facility special account was reduced from 0.858 to 0.800.

• Overview of Revenues and Expenditures

1. Road Account

Road account revenues are comprised of a number of sources, including transfers from general accounts, revenue from investment and loans, and deposits received and transfers from other accounts. Additional revenue sources consist of local and foreign loans acquired under the Act on the Introduction and Management of Public Foreign Loans, deposits received from public funds under the Public-Fund Management Act, and the station portion of the revenue generated under Article 55 and 73 of the Road Act and Article 22 of the Toll Road Act. Finally, revenue from road construction, improvement, management, and road operation are allocated to the road account. Expenditures, on the other hand, consist of the expenses for road construction and improvement, management and operation, survey and research, and technology development; investment and stake participation in and loaning to governmentinvested agencies towards supporting road projects under the Basic Governmentinvested Agency Management Act; repayments of principals for deposits received and of foreign and local loans acquired; and other expenses for the operation of the account.

2. Railroad Account

Railroad account revenues consist of transfers from general accounts, payments to the state coffers under Article 33 of the KR Act, revenue from loans, and deposits received and transfers from other accounts. Additional revenue come from local and foreign loans acquired under the Act on the Introduction and Management of Public Foreign Loans, deposits received from the public funds under the Public-Fund Management Act, proceeds from the sale (under Article 39 of the Stateowned Property Act) of state-owned properties that are under the responsibility of and are designated by MLTM, and other revenues. Railroad account expenditures are comprised of expenses for the construction, improvement, and management of general railroad and high-speed rail infrastructures and for the modernization of facilities and equipment. Investment and stake participation in and loaning to KR, etc., for the construction, improvement, and management of general railroad and highspeed rail infrastructures and modernization of facilities and equipment also account for railroad expenditures. Moreover, expenses for survey and research and technology development in connection with the construction and operation of general railroads and high-speed rails, repayments of the principals for deposits received and of foreign and local loans acquired, and other expenses for the operation of the account also comprise expenditures.

3. Public Transport Account

Public transport account revenues consist of transfers from general accounts, loans, and a deposit received and transfers from other accounts. They also include local and foreign loans acquired under the Act on the Introduction and Management of Public Foreign Loans as well as deposits received from public funds under the Public-Fund Management Act. Finally proceeds from the sale (under Article 39 of the State-owned Property Act) of properties that are under the responsibility of and are designated by MLTM and other revenues account for public transport account revenues. The myriad of expenditures of the public transport account, on the other hand, consist of expenses for the construction, improvement, and management of urban railroad infrastructures and for the modernization of facilities and equipment; subsidies and loans for urban railroad construction and operation; and investment and stake participation in and loaning to KR, etc., devoted to constructing and improving urban railroad infrastructures and to modernizing facilities and equipment. Further expenditures include expenses for survey and research and technology development in connection with the construction and operation of urban railroads; subsidies and loans for the upgrading and diversifying of public transportation facilities under Article 2, section 3 of the Act on Fostering Public Transport and Promotion of the Use Thereof; and subsidies and loans for the expansion and improvement of public facilities under Article 2, section 3 of the preceding act, and expenses for survey and research and technology development for the promotion of the use thereof. Lastly repayments of the principals for deposits received and of foreign and local loans acquired; repayment of the principal for the debt of Busan Transport Authority acquired by the government under Article 4 of the Supplementary Rule of the Busan Transport Authority Annulment Act as well as other expenses for the operation of the account are accounted expenditures of the public transport account.

4. Airport Account

Airport account revenues are comprised of transfers from general accounts, navigation safety facility service charges among the service charges stipulated in Article 86 of the Aviation Act, noise charges under Article 109 of the said act, and aviation development project revenue under Article 2, section ___ of the said act. Additionally, proceeds from the sale of relocation complexes in line with the implementation of relocation measures related to aircraft noise damage prevention projects under Article 107 of the said act are allocated to the airport account.

Transfers from other accounts, repayments of the principals for deposits received and of local and foreign loans acquired under the Act on the Introduction and Management of Public Foreign Loans, deposits received from the public funds under the Public-Fund Management Act, and other revenues are devoted to the airport account. Expenditures consist of expenses for airport construction and expansions, navigation safety facility improvements and expansions, and aircraft noise prevention measures. Further expenditures include subsidies, stake participation in, and loans acquired by the implementers of airport construction projects under Article 6 of the Seoul Metropolitan Airport Construction Promotion Act, expenses for survey and research and technology development airport construction and operation, repayments of the principals for deposits received and of foreign and local loans acquired, and other expenses for the operation of the account.

5. Harbor Account

The harbor account revenue consists of transfers from general accounts; harbor facility service charges under the responsibility of MLTM under Article 32 of the Harbor Act; service charges for state-owned properties that are under the responsibility of and designated by MLTM under Article 25 of the State-owned Property Act; proceeds from the sale of properties under Article 40 of the said act; occupation and service charges under the responsibility of MLTM under Article 9 of the Public-Waters Management Act; payments to the state coffers under Article 31 of the Korea Container Terminal Authority (KCTA) Act; payments of loans, repayments of the principals for deposits received, and transfers from other accounts; payments of local and foreign loans acquired under the Act on the Introduction and Management of Public Foreign Loans; repayments of deposits received from public funds under the Public-Fund Management Act; and other revenues. The expenditures of the harbor account, on the other hand, consist of the expenses for harbor survey and research and technology development; the expenses for the construction and improvement and maintenance and repair of harbor facilities; the investment in loaning to KCTA; repayments of the

6. Metropolitan Transportation facility Account

Revenues for the metropolitan transportation facility account include transfers from general accounts, loan payments, repayments of the principals for deposits received, and transfers from other accounts. Other revenues include payments of local and

foreign loans acquired under the Foreign Capital Introduction Act, repayment of the principals for the deposits received from public funds under the Public-Fund Management Act, metropolitan transportation facility charges under Article 11-6, section 1 of the Special Act on Large City and Metropolitan Transport Management, and other revenues. Expenditures consist of expenses for the construction and improvement and management and operation of metropolitan transportation facilities and for relevant survey and research and technology development; subsidies and loans for the construction and operation of metropolitan transportation facilities; and transfers to the railroad project special account, etc. Other expenditures include repayments of the principals for deposits received and of foreign and local loans acquired, transportation facilities whose segments and locations are designated by the Metropolitan Transport Committee under Article 11-6, section 3, paragraph 2 of the Special Act on Large-City and Metropolitan Transport Management, and other expenses for the operation of the account.

4. National Comprehensive Transportation System Master Plan

4.1 National Comprehensive Transportation System Background and Need

As transportation facilities are interdependent, an efficient investment therein should be linked with other relevant facilities. The remarkable development of South Korea's transport channeled the creation of growth engines boosting national economic development in the 1960s, while it supported the diversification of economic activities in the 1980s and subsequent periods. In the process, however, many problems emerged. For example, investment was disproportionally focused on roads, creating an imbalance in transportation facilities. Moreover, in the second half of the 1990s, connectivity between transportation facilities was emphasized. Traffic congestion in large cities cannot be addressed with road construction alone and without expanding urban railroad networks; rather, the planning and review of the national transportation network system as a whole needed to also encapsulate express national roads, general national roads, and high-speed railroads from a comprehensive perspective.

To devise a comprehensive national transportation network plan, current transportation situation and the entire future national traffic volumes should be forecasted by region and transport axis. Moreover, to forecast future traffic volumes, it is necessary to secure data regarding future population figures by region, number of vehicles, land use levels, employment structure, and GNP and GDP. As obtaining these data takes much time and money, devising a comprehensive transportation plan at the national level is challenging. Nonetheless, South Korea has been able to devise a systematic twenty-year national transportation network plan that encompasses all roads, railroads, airports, and harbors, thanks to the South Korean Transport Database (DB). The South Korean Transport DB Center, which is responsible for building and operating the South Korean Transport DB, built nationwide inter-regional O/D and networks based on regular large-scale surveys, and provided future traffic index forecasts, thereby enabling the easy and efficient formulation of a comprehensive national transportation network plan.

The comprehensive national transportation network plan is divided into the key national transport network plan and the midterm transportation facility investment plan. These two transportation plans are fundamental. While the key national transportation network plan is a master plan devised every 20 years, the midterm transportation facility investment plan, which is an execution plan for realizing the former plan, which is devised every five years.

4.2 National Transportation Network Plan

4.2.1 Plan Overview

The Comprehensive Public land Development Plan and the SOC Expansion Plan were implemented as part of the first to six 'Five-Year Socioeconomic Development Plan' from 1962 to 1991, throughout which the number of vehicles and traffic demand surged explosively. The government established the transportation facility special account in 1994, investing KRW 5 trillion in 1994, KRW 12.4 trillion in 2000, and KRW 14.2 trillion in 2004. Transportation facility investments increased from to 1.56% of the GDP in 1994 to 2.4% in 2000 and 2.1% in 2004.

Though investment in transportation facilities surged after the 1990s, Comprehensive Facility Expansion Plan could not adequately meet the total

demand for transportation. Moreover, connectivity between transportation modes such as roads, railroads, airports, and harbors was lacking. Expansion of transport modes was unbalanced, and the national transportation policy goals could not be met. A systematic long-term comprehensive transportation plan was needed to meet the onset of the Northeast Asian era. In March 1998, the government designated the formulation of the key national transportation network plan as a state task. A taskforce was established for this purpose in April 1998. A key national transportation network plan was formulated by planning for each transport mode, consultation with relevant agencies, and public hearings. In February 1999, the Transportation System Efficiency Act (currently National Transportation System Efficiency ActTransportation System Efficiency Act) was promulgated, while, the Key National Transport Network Plan (2000-2019) was finalized in December 1999 after deliberations by the Transportation Policy Committee, which were led by the Prime Minister, commenced.

The plan was later revised to consider the transportation system at a more comprehensive scale and to respond to changing circumstances. In 2007, the 1st Revised Key National Transport Network Plan (2000-2019) was formulated. Though mid- and long-term traffic master plans are fundamental, they have been found to be partially inadequate in its implementation. The revised plan was further revised with the formulation of the 2nd Revised Key National Transport Network Plan (2001-2020) in 2011, which comprehensively considered the National Railroad Network Plan, the Master Plan for Road Improvement, the 3rd Basic Harbor Development Plan, and the 4th Mid-and Long-Term Comprehensive Aviation Development Plan. Moreover, the 2nd Revised Key National Transport Network Plan also addressed strategies for green transportation associated with the climate convention and intermodal transportation systems.

4.2.2 Nature of the Plan

The four objectives of the Key National Transport Network Plan geared towards globalization and informatization, are as follows: development of transportation networks boosting national competitiveness in the 21st century; development of cost-saving logistical systems and high-efficiency multimodal transportation systems; development of speedy, convenient, and environmentally friendly transportation

systems; and development of the Korean Peninsula's transportation networks in preparation for the unification of South Korea and North Korea.

Formulated under the National Integrated Transportation System Efficiency Act, the plan offers an efficient and comprehensive twenty-year development scheme for the national transportation network involving land, marine, and air transportation. As such, it offers a long-term, comprehensive investment policy for key national transportation facilities, encompassing roads, railroads, airports, and harbors. The plan includes the following major points:

○ Overview of key national transportation facilities and respective problems;
○ Future transport circumstances, changes and prospects;
○ Objectives and strategies of the plan;
○ Strategies by task;
○ Calculation of investment size and measures for securing finance; and
○ Analysis of investment effects and prospects.

4.2.3 Plan Overview

Four objectives for globalization and informatization were set for the Key National Transport Network Plan

○ Development of transportation networks for boosting national competitiveness in the 21st century
○ Development of cost-saving logistical systems and high-efficiency multimodal transportation systems
○ Development of speedy, convenient, and eco-friendly transportation systems
○ Development of the Korean Peninsula's transportation networks in preparation for the Unification

The plan divided the period into four stages until 2020, and indicated the direction for the development of key national transportation facilities, as shown in <Table 3-2>.

<Table 3-2> Gradual Strategies of the Key National Transport Network Plan

Category	1st Stage (1998-2002)	2nd Stage (2003-2007)	3rd Stage (2008-2012)	4th Stage (2013-2020)
Development directions	- Complete expansion projects - Address country's capacity issues Establish foundation for key national transportation network	- Create framework of key national transportation network - Expand/ upgrade high-speed transport services	- Expand base for the national key transportation network - Develop key transportation network for high-speed/ mass carriage	- Complete key national transportation network - Continue implementation of cutting-edge and enhanced transportation system

Source: Ministry of Construction and Transport, Key National Transport Network Plan, 2000

The Key National Transport Network Plan was formulated in 1998. The plan was first revised in 2007 in response to changes in international trade, such as the South Korea-USA FTA, and to the changes in the public land, such as the construction of Sejong city (Multifunctional Administrative City), innovative cities, and corporate cities, and to strengthen the country's sustainable transportation system. Under the first revised plan, the objectives were revised as follows:

- Expansion of transport infrastructure encompassing roads, railroads, airports, and harbors to advance towards becoming a first-rate global transport and logistical power in the 21st century;
- Integration of land, sea, and aviation transportation networks to develop an efficient comprehensive national transportation system of connectivity between Transport modes;
- Reduction of socioeconomic costs associated with transport and logistical activities, such as traffic congestion, logistical, and traffic accident costs, to bolster the national competitiveness; and
- Development of a sustainable comprehensive national transportation system for the present and future generations.

In 2010, the plan was revised for the second time to achieve the national goals of intermodal transport and low-carbon, green growth. The second revised plan is outlined as follows:

• The plan, the fundamental transportation plan, was entirely improved to systemize the plans by category.

- Create the basic transport framework involving roads, railroads, etc., and review the measures for devising the plans by category.
- Review the measures for improving the individual plans for roads, railroads, and other categories, and for securing planning-time consistency, unity, and interconnection.

• It was necessary to set the goals and visions of the second revised plan oriented toward the future with of green growth and reduced energy consumption.
- Expand investment of green transport, and link land, marine, and aviation networks that mutually complement one another, adjust their alternative relationships, and create synergies.
- Develop a green transport and logistical system geared towards low carbon emissions and energy saving.

• Allocate appropriate transport finance and transportation sector investment from the government budget.
- Prioritize investment in transportation between means and within the same means in line with the SOC investment focused on the green-transport priority.
- Review the mid- and long-term investment plans and finance procurement measures.

The second revised plan involves transportation facility investment plans by category from 2011 to 2020. By 2020, expressways are targeted to have expanded to 5,470 km, and the operating-railroad distance to 4,955 km, and the target double-track achievement ratio is 77.7%, and the electrification ratio 83.6%. The passenger handling capacity of airports is targeted to have expanded to 95,850,000/year, and the container handling capacity of harbors to 34.12 million TEUs per year. The objective of the Comprehensive Key Transport Network Development Plan is geared towards turning South Korea into the transport and logistical hub of Northeast Asia, and also realizing public land development.

<Table 3-3> Index Goals of the Key National Transport Network Plan (2nd Revised Plan)

Category		2001	2005	2009	2015	2020
Roads	Length of express national roads (km)	2,637	2,968	3,776	4,290	5,470
	Length of general national roads (km)	14,254	14,224	13,820	14,312	14,384
Railroads	Operating length (km)	3,125	3,392	3,378	3,997	4,955
	Length of high-speed rails (km)	-	240.4	240.4	653.2	701.8

Formulation of the Key National Transport Network Plan

① Formulation of the Key National Transport Network Plan (2000-2019) in December 1999

1. Plan formulation history

· March 1998 — Formulation of a key national transportation network plan selected as state task

· April-October 1998 — Plan drafted

· October 1998 — Hearings held to gather opinions from various sectors about plan

· November-December 1998 — Draft plan formulated and consultations with related ministries regarding plan

· February 1999 — The Transportation System Efficiency Act Transportation System Efficiency Act promulgated as basis of plan

· March-August 1999 — Whole plan complemented in line with said act

· September-November 1999 — Consultation with related ministries municipalities (16 cities and provinces)

· November 1999 — The Transportation Policy Coordination Working Committee, headed by the Vice Minister of Construction and Transport, deliberated plan

· December 1999 — The Transportation Policy Committee, headed by the Prime Minister, deliberated plan

· December 1999 — Plan finalized and announced (Ministry of Construction and Transport No. 1999-386)

2. Objectives of the plan

· Secure transport infrastructure to bolster the national competitiveness in the 21st century

· Develop a cost-saving logistical system and a highly efficient multimodal transportation system

· Develop a speedy, safe, convenient, and green transportation system

· Develop a transportation network in preparation for the unification of Korean peninsula

3. Gradual development strategies

· Phase 1 (2000-2009)

- Completion of existing expansion project and addressing inter-region transport difficulties of highest priority Diversify key transport axes to distribute and adjust interregion demand for transportation and drastically improve mobility and accessibility nationwide
- Expand international transportation facilities, such as building new airports and harbors, to establish foundation for South Korea's development as transport and logistical hub of Northeast Asia
- Push to restore South Korea-North Korea transportation network to support bilateral exchange and cooperation

· Phase 2 (2010-2019)

- Continue expanding key road networks and develop rail-centered, high-speed, massive key transportation networks.
- Expand and upgrade high-speed transport services to respond to changes in demand for ransportation quality.
- Complete key national transportation network, including expansion of South-North and East-West transport axes, and further road segment connections
- Continue to implement transportation system innovation and upgrades to enable South Korea to play role of transport and logistical hub of Northeast Asia.

② Formulation of 1st Revised Key National Transport Network Plan (2000-2019) in December 2007

1. History of plan formulation

· April 2006	Formulation of revised plan commenced
· May 2006	Ministry of Construction and Transport review meetings held

· July 2006	Strategy and Environment Evaluation Committee and Advisory Council meetings held
· October 2006	Advisory meetings held for calculating appropriate allocation of fund for the transportation sector
· January 2007	Related agencies' combined planning working group launched
· Until August 2007	Ten meetings held on revised plan
· March 2007	Advisory meetings held for strategy and environment evaluation
· May 2007	Hearings held to gather opinions on research results from various sectors
· September 2007	Ministry of Construction and Transport NGO Advisory Group meetings, strategy and environment evaluation meetings, and Sustainable Development Committee deliberation meetings held
· August-October 2007	Consultation with related agencies
· October 19, 2007	National Transport Coordination Working Committee (head: Vice Minister of Construction and Transport) meetings held
· November 2007	Plan deliberated on by the National Transport Committee
· December 2007	Plan finalized and announced (Construction and Transport Notice No. 2007-539)

2. Plan objectives

· Expand transport infrastructure encompassing roads, railroads, airports, and harbors in leap towards becoming a first-rate global transport and logistical power in the 21st century

· Develop integrated network of land, sea, and aviation transport to form an efficient national comprehensive transportation system with connectivity between Transport modes

· Reduce socioeconomic costs associated with transport and logistical activities, such as traffic congestion, logistical, and traffic accident costs, to increase national competitiveness

· Develop sustainable comprehensive national transportation system for present and future generations

3. Major tasks
· Bolster efficiency and interconnectivity of the national transportation system.
· Improve mobility and accessibility to key land transport routes
· Expand global transport and logistical networks
· Gradually create Northeast Asia's single transport and logistical market
· Realize a sustainable national transportation system
· Develop transport technologies and an intelligent national transportation system
· Boost competitiveness of South Korea's transport and logistics industries

4.3 Midterm Transportation Infrastructure Investment Plan

4.3.1 Plan Overview

The Midterm Transportation facility Investment Plan is formulated every five years based on a twenty-year period in accordance with Article 6 of the National Integrated Transportation System Efficiency Act. The first plan (2000-2004), which began to be drafted in January 2000, was confirmed in March 2001 and completed in 2004. The second plan (2005-2009) began to be drafted in June 2004, was confirmed in February 2006, and was completed in 2009. The third plan (2011-2015) was devised and announced in September 2011.

The plan includes the following: (1) transportation facility supply objectives and basic investment direction; (2) scale of the key national transportation facility development project; (3) investment priorities and required finance; (4) appropriate modal share among the transportation facilities; and (5) connectivity between key national transport and local transportation facilities.

The said act includes provisions on the execution of the Midterm Transportation facility Investment Plan. First, heads of the related agencies are required to reflect the Midterm Transportation facility Investment Plan agenda in their transport-related plans, under different laws, as well as their respective business plans. Moreover, according to the Midterm Transportation facility Investment Plan, finance must be appropriately allotted to each item of the transportation facility special account as stipulated in the Transportation Facility Special Account Act. If the transportation facility development project included in the Midterm Transportation

facility Investment Plan is privately financed, it should be reflected in the privately financed investment project basic plan stipulated in Article 10 of the Private Finance Investment Act with regard to SOC infrastructure. To facilitate increased connectivity between the key national transport and local transportation facilities, MLTM may devise and implement measures to connect and operate relevant investment finances according to the pertinent presidential decrees as deemed necessary.

The Midterm Transportation facility Investment Plan is an execution plan and is thus evaluated according to the method stipulated in the aforementioned act, which requires the heads of relevant administrative agencies to evaluate the results of the midterm investment implementation by category before submission to the National Transport Committee. This committee should review the evaluation report and should notify the head of the relevant agency of the review results. The relevant agency head should, according to section 2, take the necessary action to efficiently implement the Midterm Transportation facility Investment Plan depending on the results of the review.

4.3.2 Nature of the Plan

The Midterm Transportation facility Investment Plan is devised every five years to formulate a comprehensive investment plan and transport policies regarding key national transportation facilities based on the Key National Transport Network Plan. Targeted facilities include key national transportation facilities, such as express national roads, general national roads, detour roads replacing the national roads, state-supported local roads, high-speed rail lines, general railroads, metropolitan railroads, airports, ports of trade, and multimodal logistical terminals. Local transportation facilities (linked to the key national transportation facilities), such as metropolitan roads, congested roads, urban railroads, light rail, coastal harbors, and logistical complexes. The nature and function of the Midterm Transportation facility Investment Plan are outlined as follows:

- An intermodal plan implementing the Key National Transport Network Plan on a five-year basis;
- An investment plan for nationwide transportation facilities, including the Key National transportation facilities under the Key National Transport Network Plan, and the local transportation facilities that are connected to the Key

National transportation facilities;

- A five-year plan for the development of key national transport and local transportation facilities, to address the country's overall transport problems and to efficiently respond to the various changing situations in the country;
- A five-year plan for determining the optimal investment size, finance allocation, and investment priority considering the limited finance, traffic demand forecasts, etc.; and
- A plan for preventing budget waste due to duplicate and excessive investment, for intensive investment for construction completion, and for the pursuit of green growth in a bid to maximize investment efficiency.

The Midterm Transportation facility Investment Plan is further outlined as shown below.

- Analyze transport situations and problems
- Forecast future circumstances and traffic demands
- Set plan objectives and strategies
- Calculate key national transportation facility investment size and investment ratios between transport modes
- Adjust investments in key national transportation facility development projects
- Work out measures to secure and raise needed finances
- Devise measures to execute and manage plan

4.3.3 Major Outline of the Plan

a. 1st Midterm Transportation facility Investment Plan (1999-2004)

The Ministry of Construction and Transport (now MLTM) devised the 1st Midterm Transportation facility Investment Plan (2000-2004) to efficiently invest in transportation facilities, such as roads and railroads, in efforts to develop a high-efficiency, low-cost comprehensive national transportation system. Under this plan, a total budget of KRW 99.9 trillion (average yearly increase rate: 5.9 and 3.5% of the GDP) was allocated for the expansion of transportation facilities during the plan period (2000-2004). Moreover, budget allocations for each transport mode were distributed as KRW 54.7 trillion for roads (55%), KRW 28.6 trillion for railroads (29%), KRW 4.6 trillion for airports (5%), KRW 9.9 trillion for harbors (10%), and KRW 2.1 trillion for logistical facilities and others (2%). 65% of funds have been projected (KRW 64.8 trillion) to come from the central government, with 5%

(KRW 4.6 trillion) from local governments, 19% (KRW 19.4 trillion) from public enterprises, and 11% (KRW 11.1 trillion) from private-sector capital.

<Table 3-4> Investment Size of the 1st Midterm Transportation facility Investment Plan (2000-2004)

Category	Total	Road	Railroad	Airport	Harbor	Other Logistics
Investment size (KRW trillion)	99.9	54.7	28.6	4.6	9.9	2.1
Percentage (%)	100	55	29	5	10	2
Average annual growth (%)	5.9	4.1	11.7	-21.0	20.2	13.5

Source: Ministry of Construction and Transport, Key National Transport Network Plan, 2000

Under the first plan, appropriate finance allocations for the transport modes, such as a higher investment ratio for railroads and harbors, were proposed based on studies conducted by five state-run research institutes, including KOTI, on developing a highly efficient multimodal transportation system that reduces logistical costs and bolsters national competitiveness. Moreover, to achieve efficient investment, such as preventing duplicate investments in transportation facilities, the plan proposed intensive investment for construction completion as well as setting economic efficiency and balanced regional development as investment priorities.

By category, a total of KRW 54.7 trillion (expressways, KRW 24.1 trillion; general national roads, KRW 28.9 trillion; metropolitan roads, KRW 1.7 trillion) was allocated for the construction of key road networks. As proposed in the Key National Transport Network Plan, they include seven South-North axes and nine East-West axes in a grid-type expressway network, forty-five expressway projects with a total length of 2,889 km were planned(19 completion-intended projects, 1,515.3 km; 16 continuous projects, 890.6 km; ten commenced projects, 483.3 km). Moreover, to address bottlenecks on general national roads in urban segments, a total length of 2,321 km, including sixty-seven urban detour segments totaling 386 km in length, was projected to be constructed. They include 1,341 km for key national roads, 386 km for urban detour roads, and 595 km of state-supported local roads. In addition, the plan proposed the construction of eight harbor hinterland roads, twenty-seven roads servicing industrial complexes and metropolitan roads totaling 449 km in length that would facilitate transport and logistics further.

The mode split for environmentally friendly and more efficient railroads was projected to double from 7.6% to 14.2%. The plan proposed a budget of KRW 28.6 trillion (high-speed rails, KRW 8.3 trillion; general railroads, KRW 7.9 trillion; metropolitan railroads, KRW 4.1 trillion; urban railroads, KRW 8.4 trillion), with the investment ratio gradually increasing from 25% in 2000 to 31% in 2004. For high-speed rails, the plan proposed the opening of the first stage of Gyeongbu High-Speed Rail (Seoul-Daegu) and the electrification of its Daegu-Busan segment to develop an X-shaped high-speed rail network traversing the Korean Peninsula. The construction of Honam High-Speed Rail was projected after the specific route was determined based on a master plan. For key general railroads, a total of thirty-three projects with a total length of 2,569 km (nine projects with a total length of 775.1 km intended for completion, seven continuous projects with a total length of 422.3 km, and eighteen commenced projects with a total length of 1371.7 km) were planned to be retrofitted with double tracks and electrified in a bid to connect them with high-speed rails. For metropolitan railroads, a total of thirteen projects with a total length of 363.4 km (four projects intended for completion with a total length of 73.9 km, six continuous projects with a total length of 262.6 km, and three commenced projects with a total length of 26.9 km) were proposed. Moreover, for urban railroads, the construction of railroads with a total length of 233 km (seven subways, including Seoul Line No. 9 and Busan Line No. 2 and 3 and two light electric rails) was proposed.

During the first investment plan period, Incheon Airport was opened, enhancing its profile as an international hub airport. With the opening of high-speed rail, travel time across the country was drastically reduced to half a day. By transport mode, 82.2% of the planned expressway construction and 111.3% of planned national road construction were carried out. For railroads, 98.5% of the planned increase in operating distance was achieved, with 86.5% of planned electrification completed and 101.3% of planned double-track conversion.

<Table 3-5> Facility Development Achievements of the 1st Midterm Transportation Facility Investment Plan (2004)

Category		Set Goal	Results	Achievement (%)
Road	Expressway (km)	3,555	2,922.9	82.2
	National road (km)	12,804	14,246	111.3
Railroad	Operating distance (km)	3,425	3,374.1	98.5
	Double-track Development ratio (%)	38.6	39.1	101.3
	Electrification ratio (%)	46.0	39.8	86.5

Source: Ministry of Construction and Transport, 2nd Midterm Transportation facility Investment Plan, 2006
Note: The road plan and results include the road expansion projects.

b. 2nd Midterm Transportation facility Investment Plan (2005-2009)

During the 2nd midterm transportation facility investment period, sixteen projects were completed, including 884 km of expressways and the opening of the entire Jungbu Inland Expressway. 637 km of national roads were constructed through 77 projects until 2009. Moreover, the expressway innovative traffic information system, dubbed FTMS, was installed in the newly constructed expressways with a total length of 1,359 km by 2010.

As for high-speed rail, the 2nd Gyeongbu High-Speed Rail Project involved the construction of the Daejeon-Daegu downtown segment (57 km) and the Daegu-Busan segment (117 km) as well as the continued construction of Honam High-Speed Rail. For general railroads, 81.6 km of railroads, including the Incheon International Airport railroad, were retrofitted with double tracks and electrified through three projects, while 482 km of railroads, including the Deokso-Wonju segment of Jungang Line, were expanded under eight projects.

<Table 3-6> Transport Prospects after the Completion of the 2nd Midterm Transportation Facility Investment Plan (2005-2009)

Category		2004 (A)	2009 (B)	Remarks (B-A)
Road	Express-national-road length (km)	2,923	3,807	883
	General-national-road length (km)	14,246	14,883	637
Railroad	Operating distance (km)	3,374	3,455.6	81.6
	Double-track development ratio (%)	39.1	59.5	20.4
	Electrification ratio (%)	39.8	58.5	18.7

Source: Ministry of Construction and Transport, 2nd Midterm Transportation facility Investment Plan, 2006

c. 3rd Midterm Transportation facility Investment Plan

The 3rd Midterm Key Transportation facility Investment Plan should be devised in line with the long-term goals stipulated in the Key National Transport Network Plan. The third plan should review and incorporate the goals proposed in the second plan. Thus, the third plan should aim to expand the country's transportation facilities in a timely manner that also bolsters national competitiveness and welfare of the Korean public, while also developing infrastructure to achieve balanced regional development and strive towards making South Korea the transport and logistical hub of Northeast Asia. Investment patterns should be changed to expand the key national SOC infrastructures, link public land into a network, and develop a cost-saving logistical system and a efficient multimodal transportation system. Furthermore improvements in the safety, environmental, and maintenance functions as well as the efficiency of existing facilities should be made along with supply-oriented facility investment.

In addition, an integrated transportation system should be developed to maximize the investment efficiency by allotting finance between the SOC categories and within the same categories rationally and efficiently that work towards achieving the national management goals and balanced regional development.

<Table 3-7> Transport Prospects after the Completion of the 3rd Midterm Transportation facility investment Plan (2011-2015)

Category		2009 (A)	2015 (B)	B/A
Road	Express national road length (km)	3,776	4,282	1.13
	General national road length (km)	13,820	14,369	1.04
Railroad	Operating distance (km)	3,378	4,093	1.20
	High-speed rail length (km)	240.4	653.3	2.12

Source: MLTM, 3rd Midterm Transportation facility Investment Plan, 2011

Formulation of the Midterm Transportation facility Investment Plan

① Formulation of the 1st Midterm Transportation facility Investment Plan (2000-2004) in March 2001

1. History of plan formulation

· February 1999 Transportation System Efficiency was enacted

	(Enforcement Decree enacted in August 1999)
· December 1999	Key National Transport Network Plan confirmed implemented
· February -July 2000	Each relevant agency submitted a Midterm Transportation facility Investment Plan (draft)
· April 2000	Taskforce established for formulation of Midterm Transportation facility Investment Plan
· August 2000	Draft Midterm Transportation facility Investment Plan prepared
· October 2000	Public hearings held to gather opinions
· November 2000	Taskforce meetings were held for the formulation of the Midterm Transportation facility Investment Plan.
· December 2000	Transportation Policy Coordination Working Committee (headed by Vice Minister of Construction and Transport) deliberated plan
· December 2000 -February 2001	Transportation Policy Committee (headed by Prime Minister) deliberated plan
· March 2001	Plan finalized and announced

2. Plan Objectives

· Secure transport infrastructure facilities necessary for bolstering national competitiveness

· Realize cost-saving logistical system and high-efficiency multimodal transportation system

· Realize speedy, safe, convenient, and eco-friendly transportation system

3. Plan Strategies

· Make appropriate transportation facility investments considering the financial and economic conditions, facility supply goals, etc.

· Prioritize investments, such as putting first priority on the completion of the existing projects and on addressing the inter-region transport difficulties, in an effort to achieve efficient investments.

- Enhanced priorities

  ○ Make investment in state projects a top priority, such as construction of Incheon International Airport and Gyeongbu High-Speed Rail, in order for completion within planned period, and intensively invest in individual projects to ensure completion.

○ Develop a rational modal share system, strengthen connectivity between transportation investment projects, and consider a balanced regional development effect

○ Enhance transport operational efficiency, such as through ITS projects along with transportation facility investment projects, in a bid to maximize use of country's transportation facilities

○ Strengthen investment considering new policy objectives (i.e., environment and safety), and expand investment in maintenance, repair, and safety of country's transportation facilities

- Lowered priorities

○ Cancel or defer unessential and non-urgent projects, and boldly adjust duplicate investment projects

○ Exclude inadequate projects with inadequate plans

② Formulation of the 2nd Midterm Transportation facility Investment Plan (2005-2009) in February 2006

1. History of plan formulation

· December 1999	Transportation System Efficiency ActTransportation System Efficiency Act enacted (Enforcement Decree enacted in August 1999)
· December 1999	Key National Transport Network Plan finalized and announced
· March 2001	1st Midterm Transportation facility Investment Plan (2000-2004) finalized and announced
· June 2004	Outsourced formulation of 2nd Midterm Transportation facility Investment Plan (2005-2009) completed
· July 2004	Taskforce established for formulation of Midterm Transportation facility Investment Plan
· August 2004	Draft Midterm Transportation facility Investment Plan prepared
· September -December 2004	Plan discussed within ministry and with Ministry of Fisheries and Maritime Affairs.
· December 14, 2004	Public hearings held to gather opinions
· December 2004	2nd Midterm Transportation facility Investment Plan

	(draft) prepared
· January -May 2005	Consultation with Ministry of Planning and Budget
· June -August 2005	Detailed investment plans coordinated by category
· September -October 2005	Plan discussed with related ministries
· October 2005	Strategy and Environment Evaluation Committee deliberated on and a pproved plan
· November -December 2005	National Transport Coordination Working Committee (headed by Vice Minister of Construction and Transport) deliberated plan
· December 2005 -February 2006	National Transport Committee (headed by Prime Minister) deliberated plan
· February 2006	Plan finalized and announced via gazettes

2. Objectives of the plan

· Expand transportation facilities in a timely manner to bolster the national competitiveness and to increase convenience for and enhance welfare of Korean public

- Develop infrastructure to achieve balanced regional development and establish South Korea as transport and logistical hub of Northeast Asia

- Realize a cost-saving logistical system and a high-efficiency multimodal transportation system

· Allocate finance rationally and efficiency among SOC categories and within same categories to maximize investment efficiency and develop an integrated transportation system

3. Strategies of the plan

· Expand key national SOC facilities to construct a network-type public land system.

· Develop hub ports as logistical bases of Northeast Asia in the 21st century

· Develop a high-efficiency, high-value-added logistical system

· Promote public transport in large cities, and properly manage traffic demands therein

· Increase the operational efficiency of the existing transportation systems using sophisticated technology

③ Formulation of the 3rd Midterm Transportation facility Investment Plan (2011-2015) in September 2011

1. History of plan formulation

· March 2001	1st Midterm Transportation facility Investment Plan (2000-2004) finalized and implemented
· February 2006	2nd Midterm Transportation facility Investment Plan (2005-2009) finalized and implemented
· November 2007	1st Revised Key National Transport Network Plan (2000-2019) finalized and implemented
· December 2010	2nd Revised Key National Transport Network Plan (2001-2020) finalized and implemented
· January 2011	3rd Midterm Transportation facility Investment Plan revised and research conducted
· February 2011	Taskforce launched and operated for plan formulation
· May 2011	Midterm Transportation facility Investment Plan drafted
· June 2011	Policy discussion meetings held
· June-July 2011	Draft plan discussed with relevant ministries and municipalities
· August -September 2011	National Transport Committee deliberated confirmed plan
· September 2011	Plan finalized and announced (MLTM Notice No. 2011-508)

2. Necessity of Plan Formulation

· Revise and complement 3rd Midterm Transportation facility Investment Plan in line with 2nd

· Revised Key National Transport Network Plan Change plan goals, strategies, and period

· Formulate five-year execution plan (2001-2005) to implement Key National Transport Network Plan

3. Plan Objectives

· Develop a green transportation system to lead low-carbon and green-growth era.

· Develop intermodal transportation system focused on efficiency, connectivitiy, and integration

· Expand transport in a timely manner to bolster national economic competitiveness

· Reduce socioeconomic costs, such as traffic congestion and logistical costs.

· Bolster country's global competitiveness by expanding and improving transport and logistical facilities

4. Plan Strategies

· Develop and expand an eco-friendly, energy-saving, green transportation system

· Expand country's seamless, interlinked transportation network to enhance network efficiency

· Adjust intersector stocks efficiently to bolster national competitiveness

· Increase efficiency of transportation facilities using sophisticated technology Expand global networks to bolster South Korea's international transport and logistical capabilities

4.4 Long-term Transportation Infrastructure Investment Plan by Sector

The aforementioned Key National Transport Network Plan and the Midterm Transportation facility Investment Plan are South Korea's fundamental transportation plans and aim to offer long-term transportation facility investment directions and investment plans for key national transportation facilities, such as roads, railroads, airports, and harbors. In addition, mid- and long-term plans by category, such as roads and railroads, were devised pursuant to the relevant laws to efficiently expand the country's transportation facilities. The Master Plan for Road Improvement, the fundamental road plan, and the National Railroad Network Development Plan, the fundamental railroad plan, were formulated in line with the Key National Transport Network Plan. These plans and their implementation results are outlined below.

4.4.1 Roads-Master Plan for Road Improvement

South Korea's road plans formulated under laws include the Master Plan for Road Improvement (henceforth "Road Master Plan"), the Five-Year National Road Construction Plan, and the Five-Year State-supported Local Road Plan. Of these, the fundamental plan is the Road Master Plan, and the National Road Construction Plan has the nature of an execution plan of the Master Plan for Road Improvement. The Road Master Plan is formulated on a tenyear basis by Road Agency, according to the Road Act. The Road Master Plan includes road improvement goals and directions, road improvement and management plans, eco-friendly road construction measures,

financing measures and other matters deemed necessary by MLTM or by the Road Agency for systematic road improvement.

The Road Master Plan is the mid- and long-term road plan for the implementation of the Comprehensive Public land Plan, and serves as a guideline for the local and other road improvement plans. Moreover, the Road Master Plan replaces the master plans for the construction projects of express national roads, national roads, and state-supported local roads, pursuant to Article 21, section 3 of the Construction Technology Management Act, and to Article 38-7 of the Enforcement Decree of this act. As such, the plan is very important.

The Road Master Plan was devised in 1998 at a time during which the short-term plan period (1998-2002) expired for the operation of expressways, general national roads, detour roads replacing national roads, and state-supported local roads, which were all under the responsibility of the Ministry of Construction and Transport (currently MLTM). New road policy paradigms needed to be introduced to meet environmental and safety requirements, to increase investment efficiency, and to respond to the local era. Moreover, as the 4th Revised Comprehensive Public land Plan (2006-2020), the National Finance Management Plan (2005-2009), and the Key National Transport Network Plan (2000-2019) had been revised, the Road Master Plan needed revision in response to the socioeconomic changes.

In 2005, a revised Road Master Plan (2006-2010) was devised. The Revised Road Master Plan evaluated investment as successful. For the expressway investment results, investment costs were 92.3% of planned costs, while 96.7% of planned project volumes were achieved. For the national-road investment results, actual investment cost amounted to 99.1% of planned costs, while 97.2% of planned project volumes were carried out. The investment ratio for the state-supported local roads was 95.6% of the plan.

The Revised Road Master Plan (2006-2010) placed top priority on the development of a main expressway network to support decentralization and balanced public land development. It also aimed to improve traffic-congested segments and to strengthen the connections between roads to address urban traffic congestion. The road improvement strategy put first priority on the provision of support for balanced

public land development. Furthermore, the strategy also focused on enabling access to the expressways from anywhere in the country within thirty minutes and increase connecitivity of the expressway network in order to enable travel across the entire country within half a day. In 2011, the 2nd Revised Road Master Plan (2011-2020) was devised, and the Road Master Plan is outlined as follows:

a. Overview of the Master Plan for Road Improvement (1999-2011) (devised in December 1998):

· Develop balanced road networks nationwide by 2020.
  - Standardize accessibility to promote balanced national public land development.

· Address traffic congestion segments and strengthen regional connectivity

· Turn major national roads into key roads and 3D intersections to enhance road facilities.

· Improve road networks, focusing on road functions

<Table 3-8> Road Length Changes under the Master Plan for Road Improvement (1999-2011)

(Unit: km, %)

Year	Express-ways	National Roads	Local Roads	Special-City Roads	City, Provincial Roads	Total	Paving Ratio
1999	2,040	12,418	17,145	17,892	38,039	87,534	74.7
2006	3,103	14,224	17,677	17,738	49,319	102,061	76.8

b. Revision of the Master Plan for Road Improvement (2006-2010), devised in December 2005

· Convert key road investments from local to urban areas
  - Improve Circulation of the transport in large cities, and congested roads to enhance investment efficiency

· Devise Road Master Plan guidelines for local roads to strengthen connectivity between expressways, national roads, and local roads and to prevent duplicate investments

<Table 3-9> Road Length Changes under the Revised Master Plan for Road Improvement (2006-2010)

(Unit: km, %)

Year	Express-ways	National Roads	Local Roads	Special Roads	City, County Roads	Total	Paving Ratio
2006	3,103	14,224	17,677	17,738	49,319	102,061	76.8
2009	3,776	13,819	18,138	18,749	50,501	104,983	79.2

c. 2nd Master Plan for Road Improvement (2011-2020), devised in June 2011

- Maintain same total nationwide key road networks as existing plan while integrating nationwide road networks (7×9) and Seoul metropolitan road networks (7×4+3R).
- Promote large-city traffic congestion segment improvement projects; complete beltway networks in Busan, Daegu, etc.; and facilitate construction and operation of underground roads.
- Adjust road grades and improve road management systems in an effort to computerize road management
- Manage traffic demand and expand ITS to support green growth
- Strengthen road-related international activities to enhance the country's global profile
- The total required budget is KRW 69.9 trillion, of which KRW 68.2 trillion will be obtained from state coffers, according to the National Finance Management Plan, while the balance will be obtained from private capital and public enterprises.

4.4.2 Railroads-National Railroad Development Plan

a. Overview of the National Railroad Network Development Plan and Its Implementation Results

The National Railroad Development Plan ("NR Plan") is a state mid- and long-term plan (based on a ten-year period) for efficient and systematic railroad investments in line with Article 4 of the Railroad Construction Act. The NR Plan is South Korea's fundamental comprehensive railroad plan formulated in line with the Key National Transport Network Plan, the Midterm Transportation facility Investment Plan, and the Large City and Metropolitan Transport Plan. It may be

reviewed and devised every five years. The NR Plan is outlined as follows:

- Mid- and long-term railroad construction plan
- Reducing transfer times between modes
- Financing measures
- Eco-friendly railroad construction measures

The NR Plan has a 10-year implementation period, targets the nationwide space, and encompasses high-speed rail, general railroad, and metropolitan railroad projects. Research on the master plan for the NR Plan in the 21st century was completed in 2004, and a taskforce was established in 2005 to formulate the NR Plan. The Draft NR Plan was prepared and complemented in consultation with the relevant ministries in July 2005 with the promulgation of the Railroad Construction Act. The plan was reviewed by the Railroad Construction Review Committee in 2005. In March 2006, the 1st NR Plan (2006-2015) was devised, and the 2nd NR Plan (2011-2020) was devised in 2011. The plans are outlined as shown below.

b. 1st National Railroad Network Development Plan (2006-2015)

The 1st NR Plan aims to drastically boost South Korea's railroad competitiveness to enable the railroads to compete with other Transport modes and to attract the maximum traffic demand. It also aims to achieve a running speed of 180-200 km/h to enable travel between large cities in two to three hours, thereby enhancing the speed competitiveness of railroads. Moreover, the plan aims to provide access to major railroad stations within thirty minutes and to strengthen the role of railroads as a safe and pleasant Transport modes that is people-oriented and eco-friendly

During the period of the first plan, an investment of KRW 40.4 trillion was proposed. In the first half (2006-2010) of the period, a KRW 20.4 trillion investment was projected, 64% of which, or KRW 13.1 trillion, was planned to be financed by the state coffers.

<Table 3-10> Investment Plan under the 1st National Railroad Network Development Plan

(Unit: km, %)

Finance	Total Project Cost	By 2005	2006-2010	2011-2015	Total
State coffers	699,151	132,309	131,384	185,500	316,884
Municipality cost	43,916	5,460	10,846	14,448	25,294
Private capital	47,818	15,683	32,135	-	32,135
Others	106,247	76,140	30,107	-	30,107
Subtotal	897,132	229,592	204,472	199,948	404,420

Source: Ministry of Construction and Transport, 1st NR Plan, 2006

The first plan aimed to develop an X-shaped national railroad network connecting the entire country. Two high-speed rail routes (Gyeongbu and Honam High-Speed Rail) were projected to form the major framework of the national railroad network, and six South-North axes and six East-West railroad network axes would connect with the high-speed rails to create key high-speed railroad networks. Moreover, high-speed freight cargo railroad systems were planned to be developed by achieving high speeds of the major key lines and by improving problematic segments as well as by expanding the railroad networks connecting with major industrial complexes and harbors.

Moreover, to increase access to the high-speed railroads, the expansion of transfer systems to and from high-speed rail stations was proposed to widely promote the benefits of high-speed rail services. Furthermore, the development of intermodal transfer centers connected to railroad stations were proposed to enabling general railroad stations to serve as regional transport hubs.

In addition, the construction of a South-North railroad connection was proposed for transporting freight cargo, while the expansion of detour routes in the outer Seoul metropolitan was planned. The long-term goal of realizing the silk road of railroads, connecting South Korea-North Korea, Russia, China, Russia, and Europe through the intercontinental railroad was also proposed. In determining the investment priority for the plan, the factors of efficiency, equality, and other conditions were to be comprehensively considered.

c. 2nd National Railroad Network Development Plan (2011-2020)

After the 1st NR Plan, the need for fundamental transportation plan enabling efficient investment in transportation through the systemization of individual development plans of roads, railroads, harbors, and airports was pointed. Enhancing compatibility and connectivity between these plans was voiced. Moreover, a future-oriented transportation policy was needed in line with the green-transport strategy, the KTX high-rail development strategy, and domestic and overseas transport environment changes. This led to the formulation of the 2nd NR Plan.

The 2nd NR Plan proposes the integration of public land through the rail network and the restructuring of the network into a multi-core, open structure. Towards such end, the plan aims to connect the major railroad points nationwide in a daily commuting time of one hour and thirty minutes, thus integrating the country in a single urban bloc. Four tasks were thus determined, and they are outlined as follows:

- Connect major points nationwide via high-speed KTX networks
- Develop metropolitan and express railroad networks that can cover large-city areas in thirty minutes
- Develop a green railroad logistics system
- Create an environment conducive for the convenient use of railroads

The 2nd NR Plan (2011-2020) requires a KRW 88 trillion investment for the expansion of the railroad networks, consisting of funds from the state coffers (KRW 59 trillion), municipalities' costs (KRW 3 trillion), and private capital and others (KRW 26 trillion). For budgeting by category, KRW 16 trillion will be allotted for high-speed rails, KRW 46 trillion for general railroads, and KRW 26 trillion for metropolitan railroads.

5. National Integrated Transportation System Efficiency Act

5.1 Background and Progress

Most South Korean laws pertaining to construction and transport impact the daily lives of the Korean public, such as real estate, water resources, and transport. They include twelve different categories as listed: public land policy, land, housing, city,

construction economy, technology safety, roads, water resources, freight logistics, land transport, railroads, and aviation. To strengthen coordination and process of developing transport policies for diverse categories, the Transportation Efficiency Act aims to mandate the planning and evaluation of transportation facility investment, the implementation of intelligent transportation systems, and appropriating finances for the expansion and management of transportation facilities. Thus, the Transportation Efficiency Act aims to direct the development of an efficient transportation system between transportation facilities by requiring the formulation of the Key National Transport Network Plan, the Midterm Transportation facility Investment Plan, and the Master Plan for an Intelligent Transport System. The Transportation Efficiency Act was drafted in October 1998, was reviewed through public hearings, and later promulgated in February 1999 in consultation with the relevant ministries.

To strengthen coordination in the formulation of investment plans for the road, railroad, and other categories, the Key National Transport Network Plan was required to include comprehensive transportation facility investment guidelines. A five-year national traffic survey plan was mandated to prevent the duplication of national traffic surveys conducted by MLTM and the individual traffic surveys conducted by the heads of municipalities. The act was partially amended and renamed National Comprehensive Transportation System Efficiency Act Transportation System Efficiency Act after improvements were made to the existing system.

The Key National Transport Network Plan was devised for the first time in 1999, according to the Transportation Efficiency Act. It has been revised twice since then, the first time in 2007 and the second time in 2011. The 1st Midterm Transportation facility Investment Plan (2000-2004) was formulated in 2001, the 2nd (2005-2009) in 2005, and the 3rd (2011-2015) in 2011. In 2000, Master Plan 21 for a national intelligent transportation system was devised.

5.2 Major Requirements

The Transportation Efficiency Act has undergone revisions on twenty-four occasions since enacted in 1999. It includes provisions on the formulation of a comprehensive transportation plan, the conduct of national traffic surveys, feasibility studies of transportation investment projects, and other issues regarding

efficient transportation facility investment. It also includes planning and evaluation provisions for the efficient implementation and management of transportation facility development, such as enhancements to transport logistical hubs and the intermodal transportation system, development of intermodal transit centers and intelligent transportation systems, and promotion of transport technologies. It also encompasses the relevant organizations and budget. The act is outlined as follows:

- Formulation of the Key National Transport Network Plan ("Key Network Plan")

The Transportation Efficiency Act requires the formation of a key network plan to systematically configure key national transportation networks, to enable key national transportation facilities to mutually function closely, and to enable the speedy, safe, and convenient operation of the country's transport modes. The plan is devised on a 20-year basis and should align with the Comprehensive Public land Development Plan, take precedence over the Basic Large City and Metropolitan Transport Plan, the Basic National Logistics Plan, and other transport and logistics plans. The Key Network Plan should be reflected in the plans regarding land use and is required to include the following components: traffic prospects and traffic demand forecasts, comprehensive transportation policy and transportation facility investment directions, key national transportation network development goals and strategies, key national transportation facility development projects and intermodal systems, relevant financing directions and investment priorities, the development and utilization of transport technology, the interconnection of key national transport and foreign transportation networks, and other transportation system improvements.

- Formulation of the Midterm Transportation Facility Investment Plan ("Midterm Investment Plan")

The Midterm Investment Plan is required to be devised every five years for the effective implementation of the key national transport projects defined in the Key Network Plan and related local transportation facility development projects. The agenda included in the Midterm Investment Plan must be reflected in other relevant transportation plans. Finances must e appropriately allotted to the various items of the transportation facility special account according to this plan, and the investment finance sharing ratios set in this plan must be reflected in the relevant budget. The Midterm Investment Plan is required to include the transportation facility supply goals and investment directions, scale of key national transportation facility projects, and investment priorities and financing. Other required components include appropriate modal share structures and investment finance allotments

between transportation facilities, intermodal development of key national transport and local transportation facility development projects, an investment plan for local transportation facility development projects, and other transportation facility investment matters.

- National Traffic Survey

The Transportation Efficiency Act requires the conduct of national traffic surveys to properly devise and implement national transport policies such as the Key Network Plan and the Midterm Transportation Facility Investment Plan. Specifically, the surveys aim to gather data on the transportation facility operation and traffic volume to enable the formulation of proper transportation plans and the efficient operation of Transport modes and facilities. The survey plan must be devised on a five-year basis with regard to its objectives and strategies, survey details, and methods to prevent duplication with other individual surveys. The efficiently conduction of traffic surveys jointly utilization of survey results are also stipulated.

- Formulation of a Master Plan for Intelligent Transport Systems ("ITS Plan")

The Transportation Efficiency Act requires the formulation of theITS plan for the development and use of sophisticated transport technologies, such as electronics, control, and communication as well as traffic information in Transport modes and facilities. The mandated ITS plan indicates steps to ensuring scientific and automatic operation and management of transportation systems, while also enhancing transport efficiency and stability. The ITS plan is a ten-year national plan for promoting the development and spread of intelligent transportation systems in the ground transport, marine transport, and aviation sectors. The ITS plan is to be revised every five years, as deemed necessary, and should provide the basis for individual ITS plans for vehicles and roads, railroads, sea transport, and aviation. The ITS plan includes ITS development objectives and directions; R&D, industrialization, and standardization of ITSs; finance for ITS development; and other system improvement measures. Strategies and implementation systems for the development and operation of ITSs by transport service and categorized by land, sea, and aviation; are also included in the ITS plan.

- Formulation of a Midterm Intermodal Transport System Development Plan ("Midterm Intermodal Plan")

  The Transportation Efficiency ActTransportation Efficiency Act requires the formulation and implementation of a five-year midterm intermodal transportation system development plan subject to deliberation by the National Transport

Committee for the development of a nationwide intermodal transportation system. It includes the development of intermodal transportation systems and the formulation and implementation of intermodal transportation system development measures. This plan should include the plan's objectives and directions, various intermodal development projects, an overview of and prospects for transport and logistics hubs, the selection of intermodal transportation facilities projects, investment priorities, the necessary financing, and other relevant matters.

- Formulation of a Master Plan for the Development of Intermodal Transportation Centers ("Intermodal Transportation Center")

The Transportation Efficiency Act requires the formulation of a five-year development plan for intermodal transportation centers (ITC) subject to deliberation by the National Transport Committee centers. This plan should include the directions for efficient ITC development, a survey on and analysis of the country's major intermodal and transfer facilities, ITC development measures, budgeting for the development of ITC, and other matters that are necessary for the development and activation of ITCs under presidential decrees.

- Formulation of a National Transport Technology Development Plan ("TT Development Plan")

The Transportation Efficiency Act requires the formulation of a five-year TT development plan for the promotion of R&D on transport technologies and the efficient use of results. This plan should include the TT development directions and goals; analysis of domestic and overseas TT environment; mid- and long-term development strategies for key technologies; mid- and long-term investment plans and financing measures promoting TTs; the demand for, supply of, and fostering measures for TT human resources; the use of TTs and other TT promotion measures; support measures for TT-development-related research institutes; and other matters that are necessary for the formulation of a TT development plan.

- Establishment of a National Transport Committee ("NT Committee")

The Transportation Efficiency Act requires the establishment of an NT Committee under the control of MLTM, which will deliberate on important policies related to national transportation systems as well as on transport-related policies stipulated in other laws. The NT Committee shall deliberate on the formulation and revision of the Key National Transport Network Plan and Midterm Transportation Facility Investment Plan as well as evaluating

their results. Additional deliberations shall include financing measures for transportation facility development projects, the formulation and revision of a national traffic survey plan, midterm intermodal transportation system development plans and measures and the formulation of national transport and logistics competitiveness indices. Furthermore, the NT Committee shall also address the designation of the first-class transport and logistical hubs and the changing thereof, the formulation and revision of intermodal transportation centers (ITC) and their development plans, including their designation and revision of major designation details. Lastly, the NT Committee shall also deliberate the formulation and revision of the ITS plans, execution plan for national transport technology development, and other important state policies for transportation systems, as put forth for deliberation by the chairperson.

6. Urban Transportation Maintenance Facilitation Act and Metropolitan Transportation Management Special Act

6.1 Urban Transportation Maintenance Facilitation Act

6.1.1 Background and Progress

Urban congestion has been continually worsening due to the surge in the travel in urban areas by the general public and increased use private automobiles, all of which point to the need for improvements to urban transport management systems in 1986, the government enacted the Urban Act to promote transportation facility improvement and efficient operation and management of transport modes and systems in efforts to facilitate urban traffic throughput make transport services more convenient to use.

The Urban Act was revised several times to respond to the worsening urban traffic congestion, particularly in the Seoul metropolitan. In January 1999, the act was revised to further strengthen its traffic impact evaluation function in efforts address traffic problems of large cities, limit the passage of automobiles in specific urban transport improvement zones, and impose and collect traffic-inducing charges from owners of facilities that increase traffic in the urban transport improvement zones.

In 1992, the Urban Act was revised to include the expansion of the urban transport improvement zones into small and medium-sized cities with the overall goal of responding to the surging number of automobiles and the frequently traveling public as well as the improvement of the traffic impact evaluation system and of the other current related systems.

In 1995, the Urban Act was revised to mandate the systematic formulation of a basic plan, a midterm plan, and an annual execution plan for urban transport improvement that efficiently respond to ever-worsening urban traffic problems; to mandate the traffic impact evaluation of areas other than the urban transport improvement zones; and to allow municipalities to autonomously conduct traffic demand management, such as limiting of automobile use and the collection of congestion charges.

In addition, in 2003, the Urban Act was revised to designate urban transport improvement zones that facilitate urban traffic throughput and increase transport convenience, to improve the procedure for formulating the urban transport improvement plan, to improve the legal grounds for traffic-causing charges, and to implement a system for designating traffic congestion special management areas or traffic congestion-causing facilities requiring special management. Amendments to the Urban Act strive towards reducing urban traffic congestion by strengthening travel demand management in urban locales.

6.1.2 Major Outline

- Designation of Urban Transport Improvement Zones (“UTIZ”), and Public Notification

  Under the Urban Act, MLTM may designate a city with a population of over 100,000 (in the case of a combined urban and rural city, excluding the population in the eup and myeon administrative areas) as a UTIZ. In the case of other cities or counties, MLTM may also so designate and notify the city or country upon its initiative or upon the request of the mayor or county governor, as deemed necessary. MLTM may also designate a traffic bloc involving two or more adjacent UTIZs, and may notify the public of such, for the formulation of transport-related plans.

- Formulation of a Master Plan for Urban Transport Improvement ("UTI Plan")

  The mayors and county governors of UTIZs (including special-city mayors, metropolitan-city mayors, and special-province governors) are required to devise a 20-year UTI plan according to the relevant presidential decrees. The UTI plan should include the current situation of and prospects for urban traffic and measures for effectively managing the incoming and outgoing traffic, and for the improvement of metropolitan transportation systems such as roads, railroads, and urban railroads. The UTI plan should also cover the improvement of transportation facilities, improvement of public transportation systems, management of transportation systems and improvement of the traffic clearance, and construction and operation of parking facilities. Furthermore, other included items are facility expansions for bicycle use, development of eco-friendly transportation systems, and the related investment project plans and financing measures. Likewise, relations with the other UTIZs within the traffic block or adjacent areas should be considered. The UTI plan should be devised in line with the Master Urban Plan, and any road improvements should be governed by the Master Plan for Road Improvement. In accordance with the UTI plan, a ten-year midterm urban transport improvement plan should be devised, along with annual execution plans.

- Analysis of Traffic Impacts and Formulation of Traffic Impact Improvement Measures

  Those who intend to conduct relevant projects in a UTIZ or a traffic bloc involving a UTIZ should analyze the traffic impacts and devise appropriate traffic impact improvement measures. Included items are urban development, creation of industrial locations and complexes, and energy development. Additionally, the construction of harbors, roads, railroads (including urban railroads), airports as well as the development of tourist complexes and special zones should be included. Furthermore, the installation of sports facilities, construction of buildings specified under presidential decrees pursuant to the Construction Act, and businesses impacting traffic shall be accounted for. Lastly, large-scale renovation, remodeling, and change of usage must also be analyzed.

- Imposition and Collection of Traffic-causing Charges

  Mayors are allowed to impose and collect annual traffic induction charges from owners of traffic-causing facilities in a UTIZ. Such facilities should be located in a city with a population of over 100,000 (in the case of a combined urban

and rural city, excluding the population in the eup and myeon administrative areas) and should be bigger than the sizes designated by the relevant presidential decree. Such charges should not be imposed on foreign governmental agencies, international- and foreign aid-organization facilities based in South Korea, nor on residential buildings, facilities whose traffic-causing volumes are drastically small or on which the imposition of such charges is deemed inappropriate due to inevitable public reasons, and facilities of national meritorious-service organizations and other non-profit organizations under the Act on the Establishment of Organizations by National Meritorious-Service Contributors, Etc., when such facilities are used for purposes other than those intended. Such charge exemption, however, shall not apply when the facility is being used for a purpose other than the intended one.

- Designation of a Special Management Area for Traffic Congestion ("SMATC")

As deemed necessary to facilitate urban traffic clearance and transport convenience, mayors may designate a specific area within a UTIZ as a SMATC, and may take traffic demand management action against vehicles entering facilities (except residential facilities) located in the SMATC that are bigger than the size designated by the relevant presidential decree and the SMATC. Moreover, mayors may designate facilities (excluding residential facilities) that cause serious traffic congestion to the nearby key roads and that are bigger than the size designated by the relevant presidential decree as special management facilities for traffic congestion, and may take traffic demand management action against such facilities.

- Establishment of a Local City Transport Project Special Account ("LCTPS Account")

To secure the finance that is necessary for implementing the master plan and for improving the urban transport, and to efficiently operate and manage transportation facilities, an LCTPS account may be established in special cities, metropolitan cities, and special provinces and cities located in a UTIZ. The UCTPS account shall consist of congested passage charges, traffic induction charges, fines, transfers from general accounts, and revenues related to urban transport. The special account revenue should be used for projects involving the expansion of transportation facilities and for improving the operation thereof; surveying and researching on urban transport; improvement of the services of Transport modes and bettering the management of public transport companies;

and the management of the traffic demand and the taking of traffic demand management action as well as the improvement of road and traffic safety facilities.

6.2 Metropolitan Transportation Management Special Act

6.2.1 Background and Progress

In efforts to efficiently address traffic problems of metropolitan regions, the MATM Act was promulgated in April 1997 to define matters concerning the formulation of a largecity and metropolitan transportation plan as well as establish and operate a large-city metropolitan transport committee in a bid to coordinate metropolitan traffic problems.

In January 2000, the said act was revised so that when applicable, the central government and municipalities, among cities and provinces would share the costs for the construction of metropolitan electric railroads by based on actual costs rather than length of the metropolitan electric railroad.

In January 2001, the said act was revised to require the formulation of metropolitan transport improvement measures to ease metropolitan traffic congestion caused by largescale development projects, to extend the financial burden of metropolitan transport not only metropolitan subways but also to metropolitan transport modes, and to address other related problems.

Revisions in July 2003 focused on creating parking and rest areas nationwide for business cargo trucks operating nationwide, facilitating logistics, reducing traffic congestion costs, and to building cargo storage and delivery as well as cargo information bases. The revised act mandated the construction of public-vehicle depots in outer urban areas by including the public-vehicle depots stipulated in the current Cargo Truck Operation Business Act in the metropolitan transportation facilities stipulated in the MATM Act, in a bid to allow the central government and municipalities to facilitate the construction of public-parking lots using the metropolitan transportation facility account stipulated in the Transportation Facility Special Account Act.

In January 2007, the formulation and implementation of the Master Plan for Long-Term Metropolitan Transport was required to respond to the changing metropolitan transport environment spurred by rapidly expanding areas of large cities, and to develop efficient metropolitan transportation systems. To urgently address the housing difficulties in the metropolitans, MLTM was allowed to directly devise metropolitan transport improvement measures with regard to state development projects. The said act was revised to mandate the prior review of metropolitan transportation systems related to large-scale housing projects as one measure towards preventing transport congestion in such areas, and to address the other related problems.

6.2.2 Major Outline

- Formulation of a Master Plan for Large-City and Metropolitan Transport Management ("MT Plan")

  The Special Act on Large-City and Metropolitan Transport Management requires MLTM to devise a 20-year MT plan in consultation with the heads of central agencies and the relevant special-city mayors, metropolitan-city mayors, or provincial governors, which takes measures to efficiently manage transportation systems in large cities and metropolitans. The MT plan should include the current overview and longterm forecast of the large-city and metropolitan traffic demand; the goals and gradual implementation strategies of the Master Plan for Metropolitan Transport Management; and the improvement of the existing metropolitan transportation systems and the efficient management of the metropolitan traffic demand. Other items to be included are the long-term expansion of the metropolitan transportation facilities and the connection thereof with other transportation facilities; the long-term expansion and improvement of the large-city public Transport modes; financing measures for the construction of metropolitan transportation facilities and the setting of the related investment priorities; and the metropolitan transport improvement measures stipulated under presidential decrees. Moreover, to effectively expand the large-city and metropolitan transportation facilities and to improve the metropolitan transportation systems, as stipulated in the MT plan, MLTM should devise a five-year MT plan in consultation with the heads of the relevant central agencies and city mayors and provincial governors.

- Formulation of Metropolitan Transport Improvement Measures ("MTI Measures")

  The relevant city mayors and provincial governors should formulate MTI measures in line with large-scale development projects and other projects stipulated in presidential decrees that have an impact on transport conditions in large cities and metropolitans. As deemed necessary, however, the central government may directly formulate MTI measures, granted in consultation with the relevant city mayors or provincial governors, to urgently address the housing difficulties in the large cities or metropolitans or to promote balanced regional-development projects and other state projects that are under its direct responsibility or that have been approved, permitted, or licensed. The MTI measures, as submitted or devised accordingly, should be determined via deliberation by the committee, and should be submitted to the relevant mayor or provincial governor (or they should be notified of such). This procedure shall also apply when the MTI measures are revised.

- Financial Support for Metropolitan Transportation Facilities

  The central government should, according to the relevant presidential decrees, support the financing of the projects involving the construction and improvement of metropolitan transportation facilities (excluding metropolitan railroads) that are being implemented by the heads of municipalities according to the execution plan for largecity and metropolitan transport.

  The costs of the metropolitan railroad construction or improvement projects should be shared, according to the project implementer, by the central government or municipality; by a joint corporation established by the central government, a municipality, or private enterprise; by municipalities; and by a joint corporation of municipalities and private enterprises. Moreover, the costs to be borne by the municipality, if shared by the relevant cities and provinces, should be shared based on the actual costs incurred for their respective segments of a metropolitan railroad. The relevant mayors and provincial governors, however, may have consultation and may determine their respective costsharing ratios differently.

- Imposition of Metropolitan Transportation facility Charges

  Those who implement projects that have impacts on the large-city and metropolitan transport as stipulated in the relevant presidential decrees should

pay the metropolitan transportation facility charges for the construction and improvement of the metropolitan transportation facilities. Such projects include housing development projects under the Housing Promotion Act; urban development projects under the Urban Development Act; land creation and housing construction projects under the Housing Act; and housing redevelopment projects, housing reconstruction projects, and urban environment improvement projects, and other similar projects, under the Urban and Residential Environment Improvement Act.

- Establishment of a Local Metropolitan Transportation Facility Special Account ("LMTFS Account")

The recipient cities and provinces in metropolitans may establish an LMTFS account to finance the expansion of the metropolitan transportation facilities and other relevant measures. The said account consists of metropolitan transportation facility charges as well as the central government's and municipalities' share of the cost for the construction of new metropolitan railroads and for the improvement of the existing ones. All matters concerning the operation and management of the said account shall be determined by the relevant municipal and provincial rules.

Plan in line with the Special Act on Large-City and Metropolitan Transport Management

① Master Plan for Large-City and Metropolitan Transport Management ("LCMT Master Plan")

• Background

Demand for transportation continues to rise due to the development of new towns and other metropolitan expansion projects, causing serious traffic congestion and metropolitan transport problems. The need to prepare a systematic and sustainable long-term master plan addressing the metropolitan transport problems was indicated as well as a need to devise mid- and long-term transportation plans to continuously and consistently implement metropolitan transport policies. In January 2007, the Special Act on Large-City and Metropolitan Transport Management was enacted, requiring the formulation of a 20-year master plan for the effective management of the metropolitan transport. The Five-Year LCMT Master Plan was changed into the Metropolitan Transport Execution Plan.

• Purpose

The LCMT Master Plan aims to devise a long-term comprehensive transportation plan for efficiently coping with the ongoing large-city and metropolitan transport circumstances. Moreover, it aims to offer the direction for the formulation of the Five-Year Metropolitan Transport Execution Plan, and to provide a framework for resolving the metropolitan transport problems by closely linking the relevant national and local plans.

• Warranty

- Special Act on Large-City and Metropolitan Transport Management enacted (April 10, 1997). Ministry of Construction and Transport's Metropolitan Policy Department was launched (April 10, 1998). Five-year metropolitan transportation plans established by area
- 1st Seoul Metropolitan Transport Plan (1999-2003) established on December 1998. 1st Five-Year Local Major-City Metropolitan Transport Plan (2002-2006) established on December 2001. 2nd Seoul Metropolitan Transport Plan (2004-2008) established in April 2004. Special Act on Large-City and Metropolitan Transport Management partially revised (January 19, 2007). 20-Year Master Plan for Large-City and Metropolitan Transport Management legalized (Article 3 was newly established). Formulation of Master Plan for Large-City and Metropolitan Transport Management outsourced (April 2006-March 2007). Hearing held on formulated Master Plan for Large-City and Metropolitan Transport Management (March 28, 2007)
- Advisory NGO meeting held regarding plan (March 29, 2007)

• Draft Master Plan for Large-City and Metropolitan Transport Management was discussed with relevant ministries (April 30-May 9, 2007). Sustainability Committee deliberated on Draft Master Plan for Large-City and Metropolitan Transport Management (July 4, 2007). Large-City and Metropolitan Transport Management Working Committee deliberated plan in writing (July 12-20, 2007) Large-City and Metropolitan Transport Management Working Committee held meeting to deliberate plan (October 2, 2007). Large-City and Metropolitan Transport Management Working Committee deliberated plan (November 21, 2007). Master Plan for Large-City and Metropolitan Transport Management finalized and announced (December 4, 2007).

The Master Plan for Large-City and Metropolitan Transport Management is

devised for the Seoul metropolitan as well as the Busan-Ulsan, Daegu, Gwangju, and Daejeon areas. The Seoul metropolitan includes Seoul City, Incheon City, and Gyeonggi Province. The plan covers a 20-year period, from 2007 to 2026.

The metropolitan transportation facilities under the special act include the metropolitan roads, metropolitan railroads, transfer facilities, and key-route express buses. On the other hand, the metropolitan facilities under the Master Plan for Large-City and Metropolitan Transport Management formulated by MLTM include transportation facilities (region-to-region railroad networks and road networks) within metropolitans that cover the starting and ending points to secure the continuity and completeness of passage, and transportation facilities in a sense broader than as defined under the law.

② Execution Plan

The execution plan is devised based on a five-year period in consultation with the heads of the relevant central-government agencies and the mayors and provincial governors to effectively implement the expansion and improvement of the metropolitan transportation facilities defined in the Master Plan for Metropolitan Transport.

③ Improvement Measures

The metropolitan transport improvement measures aim to define the matters that are necessary for the formulation of metropolitan transport improvement measures in line with the large-scale development projects in large-city areas, pursuant to Article 7 of the Special Act on Large-City and Metropolitan Transport Management and Article 9 of the Enforcement Decree of the same act, so as to devise and implement systematic and effective improvement measures.

The spatial scope of the metropolitan transport improvement measures is 20 km within the borders of the development project zone (10 km if the development project zone is located in a specified part of a metropolitan city); provided that the measure should include development plans that are not included in the listing of traffic volumes at the origins and destinations between areas within 10 km of the development project zone (within 5 km in the case of a special or metropolitan city), after surveying the area. If the impact on the metropolitan transport reaches

areas within or beyond 20 km from the development project zone (10 km if the development project zone is located in a special or metropolitan city), the scope should be the range affected by the metropolitan transport.

7. Policy and Technology Support for Efficient National SOC Investments

In order to efficiently implement transport construction, it is crucial to devise a mid- and long-term master plan and its execution plan along with an implementation organization, financing, and laws and systems. In addition, to enhance the investment efficiency of transport projects, technical support is needed for the successful implementation of transport projects. These technical and policy support measures have greatly helped South Korea expand its road and railroad facilities.

Of the various technologies and policies hitherto implemented, the South Korean Transport DB, the investment project evaluation system, and the investment evaluation guidelines can be cited as the prime success factors, for the reasons cited below.

First, to devise an appropriate mid-and long-term transportation plan, the accurate forecast of the traffic demand is essential. Nationwide traffic demand estimation, however, requires a vast amount of surveys, time, and budget, and should also be regularly updated. South Korea developed the South Korean Transport DB from 1998, which has been providing traffic demand forecasts for entire country and major large cities. The South Korean Transport DB helps in the formulation of the master plan and the decision making process concerning transport policies, especially with the implementation of transport projects.

Moreover, the transport projects require large-scale budgets and time, and trigger huge construction ripple effects. Investment finances create different effects according to the project in which the finance is invested. Therefore, it is crucial to select and manage projects properly. South Korea has developed and is implementing a systematic evaluation system, from planning to design to follow-up evaluation,

thus enhancing the investment efficiency of transportation facilities.

Lastly, whether to implement a transportation investment project depends mainly on the results of its feasibility study, and to enhance the objectivity of the feasibility study project and the investment efficiency, the Korean government formulates and distributes evaluation guidelines for transportation facilities. The methods stipulated in the guidelines should apply, with the necessary modification if deemed necessary, when conducting a feasibility study of a transportation investment project to be implemented by the central government. After the 1990s, the O/D (Origin-Destination Table) and networks provided by the South Korean Transport DB, as well as the standard methods stipulated in the guidelines, have been used in the evaluation of the feasibility study of transportation investment projects, thereby enhancing the evaluation confidence of the South Korean Transport DB, and alleviating excessive investment problems associated with erroneous demand forecasts. These are further discussed below.

7.1 Development and Implementation of National Transportation Database[2]

7.1.1 Background and Achievements

In the second half of the 1980s, traffic survey times and methods for feasibility studies of transportation facility development projects varied by research institute and transportation facility, which made data less reliable and difficult to reuse and share. Notably, since one-time traffic surveys for individual projects were carried out, the lack continuous and consistent data resulted in an inadequate nationwide traffic database.

The need for the development of a South Korean transport DB that would enable a more efficient implementation of transport projects arose, and the Korean government took action in the latter half of the 1990s. In 1999, the government enforced the Transportation System Efficiency Act (currently National Integrated System Efficiency Act) and conducted national traffic surveys. This act requires the development and operation of a South Korean transport DB that conducts national traffic surveys that will aid in properly devising and implementing national transport policies, such as the Key National Transport Network Plan and the Midterm Investment Plan. The Transport DB was also to comprehensively manage transport-

related data, including those obtained from the national traffic survey and individual traffic surveys of municipalities.

Thus, the South Korean Transport DB Development Project began. South Korean Transport DB Center was established at KOTI, thereby establishing a systematic national traffic data system. The DB Center's National Traffic Demand Survey and DB Development Project began as a public nationwide inter-region traffic survey project in 1988. Afterwards, the 1st National Traffic Survey Plan, which was the midterm plan, was devised in August 2009 according to the National Integrated Transportation System Efficiency Act, which was passed by the National Assembly Transport Committee. This project is currently ongoing. In 2011, the 2nd Draft National Traffic Survey Plan was prepared with an expected completion date set for 2012, and it provides the framework for the next five years of national traffic surveys and DB development.

The South Korean Transport DB Development Project aims to survey the operation of transportation facilities and means, traffic volumes, and the transportation networks at the national level, so as to gather and analyze traffic data while create databases that allow jointly data use for the formulation of transport policies and plans. The South Korean Transport DB has prevented similar and duplicate surveys in line with the implementation of road and railroad projects, thus reducing related costs, as well as the utilization of future O/D and networks in the formulation of mid- and long-term master plans.

The National Traffic Demand Survey and DB Development Project are carried out annually based on the five-year national traffic survey. The first stage of the five-year project from 1998 to 2002 established the foundations for the South Korean Transport DB and enabled the provision of traffic DB services. In the second stage, from 2003 to 2007, the South Korean Transport DB was expanded and upgraded through efforts to improve the system of gathering and aggregating traffic DB, design user-oriented Internet services, expand the volume of traffic information and promote the use thereof, strengthen the utilization and analysis of the traffic DB, and promote cooperation with the related agencies with regard to traffic survey conduction and traffic data use. The National Traffic Demand Survey and DB Development Project are now under way, enabling regular surveys and detailed

analyses and studies of relevant data, enhancing DB reliability and utilization.

7.1.2 Major Projects

The Korea Transport DB Development Project consists of statistical data, literature on and onsite surveys of land and sea transport, aviation, and logistics; research on and analysis of survey results; survey and development of national transportation networks; development and operation of DB systems; and operation and management of the relevant projects.

In 2005, a nationwide study was carried out to determine the passenger traffic volumes at the origins and destinations between regions as well as the conditions of cargo logistics, from which an inter-region O/D traffic volume DB was later created. In 2006, passenger travel was surveyed by metropolitan, enabling the survey of O/D traffic volume by metropolitan, detailing the passenger travel characteristics as well as renewing nationwide inter-region O/D traffic. Moreover, a nationwide survey of transportation facilities was conducted that enabled updates of the whole transport theme map.

In conjunction with the nationwide municipalities, the regular nationwide O/D passenger traffic volume was surveyed in 2010, while a nationwide O/D cargo traffic volume survey was conducted in 2011. Based on the 2010 Passenger Survey results extrapolated surveys and demand forecasting are being conducted in conjunction with the municipalities in order to obtain new nationwide O/D passenger traffic data. This will further improve the timeliness and reliability of O/D data.

As of 2011, the South Korean Transport DB had provided 158 transport statistics items, 38,278 literature items, nationwide inter-region and metropolitan O/D passenger traffic volume by mode and destination (current and future), nationwide inter-region cargo volume by tonnage/product item (current and future), networks for current and future traffic analyses for the entire country and by metropolitan, transport theme maps, traffic-causing units, and mode split results.

<Table 3-11> Overview of the South Korean Transport DB Development

Category	Description of Major Projects	Remarks
Passenger demand survey and analysis	Survey nationwide O/D passenger traffic volume, totaling of nationwide passenger O/D and travel demand forecasting , update nationwide passenger O/D, and research on the travel cost function	Including marine traffic
Cargo demand survey and analysis	Survey nationwide O/D cargo traffic volume, totaling of the nationwide cargo O/D and demand forecasting, update nationwide cargo O/D, and development of logistical networks	Including marine traffic
National traffic network development and analysis	Survey of transportation networks, development of a transportation network GIS DB, development of networks for use in analyses, and network development and analysis	
National traffic statistics survey and analysis	Survey of traffic-causing source units, survey of national traffic statistics, survey of carriage results and mode split ratios, survey of traffic costs and greenhouse gas emissions and development of a DB of such data, and survey of special traffic and travel statistics	
DB system development and operation	Development and operation of a DB system, and improvement of the DB management system and Website	
DB project management of DB projects, project publicity, operation of Korea Transport DB Consultative Council, and provide support for operation of Korea Transport DB Inspection Center		

7.1.3 Utilization and Expected Benefits

The Korea Transport Database (“KTDB”) is being effectively used by the government ministries and municipalities to devise and implement transport policies and plans. The KTDB service began in April 2001, and the obtained data are now used for a variety of purposes by multiple entities, including not only national agencies but also businesses, academia, and research institutes. A variety of GIS-T information, statistics, and publictraffic information are available to the general public via the Internet and other media.

While the KTDB service was provided online and offline in the past, both data application and downloading are now available the KTDB Website, streamlining the procedure. Various databases on transport research results as well as a basic data analysis function are provided online.

In addition to general transport analysis, KTDB is used in a wide range of other areas: MLTM's Gyeongbu high-speed-rail intermodal transportation system, the Home Ministry's national safety management information system, KOTI's formulation of metropolitan transportation plans for five local large-city and metropolitans, revamping of the Seoul and Daejeon bus route systems, Jeollanam-do Province road book computerization, Busan's transport DB management system, Gwangju's urban logistics plan, the National Police Agency's improvement of its traffic accident management system and electronic maps, and the Ministry of Environment's research on wild-animal habitats based on landscape ecology.

The number of such data provisions since the KTDB service commencement in April 2001 has reached over 1,000. Notably, national agencies have been using the transport theme maps of KTDB to develop ITSs, and the O/D traffic data have been used in pre-feasibility and feasibility studies of national transportation facilities.

KTDB is expected to drastically reduce the transport survey costs, manpower development and time. KTDB helps adequately allocate transportation investment finances and determine the investment priorities, and provides follow-up evaluation, thereby increasing the efficiency of transportation facility investment. This will also certainly reduce indirect national costs, such as traffic congestion and logistical costs.

7.2 Development and Implementation of Investment Efficiency Evaluation System

7.2.1 Transport Investment Project Impulsion Procedure

The implementation procedure for transportation investment projects is sequentially conducted. SOC projects must be managed in terms of their entire life cycle. Though the project implementation procedure can vary according to the country or researcher, it usually consists of the planning, budgeting, execution, and management stages. These stages are segmented into seven steps, as shown in the following table.

A transport project takes a long time to implement, and its plan must be updated in the process to reflect changing circumstances. In South Korea, each stage is assessed

using its own evaluation scheme, thus providing feedback and helping implement the project efficiently with the whole life cycle in perspective. In the planning stage, the Key National Transport Network Plan is devised so that a feasibility study is conducted for plural projects. A preliminary feasibility study is conducted during the budgeting stage, while a feasibility study is conducted during the execution phase, thus verifying the feasibility of the project. This can boost the efficiency of the transportation investment project.

<Table 3-12> Total Project Cost Management Procedure of the Ministry of Planning and Budget

Stage	Procedure	Description
Planning	Project planning	The central government agency ("CGA") head refers to similar projects and sets appropriate project size, total project cost, and project period
Budgeting	Preliminary feasibility study	If an estimated total project cost exceeds KRW 50 billion, the CGA head, requests that Minister of Planning and Budget conduct a preliminary feasibility study.
Execution	Feasibility study and formulation of master plan	The CGA head conducts a feasibility study of the technology, environment, society, finance, site, and transport in terms of the whole life cycle of the facility. The CGA head devises a master plan considering the urban management plan, the project's environmental impacts, and the relevant laws.
	Basic design	The CGA head assigns an adequate period and cost to the basic design to prevent flaws from occurring in the construction process. Basic design generally must be approved by the PB Minister before proceeding with the execution design.
	Execution design	The CGA head should reflect the results of the environmental-impact assessment, traffic impact assessment, and consultation with municipalities; examine the experts' design details once or more times; request the Public Procurement Service administrator to examine the adequacy of the unit prices proposed in the execution design; and consult with the PB Minister on the project scale, total project cost, and project period.
	Order placing and agreement	The PB Minister notifies the CGA head and the PPS administrator of the adjusted total project cost. If there is a difference between the budgeted total project cost and the actual contract price, the CGA head should request that the total project cost be changed.
	Construction	If deemed necessary, the CGA head may consult with the PB Minister to adjust the construction cost, compensation cost, and supplementary facility cost according to the total-projectcost adjustment criteria (Management Guidelines, Article 51-87).

Source: MPB, Total-Project-Cost Management Guidelines, 2006

7.2.2 Evaluation system by project stage

a. Planning-evaluating plan feasibility

Based on such legal and system grounds, South Korea operates an SOC implementation evaluation system according to stages. In the planning stage, in which the Comprehensive Key National Transport Network Plan and the Midterm Transportation Facility Investment Plan are devised, a feasibility study of the SOC Investment Project Plan is conducted before a long-term plan is devised. The feasibility study of the plan is stipulated in Article 17 of the National Integrated Transportation System Efficiency Act. The act requires a feasibility study of the plural public transportation facility development projects included in the formulation of the Key National Transport Network Plan or the Midterm Transportation Facility Investment Plan. The feasibility study of the plan is conducted according to the comprehensive evaluation procedure stipulated in MLTM's Transportation Facility Investment Evaluation Guidelines, as follows:

- Set national transportation policy goals
- Allocate appropriate investment finance among transport modest
- Prioritize investment within the modes of transport
- Assess competition relation
- Review policy considerations
- Determine final priority

b. Budgeting-preliminary feasibility study

In the budgeting stage, a transportation investment project is evaluated through a preliminary feasibility study. This procedure was adopted by the Kim Dae-jung administration, which was launched in 1998 with the task of overcoming the national economic crisis, in an effort to reform the public sector. The government established Article 9-2 of the Enforcement Decree of the Budget Account Act in April 1999 to adopt the preliminary feasibility study system, which applies to any public construction project with a total cost exceeding KRW 50 billion. The procedure aims to increase fairness and transparency in determining large-scale public-investment projects on a priority basis to prevent budget waste and to enhance financial efficiency. To secure the objectivity of the preliminary feasibility study, the preliminary feasibility study standard guidelines for road and railroad projects should apply.

The preliminary feasibility study is a draft study of large-scale development projects that analyzes their economic and policy feasibility and verifies their investment priority, adequate investment time, and financing methods, in an effort to ensure that large projects are embarked on based on solid grounds and that the projects shall be financially productive. The study targets projects with an estimated total cost of over KRW 50 billion each (for municipalities' projects, a state-supported amount of over KRW 30 billion). It is the centralagency head who requests that the PB Minister conduct the study.

The most important step of the preliminary feasibility study is the economic feasibility analysis, but policy analysis and comprehensive evaluation are also conducted. For the steps of the economic feasibility study, there is demands-and-benefits estimation, economic and financial feasibility study based on cost-benefit analyses, and sensitivity analysis. The cost-benefit analysis method is used to calculate the project's demands and benefits as well as its costs, including the total project costs and the maintenance costs. And if the benefit vs. cost ratio is greater than 1, the project is considered feasible.

Unlike the economic feasibility analysis, the policy feasibility analysis evaluates other considerations of the project and the project's social benefits or costs, which cannot be quantified. The policy feasibility analysis items are classified into common basic evaluation items and special evaluation items about the project's special characteristics and background. The basic items deal with general considerations and general items applied to all projects. They include undeveloped region for balanced regional development, regional economicripple effects, consistency with the relevant plans and policies, project imperativeness and preference, financing possibility, and environmental assessment. These and other factors are shown in <Table 3-13>.

<Table 3-13> Categorization of Policy Analysis Items

Medium Category	Detailed Category
Balanced regional development	· Undeveloped region · Regional economic-ripple effects · Additional evaluation items (optional)
Policy consistency and project imperativeness	· Consistency with relevant plans and policies · Project imperativeness and preference · Additional evaluation items (optional)
Project risk factors	· Financing possibility · Environmental feasibility · Additional evaluation items (optional)
Special project characteristics· Additional evaluation items (optional)	

Balanced regional development under the medium category includes regional backwardness, regional economic-ripple effects, and additional relevant items. Policy consistency and project imperativeness include consistency with relevant plans and policies, project imperativeness and preference, and additional relevant items. The project risk factors include financing possibility, environmental feasibility, and additional relevant items. Lastly, the special characteristics of the project include all other items.

The last step of the preliminary feasibility study puts together the economic and policy feasibility analysis results to finally assess the feasibility of the project. Towards that end, the analytical hierarchy process (AHP), a multi-criteria analysis methodology, is applied. AHP supports the evaluation of multiple decision-making goals and evaluation criteria, and of the different preference-based alternatives to individual evaluation criteria. AHP has been widely used in multi-criteria decision making since being developed by Thomas Saaty in the early 1970s. It clusters homogenous evaluation items that are necessary for decision making, organizes such items into multiple levels of a hierarchy, and analyzes and sorts them together by level, thus supporting the process of reaching the final decision. AHP performs the procedure shown below.

1. Conceptualize project
2. Determine evaluation criteria and structuring the hierarchy
3. Weigh evaluation criteria
4. Score alternative preferences
5. Synthesizing t-scores

6. Give feedback

7. Conclusions

From 1999 to 2005, a total of 224 projects were subjected to a preliminary feasibility study, and 70% of such projects belonged to the transportation facility category. Only 55% of the proposed projects were considered feasible and were thus financed.

c. Execution-feasibility study, etc.

In the execution stage, the need for conducting a feasibility study and the total project cost are evaluated. The feasibility study is stipulated in Article 57 of the Enforcement Decree of the Construction Technology Management Act, which requires the order placement agency to conduct a feasibility study of the project. However , if a construction project, however, has a total estimated cost less than KRW 50 billion and the order placement agency does not consider the feasibility study necessary given the characteristics of the project, a feasibility study can be waived. Likewise, the order placement agency is required to provide a warranty for the estimated construction costs as well as a construction cost increase ceiling to maintain the feasibility of the construction project.

This procedure aims to require the order placement agency-according to Article 57, section 2 of the Enforcement Decree of the Construction Technology Management Actto evaluate the entire construction project process, from installation to removal in terms of the technology used as well as the environment, society, finance, site, and transport to enhance the financial efficiency of the project. Thus, the feasibility study aims to determine if the investment in the construction and expansion of public transportation facilities is rational and objective. The order placement agency is required to conduct a feasibility study according to Article 57, section 2 of the said act. To ensure the objectivity of the feasibility study, which is performed mainly in the basic design stage, it should be conducted based on the Transportation facility Investment Evaluation Guidelines. The study should include the following details:

- Evaluation summary;
- Project overview (project outline and location map or situation diagram);
- History of Progress;
- Analysis of socioeconomic indices and other data;
- Economic feasibility analysis;
- Comprehensive analysis;

- Financial feasibility analysis (if deemed necessary); and
- Feasibility study results and recommendation.

Moreover, another feasibility study should be conducted if there is an unpredicted fall in the traffic demand (by over 30%) or an increase in cost (by over 20%). With regard to the preliminary feasibility study and the feasibility study, the guidelines for total project costs stipulate that large-scale public investment projects, which take a long time to execute from conceptualization to completion, have to be closely managed to effectively cope with a change in demand according to the project stage, increase the financial-investment efficiency and to prevent budgetary waste.

As such, the country's SOC projects undergo several stages of evaluation and feedback, such as a preliminary feasibility study, a feasibility study, resurvey of the demand forecasts, and feasibility restudy, thus verifying their feasibility and adequacy and enhancing efficiency in transportation investment.

7.3 Transportation Infrastructure Investment Evaluation Policy

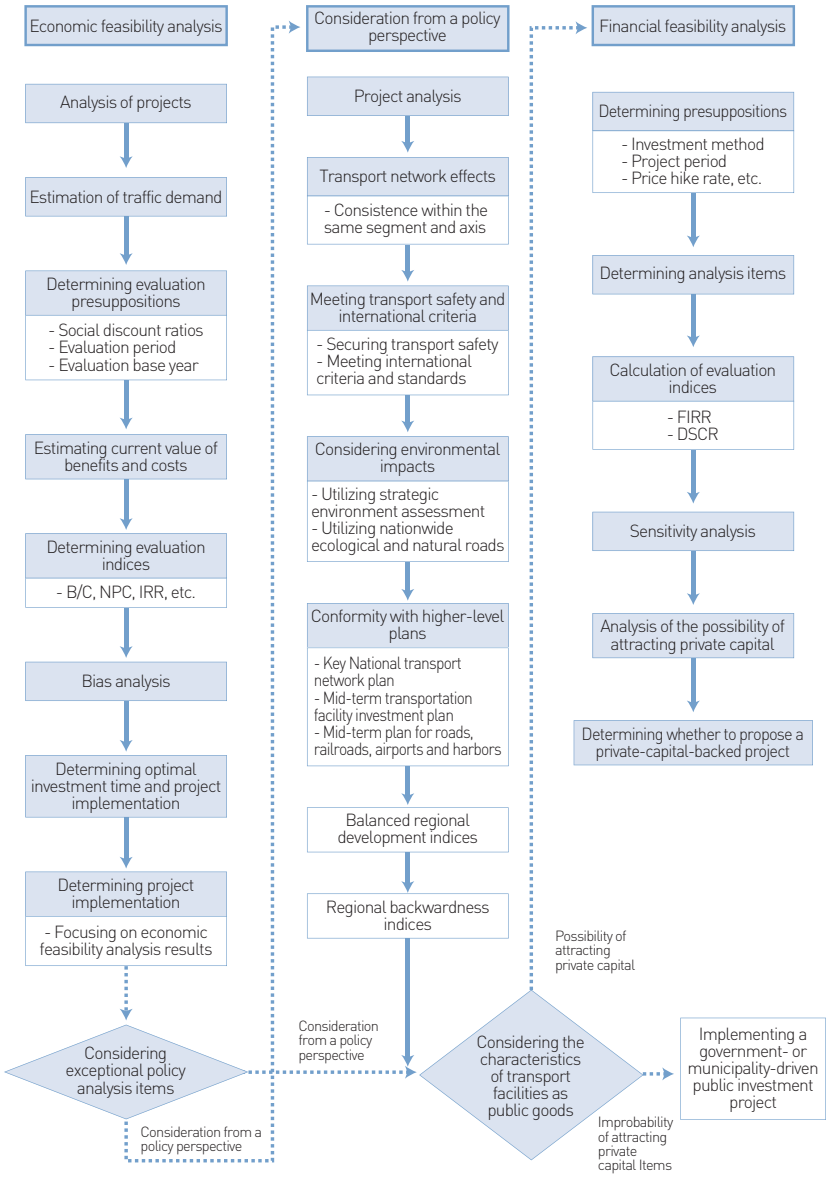
Economic feasibility is the most essential index in determining the feasibility of transportation projects. It is determined mainly through the cost-benefit analysis method. The benefits are determined by structuring a demand for transportation forecasting model and calculating the benefits by item. The evaluator's subjective views, however, have a great impact on the application of the basic units for the calculation of the benefits or discount ratios for the economic feasibility analysis, thus causing errors.

To address this problem, the government, under the relevant law, stipulates that the same analysis method and basic units be used in the evaluation of the economic feasibility of all transportation investment projects. Moreover, the Transportation Facility Investment Evaluation Guidelines have been drafted and distributed. In evaluating the economic, financial, and comprehensive feasibility of transportation facility development projects according to Article 18 of the National Integrated Transportation System Efficiency Act, the aforementioned guidelines define the estimation process for the traffic demand, costs, and benefits as well as the investment evaluation items, evaluation criteria, and evaluation methods, so as to determine the investment feasibility, investment priority, and investment allocation

to increase the efficiency of the investment. The said guidelines were revised for the third time in 2009 and are now being revised for the fourth time. The guidelines include the following details:

- Targets of the investment evaluation, and the evaluation system to be used;
- Phased project evaluation methods and procedures under a midterm plan;
- Traffic demand forecast methods and procedures;
- Cost-benefit estimation items and methods;
- Economic-feasibility analysis method;
- Comprehensive evaluation method, including the evaluation of the investment priority;
- Financial-feasibility analysis method; and
- Other relevant matters.

The investment evaluation guidelines apply to public transportation facility development projects with a total cost of over KRW 30 billion, with an exception provided. The project investment evaluation procedure is shown in the following diagram.



<Figure 3-2> Project Investment Evaluation Procedure

Chapter 4.

Outcomes and Conclusions

1. Outcomes

1.1 Increased Investments in Roadway and Railroad

Significant efforts were made in the second half of the 1960s and thereafter to expand roads because of the importance of transportation and logistics in the country's economic development. The five-year socioeconomic development plans, which begun in the 1960s, dealt with roads and railroads as essential areas, and a special account was established in the 1990s to secure stable funding sources needed for the transportation sector. These measures contributed to the continued growth of road and railroad facility investments and were pivotal for advancing South Korea's SOC to the level of advanced countries. The results of investment in transportation since the 1960s are examined as follows.

1.1.1 Before 2000

With the rapid economic growth achieved thanks to the national socioeconomic development plan begun in 1962, the role of the road and railroad transportation sector strengthened. As discussed above, transportation sector development was implemented as part of a socioeconomic development scheme.

For the road category, full-fledged investment began in the second half of the 1960s, when the 2nd Socioeconomic Development Plan was enforced. The road investment budget increased from KRW 6.1 billion in the of the first-plan to KRW

114.7 billion in the secondplan period, which represented over 1% of the country's GDP. From then until the 2000s, investment continued to rise until the sixth-plan period, when over KRW 10 trillion was invested in the road category. For the railroad category, the investment has also continued to grow since the 1960s, albeit at a lower rate than the road category. In the 1st Socioeconomic Development Plan period during the first half of the 1960s, more investments were made in railroads than in roads, though the share reversed for the second-plan period with significantly more investment in roads than railroads.

In the 3rd Five-Year Socioeconomic Development Plan period, greater investment ratios were allotted for the construction of expressways and harbors. In the 4th and 5th Socioeconomic Development Plan periods, the share of investment for railroads, roads, and harbors were reduced to finance the construction of subways.

In the late 1980s, as part of the 6th Five-Year Socioeconomic Development Plan, road investment swelled, while the investment for other transportation facilities shrank. Moreover, the percentage of the GDP for transportation facility investment fell to under 2%. In the seventh-plan period (1992-1996), railroad investment sharply rose, increasing to 0.45% of the GDP. Investment in road, railroad, subway, airport, and harbor facilities greatly increased during the eighth-plan period from 1997, with investment in roads and railroads accounting for 2.64% of the GDP.

<Table 4-1> Transportation Facility Investment Percentages of the GDP

(Unit: KRW 100 million (current price), %)

Socioeconomic Development Plan Period	GDP	Transportation Facilities					Total
		Roads	Railroads	Subways	Airports	Harbors	
1st (1962-1966)	33,753	61 (0.18)	215 (0.64)	-	26 (0.07)	52 (0.16)	355 (1.05)
2nd (1967-1971)	106,901	1,147 (1.07)	634 (0.59)	83 (0.08)	76 (0.07)	267 (0.25)	2,207 (2.06)
3rd (1972-1976)	413,723	4,674 (1.13)	2,669 (0.65)	248 (0.06)	189 (0.05)	1,284 (0.31)	9,064 (2.19)
4th (1977-1981)	1,583,855	16,302 (1.03)	7,434 (0.47)	5,532 (0.35)	1,469 (0.09)	3,451 (0.22)	34,188 (2.16)
5th (1982-1986)	3,674,664	37,191 (1.01)	9,647 (0.26)	24,379 (0.66)	2,223 (0.06)	6,186 (0.17)	79,626 (2.17)
6th (1987-1991)	7,868,142	115,225 (1.46)	14,620 (0.19)	789 (0.01)	2,538 (0.03)	11,538 (0.15)	144,710 (1.84)
7th (1992-1996)	16,424,035	189,693 (1.15)	73,162 (0.45)	30,523 (0.19)	13,944 (0.08)	20,655 (0.13)	327,977 (2.00)
8th (1997-2000)	24,368,166	526,943 (2.16)	117,890 (0.48)	86,276 (0.35)	36,161 (0.15)	48,373 (0.20)	815,643 (3.35)

Source: Ha, Heon-gu and Kim, Cheon-gon, 2000
Note: Railroads include high-speed rail investments and the metropolitan transport accounts (from 1998).

1.1.2 After 2000

Transportation facility investment as measured by percentage of the GDP shrank after the 2000s in comparison with figures prior to the 2000s, though the economy continued to expand in scale. Nonetheless, the budget for roads and railroads continued to rise until the second half of the 2000s. To overcome the global financial crisis, the total transport special account was increased from KRW 13.9 trillion in 2008 to KRW 17.1 trillion in 2009.

The road budget continued to increase, from KRW 7.5 trillion in 2000 to KRW 8.1 trillion in 2002 and KRW 8.4 trillion in 2003, though the budget somewhat declined in 2004-2007. To overcome the effects of the global financial crisis, the road budget was increased in 2008 and 2009 and reverted to pre-2008 levels in 2010, when it stood at KRW 7.7 trillion or 52.1% of the total transportation budget.

The railroad budget continued to rise to KRW 2.7 trillion in 2000, KRW 3.2 trillion in 2002, and KRW 3.5 trillion in 2003 until it somewhat declined in 2004-2007. Following the national transportation policy goals of climate change response and low-carbon, green growth, however, railroad investment have been increasing since 2008, unlike the road category. Increased railroad investment will continue in the future. As of 2010, the railroad sector accounted for 24.1% of the total transportation, and 32.9% if including the urban railroad category.

<Table 4-2> Transportation Facility Investment Trend after 2000

(Unit: KRW 100 million)

Category		2002	2003	2004	2005	2006	2007	2008	2009	2010
Total transport special account (transport tax revenue)		132,558 (76,515)	143,703 (85,818)	135,529 (91,940)	130,587 (105,327)	125,953 (89,054)	129,027 (89,827)	139,424 (79,259)	170,780 (90,428)	146,999 (92,663)
Road account	Size %	80,976 61.1%	84,363 58.7%	78,950 58.3%	69,164 53.0%	64,828 51.5%	66,641 51.6%	73,354 52.6%	90,684 53.1%	76,630 52.1%
	Transport tax	50,118	56,237	60,221	51,589	48,979	47,877	42,800	48,379	49,111
Railroad account	Size %	32,962 24.9%	35,870 25.0%	31,744 23.4%	21,537 16.5%	20,276 16.1%	20,459 15.9%	23,946 17.2%	33,303 19.5%	35,395 24.1%
	Transport tax	18,364	20,091	21,514	17,837	13,358	13,141	11,889	14,920	22,239
Urban railroad account (public transport from 2006)	Size %	(8,474) 6.4%	(7,399) 5.1%	(8,966) 6.6%	13,312 10.2%	13,874 11.0%	13,487 10.5%	14,665 10.5%	17,416 10.2%	12,925 8.8%
	Transport tax	Included in the railroad account (budget was separated from 2005)			12,655	8,015	8,983	7,926	9,043	9,266

Source: MLTM, Major Statistics on the National Transport, 2011

1.2 Increased Roadway and Railroad Facilities

Extensive efforts in terms of legislation and financing were poured into roads and railroads to bring about significant development in these areas. This helped foster the strength of the South Korean economy. Notably, road and railroad facilities greatly expanded after 2000 thanks to the efforts exerted since the 1980s. As shown in <Table 4-3>, the total road length doubled from 1990 (56,715 km) to 2010 (105,565 km). Notably, the total expressway length more than doubled from 1990 (1,551 km) to 2010 (3,859 km). The total expressway length increased 1.8 times from the 2000s to the 2010s.

As for railroads, there was a greater focus on straight-line and double tracks rather than increasing the total length. However, the length of double tracks increased by more than 1.7 times from just 847 km in 1990 to 2,301 km in 2010. Notably, after the opening of high-speed rails in 2004, 368.5 km of high-speed rail tracks had been laid by 2010, helping significantly reduce travel time. In this section, the transportation facility expansion efforts focused on roads and railroads before and after 2000 are discussed.

<Table 4-3> Trends in Road and Railroad Transportation Facility Expansion

Category		1990	2000 (A)	2010 (C)	C/A
Road	Total length (km)	56,715	88,775	105,565	1.19
	Express-national-road length (km)	1,551	2,131	3,859	1.81
Rail-road	Total length (km)	3,091	3,516	4,094	1.16
	Double-track length (km)	847	1,332	2,301	1.73
	High-speed-rail length (km)	-	-	368.5	-

Source: MLTM, Major Statistics on the National Transport, 2011

1.2.1 Before 2000

a. Roads

The total length of roads in South Korea in 1936 was 24,283 km, and there was relatively little growth until 1960, at which point there were 27,169 km of roads. With the full-fledged socioeconomic development plans that marked the country after the 1960s, the length of roads totaled 40,244 km. The length increased to 88,775 km by 2000 as road construction continued. While only 9.6% had been paved in 1970, the figure sharply rose in the 1980s and 1990s and increased to 75.8% in 2000. From 1970 to 2000, the total expressway length quadruples from 551 km in 1970 to 2,131 km in 2000, the highest increase in the road category. The striking increase can be ascribed to intensified road investment since 1960.

<Table 4-4> Road Length Trends by Class

(Unit: km, %)

Category (Year)	Road Length by Class					Total (Overall)		
	Express National Roads	General National Roads	Special- and Metropolitan-City Roads	Local Roads	City, County Roads	Length	Paved Length	Paving Ratio
1936		6,075		10,308	7,902	24,284	538	2.2
1940		6,111		10,669	7,932	24,711	613	2.5
1950		5,213		10,131	10,339	25,683	649	2.5
1960		5,706		10,579	10,884	27,169	1,005	3.7
1970	551	8,122	5,476	10,880	15,216	40,244	3,864	9.6
1980	1,225	8,232	7,939	11,021	18,535	46,951	15,599	33.2
1990	1,551	12,161	12,299	10,672	20,033	56,715	40,545	71.5
2000	2,131	12,413	17,839	17,151	39,240	88,775	67,266	75.8

Source: After 1960, each province; 1961-1966: Construction Annals; before 1960, Public land Construction Annals (1960)

b. Railroads

While the provincial road facilities were greatly expanded in the decades after the 1960s, the total railroad length nearly stagnated because efforts were focused on the construction of straight-line and double tracks as well as electrification. The country's total railroad length was 3,193 km in 1970 and 3,123 km in 2000 due to the efforts to straighten the railroad lines. However, the total double-track length, which amounted to 512 km in 1970, doubled over the next 40 years and reached 938.6 km in 2000.

<Table 4-5> Railroad Facilities by Year

(Unit: km)

Year	Total Railroad Length	Single-Track	Double-Track	Narrow-Gauge Railroads
1970	3,193.2	2,556.0	511.8	125.4
1980	3,134.6	2,415.0	719.6	47.0
1985	3,120.6	2,310.0	763.6	46.9
1990	3,091.3	2,198.2	846.8	46.3
1995	3,101.2	2,199.0	882.0	20.2
2000	3,123.0	2,184.4	938.6	20.2

Source: Korea LBS Society, Improvement Measures for SOC Investment Financing, and Their Execution System, 2004

1.2.2 After 2000

a. Roads

Expansion of road facilities also continued after 2000. The total road length increased from 91,396 km in 2001 to 105,565 km in 2010. Notably, the total length of express national roads increased from 2,636 km in 2001 to 3,859 km in 2010. The road-paving ratio increased from 76.7% in 2000 to 79.8% in 2010.

<Table 4-6> Road Length Trends by Year

(Unit: km, %)

Category (Year)	Road Length by Class					Total (Overall)		
	Express National Roads	General National Roads	Special-, Metropolitan-City Roads	Local Roads	City, County Roads	Total Length	Paved Length	Paving Ratio
1936		6,075		10,308	7,902	24,284	538	2.2
1940		6,111		10,669	7,932	24,711	613	2.5
1950		5,213		10,131	10,339	25,683	649	2.5
1960		5,706		10,579	10,884	27,169	1,005	3.7
1970	551	8,122	5,476	10,880	15,216	40,244	3,864	9.6
1980	1,225	8,232	7,939	11,021	18,535	46,951	15,599	33.2
1990	1,551	12,161	12,299	10,672	20,033	56,715	40,545	71.5

Source: MLTM, Road Work Handbook, 2011

b. Railroads

The total length of railroad tracks did not change greatly until 2004 with the opening of the first high-speed rail. Until that point, investment in transportation was focused on road construction and the electrification and double-tracking of railroads rather. Moreover, until the early 2000s, vast investments were exerted in the construction of urban railroads in efforts to address traffic congestion in urban areas, which led to an imbalance of railroad construction between regions. The total railroad length was 3,125.3 km in 2001, which was not much different from before 2000. After 2004, however, due to the opening of highspeed rails and metropolitan railroads, the railroad length was extended from 430 km to 3,557.3 km by 2010. The double-track-railroad length increased 760 km, from 1003.8 km in 2001 to 1,763 km in 2010.

<Table 4-7> Railroad Length Trends by Year

Category		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Railroad (km)	Total	3,516	3,526.4	3,539.7	3,550.7	3,796.5	3,861.7	3,874.1	3,899.4	3,885.1	3,911.9	4,094.3
	High-speed	-	-	-	-	238.6	240.4	240.4	240.4	240.4	240.4	368.5
	General (metropolitan)	3,123	3,125.3	3,129.3	3,140.3	3,135.5	3,151.6	3,151.6 (123.8)	3,158.7 (123.8)	3,140.8 (123.8)	3,137.5 (126.2)	3,188.8 (536.9)
	Urban	393	401.1	410.4	410.4	422.4	469.7	482.1	500.3	503.9	534.0	537.0

Source: MLTM, Major Statistics on the National Transport, 2011

While the total length of railroad tracks did not increase much, the improvements from converting existing tracks to double tracks as well as electrification greatly increased the carrying capacity and overall service levels of railroads in South Korea. While only 39.8% of railroads were double tracks in 2001, the percentage increased to 56.2% by 2010, while the electrification ratio increased from 30.3% in 2001 to 65.63% in 2010.

<Table 4-8> Railroad Double-tracking and Electrification Ratios by Year

Category		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Double-tracking ratio (%)	Total	37.9	39.8	40.0	40.4	45.8	47.3	47.6	48.8	49.8	51.7	56.2
	High-speed	-	-	-	-	100	100	100	100	100	100	100
	General	29.9	31.9	31.9	32.5	34.3	35.4	36.0	36.8	38.8	39.7	43.7
	Urban	100	100	100	100	100	100	100	100	100	100	100
Electrification ratio (%)	Total	30.2	30.3	30.4	30.7	52.9	55.4	59.4	59.4	60.2	62.1	65.5
	High-speed	-	-	-	-	100	100	100	100	100	100	100
	General	21.4	21.4	21.4	21.7	43.0	45.2	50.1	49.9	50.7	52.7	55.8
	Urban	100	100	100	100	100	100	100	100	100	100	100

Source: MLTM, Major Statistics on the National Transport, 2011

1.3 Enhancement of Transportation Sector Competitiveness

Sustained expansion of the transportation sector has not only increased the carrying capacity of the transportation network but also contributed significantly to national economic development and competitiveness since the 1970s. Since 1980, however, rapid urbanization and the effects of traffic congestion in urban areas and worsening

traffic problems have become important social issues. Surging cargo volumes in line with growing economic scale has also resulted in increased transport and logistical costs. These problems are inevitable in the process of economic development and will cause huge social costs if not effectively handled. South Korea has experienced rising traffic congestion costs and logistical costs since 1990 from an increase in it national economy, while the rate of cost increase has slowed down since the second half of 2000s. This is in part attributed to the efforts to cope with transport problems and strengthen the competitiveness of the transportation sector that have been taken since the second half of the 1990s through the midterm master plans involving legal and systematic improvements.

1.3.1 Changes in the Mode Split

Road category investment intensified beginning in the 1970s, which resulted in roads accounting for the highest modal share for domestic inter-region travel. In 2001, the interregion modal split by category was 83% for roads and merely 14% for railroads. However, this ratio has been gradually changing since 2000. Since the 2004 launching of high speed rail, modal shares for roads for have diminished to 81.6% while the mode share for road increased to 15.4%. Though this increase is modest, it is meaningful given that the road carriage ratio had been continuously rising for multiple decades. Notably, with the environment and climate change emerging as international issues, the country set low carbon and green growth as important goals of its transportation policy, which also explain the significance of the decrease in road modal share. This change, as discussed earlier, is attributed to efforts to intensify rail investment since the 2000s.

According to the second revised Key National Transport Network Plan, which was devised in early 2011, the projected inter-region modal share has proposed that the modal share for railroads will increase to 27% by 2020. Rising oil costs and ever increasing international pressure for climate change adaptation and low carbon emissions will call for greater efforts to enhance the mode split for sustainable transport modes.

<Table 4-9> Inter-Region Mode Split by Category

(Unit: %, man.km, ton.km)

Category		2001	2002	2003	2004	2005	2006	2007	2008	2009
Domestic passenger	Road	83.02	83.21	82.65	81.59	82.22	82.24	81.68	81.35	81.77
	Railroad	13.61	13.51	14.00	15.37	15.05	15.03	15.65	15.91	15.38
	Aviation	3.19	3.10	3.16	2.83	2.54	2.54	2.47	2.50	2.66
	Sea	0.18	0.18	0.20	0.20	0.19	0.19	0.20	0.23	0.19

Source: KOTI, 2010 South Korean Transport DB Development Project, June 2011

<Table 4-10> Domestic Inter-Region Passenger Carriage Ratio Prospects by Category

Category		2008		2020	
		Traffic Demand	Ratio (%)	Traffic Demand	Ratio (%)
Million people-km/year	Road	205,750	81.4	184,875	69.3
	Railroad	40,243	15.9	72,745	27.3
	Aviation	6,335	2.5	8,472	3.2
	Sea	579	0.2	601	0.2
	Total	252,907	100.0	266,693	100.0

Source: MLTM, 2nd Revised Key National Transport Network Plan, 2011

1.3.2 Decreasing traffic congestion costs

Increased demand for transportation resulting from the expansion of large cities and the surging number of private automobiles caused traffic congestion in urban areas. Despite the continued expansion of road and railroad transportation facilities, these efforts have not been successful in coping with the ever-increasing traffic demand. These transport problems increased social costs, such as traffic congestion costs, which have risen sharply since the early 1990s, at an annual rate of 18.0% from 1991 to 1999. South Korea realized that simple transportation facility expansion could not resolve its transport woes; since the second half of the 1990s, it exerted diverse efforts to maximize the effects of its transportation facility investment by considering the various transport modes in a comprehensive fashion. As discussed earlier, such efforts included the statelevel formulation of mid- and long-term master plans such as the Key National Transport Network Plan and the Midterm Transportation Facility Investment Plan, and other measures for the

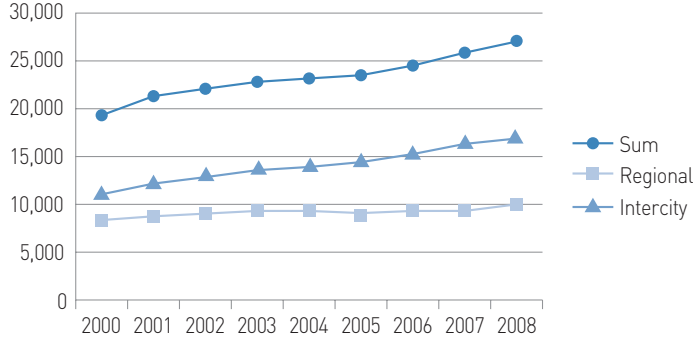
development of related technologies and policies. As a result, traffic congestion costs fell 4.1% annually from 2000 to 2008. For expressways, the average rate of annual increase in congestion costs fell from 33.9% (1991-1999) to 3.5% (2000-2008). The average rate of annual increase in annual congestion costs for general national roads fell from 15.3% (1991-1999) to -0.1% (2000-2008), thereby falling to one-tenth from the second half of the 1900s. Given the limited transport budget, efficient investment is an important policy goal, and insightful transport policies prepared for prospective changes to transport circumstances should be implemented.

<Table 4-11> Traffic Congestion Cost Trends

(Unit: KRW billion, %)

Category		Inter-Region Roads				Urban Roads	Total
		Express National Roads	General National Roads	Local Roads	Total		
1991		260	1,231	167	1,658	2,906	4,564
1999		2,693	3,857	1,086	7,635	9,478	17,113
2000		2,151	5,138	1,010	8,299	11,149	19,448
2001		1,985	5,607	1,197	8,789	12,321	21,110
2005		2,279	5,126	1,728	9,134	14,564	23,698
2006		2,413	4,920	1,847	9,180	15,441	24,621
2007		2,675	4,932	1,767	9,373	16,489	25,862
2008		2,831	5,097	1,953	9,881	17,022	26,903
Yearly increase ratio	1991-2008	15.1	8.7	15.6	11.1	11.0	11.0
	1991-1999	33.9	15.3	26.3	21.0	15.9	18.0
	2000-2008	3.5	-0.1	8.6	2.2	5.4	4.1

Source: MLTM, Major Statistics on the National Transport, 2011
Note: 1) Special-city roads, metropolitan-city roads, and city roads



1.3.3 Decreased rate for logistical costs

The national logistical costs are defined as the total costs of national resources used for transport, storage, warehousing, handling, packaging, logistical information, and general administration. National logistical costs simultaneously imply the size of a country's logistics industry and costs for logistic activities. Thus, the logistical costs consist of the transport cost, maintenance cost, packaging cost, logistical information cost, and general administrative cost. Of the total logistical cost, the transport cost ratio has been continuously increasing. This ratio rose from 58.9% in 1991 to 70.4% in 2008. It is important to effectively reduce the transport costs in order to reduce overall logistical costs, which are key factors to national competitiveness.

The total logistical costs continue alongside the country's economic development, though the rate of increase has been gradually diminishing since the 1990s. The transport cost rose to 14.4% annually in 1991-1999, while it fell to 7.76% annually in 2000-2008. This reduced rate of increase for logistical costs is attributed to the fact that the country has striven to formulate a key national transportation network plan, strengthen the connectivity between transport modes, and continue expansion of transport and logistical facilities, such as airports and harbors, since the 1990s.

Given that the integration of global transport and logistics markets will only accelerate and the logistical cost will progressively account for a greater percentage of the GDP, reducing transport costs through the development of efficient transportation systems is an essential policy goal.

<Table 4-12> Logistical-Cost Trends

(Unit: KRW billion, %)

Category		Total	Transport Cost	Maintenance Cost	Packaging Cost	Handling Cost	Logistical-Information Cost	General Administrative Cost
1991		31,989	18,857	9,147	865	642	1,180	1,298
1999		78,892	55,178	14,300	1,721	1,055	3,340	3,298
2000		77,119	49,909	19,803	1,644	1,144	2,359	2,260
2001		80,792	55,016	18,353	1,741	1,140	2,297	2,245
2005		101,019	76,957	16,889	2,063	1,809	1,621	1,680
2006		106,193	80,398	18,085	2,123	1,974	1,774	1,840
2007		117,112	88,127	21,318	2,278	1,991	1,668	1,730
2008		128,304	90,315	29,059	2,423	2,519	1,958	2,031
Average annual rate of increase	1991-2008	8.5	9.7	7.0	6.2	8.4	3.0	2.7
	1991-1999	11.9	14.4	5.7	9.0	6.4	13.9	12.4
	2000-2008	6.6	7.7	4.9	5.0	10.4	-2.3	-1.3

Source: MLTM, Major Statistics on the National Transport, 2011
Note: The transport costs do not include the international cargo transport costs.

2. Conclusions and Recommendations

Since first opening the Gyeongbu Expressway in 1968, South Korea has successfully developed advanced surface transport infrastructure involving roads and railroads in only forty years. This remarkable transportation system development contributed greatly to the country's economic growth by expanding the passenger and cargo carrying capacities of the nation's transportation facilities. Such drastic transport infrastructure development is attributed to efforts to develop a comprehensive transportation system closely integrating all modes of transport. For transport development, the fundamental transportation plan, known as the Twenty-Year Key National Transport Network Plan, and its execution and five-year plans were formulated. To achieve the goals and strategies stipulated in these plans, master transport development plans for roads and railroads are devised, upon which the implementation of investment in transportation is based. The implementations

of transportation investment projects, whose plans are systematically formulated, enable various transport modes to complement one another and more efficient investment in the country's transportation facilities.

To promote synergistic multimodal transportation systems, backing from the relevant organizations, laws, systems, and financing are essential. The domestic transport infrastructure sector exerted diverse efforts beginning in the 1980s to achieve these goals, thus creating solid foundations for the development of a comprehensive transportation system with connectivity between the country's transport modes.

This study aimed to determine the successful projects and policies involving roads and railroads so as to provide references for the future implementation of transport policies. Towards this end, the study focused on presenting examples of successful laws, systems, organizations, financing, and plan implementations with regard to the expansion of the country's transportation facilities.

To determine the background of the country's SOC implementation, changes in South Korea's country's historical context and various categories of transport were examined. For the historical context, the times before and after the 1960s, when full-fledged development of the country's transport was catalyzed, were examined. For the circumstances prior to the 1960s, transport circumstances during the Japanese colonial rule and after Korea's liberation were discussed. For the circumstances after the 1960s, the historical changes related to the country's economic size, industrial-complex locations, urbanization, and transport policies were examined. For the circumstantial changes by category of transport, changes in road- and rail-related policies and subsequent facility investments were examined. For the road category, the construction of the country's most important road route, the Gyeongbu Expressway, was closely examined. Moreover, as the country's transport infrastructure played a key role in its economic development, an in-depth examination of the role of transport infrastructure in South Korea's socioeconomic development plans and national comprehensive development plans was conducted. To evaluate how the development of the transport was carried out in the country, the administrative systems, laws, and financing systems related to roads and railroads were also presented.

The success factors driving the drastic development of roads and railroads were determined. For the success of the transport development, various factors should be closely harmonized, including the related organizations, laws, systems, and financing. Seven success factors were determined, and their backgrounds and achievements were examined. First, in terms of organizations, the establishment of KEC and railroad companies was examined. In terms of legislation, the Transportation System Efficiency Act, the Urban Transport Improvement Promotion Act, and the Special Act on Large-City and Metropolitan Transport Management were assessed, and their role in the development of a road and railroad SOC was analyzed. In terms of plans, the roles and contents of the Twenty-Year Key National Transport Network Plan and its execution plan, the Five-Year Midterm Transportation facility Investment Plan, were presented. Moreover, the basic road improvement plans-the Midterm Plan for Roads and Railroads and the National Railroad Network Development Plan-were examined. To efficiently expand transportation facilities, the supply of transport infrastructure should be timely developed, which further underscores the importance of securing stable investment finance. To secure the needed finance, South Korea established a transportation facility special account in the 1990s, which it has been successfully running since then. In this study, the transportation facility special account was determined to be a success factor in terms of finance, and was thus discussed in further detail. Lastly, diverse technologies were developed and diverse policies were implemented to efficiently pursue SOC development. This study determined and examined three success factors in this regard including the following: the development and operation of the South Korean Transport DB, the development and operation of the investment project efficiency evaluation system, and the formulation of guidelines for transportation facility investment evaluation.

Acknowledging that infrastructure development is essential to national competitiveness, South Korea has exerted extensive efforts since 1960 to construct advanced transport infrastructure matching the level of developed nations in terms of both quantity and quality. In this study, South Korea's transport infrastructure achievements from the 1960s to the present were assessed. In terms of investment, the budget allocated for road and railroad development rose stably after the 1970s and enabled the continued expansion of the provincial road and railroad facilities. Beginning in the 1970s, for the road category, efforts were focused on expanding key national roads, resulting in a drastic increase in the total length of express

national roads and key national roads. For the railroad category, urban railroads were constructed to relieve urban traffic congestion, while efforts to double-track, electrify, and straighten railroad routes improved the quality of the country's railroads. Lastly, in the increase in social costs (e.g., traffic congestion costs, logistical costs) in the transportation sector has been decelerating in the 2000s.

Notably, the formulation of master plans also considers future circumstantial changes at the midterm time period. The peak oil theory, climate change response, and international political changes were already reflected in the formulation of the Key National Transport Network Plan, which made possible investment in transportations towards developing a low-carbon and green growth-oriented transportation system. The Key National Transport Network Plan states the following projected goals up to 2020 by reflecting the following predictions of the future: a 1.45-fold increase in the total length of express national roads from 2009 to 2020, a 1.47-fold increase in the total length of railroads in operation, and a threefold increase in the total length of high-speed rail.

<Table 4-13> Transportation Facility Expansion Trends and Prospects

(Unit: km)

Category		2001 (A)	2005	2009 (B)	2015	2020 (C)	C/A	C/B
Road	Express-national-road length	2,637	2,968	3,776	4,290	5,470	2.07	1.45
Rail-road	Operating length	3,125	3,392	3,378	3,997	4,955	1.59	1.47
	High-speed-rail length	-	240.4	240.4	653.2	701.8	-	2.92

Source: MLTM, 2nd Revised Key National Transport Network Plan, 2011

In conclusion, the development of transport infrastructure such as roads and railroads takes a long time from planning to completion. Therefore, if a project is implemented without initial long-term insights, inefficiencies are bound to arise. Furthermore, as transport infrastructure projects are allotted massive budgets, to effectively execute such budgets, implementation feasibility studies should be conducted to verify the project feasibility by the implementation stage. To successfully develop South Korea's transport infrastructure, midterm master plans were formulated, and the country's transport policies were consistently implemented.

Towards these ends, extensive efforts were exerted to improve existing related laws and systems, develop the related technologies, and raise the needed finance. It is hoped that this study will be a good reference for the transport projects that will be conducted in countries with environments similar to that of South Korea.

The country implemented diverse policies and measures in addition to the cases of measures introduced herein, which were formulated and implemented in line with political and economic situations from the 1970s to the 1990s. Compared with other countries, South Korea achieved fast economic growth and experienced various economic and political changes since the 1970s. Diverse laws, systems, and financing methods that were introduced at that time were formulated and implemented in line with such domestic circumstances. Thus, these measures and systems-if intended to be applied to other countries-should be reviewed in terms of the relevant country's politics, economy, geography and space, and the people's sentiment. Also, it should be noted that these Korean cases of measures were implemented in the past, so they should be revised and adjusted if they are to be applied in other countries.

Lastly, in recent years, carbon emission reduction, peak oil, and other energy and environmental issues have become global issues, so South Korea is also requested to change its paradigm of investment in transportation. The domestic transportation sector has added "the achievement of low carbon, green growth" and "realization of intermodalism" to its major policy tasks and it is preparing diverse measures to achieve such goals. These global issues should be tackled not only by developing countries but also by developed countries. Hence, if developing countries formulate policies for efficient investment in transportation, they should consider these global issues and changes.

<Figure 4-1> Transport Network Plan (Road Network, 2011~2020)

<Figure 4-2> Transport Network Plan (Rail Network, 2011~2020)

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Appendix

APPENDIX 1. Transport Development Process and Policy Recommendation

The Role of the Transport

In the 1950s, South Korea focused on the restoration and reconstruction of roads and railroads constructed by imperial Japan for the purpose of exploiting its colony Korea, which were damaged during the Korean War. In the 1960s, infrastructure construction began in line with the goal of industrialization. In the 1970s, economic revival was pushed as the first state policy, thus leading to the expansion of infrastructure facilities and the development of key road networks for regional development and cargo transport. In the 1980s, urban transport problems began to attract the attention of policymakers.

As the construction and expansion of transport facilitate human and material exchanges, which lead to and reinforce national economic development, transportation facility investments had a tremendous impact on the national economic development well before the 1980s. For example, despite the opposition met before and during the construction of Gyeongbu Expressway in the 1970s and subways in the 1980s, these two projects can be considered transport revolution.

Challenges of Transport Construction and Solutions

The Incheon Bridge construction project was first reviewed in 2000. An execution agreement was then signed with the British AMEC in June 2003, and the construction began in June 2005 and was completed in October 2009. This project was the first privately financed transportation to be controlled by a foreign company, which triggered many controversies over the selection of the project implementer. The implementer was finally determined through many meetings and consultations with the Ministry of Planning and Budget, the Ministry of Maritime and Fisheries Affairs, and the Ministry of Finance and Economy.

The Role of the Transport in the Five-Year Socioeconomic Development Plan and the Comprehensive Public land Development Plan

The Transport Plan-although a subdivision concept of the Socioeconomic Development Plan and the Comprehensive Public land Development Plan and undertakes derived demand-helped boost the national industrial competitiveness and economic growth through the construction of nationwide road and railroad networks. This achievement should be duly noted. Notably, the development of the key transportation network in line with the Comprehensive Public land Development Plan contributed greatly to the growth of the country's manufacturing industries and hub cities. Moreover, the transportation network played a role in regional development, the development of less-developed areas, and in the infrastructure function for economic growth. Although investment in transportation facilities such as railroads, roads, airports, and harbors intensified until the 200os, connectivity between the transport modes was lacking. Since 2008, MLTM has been implementing projects involving the development of intermodal transportation systems. In the future, more efficient use of the national public land structure is expected and with seamless connection between transport and logistical flow, South Korea's transportation system will attain the transport functions of a developed country.

South Korea's Transport Development Strategy and Policy Recommendation

For transportation expansion, the national topographies, land sizes, spatial structures, etc. should be comprehensively considered. It is therefore very difficult to propose a standard development model. For transportation expansion, however, the following points should be considered:

Scientific demand forecasting for the target transportation axis will avert duplicate development between and within transport modes; Adequate connectivity should be secured considering the characteristics and strengths of the country's transport modes; and Avert falling into the "demand first, supply later" circulation logic of transportation facility demand and supply.

Source: An interview with the president, Korea Real Estate Research Institute, Kang Young-il

APPENDIX 2. Development Process of Transport and Policy Suggestions

Q1. Describe the situation in South Korea before the 1980s and what role did the then transport play in the country's economic development?

(A) The country needed an administration that would pave the way for national development. South Korea was liberated from imperial Japan in 1945. After its liberation, the government was still lacking in experience in running a modern country, but was able to overcome such difficulty with the support of United States Operations Mission (USOM).

However, President Park Chung-hee took power through a military coup in 1961, and materialized his development ambitions in the first five-year economic development plan thus creating a development framework. He considered developing the country into a world-class heavy chemical industry power, and as a part of that scheme, he constructed the Gyeongbu Expressway.

The USA continued to provide technical and financial support to South Korea through World Bank, whose aid peaked in the 1980s. In line with rapid urbanization after the 1970s, urban transport problems became serious, impacting national economic activities and national welfare, which required urgent countermeasures. In the second half of 1970s, the World Bank expected South Korea to continue having urban transport problems, and thus advised the country to prepare against these difficulties. The project was carried out in 1978 in order to receive foreign borrowings including a research fund of USD 3 million.

The South Korean government wanted only foreign borrowings excluding research fund, but that arrangement, after all, boosted the country's research capabilities. KOTI, which was established in the process of implementing World Bank projects, has thus far played a big role as the country's transport think tank.

In the 1990s, as the country made remarkable economic developments, it no longer needed loans from the World Bank. In 1991, the country repaid all of its debts. At that time, the World Bank offered more borrowings to South Korea because the country has well repaid previous loans and reaped bigger results

using the loans, and relevant foreign experts were sorry that they could not visit the country more often and drink soju.

Q2. What difficulties and episodes for overcoming them could you tell us regarding the implementation of large SOC construction projects such as the Gyeongbu Expressway?

(A) The Korean government asked KIST, the only think tank in 1978, to formulate a master plan for railroad network, sea transport, and aviation facilities. However, KIST had nearly no experience and experts in this field. Aside from few experts, there were no engineers who could interpret for foreign consulting groups. In 1966 when the World Bank's advisory group came to South Korea to plan the country's expressway, Gyeongin Expressway, an interpreter hired by the Construction and Transportation Ministry had a good command of English but did not know technical terms, so I helped him with this. A few days later, the interpreter did not show up and I was asked to interpret. My spoken English was poor, but I could communicate with the advisory group officials using technical terms, satisfying them like Koreans do not know the Chinese language but can communicate with Chinese using written Chinese characters.

Of five foreign consulting groups recommended by the World Bank, Barton Aschman, a Chicago-based transport research consulting group, and Urbitran run by Korean-American Dr. Lee Bum-jung, were selected to jointly conduct research. I, together with Dr. Hwang Yong-ju, the then director of KIST Regional Development Institute, finalized the ongoing mass cargo transportation system, and joined in and helped complete the project of formulating a plan for improving Seoul Transport. Afterwards, in 1986, our research team was launched into KOTI, and I was chosen to be the Vice President. I led the formulation of urban transportation plans for the five major cities including Busan, Daegu, Gwangju, and Daejeon, and I conducted several studies on the improvement of cargo transportation systems and public transportation systems as well. Research reports were submitted to the government. Some foreign technical team members were lacking in their abilities. Notably, the chief researcher from the American company, accompanied by his three family members, planned to stay in South Korea for one year, but he lacked experience and leadership, thus he had to be sent home. His position was replaced by the company's Executive Vice President

Mike Powils. Mr. Powils was attracted heavily by Korean culture and performed his research excellently.

Q3. At that time, what was the role of the government or the role of transport-related public corporations, authorities, and research institutes? How was their role division?

(A) It is crucial for the development of urban transport to expand roads and railroads and to systematically operate these facilities. However, at that time, the relevant authorities focused on expanding facilities, but took less interest in transport operation and were lacking in technical functions. This is true for today. Large cities including Seoul have no departments responsible for transportation plans, and even particular sections responsible for transport safety.

I emphasized that these technologies would greatly improve transport services without costing much by establishing transport operation functions. I began to undertake TSM designs with low costs. This development has probably regarded TSM as a lowcost measure, leading it to receive less attention and resulting in a lack of research and technical services in this area. Notably, TSM projects require cooperation with the police, which municipalities tend to avoid, preventing the development of the country's transport operation technology. As a result, huge national congestion costs are incurred, and South Korea is ranked the first in traffic accidents among OECD countries, a big setback for the country.

Logistics and financial businesses earn wealth faster than manufacturing businesses involving the construction of factories and the introduction of machines for the manufacture of products. Likewise, as software is not less important than hardware for electronics engineering, software including planning and operation is not less important than facilities for transportation systems. Therefore, transport does more than having more automobiles and passing vehicles faster, and it should be regarded as a service essential for pursuing the people's happiness. To that end, the government should realize the importance of transportation planning and operation technologies and should introduce such functions.

Q4. What position did the transport hold in the economic development plans or comprehensive public land plans? What was its role, and how did its role and position change according to changing times?

(A) The country's remarkable economic development began to take shape through President Park Chung-hee's outstanding leadership and judgment. This fact would not be disputed. However, a considerable part of the five-year economic development plan and comprehensive public land development plan, which were led by him, had already been prepared by the Chang Myon administration. At that time, I was working with one of the few design firms, most of which were engaged in the formulation of comprehensive public land development plans.

The Korea Construction Technical Group with which I was working had already started its formulation of the five-year comprehensive development plan for the Gyeonggin Region, so the project began before the Park Chung-hee-led military coup. The plan included the Gyeongin Canal development plan and satellite city development plans involving Neungok as a pilot town. Also, our company earned orders for the Yeongsan River basin comprehensive development plan among five river basin comprehensive development projects and eventually came to formulate plans for land and water transport, irrigation, and tourism. At that time, a work order to formulate plans for transport and tourism, which at that time were new to us, seemed to be drafted by an advisor for the Construction and Transportation Ministry who was sent by USOM. At our company, there were no engineers for transport or tourism planning, which were new to us at that time. Finally, the project was assigned to me, the youngest staff, and I had to make a report by referring to foreign references.

Also, I was engaged in the master design for Seoul-Suwon Expressway construction requested by Gyeonggi Provincial Office, and was surveying routes. This project had also been long prepared by the Gyeonggi Office. However, the Park Chunghee- led Gyeongbu Expressway plan was decided to push through, so our plan was discontinued, and our design drawings and surveying results were collected by the Construction Ministry to be disposed of. Roads, which were constructed later, involved many straight lines involving tunnels, bridges, and elevated civil engineering works in contrast to our plans to use curved lines

making the most of the given topographies. For faster construction, military equipment was mobilized, and the central government was positively involved, making the project possible.

Q5. South Korea's representative land transport can be said to be roads and railroads. What was the role of roads and railroads according to the changing times, in which areas did they conflict with each other, and how were such conflicts addressed?

(A) South Korea had to implement transportation policies focused on automobiles, so its initial investment in transport was concentrated on roads. In the initial stage of economic development, mainly road paving was performed. Afterwards, SOC investment continued, activating the construction of national roads and expressways, raising the country's current expressway density to the world's top level together with that of Germany. However, investment in railroads was neglected, and thus only some railroad double track, electrification, and trunk railroad improvement works were conducted, leading the total operating railroad length to decrease. It was only in the 2000s that railroad length began to surpass that before the country's liberation.

In 2008, railroad and road planning work was placed under the responsibility of Officer of Transportation Policy, creating a framework for carrying out these projects. However, there was an unbalanced development of railroads and land transportation systems, and this affected public transportation. This downgraded the efficiency of the transportation system and did disservice to the people.

Q6. Can you tell us about any memorable system changes or events in implementing transport projects?

(A) Huge development projects involving a total project cost of over KRW 50 billion or national funds, had to receive preliminary feasibility study by KDI since 1999, and this was a very wrong policy. Prior to that, the Construction and Transportation Ministry reviewed the feasibility of master design, and relevant officials were seen as not objectively reviewing the feasibility due to ambitions to realize projects. Thus, the projects had to be reviewed by the Budget Ministry.

The fundamental problem lied in the fact that the Construction and

Transportation Ministry was excessively focused on construction, while neglecting software involving planning functions. In actuality, a review of road plan reports reveals that a considerable number of them cite traffic congestion as the necessity of projects in the planned road segments.

Although KDI led the projects, all that was necessary was that preliminary feasibility studies should prove that road construction would ease congestion and create sufficient benefits. It was a big mistake to neglect the previous comprehensive analysis of transport situations including demand. Transport should not be misconceived simply as a service of automobile passage.

Currently, Road Departments or KDI are not capable of analyzing transport situations to improve transportation systems. Preliminary feasibility studies should shift from an analysis of automobile passage in a limited transport axis to be able to formulate and implement comprehensive transport improvement plans, which should be carried out by the department responsible for planning national transportation networks.

Q7. Lastly, in light of the country's experience in its development, what would be the main strategies or cautions for underdeveloped or developing countries including ASEAN countries to heed in implementation of transportation projects, as well as other diverse helpful policy suggestions?

(A) South Korea, looking back on its past development history, initially adopted the planning functions of the USA and the World Bank, and learned their knowhow to foster its own leadership and professionalism. In this process, the country developed its economic power, continued to raise finances, nurtured research functions, and thus became a technologically independent country. The country can now even export technologies. What played a big role here was the leadership in the adoption of right policies, supporting economic power and professional technological power. This all comes from the power of the Korean people.

Thus, if we support underdeveloped or developing countries in their development, we should awaken the mindsets of their political leaders, provide economic, technical support for some time, allow the people to enjoy the benefits

of economic development, and help them create a sustainable development model. In doing so, as we already repaid our borrowings from the World Bank in advance, we should help them repay our debts to create a win-win relationship.

Source: Interview with Professor Shin Boo-yong at Department of Construction Environment Engineering, KAIST

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