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What is Infrastructure?

- ❑ Infrastructure is facilities which are necessary for the functioning of the economy and society.
 - Sometimes used interchangeably with SOC (social overhead capital)
- ❑ **Economic vs. Social Infrastructure**
 - Economic Infrastructure: facilities essential for day-to-day economic activities.
 - **Transport facilities (roads, rails, airports and seaports): Today's focus**
 - Utility networks (for water, sewage, electricity, telecommunication, etc.)
 - Industrial parks
 - Social Infrastructure: facilities essential for the structure of society.
 - Schools, hospitals, libraries, prisons, and social welfare facilities

Role and Characteristics of Infrastructure

- ❑ Infrastructure development has contributed to economic growth and quality of lives of people
 - Many empirical studies support the notion of infrastructure-driven economic development (D.A. Aschauer (1990) and others)
 - Infrastructure investment in the past represents higher rate of economic return than the growth rates of Korea's economy

 - ❑ The characteristics of infrastructure
 - Promote and support economic development indirectly
 - Multiple objectives - efficiency, equity, and sustainability
 - Lumpiness and huge capital requirement
 - Scale economies and monopolistic supply
- For these reasons, infrastructure development used to be regarded as a role of public sector

Economic Growth and Infrastructure Development in Korea: A Chronological Review

Seoul at night in 1960

Gangnam at night in 2012

<http://imck81.tistory.com/357>

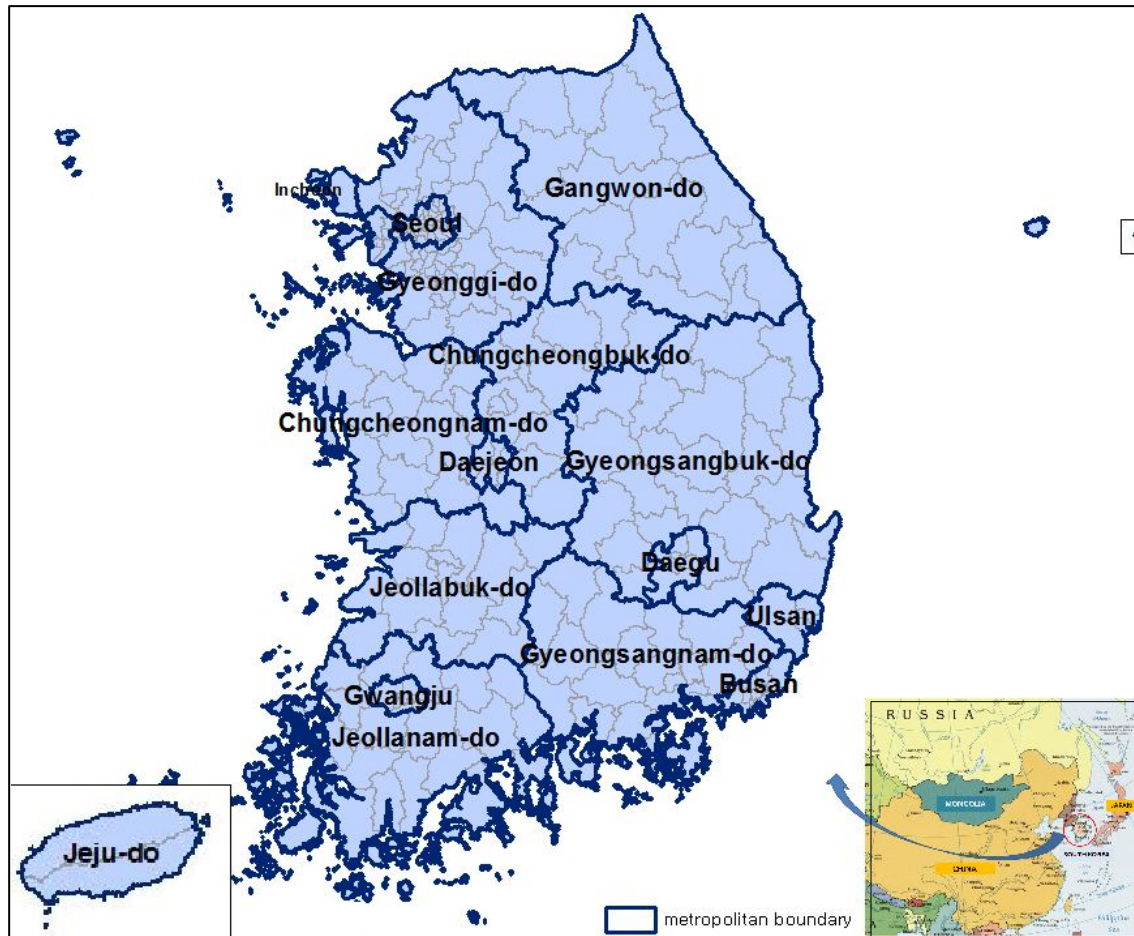




A Satellite Night View of South and North K orea

Image: PlanetObserver/
Science Photo Library.
New Scientist, 19 Dec 2
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Territory of South Korea



Republic of Korea in 2013

Population : 50,220,000

GDP : \$ 1,304.3 billion
(\$ 25,972 per capita)

Area : 100,150 km²

Road length : 106,414 km

Expressway : 4,111 km

National highway : 13,843 km

PPP road: 421km,
337km(under construction)

Rail length : 3,912 km

Infrastructure Development in the 1960s

	Economic Development	Infrastructure Development
1960s	<ul style="list-style-type: none"> - President Park Chung-hee (1961-1979) was committed to economic development and formulated a series of “Five-year Economic Development Plan.” - Export-driven economic development policy - Developing light MFCT industries 	<ul style="list-style-type: none"> - The infrastructure development was linked to the economic development plan. - Government identified infrastructure needs to support the economic development plan - 275km rail construction mainly to link mining sites (coal, iron ore, limestone, and tungsten) to industrial sites - Investment priority shifted from rail to highway because of high costs - First two expressways constructed

First Two Expressway Construction

- **Necessity of Expressway Construction**

n

- To support export-driven economic growth, it was necessary to improve accessibility to big ports from the biggest market area, Seoul metropolitan area.

- **Rapid increase in freight transport**

- Industrial complex development

- **Seoul-Incheon Expressway**

- 23.5 km, March 1967-Dec 1968
- ADB provided loan and technical assistance.



The Seoul–Busan Expressway

(428km, constructed b/w 1968-1970)

❑ The project was envisaged as economically non-viable

- The World Bank and other international development agencies turned down financing proposal of the project due to its low B/C
- Opposition parties blamed the project that it was motivated by political reasons.

❑ Political leadership and resource allocation

- The Korean government was determined to pursue the project because Seoul-Busan corridor was critical element to achieve economic growth.
- A government-wide construction committee was organized (chaired by President Park) and resources were allocated to construct the expressway.
 - Total project cost was 42.9 billion won, which amounts to 16% of government budget.
 - Construction equipments were the remains of US military left behind the Korean War.
 - Small and inexperienced domestic companies joined together to meet the huge challenges. Military soldiers were taken part in difficult construction sites and 77 people were dead.

❑ Project completion

- The construction completed in just twenty nine months, far less than planning.
- Some companies (including Hyundai) emerged as a major force in the international construction market.

Infrastructure Development in the 1970s

□ Economic development

- Restructuring of economy into heavy and chemical industries (HCIs)
- HCI complexes needed huge infrastructure development such as ports along the coast for imports of raw materials and surface transport to improve accessibility♪
- Economic growth accelerated. GNP has increased from 8.1 bill \$ (1970) to 61.6 bill \$ (1979)

□ Road development

- Nine expressway lines of 1,138 km constructed to link industrial sites, ports, and big cities.
- National highway network developed and its pavement ratio has increased from 28.2% (1972) to 55.3% (1981)
- The ride share of road has increased significantly

	1962♪	1976♪
Passenger♪	Rail : Road = 51.0 : 47.5♪	Rail : Road = 24.9 : 73.3
Goods♪	Rail : Road = 87.2 : 8.5♪	Rail : Road = 50.7 : 22.1♪

Infrastructure Development in the 1970s (2)

□ Port development

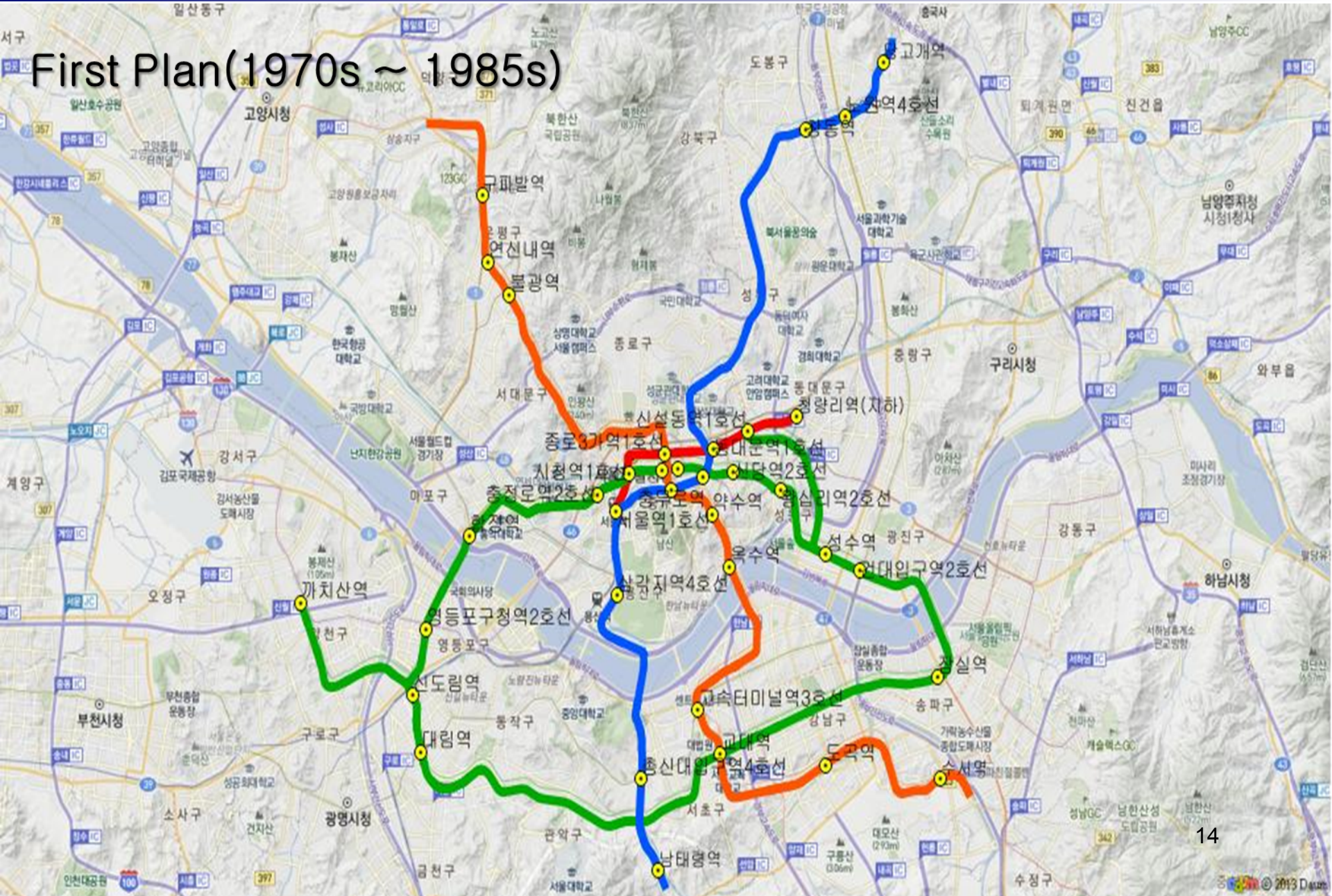
- Industrial sites and new deep water seaports were developed along the HCI industrial sites
- The annual cargo handling capacity has increased by 80% from 19 to 34 million tonnage.
 - Maximum berth capacity : 40 to 80 thousand ton
 - Simultaneous berth capacity: 81 to 129 ships

□ Urban infrastructure development

- Busan first urban expressway (15.3km) construction started in 1977, assisted by UNDP and IBRD to relieve urban congestion at the hinterland of the biggest port in Korea.
- Seoul subway line one (7.8km) started its operation in 1974.
- Seoul subway network (lines 1-4) formulated

First Phase of Seoul Subway Network

First Plan (1970s ~ 1985s)



Electrified Network of Seoul Metropolitan Area

951.7 km over 27 lines



Infrastructure Development in the 1980s

□ Economic development

- “Growth-first” strategy was replaced by “consolidating growth on the basis of stability.”

□ Infrastructure development

- The goal of expressway construction projects shifted to promoting balanced regional development
- Additional expenditure on infrastructure was needed to host international sport events such as '86 Asian Games and '88 Seoul Olympic Games.
 - First phase of Seoul subway network constructed
- Placed greater emphasis on inter- and intra-urban transportation networks and subway construction in large cities.♪

Infrastructure Development in the 1990s

▷

- The Five-Year Economic and Social Development Plan (1993-1997) period
 - Government formulated an ambitious program targeted at improving living standards (housing, the environment, urban traffic) and expanding social overhead capital (transportation and distribution, including the development of communications standards) in an attempt to address infrastructure gap.
 - In the early 1990s, infra gap particularly that of land transport was regarded as a major bottleneck of economic growth.

Congestion Costs and Logistics Costs

(Unit: trill Won, %)

Year	GDP (Current) (A)	Transport Congestion Costs (B)	B/A (%)	National logistics costs (D)	D/A (%)
1993	277.5	8.6	3.1	41.2	14.8
1994	323.4	10.0	3.1	47.8	14.8
1995	377.3	11.6	3.1	57.9	15.3
1996	418.5	15.9	3.8	63.8	15.2
1997	453.3	18.5	4.1	69.6	15.4
1998	444.4	12.2	2.7	74.2	16.5
1999	482.7	17.1	3.5	78.9	16.3

Source: Ministry of Construction and Transport, *National Transportation Plan (2000~2019)*, 1999.
Originally calculated by KOTI (Korea Transport Institute)

Motorization and congestion

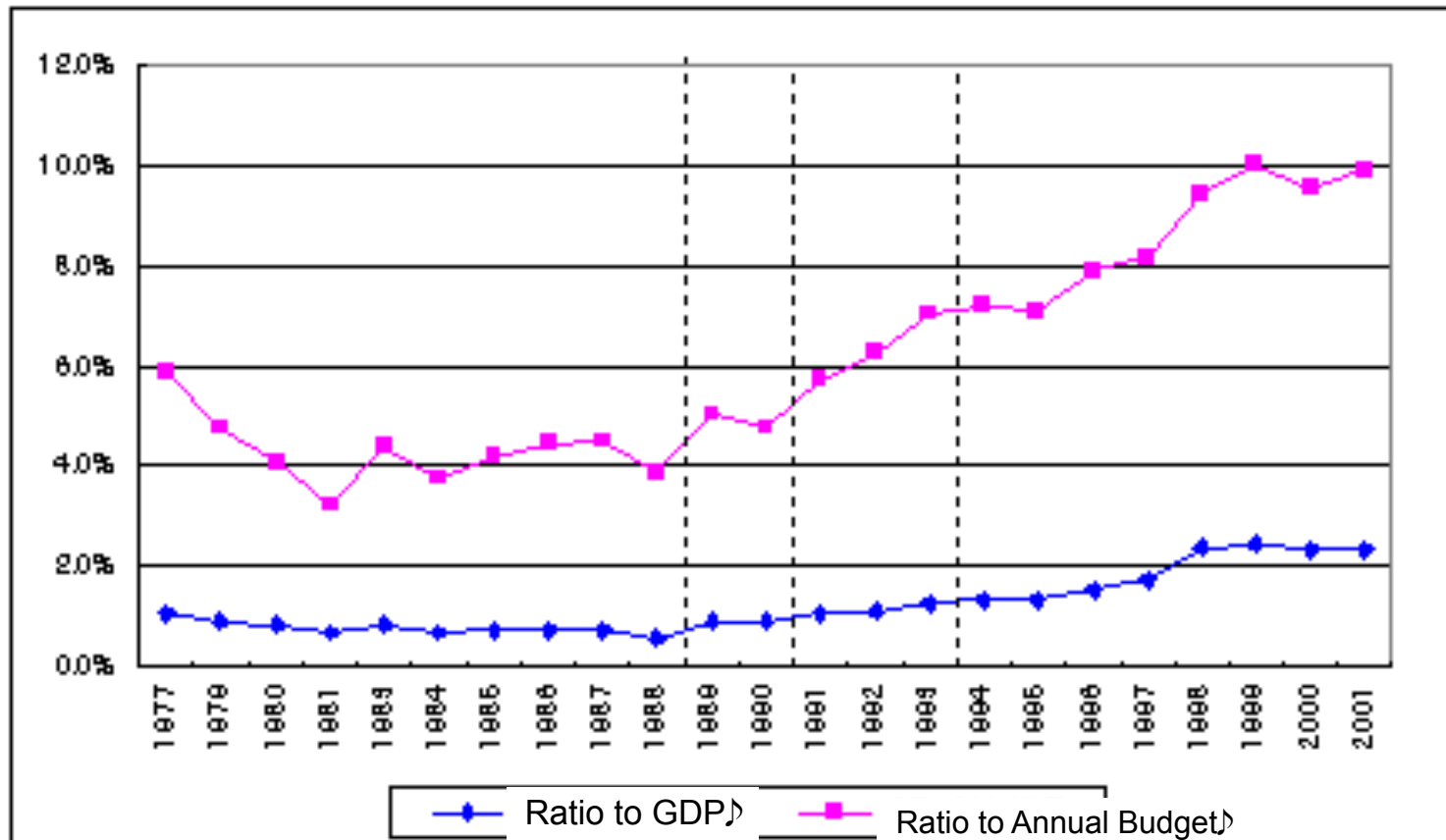
- Because of a unprecedented rapid motorization during the 1980s resulted from income growth, Korea faced a serious congestion problem causing high logistical costs.

	1970	1975	1980	1985	1990	1995	2000	2005	2010
Registered Vehs (thou)	61	84	249	557	2,075	6,006	8,084	11,122	13,632
Road Length (km)	40,244	44,885	46,951	52,264	56,715	74,237	88,775	102,293	105,565
Rail Length (km)	3,193	3,144	3,182	3,121	3,259	3,321	3,516	3,862	4,094
Vehicle/Lane at the Seoul-Busan Corridor				1,487	3,483	7,311	4,622	4,215	4,396
GDPpc (10 thou in 2005 W)	8.8	30.2	104.6	212.0	441.1	919.5	1,311.8	1,839.3	2,444.8

Index (1990 = 100)	1970	1975	1980	1985	1990	1995	2000	2005	2010
Registered Vehs	2.9	4.0	12.0	26.8	100.0	289.4	389.6	536.0	657.0
Road Length	71.0	79.1	82.8	92.2	100.0	130.9	156.5	180.4	186.1
Rail Length	98.0	96.5	97.6	95.8	100.0	101.9	107.9	118.5	125.6
Vehicle/Lane at the Seoul-Busan Corridor				42.7	100.0	209.9	132.7	121.0	126.2
GDPpc	2.0	6.8	23.7	48.1	100.0	208.5	297.4	417.0	554.3

Trend of Infrastructure Investment

- The Korean government increased infrastructure investment more than 20% every year in the 1990s, far exceeding the growth rate of the national budget



Transport Tax

- ❑ Created by the Transport Tax Act of Dec 1993
 - Initially created as a 10 year sunset tax, the transport tax has been extended four times by three years in 2004, 2007, 2010, and 2013.
- ❑ Transport, energy and environment (TEE) tax is new name of the transport tax since 2007.
 - Expanding its spending targets could help overcoming the resistance to extending transport special account in 2007.
 - The expenditure of the tax revenue has been redefined:
 - Construction and operation of transport facilities & public transportation improvement (80%)
 - Support energy and natural resource related business (3%)
 - Environment conservation (15%)
 - Metropolitan and regional development special account (2%)

Decomposition of Petroleum Price

	Gasoline (Supreme)	Gasoline (Normal)	Diesel	
Consumer Price (A+B+C+D)	2,072	1,968	1,757	
Factory Price (Before Tax) (A)	1,007	946	972	
Tax and Surcharge (B)	921	915	679	
TEE tax (B1)*	529	529	375	
Education tax surcharge (B2)	79	79	56	B1 * 15%
Driving tax surcharge (B3)	138	138	98	B1 * 26%
VAT (B4)	175	169	150	(A+B1+B2+B3)*10%
Sales charge (C)	36			%
Distribution costs and Profit (D)	107	107	107	

Source: Adapted from Korea National Oil Corporation, Opinet; <http://www.opinet.co.kr/chart.do?cmd=oilknow.saleprice.list>

Note) Price as of 3rd quarter, 2013.

* TEE tax is a **specific duty**, not an ad valorem tax; and its tax rates can be **adjusted within 30%**.

Transport Facility Special Account

- Transport facility special account was created in Dec 1993 , merging road special account and urban metro special account thus increasing its revenue sources
 - Former road special account and urban metro special account were created in 1988 and 1990 respectively.
 - Transport facility special account aims to secure financial resources of construction and operation of transport facilities and to enhance managerial efficiencies of facilities by applying user-charge principle.

Sectoral Allocation of Transport Special Account

(Unit: Trill. KRW, %)

	'94	'97	'01	'04	'08	'09	'11
Total in Trill KRW	4.5	8.3	12.5	13.6	13.2	17.0	14.5
Road	62.6	62.3	64.6	58.3	52.7	52.8	50.6
Rail	7.3	9.0	14.9	16.8	17.0	19.6	26.3
Urban Metro	14.2	10.0	7.6	6.6	10.3	10.3	7.8
Airport	7.1	7.4	2.7	2.7	1.7	0.5	6.0
Seaport	8.8	11.2	8.1	12.4	13.1	10.5	9.3
Transport system	-	-	2.0	3.3	5.2	6.2	-
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Expansion of Infrastructure Stock

Type	'90(A)	'05(B)	(B)/(A)
Four or More Lane Road (km)	4,823	19,375	4.01
Express Highway (km)	1,559	2,972	1.91
Dual Carriage Rail (km)	847	1,343	1.59
Port Capacity (Mill.ton/year)	190	514	2.70
Airport Capacity	1,331	2,012	1.51

Signs of Over-Investment

□ Optimism bias in traffic forecasting

Deviation of Actual traffic volume from Forecast by construction completion year (%)

	1994 or before	1995-1998	1999-2001	2001 or after
Average	+41.2	+27.6	-20.4	-55.5
s.d.	50.8	134.7	37.9	20.8

Source: Kang Soo KIM (2007), KDI.

Deviation at the opening year = (Actual-Forecast)/Forecast

□ Increased construction cost

- Design standard upgraded
 - ✓ National highway designed with 4 lanes and design speed at 90km/h
 - ✓ Grade separation at all intersections

Infrastructure Development in the 2000s

▷

□ Now paradigm of infrastructure development evolved to enhance fiscal efficiency

- In the wake of financial crisis in the late 1990s, the fiscal soundness became a very important policy agenda.
- Criticism on loose fiscal discipline in infrastructure development
 - Cost and time overrun
 - Due diligence regarded as a formality

□ New public investment management system evolved in the 2000s

- The topic of Dr. Jay-Hyung Kim's presentation▷

Increased role of PPPs in the 2000s

- PPPs have played a significant role in providing infrastructure in a timely manner, expanding fiscal space since the financial crisis in the late 1990s.

Public & Private Infrastructure Investment Trends

Unit: Trill. KRW, %

	95-00	02	04	06	08	10	11	12
Total SOC Investment	72.4	17.2	19.1	21.3	24.3	27.2	26.6	25.5
Government Investment (A)	69.7	16.0	17.4	18.4	20.5	24.5	24.4	23.1
Private Investment (B)	2.7	1.2	1.7	2.9	3.8	2.7	2.2	2.4
B / A (%)	3.9	7.5	9.8	15.8	18.5	11.0	9.0	10.3

A : Annual budget in transportation and regional development sector, The Five-year National Fiscal Management Plan

B : Private investment involvement in SOC sector

History of PPP Act

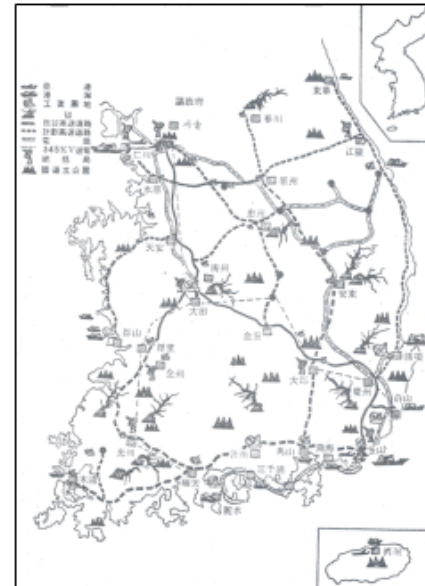
- ❑ 1994, PPP Act legislated. 'Act on Promotion of Private Investment into Social Overhead Capital'
 - To fill the 'infrastructure gap' PPP procurement scheme was introduced.
- ❑ 1999, PPP Act amended to promote PPP market
 - PPP market lost its momentum after financial crisis in 1997-8
 - Promoted unsolicited proposals by awarding bonus points
 - Risk Sharing (Minimum Revenue Guarantee)
- ❑ 2005, PPP Act amended. 'The Act on Private Investment on Infrastructure'
 - PPP facilities expanded to include social infrastructure such as schools, public housing, and museums.
 - Strengthened **fiscal discipline**
 - VfM (Value for Money) test introduced
 - Promotion of competition
 - Performance based government payment

Role of Public Institutions for Infrastructure Development

National Territory Development Plan

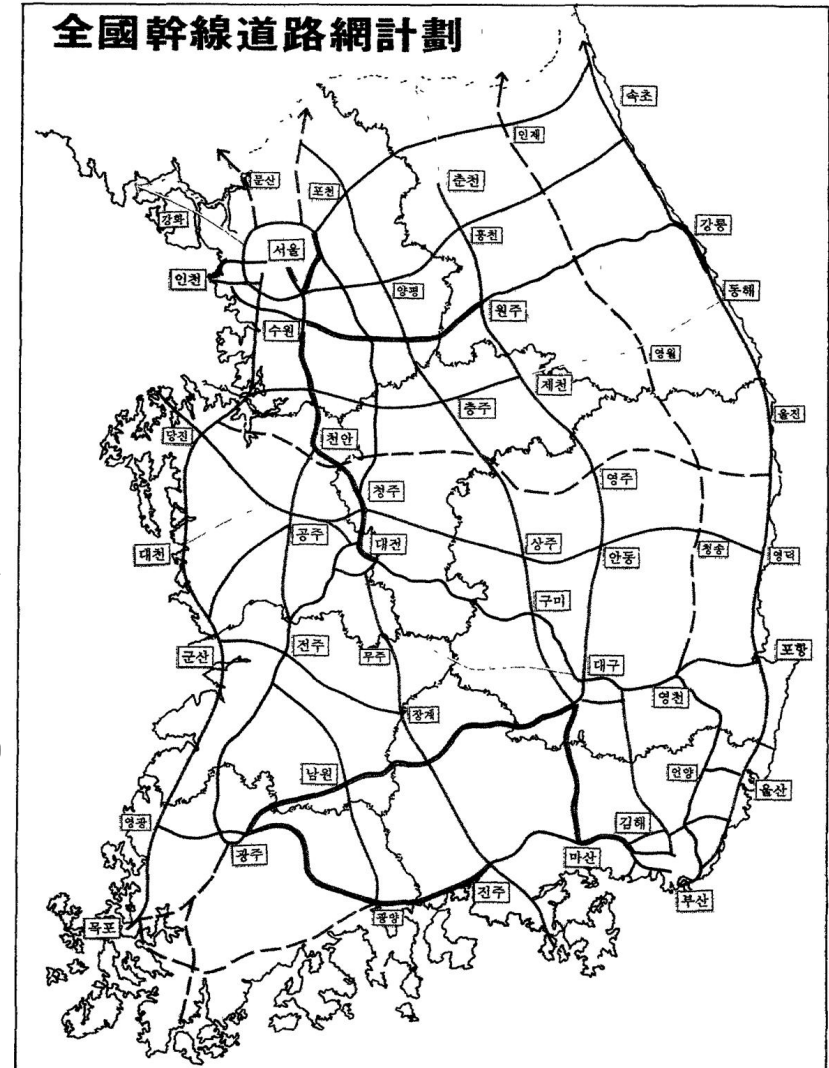
□ The Role of National Territory Development Plan

- Highest level comprehensive physical plan about the future of Korea
- Coordinate territorial development and plan to supply physical infrastructure
- For example, based on the 3rd National Territory Plan (1992-2000), National Arterial Road Network Plan was formulated with theoretical support of KRIHS.



National Arterial Road Network Plan (7 X 9)

- Construct 7 vertical axes and 9 horizontal axes at expressway standard.
- Underlying idea is to make every people in the territory accessible to expressway less than half an hour.
- KRIHS provided theoretical ground and analytical evidence.
- Paradigm prevailed in the 1990s through early mid 2000s.



Role of Government Ministries

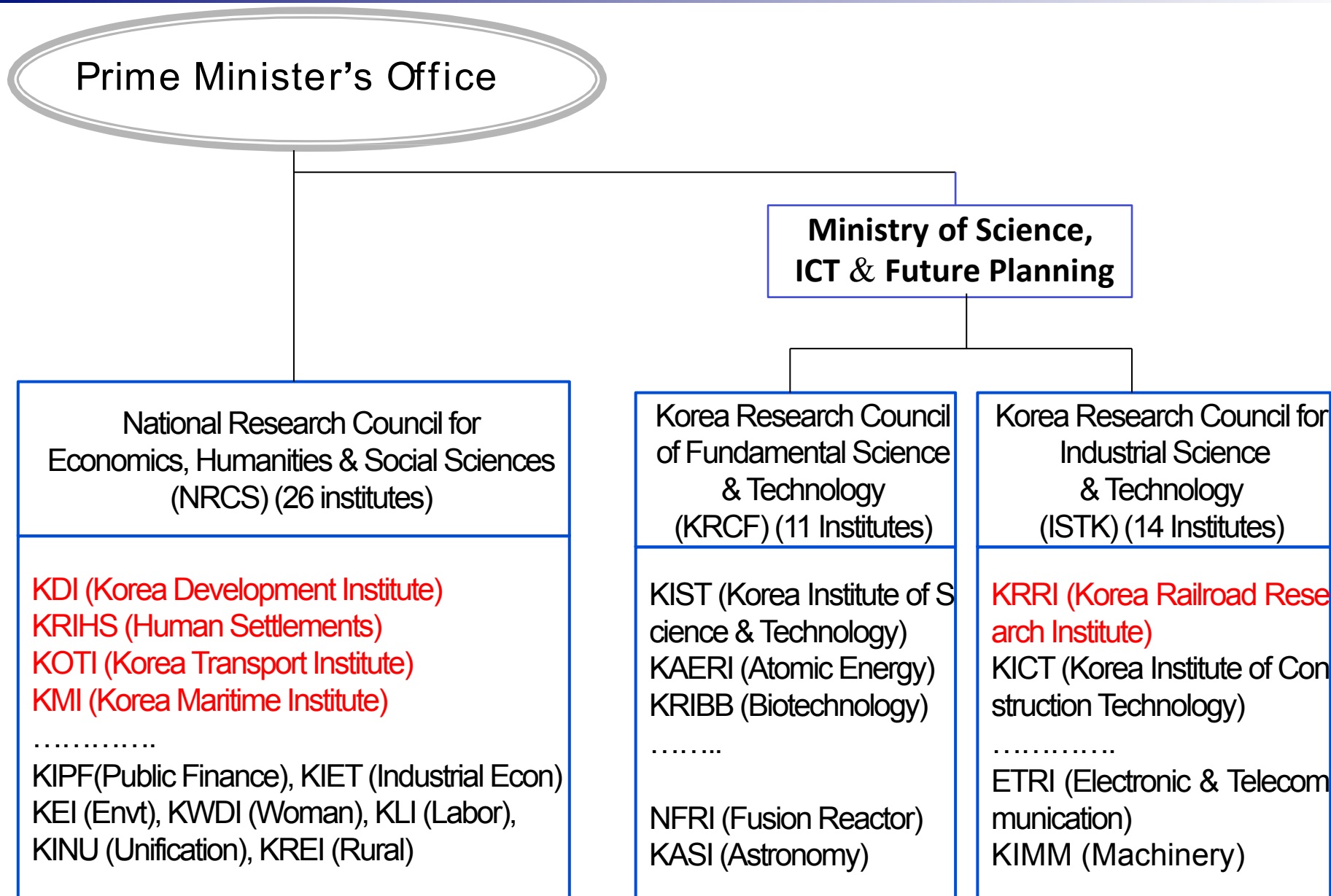
- MOSF (Ministry of Strategy and Finance)
 - The focal point for inter-ministerial and inter-agency coordination
 - Budgeting for infrastructure
 - Keep infrastructure investment aligned to Korea's economic development goal

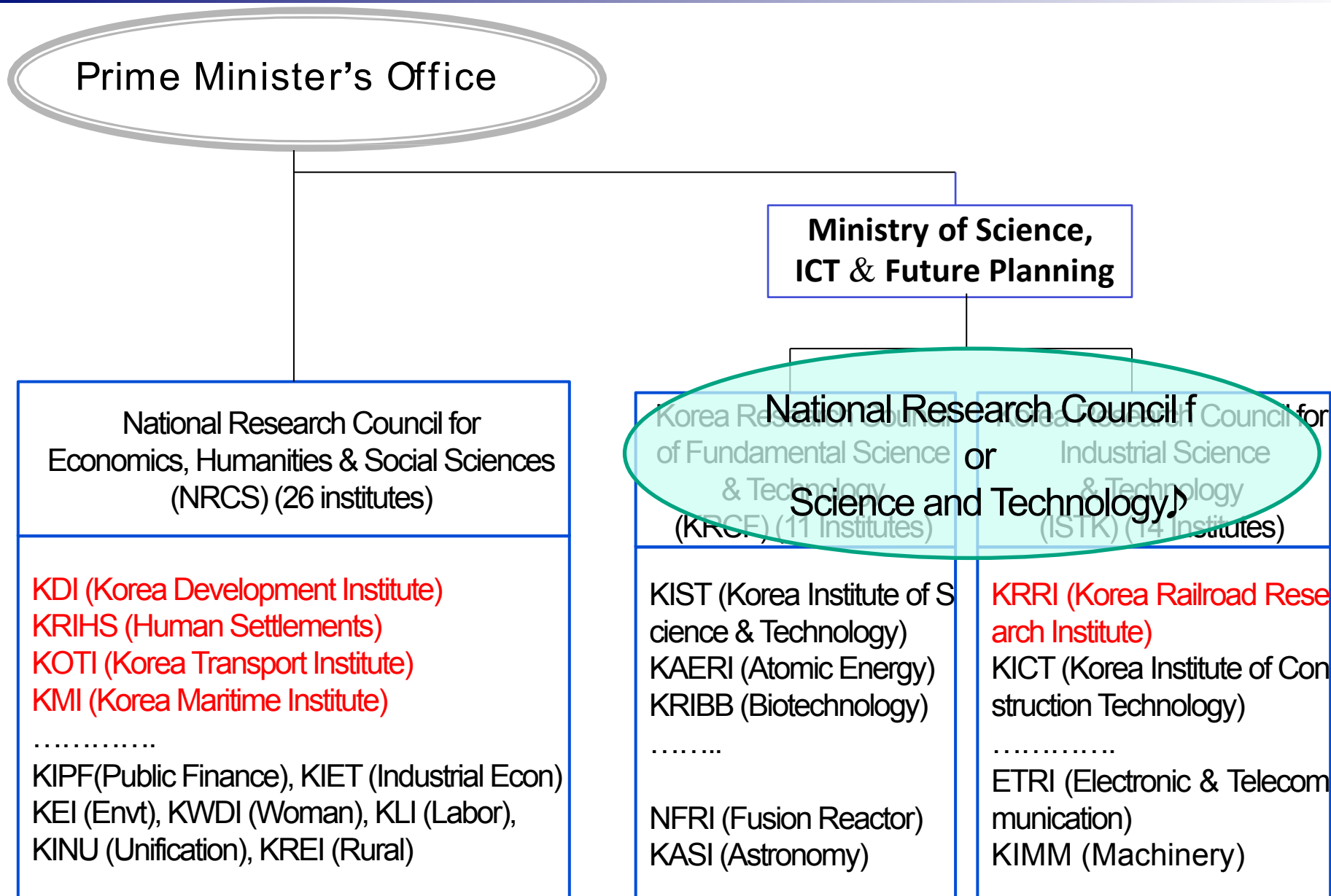
- Line Ministries (MOLIT: Ministry of Land Infrastructure and Transport) and Ministry of Oceans and Fisheries)
 - Comprehensive approaches under the guidance of a long-term vision
 - National infrastructure planning
 - Executing and managing infrastructure investment

Planning Process for Infrastructure Investment

- **Strategic level : Comprehensive approaches under the guidance of a long-term vision** (Transportation System Efficiency Act.)

<p>♪ I♪</p>	<p>Twenty-Year National Intermodal Transport Plan (NITP)</p>	<ul style="list-style-type: none"> ▪ Draft plan prepared by Minister of Land, Infrastructure and Transport (KRIHS and KOTI involved) ▪ Reviewed by the Transportation Policy Committee (chaired by the Prime Minister)
<p>♪ II♪</p>	<p>Five-Year Transportation Infrastructure Investment Plan</p>	<ul style="list-style-type: none"> ▪ Investment priorities, investment resource funding plan, etc. ▪ Facilities: National and local transportation facilities
<p>♪ III♪</p>	<p>Implementation of Mid-term Transportation Infrastructure Investment Plan</p>	<ul style="list-style-type: none"> ▪ Various implementation plans are established and projects are implemented according to plans. ▪ Investment requirements are reflected in the allocation of the special account for transport facilities.
<p>♪ IV♪</p>	<p>Performance Evaluation of Mid-term Transportation Infrastructure Investment Plan</p>	<ul style="list-style-type: none"> ▪ The Transportation Policy Committee evaluates the implementation performance of the plan every year and provides feed-back.





Size of Government Think-tank

	No Employees	Budget (bill Won)
NRCS (2012)	2,537	796
KDI	237	80
KRIHS	156	49
KOTI	103	38
KMI	102	30
ISTK (2012)	10,238	2,027
KRRI	533	92
KICT	813	144
ETRI	2,890	566
KRCF (2013)	5,037	1,971
KIST	714	282

KRIHS (Korea Research Institute for Human Settlements)

□ Foundation and Missions

- Established in 1978 as the first think-tank on territory and infrastructure development
- To develop long-term and short-term plans and policies to lead to efficient use of land resources and to restructure unbalanced spatial structures.
- Researches on national territorial development, environment, regional and urban development, infrastructure, land use, transportation and geographical information system.

□ Major works

- National territory development plans
- National highway network construction plan
- New town development plans including multi-functional administrative city (Sejong City)

KOTI (Korea Transport Institute)

□ Foundation and Missions

- Established in 1986
- To develop policy/technology and solutions to the problems in transport and logistics facing the world
- Areas of research include road, rail, aviation, logistics and management of national transport DB (**KT_DB**)

□ Major works

- Twenty-Year National Intermodal Transport Plan (NITP)
- Implementation of Mid-term Transportation Infrastructure Investment Plan
- National railway network plan
- National logistics facility development plan
- ITS (Intelligent Transport System) plan

KMI (Korea Maritime Institute)

□ Foundation and Missions

- Established in 1984 as a research center for logistics economics
- In 1997, its research areas has expanded to overall maritime affairs and fisheries.
- Its research areas include sustainable maritime environment management, resource management system, and development of ocean industry

□ Major works

- Korea international trade port development plan: 10 years
- Long term plan for ocean industry development
- Comprehensive plan to manage maritime environment

KRRI (Korea Railroad Research Institute)

□ Foundation and Mission

- Established in 1996 as a research institute specialized in technology and sciences for railroad.
- Member of Korea Research Council for Industrial Science & Technology
- To develop advanced rail system of high speed, urban rail transit, light rail transit (LRT)
- Secure railway service quality

□ Major works

- Mid- and long-term basic plan for railway technology development
- Mid- and long-term basic plan for logistics technology development

PIMAC of Korea Development Institute

- PIMAC (Public & Private Infrastructure Investment Management Center) was established as a merger of PIMA and PICKO by the second amendment of 'The PPP Act' in January 2005.
 - PIMA (Public Investment Management Center) was founded in Jan 2000 as an affiliated body of KDI for government project appraisals called PFS (Pre-Feasibility Study)
 - The PICKO (Private Infrastructure Investment Center of Korea) of KRIHS (Korea Research Institute for Human Settlements) was founded in April 1999, to manage PPP projects as stipulated by the amendment of PPP Act.

- Missions
 - Carry out due diligence on government, PPP, and SOE projects
 - Plays multiple roles of researcher, policy advisor, gatekeeper of major projects, and government agency

SOEs (State Owned Enterprises)

□ Planning authority and service delivery entities

- A strong planning authority and service delivery entities that could construct, operate and maintain the infrastructure most effectively in each sector.
- These bodies were largely responsible for ensuring services at fair market prices

□ Why SOEs?

- Lack of capital and technology in the private sector at the early stage of economic development
- Non-profitable nature of public mandates (public housing)
- Intention to prevent private monopoly (Network industry)

Transport related SOEs

	Foundation♪	Duties♪
Korea Expressway Co.♪	1969♪	Expressway construction and maintenance♪
Korea Land and Housing Co.♪	2009♪	Land development and public housing supply. Merger of Korea Land Co (1975) and Korea Nat'l Housing Co.(1962)♪
Korea Water Resources Co.♪	1967♪	Construction of dams and regional water supply network♪
Korea Rail Network Authority♪	2004♪	Planning and construction of railroad network♪
Korea Railroad ♪	2005♪	Delivery of railroad services including KTX♪
Port Authorities in Busan, Incheon, Ulsan and Yeosu ♪	2004, 2005 2007, 1990♪	Planning, construction and promotion of respective ports♪
Incheon Airport ♪	1999♪	Planning, construction and operation of Incheon International Airport♪
Korea Airports Co.♪	2002♪	Planning, construction and operation of Gimpo and local airports♪

KEC (Korea Expressway Corporation)

- ❑ Founded in 1969, KEC is responsible for expressway construction, expansion, repair and maintenance.
 - Before 1988, the government budget primarily took care of construction projects while the KEC provided management services.
 - After 1989, fund raising through issuing SOE bonds was promoted to finance rapid expansion of expressway network
 - The KEC have a considerable level of autonomy in managing its own budget and implementing projects. The KEC also get involved in basic planning in the process of making comprehensive development plans which seems to help smooth implementation

Concluding Remarks

Features of Infrastructure Development in Korea

- ❑ Infrastructure development was closely linked to economic growth plan
 - Government identified infrastructure needs to support economic development
 - Economic planning ministry played an important role in the decision-making process for infrastructure investment
- ❑ Capability to adjust infrastructure investment priority along with the economic development stage
 - The priority has shifted to meet economic and social needs, often over short periods of time
- ❑ Infrastructure development was guided by a strategic vision of economic development
 - Continuous commitment to high quality infrastructure was based on the sustainable long-term vision; to maintain the competitiveness in export markets, to support more balanced social development

The Role of Government Think-tanks

- Government think-tanks contributed to effective infrastructure development
 - To guides infrastructure development by a strategic vision
 - To formulate infrastructure development strategies consistent with government wide economic growth policy
 - To draft long- and mid-term plans for infrastructure development
 - To provide government with information based on rigorous researches
 - To accumulate, manage, and analyze data and evaluate policy impacts
 - To get support of public and other ministries
 - Introduction and extension of transport tax

MURD (Master of Urban and Regional Development) MUAP (Master of Urban Administration and Planning)

Full Scholarship Degree Programs Sponsored by KOICA and SMG

- ❑ MURD for national government officials (19 students every year)
 - Program begins in Aug 2014 (16 months)
 - Infrastructure development, national territory development, new town development

- ❑ MUAP for city government officials (20 citizens every year)
 - Program begins in Aug 2014 (13 months + 1 year)
 - Urban planning, urban finance, urban regeneration

- ❑ ISUS@uos.ac.kr <http://ISUS.uos.ac.kr>

 KOICA



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