

Proactive National Transport Strategy for Low Carbon and Green Growth in Korea

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Abstract

According to the IPCC, global warming is mostly attributable to greenhouse gas (GHG) emissions from fossil fuel combustion. The transportation sector accounts for about 20% of greenhouse gas emissions and is the second largest emitter in Korea, trailing only the industrial sector. Within the transportation sector, road transportation dominates with an emission share of over 80%. Therefore, reducing transportation's impact on the environment should require transforming the current automobile-based transport system into a more energy efficient, low carbon and eco-friendly one.

Greening of the current transportation system requires a long term vision and multifaceted approaches. Land use and urban design should reflect energy and environmental considerations. Technologies should also be promoted and economic incentive schemes should be provided not only for the technological developments but also for behavioural changes in transportation. Transforming our transportation system into an environmentally friendly one would provide many opportunities for green growth and also indispensable infrastructure for sustainable economic growth and prosperity.

Introduction

Green growth is defined as attaining economic growth while minimising the burden on the ecosystem. The concept of green growth is relatively recent but it has already received much attention. Traditional policies for sustainable transport include technological developments, economic incentives, environmental standards, and regulations. However, the implicit assumption is that there are trade-offs between attaining environmental sustainability and achieving higher economic growth. Green growth seeks

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the possibility of decoupling the inverse linkage between economic growth and environmental preservation. President Lee Myung Bak proposed a national development strategy of 'Low Carbon and Green Growth' in August 2008, and as a result, sectoral strategies

have been pursued in order to develop green industries as an 'engine for growth' for the future. As for the institutional framework for promoting green growth, the National Green Growth Committee was created in February 2009 and the Green Growth Law is being deliberated in the National Assembly.

Major developed countries have also established ambitious national low carbon green growth strategies. Germany is aiming at reducing carbon emission by 40% in 2020 compared with 1990 emissions. The U.K.'s plan is also ambitious: 60% reduction by 2050. Japan also announced their 'Thirty Thirty Plan', which means 30% GHG reduction by 2030. Through cutting year 2000's GHG emissions by 4.2% in 2006, Japan has already reduced 11 million tons of transport-related GHG. In their 2008 White Paper, the Japanese government revealed their policy directive involving vehicle technology and alternative fuel developments, traffic flow improvement and means to induce behavioural change in transport users. These efforts are reflected in Japan's ultra-efficient urban transport system and the dominance of Japanese car manufacturers in the world markets.

Low carbon green growth is the most urgent and proactive policy direction for Korea to maintain its global competitive edge and to ensure sustainable economic growth. More specifically, low carbon green growth requires diminishing GHG emissions and environmental burdens in the course of economic growth and simultaneously developing and utilising green industries for further economic developments.

New industries are expected to be developed and subsequently, new markets will also be created in many energy and environment related fields as stricter environmental and energy related regulations are introduced. Korea's economy is still centred on manufacturing and IT, so Korea can leverage its competitive advantage in these fields to develop GHG-reducing technologies. More attention and investment should be directed to developing low carbon green industries in order to drive momentum for a sustainable future.

Transport in Korea in the Energy-Climate Era

Mobility has tremendously increased during the last century. One of the most salient characteristics of the previous century is rapid motorisation and expansion of related infrastructure and industries. Increased vehicle use has enabled us to enjoy fast and convenient travel as well as rapid economic development and economic prosperity. Transport policy in many countries has centred on the car rather than on the person. And our lifestyle has been more and more dependent on automobiles for our socio-economic activities.

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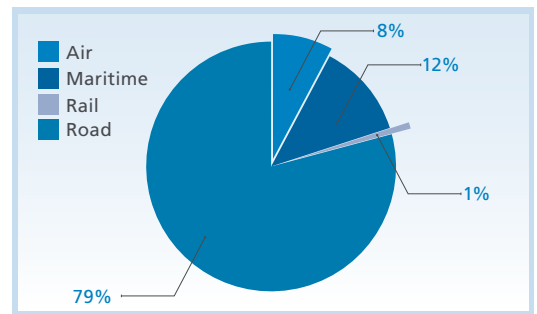
However, increased automobile use can cause serious negative repercussions, such as, air pollution, noise pollution, congestion,

and even climate change, resulting from combustion of fossil fuels. The sustainability of an automobile-based transport system is now being seriously questioned, especially due to major global issues such as the possibility of climate change. The Intergovernmental Panel on Climate Change (IPCC), which is a UN subsidiary, predicts that the average temperature will increase by 1.8 to 4 degrees Celsius over the next 100 years and the sea level will also rise by 58 centimetres. Rising sea levels could threaten to inundate low-lying areas and islands, threaten dense coastal populations, erode shorelines, damage property, and destroy ecosystems. The rising temperature could also cause dangerous consequences, such as, stronger storms and more heat related illnesses and deaths. Korea has experienced a 0.6 degree Celsius increase in average temperature in just the last decade and also a 10% increase in precipitation compared with 30 years ago. This suggests that Korea is not immune to global climate change impacts.

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emissions from fossil fuel combustion (OECD/ITF 2008). The transport sector accounts for about 20% of greenhouse gas emissions and is the second largest emitter in Korea, trailing only the industrial sector. Within the transport sector, road transport dominates with an emission share of over 80% (Table 1). Thus, reducing transport's impact on the environment should require transforming the current automobile-based transport system into a more energy efficient, low carbon and eco-friendly one.

Figure 1: Energy consumption in transport sector by mode in Korea (2006)



Sustainable development in transport has also been a major concern for Korea. Both vehicle ownership and transport demand have increased tremendously during the past two

Table 1: GHG emissions in the transport sector in Korea

Modes		GHG (Million CO ₂ eq)	Share (%)
Road	Private	61.07	57.67
	Commercial	24.64	23.27
Road Subtotal		85.71	80.94
Rail	Regional	1.43	1.35
	Urban (Subway)	0.52	0.49
Rail Subtotal		1.95	1.84
Water		11.61	10.97
Aviation		6.62	6.25
Transport Total		105.89	100.00

Table 2: International comparison of energy consumption in transport sector

Country	Aviation	Road	Rail	Total	Per Capita Energy Consumption
Unit	M TOE*	M TOE	M TOE	M TOE	TOE/Person
Canada	5.7	42.3	1.7	55.6	1.72
U.S.	82.0	527.9	11.6	639.2	2.16
Japan	10.8	77.5	1.8	94.1	0.74
Korea	3.5	26.3	0.5	34.2	0.71
Australia	4.4	23.6	0.7	29.3	1.44
France	7.1	43.3	1.0	51.9	0.85
Germany	8.0	54.2	1.9	64.5	0.78
Italy	3.8	39.9	0.5	44.9	0.77
Spain	5.2	31.2	1.0	39.1	0.90
U.K.	12.7	40.2	0.9	54.8	0.91

Source : OECD Environmental Data Compendium 2006/2007

*M TOE: Million Ton of Oil Equivalent

decades and as a result, energy consumption (Figure 1) has increased very rapidly, and vehicles have become the major source of urban air and noise pollution in many Korean cities. The growth shows no sign of subsiding, and both passenger and freight transport demands are forecasted to increase 1.5 and 2.1 times by 2019, respectively. Already, many Korean cities suffer from chronic traffic congestion, costing an estimated U.S. \$24 billion dollars per annum in Korea, which is about 3% of the national GDP.

In terms of per capita energy consumption in the transport sector, Korea is already on par with many European countries and Japan (Table 2). But while rail is regarded in these countries as the most environmentally friendly mode due to its high energy efficiency and the high possibility of fuel substitution in the sector, its potential has not been fully exploited in Korea yet.

Proactive National Transport Policy for Low Carbon and Green Growth

Environmental sustainability has been one of the main concerns among transport planners as well as policy makers. However, transport is the most difficult area for environmental sustainability due to ever-increasing demand and its extremely heavy reliance on non-renewable fossil fuels. A new paradigm of low carbon and green growth strategies are required. These include low carbon infrastructure, new land use framework, development of green logistics and technologies, modal shift to low carbon and non-motorised transport, and improvements in energy efficiency.

Undersea high speed rail and waterway logistics infrastructure for the environment

Since Korea is a very densely populated, urbanised country, mass transit and

railways have very high potential for environmental sustainability.

Currently, eight subway lines amounting to 492 km are in operation in Seoul and five other major cities in Korea. Nine subway lines totalling 226.5 km are under construction in six cities with populations of one million or more. Additional subway lines totalling 159 km are planned through 2019. The total subway network will be expanded from 492 km to 651 km by 2019, and especially in Seoul, the subway modal share is projected to increase from the current 35% to over 50%.

For interurban railways, 1,418 km of new railway lines are planned to be added by 2020 to the existing stock of 3,374 km. Rail electrification will also be increased from 47% to 78%.

Compact development based on rail or mass transit would induce people to use more energy efficient means of transport (Figure 2).

Figure 2: Plan for Eurasian railways



The proposed undersea high speed railway linking Jeju Island and Honam Province (Figure 3) can provide a secure alternative to land

transport for travellers and can also help create an ultra metropolitan economic bloc in the southwestern part of the Korean Peninsula. It can also provide green growth opportunities, as well as, an economic stimulus in the current economically depressed times.

Figure 3: Concept of Honam-Jeju Undersea Railway



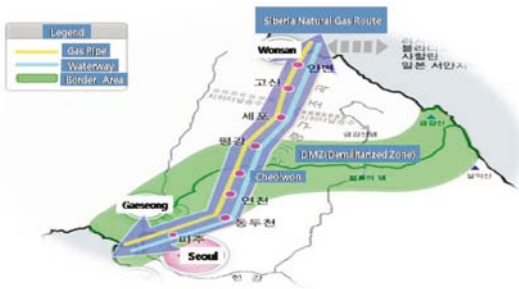
Waterborne transport offers another possibility for low carbon green transport in Korea, where coastal areas are developed for industries and logistics. Inland ports need to be developed to fully exploit this potential. The Kyung-In Canal (Figure 4) connecting Seoul and Incheon, and the four major river regeneration projects, would revitalise economically depressed hinterland areas and would also provide employment opportunities.

Figure 4: Rendering of Kyung-In Canal



A waterway connecting Seoul and North Korea's Wonsan (Korea Peace Waterway, Figure 5) is proposed in order to secure water resources and also to ease the tension between the South and the North. It will be approximately 200 km long and will contribute to the promotion of tourism along the waterway.

Figure 5: Proposed route of Korea Peace Waterway



Green transport cities

A new land use framework is required in order to reduce travel demand and to fully utilise the public transport's potential. Development of high density cities around the KTX high speed rail stations would serve as energy efficient regional hub cities. It would also facilitate balanced regional growth and help reduce regional auto travel. High density development around public transit should be promoted in order to encourage public transit patronage. Pedestrian travel should also be encouraged by constructing more pedestrian friendly facilities. For example, Daegu city transformed its busiest downtown street into a transit mall, allowing access to urban buses only during the day. The Ministry of Land, Transport and Maritime also plans and develops pedestrian priority zones to improve walking conditions (Figure 6).

Figure 6: Pedestrian priority area in Seoul downtown



Green technology development in transport

Non-motorised forms of transport lead to zero carbon emissions. Bicycles are extensively used in many European and Asian cities but their modal share in Korean cities is minimal due to limited infrastructure and low public reception. Bicycles should be promoted for short distance commuting by providing adequate infrastructure and increased safety. Figure 7 is a conceptual illustration of a Bicycle expressway, which is dedicated to bicycles, quite similar to light rail transit infrastructure.

Figure 7: Illustrations of bicycle expressway



The concept of transport power plant is an electricity generating initiative by installing photovoltaic facilities along transport infrastructure, such as, highways, railways and waterways. The electricity generated in such transport power plants can be used for the transport facility itself or it could be used ultimately for charging future electric vehicles.

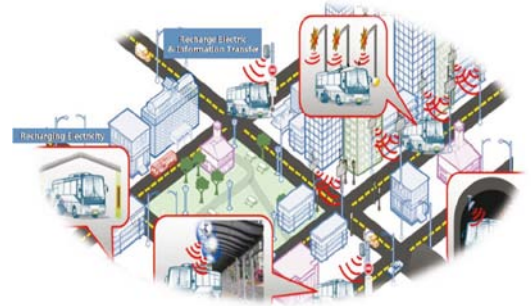
Green car development

Current dependence on heavy fossil fuel for transport should be reduced by diversifying energy sources. Neighbourhood Electric Vehicles (NEV) offer a promising alternative to conventional vehicles for short distance trips in urban areas. Wireless electricity technology could facilitate the introduction of electric vehicles by solving their current battery limitations. Fuel cell technology could be a long term option in future alternative fuel vehicle developments. Legal support and economic incentives should be provided for the development of these types of green vehicles.

Wireless power supply technology is another promising technological option that could ultimately eliminate the challenging requirement for powerful and efficient batteries for electric vehicles. Vehicles travelling in downtown areas or highways can be charged or supplied with electricity continuously (Figure 8).

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Figure 8: Concept of wireless power supply city



Travel demand management

Another important pillar in policies for environmental sustainability is travel demand management (TDM). Measures to increase transport supply are often expensive or difficult to implement, and gains from these and other improvements are offset by further increases in travel demand. Lower-cost TDM strategies are intended to reduce demand, particularly single-occupant vehicle demand, and optimise system performance, reduce peak period congestion, save energy, and improve the environment. Various policy measures have been employed in order to discourage passenger car use in Korea. The Sustainable Transport & Logistics Act, in force from this year, allows local government to restrain total traffic volume in certain areas and adjust travel fares to promote public transportation.

Another good example of TDM is congestion pricing. An experimental congestion pricing scheme was introduced in two major tunnels which connect the downtown area and the southern part of Seoul in November 1996. The charge was set at 2,000 won per crossing and it was applied during the peak hours in weekdays to private passenger cars.

The charge has reduced 12,000 vehicles per day at Seoul downtown, which is 13.3 % of total downtown traffic volume. More elaborate congestion pricing schemes should be developed, based on emission produced by each vehicle type and travel speed, in order to reduce congestion-related externalities and environmental burdens.

Parking policy

Previously, the core of Korea's parking policy was to provide adequate parking for every building and facility. This thinking is about to be reversed and decreased parking spaces in the CBD is being considered so as to reduce the influx of private passenger cars into Korea's cities. On the other hand, park-and-ride facilities have been continuously constructed. Parking-related charges should be employed in order to better reflect the cost of providing and maintaining parking spaces, as well as the externalities caused by the use of private passenger cars.

Modal shift in freight transport and green logistics

The freight transport sector accounts for 31% of the total transport CO₂ emissions and it is also regarded as the most inefficient of Korea's transport sectors. In particular, less efficient private freight vehicles dominate the sector. The government is now establishing a plan to reduce freight's dependency on the road sector and to increase the capacity of the freight rail, a more energy efficient and environmentally friendly way to move the nation's goods. This sector can also be made more efficient through policies such as

green logistics certification, which provides incentives to logistics firms to reduce energy consumption and GHG emissions.

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Conclusion

Greening of the current transport system requires a long term vision and multifaceted approaches. Land use and urban design should reflect energy and environmental considerations. Technologies should also be promoted and economic incentive schemes should be provided not only for the technological developments but also for behavioural changes in transport demand and usage.

Transforming our transport system into a low carbon and environmentally friendly one would provide many opportunities for green growth and also indispensable infrastructure for sustainable economic growth and prosperity.

A legal framework is required in order to facilitate the transition to green transport systems. Investments on transport infrastructure should be guided by a revised assessment methodology which takes the environmental benefits and cost into full consideration.

References

OECD. 2008. Environmental Data Compendium 2006/2007

OECD/ITF. 2008. *Greenhouse Gas Reduction Strategies in the Transport Sector: Preliminary Report (2008)*



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