

Green Growth for a Greater Korea

— White Book on Korean Green Growth Policy, 2008–2012 —

| Preface |

Green Growth started as a vision put forward by ROK President Lee Myung-bak in the summer of 2008. At the time, it was simply a two-word term, a “vision” whose very concept was unfamiliar to the general public. Now, just short of five years since the vision was first pronounced, Green Growth has morphed from a vision to reality.

In Korea, Green Growth materialized into a policy with short- and long-term goals, and budgets were allocated to achieve those ends. Green Growth brought increased investment and created jobs. Furthermore, going green has become a part of people’s everyday life, leading to sea changes that were unimaginable five years ago. In addition, Green Growth clearly has established itself as a global vision not only for Korea but for the world. Green growth has emerged as a new key agenda on the global stage, spanning the Davos Forum, the OECD, the UNEP, the World Bank, and the G20 Summit. More importantly, it spurred the international community to take concrete action, leading to the creation of the Global Green Growth Institute (GGGI) and the Green Climate Fund (GCF). Above all, Green Growth gave birth to Korea’s Green diplomacy. It proved to be pivotal as Korea, which had risen from the periphery to the center of the global stage, looked for ways to play a bridging role as a middle power between developed and developing nations. All in all, Green Growth, which began as a national vision for the future, became a driving force that enabled Korea to mature into “a greater Korea.”

Green Growth began as a future-oriented national vision aimed at responding

to the domestic and international economic downturn characterized by low growth and low employment and to the global threat of climate change. The term “green growth” actually has been used among a small number of environmental scientists since approximately 2000, but it was generally mentioned in the context of Sustainable Development, a UN-led central agenda for the international community since 1987, as in “Sustainable Development in the environmental field.” Green Growth initiated by the Lee Myung-bak administration in 2008 aspired to transform the Korea from a “brown civilization” that relies on carbon energy consumption into a “green civilization” that has its foundations in low-carbon, new renewable energy consumption. It was meant to be more than a policy—it was a national vision for leading a civilizational paradigm shift. Regrettably, this book does not delve into the more philosophical aspects of the Lee Myung-bak administration’s Green Growth vision, such as the civilizational paradigm shift. We ask our readers to understand the limitations of this book as a policy white paper, whose goal it is to provide a tour d’horizon of the Lee Myung-bak administration’s Green Growth policy and Green diplomacy.

In a sense, Green Growth has colored the past five years of the Lee Myung-bak administration. The administration’s history is infused with policy efforts to crystallize the vision of Green Growth. It has been a journey undertaken to turn the Green Growth vision into a Green Growth regime. This book recapitulates the Lee Myung-bak administration’s Green Growth strategy and policy and their successes from 2008 to 2012. As challenging as it was to summarize the ins and outs of the past five years in a single book, we are confident that this publication will help further the reader’s understanding of the birth and development of Green Growth, as well as its accomplishments thus far. Such

attainments truly went beyond national borders. They raised Korea's national prestige and gave a boost to its international status.

The Lee Myung-bak administration's Green Growth policy over the last five years has resulted in astounding achievements and legacies, bringing Korea one step closer to the Korean people's unanimous desire for "a greater Korea." The future of Green Growth now hinges on whether the present successful policy framework is further developed and applied to other policy areas. Most importantly, the success of Green Growth depends on how widely the Green Growth discourse and its corollaries percolate into the people's everyday life and culture.

The numerous challenges triggered by climate change are not part of the future that has yet to come—they have already arrived and are part of the present. The very act of proactively responding to these challenges together is the driving force for spurring new growth and building a sustainable civilization, a point that is gaining much traction within the international community. The current crisis is awakening us to a collective destiny. By the virtue of that destiny, perhaps we have won ourselves an opportunity to build a planet-responsible civilization.

In conclusion, what we need is action. As they say, the best way to predict the future is to shape it the way you want it. As such, we should effect new changes not from a "business-as-usual" perspective but with a "business-as-wanted" mindset. This is all the more reason why Green Growth requires the virtue of practice, not theory. In this vein, this book is a chronicle

of practices that embody the "me-first" principle. It is also a manual charting a course of action for the future. The one last finishing touch to this book will be our perennial efforts to translate the words in this book into action.

Although this is but one book, it required much research and information, and we could not have written it without the generous help of those around us. Chung Hyun-yong, Suh Kyu-shik, and Lee Seung-yeol of the Presidential Committee on Green Growth (PCGG) were of immense assistance throughout the entire process of writing this book. Cha Sang-min of the PCGG played an indispensable part in the editing and translation of this book. We would also like to convey our gratitude to Dr. Chang Ki-bok and Bae Jin-young of the Korea Environment Institute (KEI) for their translation of this book.

Green Growth is a path we should continue to take as long as we, human beings, live on earth. That path can evolve as it forks into many different roads. And as we tread that path of everlasting journey toward Green Growth, it is us that is stopping us and it is us that is moving us to the future we want.

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Chapter 1 | Early Movements in Low-Carbon Green Growth Policy

“Climate change is a challenge shared by all of humanity. In order to tackle this challenge wisely, we must build up the awareness that we, as humans, face the same destiny. Such awareness is the basic foundation of global governance and the starting point for a planet-responsible civilization aiming toward inclusive development. In that regard, I believe that green growth is an unending journey toward our collective destiny as a planet. As long as man, and the earth on which humanity life exists, the path of green growth will be ever-lasting.” – President Lee Myung-bak, during a special address at the 2012 Global Green Growth Summit

Section 1: Responding to Global Crises – the Birth of Green Growth

The world is faced with an environmental crisis symbolized by climate change as well as a resource crisis exemplified by high oil prices. The climate change issue has fundamentally shaken the roots of ecological order through a series of climatic disasters, and poses a threat to the very existence of mankind.

In a book released by The Club of Rome in 1972 entitled 'The Limits to Growth', which served as a warning to the global society regarding environmental issues, it explained that as a result of analysis on the five main elements of growth including population, industrialization, environmental pollution, food production, and resource consumption, the limits of sharp recent growth were being exceeded. Furthermore, based on the awareness

of the stark reality relating to 'an absolute lack of resources' comparative to the global population, the point was raised that this growth limiting issue must be resolved by focusing on global equality.

Together with the problems of climate change, the limits of natural resources, the trends of globalization and the explosive growth of developing countries have a primary influence on the global economy and society. Based on our experiences until now, the speed and size of growth and the resulting effects have been faster and more significant than previously thought. The global population has recently passed the 7 billion mark and is showing a trend toward a continued increase, and such population increase has various connotations when considering the scarcity of natural resources. Points worth paying attention to in this regard include, the further increase of the global population, a larger middle class in industrializing nations, changes in consumption patterns, and an ageing population.

In the next 20 years, the advent of roughly 3 billion middle class citizens is expected in industrializing countries and the income of these individuals, particularly in Asia, is rising at an unprecedented level. An example of this is the Chinese economy, which has grown at a rate 10 times faster to that of the United Kingdom during its industrial revolution, while boasting of a population over 100 times that of the latter. Consequently, both consumption and demand for energy and natural resources have risen exponentially as a result of such an explosive increase in the middle class of industrializing nations. According to the 'World Energy Outlook' published in 2009 by the International Energy Agency, the demand for oil is expected to grow from 12 billion tons in 2007 to roughly 16.8 billion tons, or 40% more by 2030, an average annual increase of 1.5%. According to the 'Global Trends and Future Policy Measures' report jointly presented in April 2012 by the Samsung Economic Research Institute, LG Economic Research Institute and McKinsey Global Research Institute, the world energy demand in 2035 will reach 1.4 times of its present level, and global warming is expected to continue due to increases in greenhouse gases resulting from the economic

growth of industrializing nations such as China and India.

After the advent of the industrial revolution which included the invention of the steam-engine locomotive, the source of power for the development of mankind until the present has been obtained from brown energy i.e. fossil fuels. However, fossil fuels that provide the majority of brown energy that we use do not exist in an unlimited abundance. Rather, their reserves are quite limited. The World Resource Institute expects that, according to calculations made on the current rate of human consumption, oil deposits will be depleted within 40 years, and the world's natural gas reserves exhausted in about 58 years. The discovery and extraction of new energy sources will become increasingly difficult and the price of such commodities will climb each time the demand for resources experiences a sudden rise. The current supply of many such resources is not able to keep up with increases in demand. It has become obvious that resources such as energy, minerals, food provisions, and water will become an important factor influencing the fate of a nation's future. The surge in demand for such limited resources gives rise to more than just a few global issues. Energy and resource prices have boomed, and international disputes surrounding resources have not only intensified but as the number of consumers continues to grow, ensuing climate change issues such as global warming augment in intensity.

Our current fossil-fuel-dependent energy consumption structure has reached its limits in terms of the acceleration of resource depletion and worsening of environmental pollution. Worldwide economic development, in particular the rapid growth of developing countries, has further intensified both the rate of carbon emissions and the resulting climate change phenomenon. Consequently, the ability of the earth's environmental system to absorb emitted greenhouse gases has weakened as a result of the rapid progress of urbanization along with an increasing reliance on fossil fuels. In November of 2007, the IPCC Intergovernmental Panel on Climate Change published its fourth assessment report (IPCC AR4) compiling international research results related to climate change. According to this report, the

average temperature of the earth will raise 1.1-6.4°C by 2100, and the increase in the concentration of greenhouse gas is expected to be more intense in inland areas at higher latitudes. As a result, the frequency of high temperature, arctic weather, heat waves, and torrential downpours will increase, and the intensity of typhoons will also strengthen. In addition, the sea level is expected to rise between 0.8 - 0.59 m by the end of the 21st century due to the thawing of sea ice. Based on the report, the IPCC estimated that if the temperature were to rise more than 3°C by 2080, 1.1 - 3.2 billion people would experience a shortage of water and over one-fifth of the world's total population would be affected by flooding.

Global warming can essentially be blamed as the cause for the wildfire-like spread of climatic phenomena across the globe, such as ecological disasters including drought, flooding, and heat-waves. Considering the fact that how each nation responds to the issue of climate change determines their national competitiveness and sustainable development, it is no longer a viable option to ignore environmental factors in terms of economic development. Ultimately, making the effort to curb further global warming for the future of mankind is a responsibility shared by human society as a whole. Therefore, the industrial sector cannot continue in structural terms to be dependent on fossil fuels, which have been the economic and social foundation of the world for the past 100 years. We have been awakened to the fact that a society which has for so long been economically and socially built using energy derived from fossil fuels, as well as the paradigm of industrial society, cannot continue to exist in its present state.

In his work 'Code Green', renowned columnist of the New York Times Thomas Friedman stated that "if mankind intends to maintain the present rate of development until 2050, it must build a single 1 GW nuclear reactor every day. If it doesn't, each of the world's 190 nations will have to agree unanimously to reduce their consumption levels of oil and coal, which in reality is a difficult task to accomplish. Therefore, if cars and houses

which consume little energy or are low-polluting are not developed, humanity will face a severe crisis". Along with this warning, many intellectuals and experts have begun to point out the problems with the current paradigm, which heavily depends on fossil fuels. Furthermore, international organizations and individual nations are also paying attention to the limits of the growth paradigm which has based itself on non-renewable energy, as well as the background of the global warming era. While the future-oriented growth paradigms and national development strategies have been explored for competitive purposes, the international cooperation has been pursued regarding the problems of energy or climate change arising from the nature of the issue exceeding political boundaries.

With the arrival of the era of resource shortages and intensifying environmental crises, developed nations recognized climate change and energy issues as their most dire problems and were required to focus all their strength on promoting the efficient use of energy and resources as well as minimizing environmental pollution. In particular, the limits of economic growth coming from the investment of elements such as capital and manpower have been overcome, while constant efforts have been made to turn these crises into opportunities such as the drafting of legislation to secure and promote new growth engines including renewable forms of energy, environmental industries, and a carbon-trading market among others. Several leading countries have set green growth as an important policy target and many of them have pursued green growth as their national development strategy for the purpose of breaking away from the carbon dependent economic paradigm and to preempt the world market in green technology and industry.

<Main Countermeasures to Climate Change by Nation>

| Nation | Main Countermeasures |
|---------------------|--|
| European Union (EU) | <ul style="list-style-type: none"> – Introduction and enforcement of an emissions trading scheme (EU-ETS, 2005) – Setting a target of a 20% reduction in greenhouse gas emissions by 2020 compared to 1990 – Enforcement of 'EU Climate Change Directives' to promote greenhouse gas reductions (April 2009) |
| United Kingdom | <ul style="list-style-type: none"> – Foundation of the 'Department of Energy & Climate Change (DECC)', organization responsible for climate change – Passed the world's first bill for climate change, clarifying targets for greenhouse gas reductions |
| France | <ul style="list-style-type: none"> – Enactment of 'Loi Grenelle 1' (Grenelle Environment Law 1) outlining the formation of Europe's most efficient low-carbon economic structure and a 25% reduction in greenhouse gas emissions by 2050 – Setting objectives for a 20% reduction in CO₂ emissions and an increase in the proportion of recoverable energy to 20% by 2020 – Introduction of a carbon tax |
| USA | <ul style="list-style-type: none"> – Plan for the dissemination of low-carbon energy by concentrating on the promotion of new and renewable energy industries and investment of US 150 billion dollars over the next 10 years – Introduction of the Mandatory Reporting Rule (MRR) for greenhouse gas emissions (2009) – Promotion of the formation of institutional infrastructure for the reduction of greenhouse gas through legislative proposals such as the 'The American Clean Energy and Security Act of 2009 (ACES)' (Maxman-Markey Act) – Introduction of a greenhouse gas emissions capping and trading scheme at federal level (Greenhouse Gas Cap & Trade Scheme) |
| Japan | <ul style="list-style-type: none"> – Presentation of 'Cool Earth 50' laying the foundations of a low-carbon society (May 2007) – Declaration of 'Fukuda's Vision' for a low-carbon society (2008) – 15% reduction in greenhouse gas emissions compared to 2005 (2020) – Materialization of core technologies relating to new and renewable energy, and energy efficiency |

| Nation | Main Countermeasures |
|--------|---|
| China | <ul style="list-style-type: none"> – Presentation of the 'Climate Change Program' composed of comprehensive targets for responding to climate change, public pledges such as a reduction in the degree of intensive energy use (June 2007) – President Hu Jintao took advantage of the UN Climate Change Summit to announce intentions to boost non-fossil fuel dependence to 15% by 2020 in his presentation 'Coordinated Response to the Challenges of Climate Change' (September 2009) |
| India | <ul style="list-style-type: none"> – Presentation of a national plan of action regarding climate change, selection and promotion of 8 key areas for development including solar energy (June 2008) – Presentation of a target for the reduction of CO₂ emissions per unit of GDP (December 2009) |

Korea is not exempt from the global environmental and energy crises. Without resources of its own, Korea's vulnerability regarding environmental problems, which came in the aftermath of rapid economic development with a high dependence on foreign-sourced energy, cast a shadow darker than that of any other country on its future development and even survival. The country has traditionally belonged to the group of countries most dependent foreign energy resources, with a level of dependence reaching 96%. Moreover, Korea's rate of dependence in terms of fossil fuels exceeded 80%, compared with Japan's 73%, the USA's 64% and far higher than France's 53%. In particular, Korea occupied 4th place in terms of oil imports and 7th in terms of consumption globally, while its weakness in the supply and demand of energy and resources was simultaneously brought to light, faring relatively poorly in contrast with other nations in self-sufficiency and autonomous development. Even though it has been impeded by the main causes of the global economic crisis including climate change, Korea's share of self-sufficiency of the world's primary energy source in fossil fuels (10%) continued to fare poorly compared to other nations including France (97%), Spain (62%) and Japan (23%). Furthermore, the level of dependence on the

import of primary natural resources such as minerals was extremely high, which led to the structural problem of an intensification of competition and depletion of energy and resources. More importantly, the types of industries that constitute 75.3% of the nation's industrial output such as oil, chemicals, steel, cement etc. were all high-energy consuming. Ultimately, it was inevitable that such a structure would be highly sensitive to price fluctuations and the supply/demand of energy due to the fact that such energy problems formed a close relation with the structure of industry itself. As a result, Korea's economic foundations suffered a devastating impact each time the price of energy rose sharply and the economic fate of the country itself is swayed by external factors. Thus, Korea's economic structure was viewed from the perspective of excessive energy consumption and low structural efficiency, inefficient energy consumption and general lifestyle were in dire need of improvement. 120 billion USD, equaling the total annual export value of all leading export industries in Korea, including semiconductors (approx. 50 billion USD), shipbuilding (approx. 49 billion USD), and automobiles (approx. 35 billion USD), was poured into the importation of energy on a yearly basis. In effect, even in pointing out the fact that the current account balance was reduced by 2 billion USD whenever the price of crude oil rose 10%, Korea's susceptibility regarding energy resources loomed as a problem that needed to be resolved as quickly as possible.

With the rise of environmental issues affecting the entire planet, global warming was a key agenda in the international community as a worldwide matter for concern, and this consequence of climate change had already made a strong emergence in Korea. The rise in temperature in Korea had exceeded the global average and the frequency of droughts and flooding was predicted to increase. Moreover, the topographical feature of being surrounded by sea on three sides and complex natural and artificial environments created more possibility of climate disasters and the resulting damage inflicted would ultimately be more devastating relative to other nations. If the average global temperature has risen 0.7 degrees Celsius

between 1912 and 2012, Korea's 1.9 degree rise during the same period shows that the climate change in Korea was progressing quicker than the international trend, even considering the effects of rapid industrialization and urbanization. When taking into account of such susceptibility and vulnerability relating to energy and resources, as well as the appearing signs of the effect of climate change, Korea had no choice but to join the international movement for change. Most importantly of all, the conversion to a new growth paradigm for the transformation of lifestyle, as well as new industries and energies that could overcome an industrial society which had hit its structural limitations, were desperately needed.

While speculation capital poured in, the price of the world's raw materials underwent an unprecedentedly sharp increase with the price of oil worming its way upward from the second half of 2007. The oil price, which had remained around the 40-50 US dollar level for many years, showed signs of continuing to soar towards the 150 US dollars/barrel mark, and the price of resources from other regions such as iron ore and grain accompanied the rise in the price of oil. While the world faced an energy crisis as a result of high oil prices, President Lee Myung-bak, elected as the 17th president of Korea after gaining the overwhelming support of the nation's citizens in aspiring to 'save the economy', was called upon to devise a solution which grow the nation into a 'Stronger Korea' by fundamentally resolving the energy crisis and recovering its strong potential for growth at the same time as planning for the future.

Section 2: Low-Carbon Green Growth, Transformation to a New Paradigm

Immediately after being elected in December of 2007 as the 17th president, President Lee Myung-bak put together an unfamiliar team while organizing the 17th 'Presidential Transition Committee'. This was the 'Climate Change Task Force'. The 'climate change' issue, which had never been

properly mentioned during the election campaign, made its official debut at a crucial point where the organization was preparing to seize power and take over from the existing government. Unfortunately, due to the many pending issues and its relatively short time in existence, the 'Climate Change TF' didn't receive special attention. However, it did give notice to the intent of President Lee's government to fundamentally rearrange and alter the basis of governmental administration from its previous form which had focused, for a long time, on pending issues only.

Along with the founding of the government in February of 2008, President Lee established a Chief Secretary of Government Planning for dealing with ministerial government projects of the Blue House Presidential Office under the unfamiliar name of the 'Secretary of Future Vision'. After the disappearance of the Economic Planning Board into the annals of history following the establishment of the Ministry of Finance and Economy in 1998, the mission regarding the planning of the nation's medium-to-long-term history was reborn in the Presidential Office. (In July of 2010, the 'Secretary of Future Vision' was changed into the 'Secretary of Green Growth Environmental Planning', and in September of 2011 the same occurred with the Chief Secretary being renamed and restructured into the 'Secretary of Green Growth Planning', thereafter taking the role as the control tower for the 'Low-Carbon Green Growth' strategy and policies reflecting President Lee's governmental philosophy.

Around April of 2008, during the almost simultaneous launch of the 'National Foundation 60th Anniversary Commemoration Service Bureau', the 'Presidential Committee for Future Planning', and the 'Presidential International Advisory Panel', President Lee became the key person behind the 'Secretary of Future Vision', and together with the three organizations requested answers from available heads of the public and private sectors to a series of three questions. First question was, what had Korea achieved in the last 60 years, and how could this achievement be defined? Second, were the achievements that Korea had made over this 60 year period also possible

in the future? Third, if not, what would be the alternative?

If we discard factional and ideological biases, the answer to the first question was completely unquestionable. Korea grew into a leading economy in 10th place globally only 60 years after being liberated from the Japanese occupation, suffering through exploitation and the calamities of war, and then being evaluated widely as "not being able to pick it up even after 100 years had passed". Furthermore, similar to the case of a 'rose blossoming in a garbage can', democracy fully bloomed as a result of numerous peaceful changes of government. Along with the successes of industrialization and democratization, Korea became the sole nation at the time to undergo a full transformation from being the beneficiary of foreign aid to becoming a foreign aid donor, while its status heightened within the international community. After the end of the Second World War, Korea accomplished the 'modernization revolution' in a short period of time, a feat unattained by any other recently independent nation. Although there were twists and turns along the way, as well as the pain of division with the North, the history of Korea merited positive attention on the whole and the driving force behind such attention were the citizens themselves. In effect, the 60 years following independence could be defined as 'the history of the people's miracle'.

Answers from intellectuals and experts to the second question, which asked if the achievements that Korea had made in the past were also possible in the future, were both positive and negative however, following analysis made from several angles, it was concluded somewhat regrettably that 'negative' responses outweighed 'positive' ones. The main reason for this is as follows. First of all, the curtain had been drawn 10 years ago on the 'mythically rapid growth' that created the Korean economic miracle, and basic economic conditions including a slow rate of growth, jobless growth, polarization etc. had enshrouded the entire world. As American economist Paul Krugman had pointed out, quantitative growth through the investment of labor and capital had come face-to-face with its limitations, and employment could not go along with it. There are several reasons for this

but the biggest reason was not being able to come up with a new engine for growth and method for development.

Secondly, the weakness regarding energy security had become more significant. The industrial structure's excessive dependence on energy, in particular fossil fuels, had reached its limit. Korea, whose energy demands were almost entirely imported, had been spending 100 billion USD per year on fuel imports and with the high oil price shock of 2008 ended up having to spend 140 billion USD on the importation of energy. This was a greater amount than the total earned producing long-standing traditional Korean exports including automobiles, semiconductors, and ships. Despite this, Korea's energy efficiency fell short of the OECD average and was shown to possess a structure which would take a direct hit in terms of susceptibility and vulnerability regarding energy fluctuations. Moreover, considering the growing trend of enormous energy consumption in the emerging economic powerhouses of China and India, it was obviously apparent that Korea's energy security issue would only become even more serious.

Finally, the reason for the gloomy outlook on Korea's future was the 'inconvenient truth' of no longer being able to disregard climate change. The average rise in the earth's temperature over the past 100 years was 0.74 degrees Celsius, however Korea's case exceeded this figure over twofold, and in some parts, the rise in sea level was also higher than the global average. As an instance of this, during her first visit to Korea as a young volunteer, Katherine Stevenson was captivated by the country's four distinct seasons, however since returning, this time as Ambassador, she noted regrettably that only the summer and winter seasons remained, and the obvious cause for this was climate change and atmospheric warming within Korea. However, the majority of Koreans were insensitive to this change. Even in the midst of the decades of drought and flooding, changes in the fruit and fish placed on the dinner table and gradual change from a temperate to subtropical climate, a sense of awareness regarding the truth hidden within these changes has been mostly absent. Until now, despite the changes in peoples' livelihoods

and the environment itself, very few citizens have been looking the 'inconvenient truth' in the eye by immediately confronting the reality of these issues and the general sense of alarm has been minimal. In Korea's case, the level of greenhouse gas, a cause of global warming, has risen roughly twofold in the past 15 years, however provisions regarding this have been difficult to identify. In particular, while some developed nations have used global warming as a reason to arm themselves with new regulations, and others pushed hard to create opportunities in new markets, in actuality Korea did not possess any form of policy to fall back on.

In this way, with the low economic growth stalemate, minimal capacity for job creation, energy security crisis, and the impact of climate change, it was impossible to be optimistic about the future of Korea. The government of President Lee implied that, as a result not being able to continue the 'great history' of the country's antecedents, a more creative and progressive vision and strategy than the existing ones must be adopted for the country's future.

This in itself naturally embodied the answer to the final question, in that for Korea to be able to achieve the same kind of miracles as it had in the past, it had to undertake fundamental and overall changes to its system of development seeking future innovation at the same time as overcoming the challenges facing the country. In other words, a total paradigm shift was demanded.

In August of 2008, while Korea celebrated its 60 anniversary of independence, President Lee Myung-Bak's vision of the future was brought into being in welcoming the 'new dream of the people' generation. The new Korean development paradigm of "the vision for low-carbon green growth" proclaimed by the President symbolized the transformation into a new future-oriented paradigm, balancing the past as well as embodying the 'new dream' of the people for a 'Stronger Korea'. In order to realize this dream, the Lee government developed and implemented its 'low-carbon green growth policies' over a 5 year period to prepare for the future, and recover

and expand its forgotten growth potential and develop new engines for growth at the same time as becoming more influential on the international stage. This, in turn, united the willpower and effort of the people toward a 'Stronger Korea'

<What is Low-Carbon Green Growth?>

1. Green growth aims to create a new paradigm for development by transforming the contradictory relationship between economic growth and environmental protection into a complementary one. In a broad sense, green growth seeks to transform societal structure from a fossil fuel dependent model to a low-carbon economic model by turning quantitative growth into qualitative growth,
2. Green growth's active response to climate change and the energy crisis in itself is the main driving force behind the creation new growth and jobs. More importantly, a focus must be made on the development of green technology and infrastructure in order to realize this creation.
3. While green growth encompasses all industrial sectors such as transport and construction, it also applies to all areas of normal life including consumption and cultural activity in terms of food, clothing and shelter.
4. The base of green growth is comprised of the active participation and cooperation of governments, businesses and the people, and must be systematically supported. In particular, green growth furthers the agenda for a socially integrative nation essentially taking precedence of the notions of social stratum, generation, political faction and ideology.
5. Green growth contributes to international society through active implementation and cooperation in as much as the universal human attributes that respond the joint challenges of the global village, raising the status and distinction between nations. Based on the 'me-first spirit', green growth advances the transformation into a planet-responsible civilization in which the earth and mankind can exist together in a harmonious state.

In July of 2008, one month before presenting the plan for green growth, President Lee visited Hokkaido in Japan in order to attend the Toyako G8 Summit as an invited participant. It was the first time that Korea had received an invitation to attend a meeting of developed nations known as the G8 Summit as part of the enlarged membership. At the summit, representatives from 16 countries including Korea deliberated on the singular issue of 'climate change'. Finding a path for sustainable growth through international cooperation and creation of new growth engines by finding a breakthrough in the global energy crisis was the joint task of international society. At the same time, President Lee established the East Asia Climate Partnership (EACP), indicating his intent to become an "early mover" in the response to climate change at this meeting and sending a message to international society regarding the intent to play a "bridging role" between both developed and developing nations. This was the first hint indicating the existence of a 'low-carbon green growth' policy which was in planning at the time. In the same presentation, the President received a high favorable response from the major nations in attendance, and it was an opportunity to confirm at both home and abroad that 'Korea can do something in international society'.

In his address given on the 15th of August 2008, during commemorations for 60 years since National Foundation and the 63rd anniversary of National Liberation, President Lee presented 'low-carbon green growth' as Korea's new national vision for the next 60 year period, and defined green growth as a "new national development paradigm creating jobs and new growth engines through green/clean energy" i.e. "sustainable growth that reduces greenhouse gas and environmental pollution". Through the 'low-carbon green growth' vision and policies, new growth engines were expanded to ensure national development and improvements made in the quality of life and environment on the one hand, while on the other a future-oriented national strategy was formulated to attain a 'killing three

birds with one stone' effect through green growth such as making contributions to international society for tackling climate change. In addition, there was point in time where the transformation into an economic system with a virtuous cycle became necessary not only in Korea but in the international society at large. However, looking at 'green' (environmental protection) and 'growth' (economic development) as having an organic relationship, and one country's national strategy composed of future vision and a policy platform i.e. the movement of 'green growth' away from its classification as a mere concept, and thus the adoption of a broad national strategy encompassing the economy, industry, technology, national territory, environment, national consciousness, and behavioral changes was the very first instance of its type in the world.

Korea achieved rapid economic growth through the development of heavy chemical industries and a previous export-led strategy. Korea, which was once barely surviving on foreign aid amidst the ruins of the Korean War, has achieved the so-called 'Miracle on the Han River' and has grown into an aid donor nation designed by the OECD Development Assistance Committee. Following this, the creation of another growth engine in the IT industry was achieved, however, for a 10 year period commencing in the second half of the 1990s, the national average annual salary per capita remained at 20 thousand US dollars and the creation of a new growth engine was considered urgent. In addition, as the 10th largest consumer of energy with high level of import dependence, Korea was at a stage where it needed to reconstitute future strategies on energy. The more serious the climate change issue became, the more international society compelled each nation to reduce their carbon emissions through increasingly strict regulations, and in cases where obligations to reduce greenhouse gas were imposed, the burden on Korea's economy was immense. Ultimately, as the effects of climate change and the energy crisis began to be felt, the time had come for a new future development strategy aimed toward continual economic development. If the country did not take the lead regarding this international course of

events, entry as an advanced nation was a difficult task. Therefore, the Korean Government indicated 'low-carbon green growth' to be the new national vision for the next 60 years and the path towards a stronger Korea, subsequently laying the preemptive foundations to prepare for changes in international trends.

The term 'green growth' is comprised of two separate values. The two concepts of the environment and growth have been perceived until now as being mutually exclusive. However, the synthesis of such opposing concepts has already been used to pioneer new markets in developed nations and transformed into a new growth engine. They have developed promising new products and technology in the areas of energy and the environment, which they discovered in the process of transforming their existing growth paradigm into a more environmentally friendly one. In addition, new growth engines and new jobs were created through an attempt at integration with existing industries. The world, without giving regard to environmental issues, was being operated as an inconceivable economic development mechanism. The concept presented in such a situation was indeed 'green growth'. The focus of green growth was the pursuit of economic growth with an eye to minimizing resource usage and environmental pollution, and it exists as a virtuous structure applied as an economic growth engine. Green growth maximizes the synergy of the two values of the environment and economic growth. This was also a task which had to be developed creatively based on the vision shared by the government and citizens, businesses and civil society.

Chapter 2 | Establishment of a Foundation for the Implementation of Low-Carbon Green Growth Policies

Section 1: Establishment of the Presidential Committee on Green Growth and Formulation of a Green Growth Implementation System

In terms of the implementation of government policies for the realization of the ‘low carbon green growth’ vision, government organizations including the ‘Committee on Climate Change Countermeasures’, ‘National Energy Committee’, and the ‘Sustainable Development Committee’ with intimate ties to the policy-related factors of climate change response, energy and sustainable development respectively, were all run separately. Policy-related links were thus judged to be lacking, and the synergy effect as being inadequate. In 2008, the Lee administration decided to combine these three strategic committees in functional terms by launching the Presidential ‘Committee on Green Growth’ in order to build a strong and systematic implementation system of green growth. Following this, in January of 2009 the ‘Regulations Relating to the Operation and Establishment of the Committee on Green Growth’ were enacted by a presidential order, and in December of 2009, the committee became a legally recognized organization as a result of the enactment of the ‘Framework Act on Low Carbon, Green Growth.’

The first meeting of the ‘Presidential Committee on Green Growth’ was held in February of 2009 and began its role as the main organization for green growth. According to Article 14 of the ‘Framework Act on Low Carbon, Green Growth’, two co-chairpersons were appointed to the ‘Presidential Committee on Green Growth’, and the organization was

composed of officials and non-government members. The chairpersons (2) included the Prime Minister and another who was designated by the President from among the civilian members of the committee. The public servants of the Ministry of Strategy & Finance, Ministry of Education, Science & Technology, Ministry of Knowledge Economy, Ministry of Environment, and the Ministry of Land, Transport & Maritime Affairs selected by presidential decree became members of the committee. The body of members, appointed by the President himself, was composed of individuals with abundant experience and academic knowledge relating to low-carbon green growth areas such as sustainable development, green industry/technology, energy/resources and climate change. Furthermore, according to Article 18 of the 'Framework Act on Low Carbon, Green Growth', the 'Green Growth Planning Committee' is the base organization whose role is to efficiently support the operation and duties of the committee and its subcommittees. The Green Growth Planning Committee is composed of the Policy Planning & Coordination Team, Energy Policy Team, Climate Change Policy Team, Green Technology & Industry Team, Green Life & Sustainable Development Team, and the International Cooperation Team.

The 'Presidential Committee on Green Growth' became responsible for matters relating to planning strategies for green growth policy, fundamental planning, the legal system, matters relating to the development of green industry and training of manpower, development related to green growth, matters relating to green growth-related education and public relations, the dissemination of information/knowledge, matters relating to energy and the response to climate change for the purpose of green growth, as well as for matters relating to green growth-related international cooperation. The 'Green Growth Planning Committee' was established as an executive office in 2009 at the time of the committee's foundation, composed of 50 members from the Policy Planning & Coordination Team, Green Technology & Industry Team, Climate Change Policy Team, Energy Policy Team, Green Life & Sustainable Development Team, and the Negotiation TF,

included the heads of the Head Office for State Affairs and Future Vision Secretary (later known as the Green Growth Planning Office) as joint chairpersons. The 'Green Growth Planning Committee' supported the running of each subcommittee, prepared and created green growth implementation policies, and assisted in verifying the implementation status and management of green growth

Similar to the central Presidential 'Committee on Green Growth', a 'Regional Committee on Green Growth' was composed with a maximum of 50 non-governmental delegates nominated as co-chairpersons by the executive mayor and regional governor, or city/governor affiliated administrative branches. The 'Regional Committee on Green Growth' deliberates on matters relating to the basic direction of the low-carbon green growth of local governments, matters relating to the establishment and modification of regional implementation plans, matters relating to plans of action, and emphasized implementation projects for the fulfillment of regional implementation plans. In principle, regular meetings are to be held twice a year. However, extra sessions are held frequently if needed. The Head of the Green Growth Departmental so serves as an assistant administrator to support the committee. However, different to the central committee, since a permanent secretariat such as the 'Green Growth Planning Committee' had not been established, there were limits in terms of the implementation of policy revisions. Article 21 of the 'Framework Act on Low Carbon, Green Growth' is defined so that agencies responsible for green growth can be designated by each central administrative agency and self-governing body in order to build a system for the smooth cooperation and effective implementation of green growth measures. In addition, the 'Green Growth Forum and civil practice movement Green Start Network' took on the role as think tanks for green growth, and were run with the support of the central government as a form of regional green growth governance.

<Vision & Implementation Strategy for Green Growth Plans by City/Province>

| Area | Green Growth Vision | Strategy |
|----------|--|---|
| Seoul | Seoul – World Leader in Green Competitiveness | <ul style="list-style-type: none"> ■ Climate friendly city ■ Green growth city ■ Highly adaptable city |
| Busan | Busan – Leading Green Growth by way of a Green Ocean | <ul style="list-style-type: none"> ■ Build a low-carbon society ■ Promote green growth ■ Realize a green lifestyle |
| Daegu | Daegu – Leading City in Global Green Growth | <ul style="list-style-type: none"> ■ Creation of new green growth engines ■ Dapt to climate change and improve energy efficiency ■ Creation of a green city and green lifestyle |
| Incheon | Incheon – A Happy Green Economic Community | <ul style="list-style-type: none"> ■ Build the foundations for green growth and green lifestyle revolution ■ Adapt and respond to climate change ■ Develop green technology and industries ■ Expand green spaces and low-carbon city infrastructure |
| Gwangju | Building The Nation's Leading Green Growth City | <ul style="list-style-type: none"> ■ Dapt to climate change and increase energy efficiency ■ Create new growth engines for green technology and industries ■ Create a green city and put green lifestyle into practice |
| Daejeon | Daejeon – Leading City in Green Growth & Carbon Reduction | <ul style="list-style-type: none"> ■ Take initiative in responding to climate change ■ Develop new green growth engines ■ Build a carbon-reducing city/transport system ■ Citizen-led green revolution |
| Ulsan | Ulsan – An Ecopolis Leading the Korean Low-Carbon Green Movement | <ul style="list-style-type: none"> ■ Ealize a low-carbon city through greenhouse gas reduction ■ Timulate the local economy through green technology/industries ■ Create an 'Ecopolis' green society |
| Gyeonggi | Gyeonggi-do – Korea's Green Leader | <ul style="list-style-type: none"> ■ Gyeonggi-do, Korean heartland of new green industries ■ Develop into a global leader in green cities/transport ■ Establish a series of national systems of adaptation to climate change for a 100-year period |

| Area | Green Growth Vision | Strategy |
|-----------|---|--|
| | | <ul style="list-style-type: none"> ■ Implement the green-lifestyle revolution with the participation of residents |
| Gangwon | Gangwon-do – The Lungs of Korea & Green Growth Leader | <ul style="list-style-type: none"> ■ Create the country's largest carbon absorption center ■ Become a base region for clean energy industries ■ New growth drive for green industries ■ Create a mecca for ecological tourism, natural healing |
| Chungbuk | Chungbuk – 'The Land of Sun & Life' the Center of Green Growth | <ul style="list-style-type: none"> ■ Reduce greenhouse gas and strengthen capacity to respond to climate change ■ Develop green industries and create new growth engines ■ Create a green lifestyle environment and improve quality of life |
| Chungnam | Building a Green Chungnam Harmonizing Environment and Growth | <ul style="list-style-type: none"> ■ Respond to climate change and become energy self-reliant ■ Create new growth engines for green technology/industries ■ Create a healthy and happy green lifestyle |
| Jeonbuk | North Asian Base for Global Green Growth | <ul style="list-style-type: none"> ■ Develop green industries ■ Stimulate green agriculture ■ Create green spaces ■ Build a green society |
| Jeonnam | Jeonnam – Green Growth Leader | <ul style="list-style-type: none"> ■ Create 'Jeonnam – The Land of Green' ■ Develop green growth industries ■ Implement green growth-leading local governments |
| Gyeongbuk | Gyeongbuk's New Challenge – Building Korea's Green Capital | <ul style="list-style-type: none"> ■ Adapt to climate change and become energy self-reliant ■ Create new green growth engines ■ Improve quality of life and raise the status of Gyeongbuk |
| Gyeongnam | Korea's No. 1 Region for Low-Carbon Green Growth | <ul style="list-style-type: none"> ■ Energy self-reliance and adaptation to climate change ■ Create new growth engines ■ Make the green lifestyle revolution a reality |
| Jeju | Creating an International Model Green Growth City – Best in Asia by 2020, the World by 2050 | <ul style="list-style-type: none"> ■ Preemptive response to climate change and energy self-reliance ■ Develop new growth engine industries ■ Create a green eco-city |

In order to effectively implement the national vision of green growth, the participation of the private sector was urgently needed. Thus, the creation of a two-way discussion channel with the government, eliciting a realistic change in private sector behavior was necessary for green growth. As such, in April of 2009, the Lee administration improved the responsiveness of its green growth policy and launched five 'Green Growth Private Sector Consultative Bodies' based on each of the teams of the 'Presidential Committee on Green Growth' in the five areas of industry, science and technology, finance, IT, and lifestyle for the purpose of improving the public-private partnership (PPP). The government took the lead in launching these consultative bodies, which included important figures from the industrial, finance, science/research as well as from consumer sectors, civil organizations and local governments, in order to spur the active participation of the private sector in its partnerships with the PCGG(Presidential Committee on Green Growth). Since 2010, as green growth policy has undergone full-scale, stage-by-stage implementation, a system for public-private communication has been run smoothly in regard to the central issues of each policy by merit of previously held activities of the consultative bodies. However, since 2011 such activities have decreased somewhat due to a decline in the momentum of implementation, and the PPP was analyzed to be lacking with regard to collected opinions and agendas uncovered in each consultative body. In 2012, it was decided to actively utilize these private sector consultative bodies as an opportunity to build and expand the scope of discussion channels with the private sector and the opinions gathered from interested parties relating to green growth policy. In addition, sector-specific meetings were to be held for the release of information once per quarter regarding the agenda prior to the PCGG's report conference. Furthermore, joint meetings of the consultative bodies were held in cases deemed necessary in order to stimulate exchanges, and during the 4th quarter such a meeting was also held with private sector consultative bodies for discussion on and the synthesis of green growth. In addition, information was released and

personal networks strengthened by the frequent forwarding of e-mails which included conference agendas or materials published by the PCGG.

Since its founding in 2009, the PCGG has held a total of 21 regular sessions in the form of national reporting conferences and 11 conferences for the reporting of implementation results, and it has contributed largely to spreading and materializing the green growth vision by preparing foundations for GHG(greenhouse gas) reductions, developing green technologies/industries and strengthening the capacity for climate change adaptation among others.

Section 2: A New National Development Strategy, National Green Growth Strategy & Five-Year Plan

The strategy relating to green growth was largely implemented by the Lee administration by dividing it into a comprehensive plan and a sector plan. The 'comprehensive plan' was established according to the 'Framework Act on Low Carbon, Green Growth' as a master plan inclusive of the central/regional government and departmental implementation projects, while the 'sector plan' was also established according to the same act, with a separate law as a plan for each sector with connections to green growth. In July of 2009, the Lee administration presented the 'National Strategy for Green Growth (2009-2050) and its action plan, the 'Five-Year Plan for Green Growth (2009-2013), as the most significant comprehensive plan regarding green growth.

1. National Strategy for Green Growth (2009–2050)

In order to fulfill the three objectives of ①low-carbon/highly energy efficient 'Green Society', ②A 'Green Economy' in which growth is led by green

technology/industries, and ③A 'Green Korea' leading global green growth, the National Strategy for Green Growth (2009 - 2050) indicated 10 policy directions and 50 core projects. The strategy also created long term national objectives for the purpose of boosting Korea's international ranking into the top7 in terms of overall green competitiveness by 2020 (green technology and industries, capacity to adapt to climate change, level of energy self-reliance, energy welfare, etc.) and the world's top 5 strongest green nations by 2050. Furthermore, the 'Five-Year Plan for Green Growth' generated subsidiary projects to be fulfilled for each of the core projects and suggested in concrete terms an implementation policy including yearly target objectives, implementation agents, and investment plans for each of these subsidiary projects. In addition, the government established the '2% budget rule' referring to the 2% of the national GDP which was to be allocated over a 5year period from 2009 to 2013 for the implementation of its green growth strategies. This 2% of GDP was equivalent to twice the total amount of green investment capital comparative to the level recommended at the time by the UN for the transformation into a green economy, ensuring that Korea received the international spotlight.

<National Strategy for Green Growth (2009–2050)>

| 3 Goals | 3 Strategies | 10 Policy Directions | 50 Core Projects |
|--|--|--|---|
| Green Society (Highly efficient society in low-carbon energy) | Adapt to climate change and realize energy self-reliance | ① Efficient reduction of greenhouse gas | ①-1 Carbon-based society ①-2 Carbon-reducing society ①-3 Society cyclically absorbing carbon ①-4 Low-carbon oriented green Korean peninsula |
| | | ② Strengthen energy self-reliance, move away from oil dependency | ②-1 Build a low consumption/highly energy efficient society ②-2 Expand the supply of clean energy ②-3 Expand the supply capacity of nuclear energy ②-4 Strengthen overseas resource development capacity |
| | | ③ | ③-1 Build a climate observation, prediction and |

| 3 Goals | 3 Strategies | 10 Policy Directions | 50 Core Projects |
|---|---------------------------|--|---|
| | | Strengthen capacity to adapt to climate change | <p>early response system</p> <p>③-2 Strengthen the national health administration in response to climate change</p> <p>③-3 Strengthen the national food safety system</p> <p>③-4 Strengthen management capacity for water resource stability</p> <p>③-5 Utilize and manage the ocean in a climate-friendly manner</p> <p>③-6 Strengthen disaster management in response to climate change</p> <p>③-7 Sustainable management of forests</p> |
| Green Economy (Green economy, leading the growth of green technology/industries) | Create new growth engines | ④ Develop green technology and growth drive | <p>④-1 Magnify investment for green technology development in strategic terms</p> <p>④-2 Build an efficient green technology development system</p> <p>④-3 Accelerate the industrial adoption and transfer of green technology</p> <p>④-4 Expand infrastructure for the development of green technology/industries</p> <p>④-5 Stimulate international cooperation for the development of green technology</p> <p>④-6 Develop green technology industries as a new growth engine</p> |
| | | ⑤ Foster green industries and the 'greening' of industries | <p>⑤-1 Structure the economy/industry based on resource circulation</p> <p>⑤-2 Spread innovation and green transformation by industry</p> <p>⑤-3 Develop small and mid-size green venture businesses</p> <p>⑤-4 Develop knowledge-driven green clusters</p> |
| | | ⑥ Enhance industrial structure | <p>⑥-1 Develop integrated hi-tech industries as new growth engines</p> <p>⑥-2 Develop high added value service industries</p> |
| | | ⑦ Create the foundations of a green economy | <p>⑦-1 Stimulation of financing for green technology/industry policies</p> <p>⑦-2 Build green financial infrastructure</p> <p>⑦-3 Develop a carbon market</p> <p>⑦-4 Administer an eco-friendly tax system</p> <p>⑦-5 Provide tax support for green products/industries</p> <p>⑦-6 Reform regulations and incentives for a low-carbon society</p> |

| 3 Goals | 3 Strategies | 10 Policy Directions | 50 Core Projects |
|---|--|---|--|
| | | | ⑦-7 Energy welfare ⑦-8 Accelerate the creation of green jobs ⑦-9 Expand training of green-oriented individual talent |
| Green Korea (World Leader in Green Growth) | Improve quality of life strengthen national ranking | ⑧ Create national green land and transport | ⑧-1 Create green land and cities ⑧-2 Expand ecological domains ⑧-3 Increase the amount of green structures ⑧-4 Build a green transport system ⑧-5 Stimulate the usage of bicycles |
| | | ⑨ Green lifestyle revolution | ⑨-1 Build a base for education on green growth and foster 'green citizens' ⑨-2 Spread the practice of green lifestyle ⑨-3 Stimulate green consumption ⑨-4 Create green villages and green movement ⑨-5 Revitalize ecological tourism |
| | | ⑩ Realization as a model nation in international green growth | ⑩-1 A nation cooperating in the realization of global green growth ⑩-2 A nation recognized as a model for green growth ⑩-3 A nation assisting the green growth of developing countries ⑩-4 A nation presenting a model for green growth |

On the other hand, the sector plan was divided into the Core Plan, Related Plans, and Other Plans according to the sector, as plans for sectors with direct or indirect connections to green growth. As a plan directly related to the strategic objectives of green growth together with the 'Five-Year Plan for Green Growth (2009-2013)', the Core Plan was confirmed at a Cabinet meeting after undergoing deliberation by the PCGG. Furthermore, the 'National Energy Master Plan' relating to Article 39 of the 'Framework Act on Low Carbon, Green Growth', the 'Climate Change Response Master Plan' based on Article 40, and the 'Sustainable Development Master Plan' from Article 51 were established and presented.

'Related Plans' refer to the main national plans established according to other laws as plans with either a direct or indirect relation to green growth. Examples of these plans are the 'Framework Act on National Land' based

on the 'Comprehensive Plan for National Land', the 'Balanced National Development Plan' based on the 'Special Law on Balanced National Development', and the 'National Science & Technology Master Plan'. 'Other Plans' refer to the administrative plans of each central government department with a relation to green growth, and some established and presented examples of these include the Ministry of Knowledge Economy's 'New & Renewable Energy Plan' and 'Green IT Strategy', and the Ministry of Environment's 'Low-Carbon Green Growth Implementation Plan' among others.

<Implementation Plan for the Low-Carbon Green Growth Strategy>



Moving away from the concept of green growth related issues to new and renewable energy adopted by several existing nations, the Lee administration widened the conceptual definition of green growth in establishing a comprehensive plan for global green growth embracing

nations, people, and businesses. This included reports, theses, and opinions from all fields for the reexamination and modification of the targets of existing plans, such as master plans for each area including energy, climate change, green industry, green society, and lifestyle revolution, as well as for investment plans. Furthermore, through reviews on the business plans of each government department relating to green growth, a comprehensive plan reflecting the results of research related to the participation of specialized public-private sector institutions was established and the overlapping of similar business relations was eliminated, after which the expected effectiveness of green growth investment could be visualized. In addition, the importance and degree of relation of the green growth investment sector and relevant businesses were reviewed in detail, and a core project was put together. Following the implementation of an optional budget, rather than just presenting a simple list of investment plans regarding the green growth sector, the expected effectiveness of investment itself was clearly presented. While long-term investment in the green growth sector must be conducted with antecedence, considering that the effects of investment obviously appear over the long term, the analysis period was set to begin in 2013 and extend until 2050, with the years 2020, 2030, and 2050 designated as evaluation points.

2. Five-Year Plan for Green Growth (2009–2013)

In the ‘Five-Year Plan for Green Growth (2009-2013)’ presented as an implementation plan together with the ‘National Green Growth Strategy (2009-2050)’ in July 2009, the Lee administration suggested medium and long term targets for national GHG reductions, and committed resolutely to such reductions by establishing phased reduction strategies by sector. Through this plan, the ‘Emissions Trading Scheme’ and standards for automobile GHG emissions were introduced, as well as the restrictions to achieve reduction targets for buildings, transport, and industry. Also, this plan supported the

construction of the infrastructure and industrialization of new and renewable energy needed to build a low energy consuming and highly energy efficient society, as well as spur technological innovation for improving energy efficiency in order to strengthen energy-related self-reliance. Moreover, the export of nuclear technology was also looked into for the purpose of turning Korea into a nuclear energy exporting powerhouse. In particular, the plan intending to construct an intelligent strategy network by 2013 inside the general strategy network, which could optimize energy efficiency and integrate IT into existing strategy networks, has gained much attention due to the nature of its intimate relation with people's actual lives. To strengthen the capacity for adaptation to climate change, the pertinent projects scheduled until 2013 were prepared with the base concept of the early response system including the prediction techniques and scenarios for climate change. Then, the securing of clean water, reinforcement of national health administration, and development of standards and systems for the prevention of disasters were implemented. Based on the '2% budget principle' which allocates 2% of GDP to green investment as mentioned previously, the government increased the assistance for green technology development and growth drive. The government established a policy to extend the weight of green R&D from all R&D investment to 20% level by 2013 from 15% in 2008. With the intensified support for green R&D, the government promoted green technologies such as new and renewable energy, LED, and green cars, which were previously called the green industry group, as well as introduced early industrialization so as to lead the world market. On the other hand, they decided to apply green technologies to the industries Korea had superiority over in the past, such as steel, textiles, petro-chemicals and shipbuilding, by supporting the greening of production systems for those industries. In addition, they tried to reinforce the green capability of small and medium companies by raising exclusive funds for them, extending the policy fund and credit guarantees along with supporting green business strategies in order to convert them to green work fields. They reinforced the R&D

investments on the green small and medium companies, extended the support for policy fund, and expanded green partnerships with large and medium companies. The government also supported fostering of the high-tech fusion industry and high value service industry to advance the industrial structure for environment-friendly industry groups. In particular, the broadcasting and communication industry was provided with integrated legislature for the revitalization of new services such as the IPTV, DMB, and WiBro, to keep up with the trend of the advanced broadcasting system.

In the meantime, vulnerable social groups were also considered so that the fruit of green growth can reach the entire population, creating sustainable societies. They strengthened the support for the housing of those on low incomes to enhance HVAC efficiency, and reduced the number of energy poverty households from 1.23 million in 2009 to 0.89 million in 2013, demonstrating an active effort to remove the dead zones of energy welfare. To develop a stable water supply system for residents in vulnerable areas, water and sewerage systems in farming and fishing villages were added, and other policies were implemented to resolve water shortages in areas effected by drought. In addition, other projects including forestation, carbon recycling villages, and the construction of small/medium scale dams were expanded to create employment opportunities and raise incomes. It was a policy in connection with the 'Green New Deal Project to Create Jobs' which was presented by the government in January 2009 in order to confront the worldwide economic crisis. The Green New Deal Project, a government project for low-carbon and a green environment, consisted of nine core projects including the Four-River Restoration Project, development of a green transportation network, supply of green cars and clean energy, preparation of alternative water resources, and construction of small/medium-size green dams, as well as 27 related projects. A total of 36 projects were the prescription to overcome the economic crisis with a goal of creating 956,420 jobs by investing a total of 50 trillion Won (37 trillion Won of national expenditure, 5 trillion Won of local government expenditure, and 7 trillion

Won of private capital) for four years from 2009 to 2012. The strategy of achieving green growth, while at the same time overcoming the economic crisis, received a great deal of attention from the international society.

Section 3: Preparing the Legal and Institutional Basis for Green Growth

1. Enactment of the Framework Act on Low Carbon, Green Growth

For the successful implementation of the ‘low carbon green growth’ in terms of national policy, an integrated legal approach was necessary in the entire social structure including economy, industry, technology, land, environment, national consciousness, and action. In particular, legal and institutional support was most required to strongly implement the national vision of ‘low-carbon green growth’ in an efficient and systematic way. Many advanced countries have acknowledged the climate change and energy issue as a major agenda and concentrated their country’s efforts on the efficient use of energy and resources, and at the same time, the minimization of environmental problems. These countries have completed or are in the progress of enacting anticipatory legislation to deal with problems related to climate change and high oil prices. In particular, they have overcome the limits of economic growth driven by the input model of capital and labor power, and have been enacting or revising laws to strengthen and promote new growth engines such as new and renewable energy, an environmental industry and a carbon market. In the European Union(EU), the ‘Climate and Energy Package 2008’ was passed by the European Parliament in December of 2008 in order to enhance energy efficiency by 20%. The US proposed the ‘Lieberman-Warner Climate Security Act (Draft)’ in 2008, and the ‘Cap-and-Trade Emission Scheme’ has been in effect in some states. Around 2009, Barbara Boxer, a Senator of the State of California and chairman of

the Committee on the Environment and Public Works, had been continuously working on the enactment of climate change bills including trade restrictions for countries which did not make efforts to reduce GHGs. Previous to this, Australia established the 'National Greenhouse and Energy Reporting Act' in September 2007, and introduced the Cap-and-Trade Emission Scheme in 2010. Japan amended their laws three times since the 'Law Concerning the Promotion of the Measures to Cope with Global Warming' was enacted 15 years ago in 1997, and enforced a demonstration project of the 'greenhouse gas emission trading system' from December 2008. In November 2008, The UK was the first in global terms to stipulate the objective of reducing its mid-to-long term GHG emissions (26% by 2020 and 80% by 2050), and enacted the 'Climate Change Act', which included the introduction of a carbon budget system. France, in particular, enacted the 'Grenelle Environment Law 1' in July 2009 with the objective of forming Europe's most efficient low-carbon economic structure by 2020, which includes the areas of energy, climate-building, atomic energy, green consumption, biodiversity, and sustainability.

In Korea's case, there was an attempt for the legislation of a 'Climate Change Response Act' in 1999 in connection with the response to climate change or restriction of GHG emissions similar to the aforementioned examples in advanced countries. Motions by assemblymen and two attempts by the government were made to enact the law, only to be met with failure due to the reason that it was too early for such action. The 'Framework Act on Energy' was established in 2006 and the enactment of the 'Framework Act on Sustainable Development' took place in 2007. However, the 'Framework Act on Climate Change (Draft)', whose initiation was led by the Prime Minister's Office before the government of President Lee was blocked even after an agreement was made between the relevant offices and the pre-announcement of legislation in September 2008.

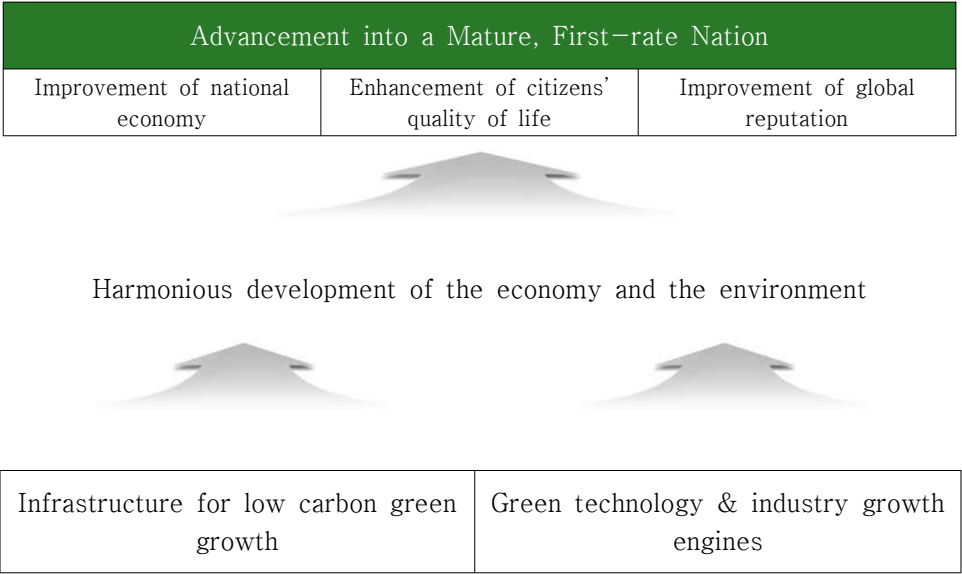
As a result, the Lee administration recognized the necessity of integrating existing legislation related to green growth immediately after its

announcement of the ‘low-carbon green growth’ in October 2008, and requested the preparation team for the PCGG to move ahead with the legislation. Following this, the ‘Framework Act on Low Carbon, Green Growth (Draft)’ was prepared in December 2008. The ‘Framework Act on Low Carbon, Green Growth’ was finally passed at the first plenary session of the 285th provisional session of the National Assembly on December 29, 2009, after an agreement was reached between relevant authorities (Dec. 24-29, 2008), pre-announcement of legislation (Jan. 15-29, 2009), five discussion meetings with industries (Jan 23, Feb. 10, Feb. 13, 2009), a public hearing (Jan. 28, 2009), and attendance at a discussion meeting hosted by a civic group (Feb. 10, 2009). On April 4, 2010, the government passed a resolution in favor of the enactment proposal for the ‘Framework Act on Low Carbon, Green Growth Enforcement Ordinance’ at the 15th Cabinet Meeting as entrusted and specified by the ‘Framework Act on Low Carbon, Green Growth’.

<The Legal System of the ‘Framework Act on Low-Carbon, Green Growth’(Total of 7 Chapters, 64 Articles)>

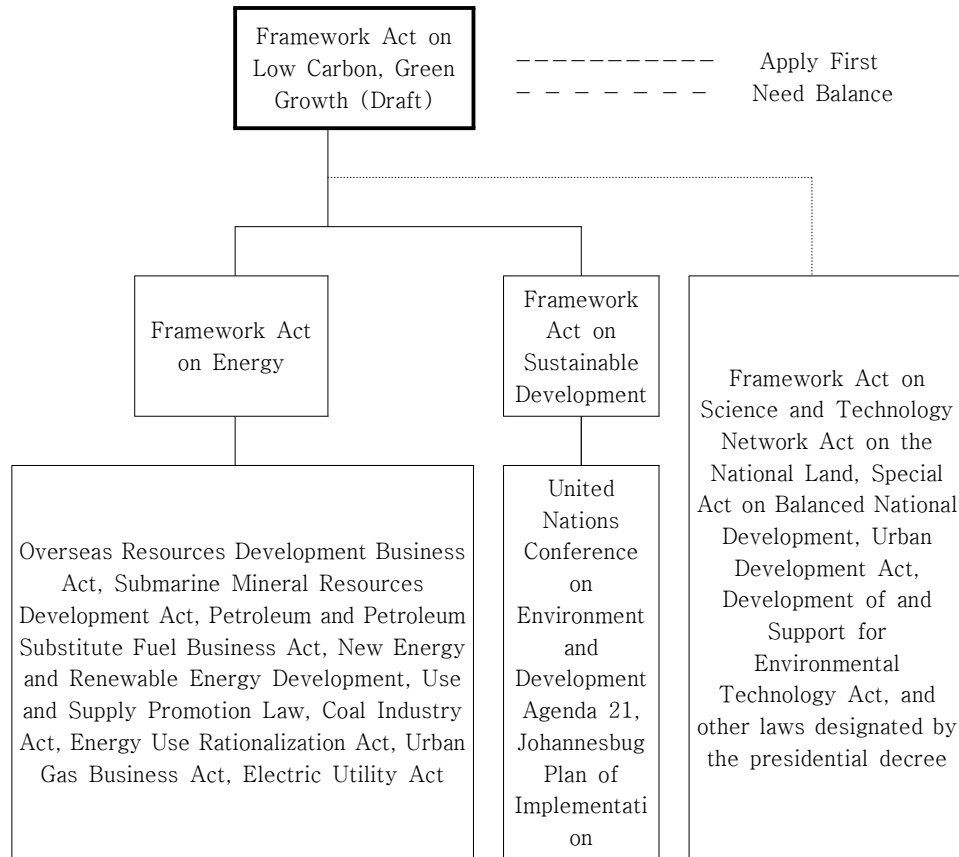
| Item | Major Contents |
|---|--|
| Chapter 1: General Provisions | Purpose, definition of terms, principles of implementation, responsibilities by subject, etc. |
| Chapter 2: National Strategy for Low-Carbon Green Growth | Establishment, enforcement, inspection and evaluation of the national strategy for green growth plan |
| Chapter 3: Presidential Committee on Green Growth, etc. | Constitution, operation, and function of the committee |
| Chapter 4: Implementation of Low Carbon, Green Growth | Green growth, industry promotion, resource circulation, green technology, green financing, environment friendly tax reform, green job creation, etc. |
| Chapter 5: Realization of a Low-Carbon Society | Establish basic climate change & energy plan, target management, reporting greenhouse gas emission and energy usage, cap and trade emission scheme, etc. |
| Chapter 6: Realization of a Green Lifestyle and Sustainable Development | Land, water, green transportation, building, agriculture, green consumption, and life, etc. |
| Chapter 7: Supplementary Rules | Financial assistance, promotion of international cooperation, preparation of national report, fines, etc. |

<Purpose of the ‘Framework Act on Low Carbon, Green Growth’>



The ‘Framework Act on Low Carbon, Green Growth’ is a base act on ‘low-carbon green growth’, which takes precedence over existing legislature such as the ‘Frame work Act on Energy’ or the ‘Framework Act on Sustainable Development’. If other ordinances are enacted or amended, it should agree with the purpose of this act as well as its basic principle.

<The Relationship of the Framework Act on Low Carbon, Green Growth with other Legislation>



The Lee administration enacted the 'Framework Act on Low Carbon, Green Growth' to realize the new national strategy for low-carbon green growth, in which the environment and growth are well balanced, breaking away from the carbon-dependent economic paradigm to cope with climate change and the energy crisis. In a constitutional country such as Korea, green growth policy as a national strategy and practical measures for green growth are rather difficult to secure effective outcomes for, as well concerning the validity of execution without a legislative and institutional support. The fact

that the legislature containing the direction of government policy was enacted with overwhelming bipartisan support had the same significance as receiving ratification of the national vision from the representatives of the people for the future and direction of the policy proposed by the government. The low carbon green growth strategy of the Lee administration is a national system pursuing growth within reasonable limits for the reduction of GHG and economization of energy, while growing through the simultaneous development of technology and promotion of new growth engines. The 'Framework Act on Low-Carbon Green Growth' entails a significant historic meaning both domestically and abroad in regards to the fact that it is the first comprehensive law in the world to include low-carbon green growth strategies and policies such as the response to climate change, energy, sustainable development, and new growth engines, reflecting President Lee's philosophy and green leadership for the nation.

2. Setting Midterm Goals for National Greenhouse Gas Reduction

According to the fourth report of the 'Intergovernmental Panel on Climate Change' IPCC in 2007, the average global temperature for the past 100 years has increased by 0.74°C. If the rate of GHG emissions continues at its current level or increases, the global temperature at the end of the 21st century will rise by a maximum of 6.4°C compared to the average temperature at the end of the 20th century, and the sea water level is predicted to increase by a maximum of 59cm. Global warming can create environmental crises such as severe climatic disasters and destruction of the ecosystem as well as serious threats to society, the economy, and even culture. The economic loss due to climate change was reported in the "Stern Review, the Economics of Climate Change" published by Nicholas Stern, a professor at the London School of Economics and Political Science (LSE) in 2006, and the results proved that worries concerning climate change were not groundless fears.

The report warned that climate change will aggravate climatic disasters such as droughts, floods, and scorching heat waves, and the economic cost of climate change will reach 5% to 20% of GDP. According to research conducted by the International Research Institute for Climate and Society (IRI) of Columbia University in the US, in 2011 the frequency and the amount of damage caused by weather phenomena in the 2000s increased 50% compared to that of the 1990s. The magnitude of climatic disasters in the 1990s was 224 times per year on average, totalling 50 billion dollars in damages, while there were 347 cases in the 2000s with damages totalling 72 billion dollars. Climate change is having increasingly serious effects on people's lives, such as the loss of life and economic damage resulting from abnormal changes in the weather. According to one piece of research, the average annual loss of life for the last 10 years (2001-2010) was 68 people and the amount of property damage reached 1.7 trillion Won. In particular, annual average property damage increased 3.1 times compared to the 1990s, and 5.3 times compared to the 1980s.

The political effort for coping with climate change can be divided into two parts. One is 'mitigation' of GHG itself, one of the main causes of global warming, while the other is 'adaptation' by preparing to minimize risks due to actual or anticipated climate changes. While mitigation means the direct and fundamental control of the cause, adaptation focuses on the results rather than causes for the purpose of advance preparation. None of the policies should be abandoned, and national resources should be distributed in harmony. However, the former is more urgent in Korea in the respect that it regulates a more fundamental cause and insufficient investment has been made on the restraint of GHG emissions including carbon dioxide due to the cost problem in the process of industrialization. The Korean industry had developed mainly with manufacturing businesses for seven years from 2000 to 2007, and the rate of carbon dioxide emission from the production process increased 103%, ranked first among OECD countries. The amount of emissions based on the energy sector marked 9th

position globally, indicating a serious level. It was attributed to the industrial structure and social structure which is comprised of high energy consuming businesses with much dependence on fossil fuels such as steel, cement, and petrochemicals.

President Lee Myung-bak ordered the research and gathering of opinions for the establishment of '2020 midterm greenhouse gas reduction goal' immediately after he declared the vision of low carbon green growth in August 2008. Thus, eight professional research institutes participated to analyze potential reductions in a scientific and systematic method that was internationally accepted. The results were verified for reliability and supplemented through a review committee headed by the chairman Lee Hoe Sung, who was the Vice Chair of the Intergovernmental Panel on Climate. Through the process, three scenarios were presented as the national 2020 midterm GHG reduction goal on August 4, 2009, which were to reduce ①21%, ②27%, and ③30% of GHG compared to anticipated 2020 emissions (Business As Usual, BAU). When those are converted as the absolute criteria based on 2005 GHG emissions (594 million tons of CO₂), they correspond to reductions of ①8% increase, ②no change, ③4%, respectively. President Lee Myung-bak ordered the PCGG, a presidential committee, which has already conducted with eight types of businesses around 30 discussion meetings as well as discussions within the government, to collect the opinions of citizens from all walks of life after the announcement of the scenario. Following this, 44 additional debates and public hearings were held to carefully gather the opinions of the general public.

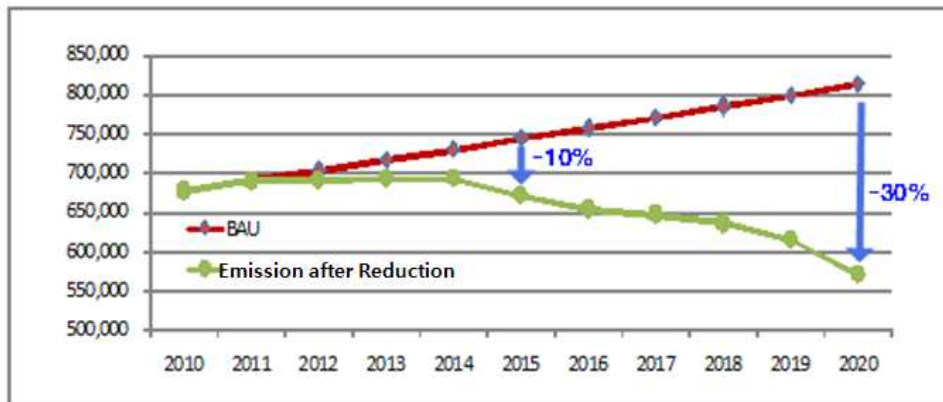
After the announcement of the scenario, industries requested the status of a developing country be maintained in international agreements in fear of weaker industrial competitiveness resulting from the reduction of GHG and proposed a reduction target of ①21% or below. On the other hand, civic groups emphasized the responsibility for the ninth greenhouse gas emission as a member country of the OECD and suggested a reduction of 25% of the absolute total compared to 2005, which is greater than in proposal

③ The 1st and 2nd debates prepared by the ‘Special Committee on Climate Change’ of the National Assembly and discussions with private members of the PCGG made some progress on proposal ③ or a level higher according to the necessities of reduction targets suitable for the national status, such as the national brand and powerful signals for green growth, etc.

Developed countries showed the trend of raising their reduction goals higher than those that they had announced prior to the United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP15) in Copenhagen in December 2009. Prime Minister Hatoyama of Japan drastically adjusted the country’s reduction goal from 8% to 25% compared to 1990. The US also raised its reduction goal from 17% set at the House of Representatives (Waxman-Markey Bill) to 25% in the Senate (Kerry-Boxer Bill) compared to 2005. In addition, Sweden and Norway followed suit in October 2009 for a 40% reduction goal compared to 1990, which is the maximum recommended by the IPCC for advanced countries. Other developing countries changed their position to oppose the setting of reduction goal itself or seriously reviewed their measures to announce active goals prior to the Copenhagen conference.

The Lee administration considered choosing one proposal from either ② or ③ after putting together research results and collected opinions. Proposal ② was evaluated as having fewer burdens for each economic subject but also faced major opposition from civic groups and caused relatively less signal effects in international society. Proposal ③ had clear signals regarding low-carbon green growth and was in accord with global demand, but the cost was the concern of the industries which might oppose it. Eventually, the government made a final decision and announced the reduction plan as the mid-term (2020) national GHG reduction goal compared to the BAU in November 2009.

<Midterm GHG Reduction Goal in Korea (by year)>

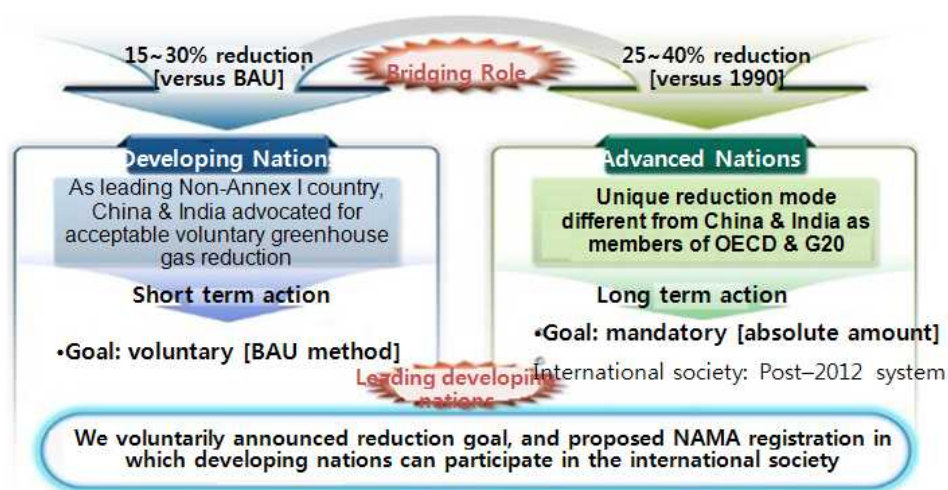


Korea's national reduction goal was the highest level compared to the 15-30% range of BAU that was recommended to developing countries by the IPCC. This reflected the will of the Lee administration for strong green growth policy in Korea and active participation in the global effort to cope with climate change. In addition, the reduction goal of Korea received much praise from both developed and developing countries in international society, as it was a voluntary decision independent of the result of the scheduled COP15 discussion and reduction goals of other countries.

The Korean initiative for reduction goal setting was giving shape to President Lee Myung-bak's promise at the Toyako G8 Summit in July 2007, where he announced Korea to be an 'early mover' in climate change response, which provided an opportunity for the international society to understand the vision of Korea for low-carbon green growth. President Lee did not stop at setting the reduction goal. At the UNFCCC (COP15) in Copenhagen he attended later on, Lee proposed that Korea play a bridging role between developed and developing countries in the area of international cooperation for climate change response. The international society noticed the leadership of Korea in terms of responding to climate change by suggesting an installation of the NAMA (Nationally Appropriate Mitigation

Action)Registry to promote spontaneous reduction and a constructive proposal to give them carbon credit for their voluntary reduction efforts.

<Korea's Proposal at the COP15 in 2009>



On the basis of the national GHG reduction goal, finalized and announced in November 2009, more detailed reduction goals (draft) were prepared by industries and sub-industries in July 2011, including industry and conversion (generation), building and transportation, and agriculture and stock breeding. In other words, the national GHG reduction goal of 30% compared to BAU by 2020(a total of 813 million tons of CO₂) was set for seven sectors and 25 businesses in each category. In addition, GHG reduction goals were set for 470 businesses which emit GHGs above a certain amount (125,000 tons per year) for the enforcement of the Greenhouse Gas Energy Management System.

<Reduction Goal for Each Sector Compared to 2020 BAU (Unit: %)>

| Industry | Conversion | Transportation | Buildings | Agriculture & Animal Husbandry | Waste | Public & Others | National Total |
|----------|------------|----------------|-----------|--------------------------------|-------|-----------------|----------------|
| 18.2 | 26.7 | 34.3 | 26.9 | 5.2 | 12.3 | 25 | 30 |

The GHG reduction goal set for each year and business was the blueprint for leading the ‘low-carbon green growth’ of Korea by 2020. It became important to prepare for anticipated future changes and to enhance the national green competitiveness by presenting a powerful signal about the necessary practice of green growth to the economic subject, surpassing the simple concept of greenhouse gas reduction. Furthermore, it could provide important momentum for the fostering of future growth power in the era of high oil prices by advancing green technology and new industrial development such as new and renewable energy, energy saving technology, green cars, and green homes which are intensively promoted as new growth engines.

3. Introduction of the Greenhouse Gas Energy Management System

After the Lee administration had set and announced the national mid-term GHG reduction goal in November 2009, President Lee began to actively develop a response system for achieving such a goal. Korea implemented a voluntary reduction goal suitable for a country leading green growth, even though it was not one of the countries that was obligated to carry out mandatory reductions by the Kyoto Protocol. Hence, the response system had to be decisive, and be a model for global society. Each nation had been seeking response measures to climate change by converting the focus of energy policy to demand management, in order to restrain GHGs - which are the main cause of global warming. Korea also endeavored to

reduce emissions from the energy consumption sector, which account for 84% of national GHG emissions. It has continuously endeavored to change the paradigm of energy policy, by establishing the 'First Master Plan for National Energy' in August 2008, followed by the 'Energy Demand Management System' in June 2009. However, energy efficiency in Korea was relatively lower than that of developed countries, due to its energy saving policy in the past which focused on simple restrictions. For stable economic growth, Korea was faced with the urgent condition for GHG reduction and energy demand control at the national level.

The 'Greenhouse Gas Energy Management System' is a system which was mainly practiced by developed European countries in order to set targets for reducing the amount of GHG emissions as well as energy use, or set goals for improving energy efficiency by preparing implementation plans and management systems. It can be divided into Voluntary Agreements (VA), in which a company voluntarily sets the goal and carries out reduction, and 'Negotiated Agreements (NA)', in which a company and the government agree on the goal and grant incentives or penalties through measurement, reporting, and verification of performance. Korea introduced 'Negotiated Agreements' in 1998 to induce the economization of energy in industry. However, in recent times the performance of energy saving has continuously declined due to the passiveness of the goals of participating companies as well as diminished interest. Therefore, the necessity for the introduction of the 'Greenhouse Gas Energy Management System', a type of reinforced VA, was raised to effectively cope with the situation of high oil prices and climate change.

As a result, the Lee administration prepared stipulations for Article 42 (Climate Change Response and Energy Goal Management), Article 44 (Reporting of Greenhouse Gas Emission Amount and Energy Use Amount), and Article 64 (Fines) in the Framework Act on Low Carbon, Green Growth (draft) which was in the process of being enacted at the time. By voting for the 'Energy Demand Management System' at the Meeting for Emergency

Economic Measures in June 2009, the Greenhouse Gas Energy Management System was introduced for each sector. The key point was that VA will be applied for those businesses with an annual energy consumption greater than 20,000 TOE and buildings with consumption greater than 10,000 TOE, in order to strengthen the effectiveness of the VA. Later, the PCGG was requested to formulate implementation measures of the system with relevant authorities. Following the passing of the 'Framework Act on Low Carbon, Green Growth' by the National Assembly in December 2009, they prepared an enforcement ordinance and developed the institutional basis to enforce the 'Greenhouse Gas Energy Management System'. As the Framework Act on Low-Carbon, Green Growth and the Enforcement Ordinance went into effect in April 2010, the institutional basis was prepared for the full implementation of the Greenhouse Gas Energy Management System in Korea.

With the full enforcement of the 'Greenhouse Gas Energy Management System', about 600 businesses and workplaces, which account for 70% of the total amount of emissions in 2007 of 620 million tons, were included in the control target and managed by the 'Greenhouse Gas Energy Management System', which enabled the systematic control of 70% of the GHG emissions in Korea and the pursuit of efficient energy saving and GHG reduction. Currently, only 27 EU member countries which have joined the EU-Emission Trading System (EU-ETS) have systematic control of the world's GHG sources. Japan, the US, and Australia are working to systematically manage GHGs through the enactment of climate change response measures, but the process has been delayed due to political and economic problems. GHG controls utilizing existing environmental ordinances also had little effect. In the case of Japan, the 'Greenhouse Gas Emission Reporting System' was in effect, and a demonstration ETS was in operation through the voluntary participation of businesses. Moreover, the US has been enforcing the 'Mandatory Reporting Rule' since 2010. Thus, the 'Greenhouse Gas Energy Management System' introduced by the Lee administration was evaluated globally as an exemplary initiative, and was recognized once again by

international society a model in green leadership. The system stimulated the voluntary will of businesses, rather than the simple enforcement of restrictions, which promoted effective GHG reduction in the industry and generation sectors. The system also promoted the preparation for the future initiative market environment envisioning future-oriented green growth allowing businesses to strengthen their future competitiveness. Subsequently, it is anticipated that the effect of low carbon green growth will be realized in order to balance energy reductions of GHG and national economic development in line with the nation's status as a member country of the OECD and G20, along with the settlement of the system.

4. Management of the Greenhouse Gas Inventory with the Installation of the Greenhouse Gas Inventory & Research Center (GIR)

There has been an increased need for independence and professional competence in the systemization of dispersed GHG information as well as the support for the setting of GHG reduction goals in order to achieve these goals and smoothly implement the policies related to low carbon green growth. Consequently, President Lee Myung-bak ordered the development of an independent, permanent research system. With the active enforcement of the 'Framework Act on Low-Carbon Green Growth', a legal foundation was prepared to establish an organization as the think-tank of global GHG reduction for low-carbon green growth. The Greenhouse Gas Inventory & Research Center of Korea (GIR) was founded based on Article 35 of the 'Framework Act on Low-Carbon Green Growth Enforcement Ordinance'. The PCGG then launched a task force team for the GIR in April 2010 jointly with the Ministry of Environment, and officially founded the center in June 2010. Regarding the constitution of the organization, the number of administrative staff was minimized for the professionalism and independence of the center, and consisted of researchers and staff dispatched from related organizations.

<Major Functions of the Greenhouse Gas Inventory & Research Center (GIR)>

- Analysis & setting of GHG gas reduction goals for the nation and sectors (jointly with the PCGG)
- Comprehensive information management for national GHG gas statistics per international standard and representation of the center
- Overall management on the detailed information related to the enforcement of the Greenhouse Gas Energy Management System for businesses and public organizations
- Survey and research for the support on GHG reduction in Korea and overseas
- Cooperation with international organizations, groups, and developing countries regarding low carbon green growth

The GIR was significant in that it was equipped with a comprehensive information system related to GHGs for the first time in Korea. In the past, the GIR set yearly goals for 25 businesses in 7 sectors by materializing previously announced, national mid-term GHG reduction goals (30% compared to BAU by 2020), and surveyed and scientifically analyzed 760 reduction technologies and policies to derive optimum goals. In addition, an organizational system was formulated while the regulations for the 'Guideline for the National Greenhouse Gas Measurement, Reporting and Verification (MRV)' were being enacted in February 2011, to develop a national GHG inventory management system. It was first applied in the verification of the 2009 national GHG inventory published in November 2011. In addition, after stable operation of the information system for the 'Greenhouse Gas Energy Management System', a public counseling center was maintained to receive and manage various forms of information electronically, such as through the specifications and implementation plans of the control targets (458 businesses and 736 public organizations), and manage the smooth operation of the system. Besides this, presentations for

the construction of the GHG inventory were held frequently. In addition, the GIR, as the national organization which leads green growth, actively participated in the effort for the response to global climate change. Among Non-Annex I countries in the UNFCCC, the 'Third National Report' was prepared and submitted in the third place according to the convention. A meeting for the writers was also held in order to prepare the 'Fifth Evaluation Report' of the IPCC, which will be published in 2014. Also, in July 2011 approximately 200 individuals with connections to the green growth sector were invited from developing countries to spread the low-carbon green growth vision through the 'Forum for Green Growth in Developing Countries and Analysis of Greenhouse Gas Reductions'. Meanwhile, the 'Greenhouse Gas Inventory & Reduction Model Training Program' was operated for the training of staff from developing countries in the GHG field, expanding the international cooperation network and receiving positive reviews from global society.

5. Enactment of Regulations on the Allocation and Transaction of the Greenhouse Gas Emissions Allowance

With intensified international competition for resources and the discussion on the development of a new climate change system, international pressure on Korea –one of the highest producing countries in terms of GHG - increased. Domestically, when considering the speed of GHG increased and energy intensity, the changing of the economic structure of abundant energy consumption and carbon became an urgent issue. The Lee administration introduced the Greenhouse Gas Emissions Trading Scheme (GHG ETS) as the key tool for low-carbon green growth as a preemptive strategy to convert the crisis of climate change into an opportunity.

The 'GHG ETS' is a system that allows an individual company with a GHG allowance or emission credit to choose either the reduction of GHG,

or purchase of credit by comparing the cost of the GHG reduction and the price of the emission credit in the market. It is one of the most effective means to reduce the cost of GHG reduction in the country itself by applying the market principle. Twenty seven EU countries, which have been operating the GHG ETS since 2005, succeeded in effective GHG reduction without any decrease in industrial competitiveness that some had feared. During the period since 1990 when GDP grew 40%, a decoupling phenomenon resulting in 16% of GHG emission occurred in 2005 when the trading system was enforced. Meanwhile, mandatory ETSs are being implemented in the US and Japan. In the case of the U.S., 10 northeastern states including Connecticut and New York enforced the 'Regional Greenhouse Gas Initiative (RGGI)' which is a cap-and-trade emission scheme. The State of California was planning for a regional ETS in 2012 to reduce emissions by 2% each year with the participation of about 360 businesses. China and India were reviewing demonstration projects for regional emission trading schemes. Australia was resuming the enactment of the ETS scheme to be introduced in 2015.

The Lee administration prepared a bill for the 'Greenhouse Gas Emissions Trading Scheme' and pre-announced bill legislation in November 2010. The government then explained the purpose of the bill and listened to the opinions of the general public by way of several public hearings and discussion meetings with industrial associations, such as steel and oil companies and major enterprises. In addition, they carefully listened to the opinions of industries regarding cost burdens due to its nature as a newly introduced system, and most of their opinions were reflected through the meeting with the vice-ministers and ministers of related authorities and the review of the Regulatory Reform Committee. The bill was thus revised to reflect the opinions of industries, was pre-announced again in March 2011, which was followed by a review made by the Ministry of Government Legislation, approval in the meeting of vice-ministers and Cabinet meeting, and submission to the National Assembly in April 2011. Later, another revised

alternative reflecting various opinions from industries and environmental groups was drawn up at the ‘Special Committee on the Climate Change Response and Green Growth’ based on the government’s draft bill. The bill was passed in February 2012 with the agreement of both the ruling and opposing parties, after which the ‘Greenhouse Gas Emissions Trading Scheme’ was institutionalized by the enactment of the ‘Act on Allocation and Trading of Greenhouse Gas Emissions Allowances’ at the regular session of the National Assembly in May 2012. This act will take effect from 2015.

In the legislation process of the ‘Greenhouse Gas Emissions Trading Scheme’, the Lee administration did its utmost to find an agreement between the prevention of competitiveness of Korean industries by the introduction of the system and securing the effectiveness of the system. Considering the competitiveness of industry and market stability, more than 95% was allocated for free during the 1st and 2nd planning periods, and a basis for the free allocation was prepared for businesses that are sensitive to the international competition. Participation of a third party in the market can be restricted within 6 years from 2015. To secure effectiveness of the system, opinions from the industries and environmental groups were fully gathered and reflected, such as imposing fines for those who cancel each other and approving an emissions allowance in fraudulent or wrongful ways.

<GHG Emissions Quotas & Laws Relating to Emissions Trading (Total of 8 Chapters, 42 Provisions)>

| Item | Major Contents |
|--|---|
| Chapter 1 General Rules | <ul style="list-style-type: none"> ■ Purpose, definition, and basic principles |
| Chapter 2 Establishment of Basic Plans for an Emissions Trading Scheme | <ul style="list-style-type: none"> ■ Establishment of basic plans for an emissions trading scheme ■ Establishment of allocation plans for national emissions allowance ■ Installation of emission allowance allocation committee |

| Item | Major Contents |
|--|--|
| Chapter 3 Designation of Parties and Allocation of Emissions Allowance | <ul style="list-style-type: none"> ■ Designation of parties ■ Exclusion of target management system ■ Allocation of emissions allowance and determination of free allocation ratio ■ Approval of early reduction performance ■ Adjustment and cancellation of emissions allowance |
| Chapter 4 Transaction of Emissions Allowance | <ul style="list-style-type: none"> ■ Transaction of emissions allowance and registration of the transaction account for emissions allowance ■ Reporting emissions allowance transactions ■ Transaction offices for emissions allowance ■ Stabilization of emissions allowance market |
| Chapter 5 Reporting, Verification, and Certification of Emission Quotas | <ul style="list-style-type: none"> ■ Reporting and verification of emissions quotas ■ Certification of emissions quotas |
| Chapter 6 Submission, Carry-Over, Borrowing, Offset and Expiration of Emissions Allowance | <ul style="list-style-type: none"> ■ Submission of emissions allowance ■ Carry-over and borrowing emissions allowance ■ Offset and certification of greenhouse gas reduction by external project ■ Expiration of emissions allowance ■ Fines |
| Chapter 7 Supplementary Rules | <ul style="list-style-type: none"> ■ Financial support and tax relief ■ Relations with international carbon market ■ Survey, claims and fees |
| Chapter 8 Fines | <ul style="list-style-type: none"> ■ Penalties and fines |
| Supplementary Provisions | <ul style="list-style-type: none"> ■ Exception during the 1st planning period and free allocation ratio ■ Exception on the registration for emissions allowance transaction account ■ Exception on emissions allowance carry-over |

The legislation of the Lee administration of the 'Greenhouse Gas Emissions Trading Scheme' among polices regarding green growth vision received much international attention. No other nations have ever worked in such a drastic and initiative way as Korea has. In particular, as a result of the 17 the UN Framework Convention Climate Change Conference of the

Parties (COP17) in December 2011, all parties agreed to develop a new mandatory reduction system beginning in 2020. Korea has secured an initiative footing in the international negotiation on climate change since 2012 through the introduction of 'Greenhouse Gas Emissions Trading Scheme' on a national level.

6. Development of an Institutional Basis through Enactment by Field

Some examples of the development of an institutional basis for low carbon green growth strategy by the Lee administration include the 'Framework Act on Low-Carbon, Green Growth' and the 'Act on Allocation and Trading of Greenhouse Gas Emissions Allowances'. In addition, they spared no efforts on the enactment of policies to materialize the low-carbon green growth strategies of major fields. The 'Sustainable Transportation Logistics Development Act', enacted in June 2009, 'The Act on the Creation and Facilitation of the Use of Smart Grids', enacted in May 2011, and the 'Construction Support Act for Green Buildings', enacted in February 2012, were the results of the efforts for the institutionalization of green growth strategies.

(1) Sustainable Transportation Logistics Development Act

In the past, the policy for transportation logistics considered improving mobility and accessibility for passengers and cargo to solve traffic congestion due to the rapid increase in demand for transportation. However, the Lee administration wanted to adjust the policy to focus more on sustainability, in order to cope with domestic and foreign conditions such as the energy crisis, increased environmental pollution and damage, and agreements on climate change. If the sustainability of the transportation logistics were to be ignored, the social cost would sharply increase and the

national competitiveness would be weakened due to weighted international pressure on GHG gas reduction. Korea has a high rate of energy dependency, and the cost of energy imported in 2006 amounted to 85.6 billion dollars, which accounted for 27.7% of total import expenditure. Therefore, there was a need to reduce the social cost by making the chronic transportation logistics system greener and highly energy efficient. The total social cost related to transportation in Korea, including environmental costs, was about 66.3 trillion Won in 2006, which corresponds to 8.2% of the GDP. This value was much higher than those compared to the UK (4.7%) and France (5.6%) in the same period, and securing sustainability through green transportation logistics was essential for improving national competitiveness. As the unique characteristics of transportation logistics accompanying the changes in people's lifestyles and economic activity requires a long period of time for the system to change, the preparation of a legal and institutional device was urgently needed to convert the national transportation system into a political paradigm that is environmentally friendly, energy-saving, and sustainable. Thus, the Lee administration operated a task force made up of experts in sustainable transportation logistics and conducted studies on policies beginning in May 2007 after going through reviews of both enactment feasibility and of the draft bill since March 2007. In August and September 2007, the implementation plans of the legislation were reflected in the 'National Transportation Network, Modification Plan (draft)' and the 'Forth Comprehensive Plan on Combating Climate Change (draft)'. Following this, agreements were made with relevant authorities and the draft bill was submitted to the National Assembly. Consequently, the 'Sustainable Transportation Logistics Development Act' was enacted in June 2009 and has been in effect since December 2009.

Through the legislation of the 'Sustainable Transportation Logistics Development Act', a development and management system for the GHG emission coefficient in the transportation logistics sector was drawn up, and incentives were granted for voluntary reductions within the regional cap for

automobile traffic. Automobile operation could be restricted if needed, and the establishment and implementation of the transportation sharing goal were mandatory in special countermeasure areas. The basis for economic incentives and the administrative order was prepared to promote a modal shift to other means of transportation, and a legal foundation for the implementation of a green transportation policy was prepared to promote the dissemination and use of public transportation, such as a priority pass for public transportation and support for outstanding businesses, as well as to stimulate the use of bicycles and encourage people to walk more.

The success of green transportation policies will achieve synergy effects such as enabling Korea take a step forward in become one of the four major producing nations of green cars, an environment-friendly industry, as well as the export of high-tech railways and ITS. In addition, effective political links for the vision of low-carbon green growth will be promoted. In addition, a preemptive response to high oil prices and the energy crisis can be effectively made through the conversion to an energy-saving transportation logistics system. Furthermore, the ever increasing international burden concerning the obligation of making reductions in the transportation sector can be prepared in advance to produce an initiative for international negotiations on climate change. In this context, the 'Sustainable Transportation Logistics Development Act' is expected to promote a transformation in the big picture of low-carbon green transportation logistics.

(2) Act on the Creation and Facilitation of the Use of Smart Grids

In recent years, the paradigm of the power industry transforming together with the acceleration of the fusion from lower prices and expansion of power supplies to the supply of clean energy sources, enhancement of energy efficiency, and consumer participation in energy-conservation. However, at the time the legal and institutional bases were not ready to combine power and informational technology at the national level, and

legislation on the system to support the synergy effects of IT and the power industry was also needed. In particular, the amount of energy consumption in global terms was expected to increase 43% by the year 2030 compared to that of 2006 in spite of the worldwide atmosphere oriented toward energy conservation. In Korea, efficient energy consumption was urgently needed as the consumption of electricity, among various energy sources, had been rapidly increasing. Thus, the Lee administration enacted the 'Act on the Creation and Facilitation of Use of Smart Grids', which comprised the vision of low-carbon green growth.

When the intelligent power network is constructed, information on status of electricity usage and electrical voltage is able to be provided in real time to suppliers and consumers, which can induce spontaneous energy-conservation and enable the distribution of power demand to be shifted to the time frame in which the rate is lower. Suppliers can utilize power more efficiently by producing the energy sufficient for meeting demand through accurate measurement. In particular, there is a need to expand the supply of clean energy sources such as new and renewable energy, electric cars, environment-friendly transportation and home appliances as Korea's GHG emissions account for 1.6 times that of the average of OECD nations. In order to vitalize the supply of new and renewable energy, the development of a smart control system was essential to freely link power grids to new and renewable energy, which will have a frequent variation in output. The amount of power generated by new and renewable energy is difficult to predict unless weather forecasting is 100% accurate, as the generation of power depends on the natural environment such as wind strength and light from the sun. Therefore, large size power storage devices including NAS batteries, capacitors, and fly wheels were needed to supply stable electricity or smart grids were necessary to be installed in order to control the electricity supply in real time.

Korea has been operating both sliding-scale and progressive-stage systems for electric voltage for the purpose of energy conservation, however

power consumption has shown an increasing trend due to its low expense and ease of utilization. In addition, the efficiency of power generation facilities has decreased as a result of the power consumption pattern, concentrated in specific time frames, and the enormous financial investment in the construction of power plants. The construction of smart grids enabled the distribution and control of the demand for power and could fundamentally improve energy efficiency. In particular, as the Kyoto Protocol went into effect for the prevention of global warming, the expansion of new and renewable energy was necessary to cope with the obligatory CO₂ reductions. New and renewable energies such as wind power and solar have irregular power generation rates and need separate devices for quality control. Therefore, the intelligent power grids were necessary to connect new and renewable energy sources to power grids on a large scale.

In Jul 2009, President Lee Myung-bak attended the G8 Summit held in L'Aquila, Italy. During the meeting of the 'Climate Change Session (MEF)', he proposed a 'working group' to solve climate problems, and Barack Obama, the President of the USA along with the co-chairman of the summit adopted it on the spot. Through the meeting, the leaders agreed on the 'seven transformation technologies to change the world' and selected the leading countries for each area. Korea was chosen as the leading country in the smart grid area, and Korea's 'low-carbon, green growth' policy received a great deal of attention with the hope that Korea will play a leading role in the development of technology for the response to climate change. Smart grid was one of the green technology areas which received attention from international society, and Korea took the role of leading the technology in global terms at the same time.

As the International Energy Agency (IEA) predicted that the cost of new investment in the global electricity industry from 2007 to 2030 would be 13.6 trillion dollars, the international smart grid market was expected to grow rapidly. Therefore, there was a need to promote a new growth engine based on green technology which could succeed the semi-conductor and IT

industries in Korea, which were looking for a growth engine in the new technology area. Major developed countries recognized the importance of smart grids as a form of infrastructure for low-carbon green growth, and started to construct the legal and institutional bases along with technology development, standardization and a supply policy. Many laws were enacted such as the 'Energy Independence and Security Act' of the USA in 2007, the Climate and Energy Package of the EU in 2009, and the Green Energy Act of Canada in 2009. In Korea's case, the existing 'Electricity Enterprises Act' was a form of legislation stipulating the items required for the general supply of electricity, and was limited to fostering and promoting the industry combining both electricity and IT, as the scope of its application included only generation, power transmission, distribution, and electricity sales. As a result, the Lee administration pushed forward the enactment of legislation to define required items for the construction of combined infrastructure and creation of new growth engines in the era of climate change by supplementing existing systems and exceeding the boundaries and scope of existing electricity businesses.

In August 2008, the Lee administration announced the vision for low-carbon green growth and established the 'Smart Grid National Road Map' in January 2010 to construct the national smart grid, a world first. The 'Smart Grid National Road Map' announced the vision of constructing the infrastructure for low-carbon green growth through the development of smart power grids, beginning from pilot city and metropolitan areas and extending it nationwide, with the goal of completing the construction of smart grids on the national level by 2030 according to the 'pre-base construction and post spread strategy'. For this purpose, the technology development and business models for each phase in five areas were proposed: 1) Smart Power Grid, 2) Smart Consumer, 3) Smart Transportation, 4) Smart Renewable, and 5) Smart Electricity Service. Measures to foster smart power grids as a strategic export industry were also included in the proposal. In particular, the road map preannounced the enactment of a special law to institutionally

support the development of speedy business models by companies as a new growth engine in the area of power grids.

<Development Strategies by Phase for the Smart Grid National Road Map >

| Phase | Development Strategies and Implementation Policy |
|------------------------|---|
| Phase 1 (2010~2012) | <p><Construction of infrastructure for smart transmission and distribution system></p> <ul style="list-style-type: none"> - Construction of multi-regional monitoring system (WAMS-SIPS) - Construction of digital transformation system in international standards - Feasibility study on the DC distribution system - Basic design and construction of smart distribution system - Construction of infrastructure for smart power grid standards |
| Phase 2 (2013~2020) | <p><Extended application of smart transmission and distribution system and real time operation></p> <ul style="list-style-type: none"> - Construction of multi-regional real time monitoring and control system - Extended application of digital transformation system - Securing DC distribution design and operation technology |
| Phase 3 (2021~2030) | <p><Construction of national level smart transmission and distribution system and construction of integrated energy smart grid></p> <ul style="list-style-type: none"> - Construction of multi-regional system protection and auto restoration system - Development of integrated smart grid equipment including power, gas, water resource, and system development |

The Act on the Creation and Facilitation of Use of Smart Grids' required the establishment and enforcement of the 'smart power grid basic plan' every five years which includes policy goals, technology development and demonstration, supply and dissemination, industry promotion, standardization, information protection, and system improvements. It also enabled the creation of various new industries based on energy information, through the support of the investment cost by smart grid businesses. In addition, a certification system was to be enforced on the smart grid devices

and products to secure stability and interoperability of smart grids. Intensive smart grid areas are designated to enhance the acceptability of the people for smart grids and to disseminate the use of smart grids nationwide. As smart grid is based on IT, devices for the protection of personal information were also prepared to guarantee the stability and reliability of the smart grid information.

The enactment of the 'Act on the Creation and Facilitation of Use of Smart Grids' by the Lee administration exceeded the legislative and political limits related to power defined by the 'Electricity Enterprises Act' which focused on restrictions. It had a significant meaning in that it prepared the institutional basis for the stable development of national fusion energy infrastructure and systematic development of related industries which were essential for the realization of low carbon green growth. Along with the relief of uncertainty regarding the future as well as the alignment of the implementation system by the enactment of the act, even momentum was reinforced for the investment of companies in technologies and businesses related to smart grids. There was a visible increase of investment by enterprises in order to establish an advanced position in the world market in the promising new growth engine area, as the foundation for business registration, investment support, and certification for smart grids were prepared.

(3) Construction Support Act for Green Buildings (motioned by the assemblymen)

The Framework Act on Low Carbon, Green Growth, which was enacted in December 2009, stipulated the implementation of policy to expand 'green buildings.' However, matters related to energy of buildings were stipulated in the Energy Use Rationalization Act and matters related to environment-friendly buildings were partially stipulated in the Building Act, and they have been separately handled by individual policy. In addition,

other various systems such as the Environment-friendly Certification, Housing Performance Rating Indication System, Energy Efficiency Rating, and Environment-friendly Housing Construction Standard were being operated by individual laws regarding green buildings, including the Building Act, Housing Act, Energy Use Rationalization Act, and the Act on the Promotion of The Development, Use and Diffusion of New and Renewable Energy, which increase the social cost. Hence, there was a need to prepare specialized legislation for the effective implementation and systematic operation of the green building revitalization as a new paradigm in the realization of the low-carbon green growth policy.

Some of the biggest problems with the existing regulations related to green buildings were performance specifications that were remarkably lower than that of foreign standards and various government-led certification systems which were not legally binding or effective. Representative systems that support the construction of green buildings include the Environment-friendly Building Certification by the Building Act, the Housing Performance Rating Indication System by Housing Act, and the Greenhouse Gas Energy Management System that became effective from April 2010 based on the 'Framework Act on Low Carbon, Green Growth'. In the case of 'Environment-friendly Building Certification,' it was expanding its application to public buildings but there were relatively few criteria on energy and carbon emission. The Housing Performance Rating Indication System or Energy Efficiency Rating did not provide much benefit to businesses and users. Therefore, there was a limitation in expectations regarding the general expansion of green buildings with those systems. Further, the management of existing housings and commercial buildings which account for the majority of buildings rather than just a few large buildings, and enticement measures were insufficient conditions.

In Korea's case, the construction sector accounted for 1/4 of total domestic GHG emissions, In response to this, the Lee administration prepared an institutional policy for the reduction of GHG emissions from buildings

and the spread of green buildings to realize low carbon green growth. There was a need for legislation that stipulated the establishment of building energy and a GHG information system, green building certification, designation of green building centers, setting total energy consumption quotas, introducing an energy consumption certification system, and training professionals in the green building area.

In response to the enactment process by the government, the Construction Support Act for Green Buildings which was jointly motioned by 10 assemblymen including Mr. Gi-hyun Kim of the Land, Transport and Maritime Affairs Committee, was passed by the National Assembly in a regular session held in December 2011, enabling the legislation of the law. In February 2012, the Lee administration promulgated the enactment of the Construction Support Act for Green Buildings, and the legislation prepared subordinate laws including an enforcement ordinance and enforcement regulations over a one year period, which will become effective as of February 2013. Thus, the requirements for the construction of green buildings were stipulated at national level and a comprehensive and systematic legislation was prepared for the reduction of GHG emissions from buildings and the spread of green buildings. President Lee Myung-bak ordered the concentration of all administrative efforts on supporting the construction of green buildings, including the early adoption of enforcement ordinances, the enhanced allocation of the budget, and the building up of necessary institutional infrastructure.

Chapter 3 | From Brown Growth to Green Growth, the Implementation of Green Growth Policy

Section 1: Energy Policy for Green Growth

Environmental restrictions among countries are rapidly increasing with the efforts of international society in reducing greenhouse gases (GHGs) in response to climate change. In addition, each nation is fiercely competing to secure energy resources as a national strategy to survive. The preparation of a solution for coping with the ultimate depletion of energy resources and the development of new and renewable energy has risen as the top priority task for all nations. In particular, the international oil price has reached an all-time high nearing 140 dollars per barrel with the sudden increase of oil demand by newly emerging nations, and the oil price is not expected to decline in the near future. Korea is a resource-poor country with 96% of its energy dependent on the import of foreign energy and is one of the ten biggest energy consumers in the world, as well as the 10th largest CO₂ emission country. Thus, there was an urgent need for a new paradigm and continuous innovation for the national energy policy to effectively cope with changes of global energy environment and to secure sustainable economic growth.

1. A Switch to a Low Energy Consuming and Highly Efficient Society

Korea is a large energy-consuming country with a total energy consumption of 271 million TOE in 2011 (TOE: Ton of Oil Equivalent, applied to all kinds of energy including oil, gas, and electricity, equivalent to the calories in 1 ton of crude oil. One TOE is defined as 107kcal). In terms of energy sources, petroleum accounts for the highest portion at 38.7%, followed

by coal at 29.3%, LNG 17.2%, and atomic energy at 11.9%. The importance placed on petroleum is steadily decreasing due to the policy of diversifying energy sources such as natural gas and extend atomic energy, however it is still used as the main source of energy. The import of energy imposes a large burden on the national economy as high oil price around \$100 per barrel continues on with the unstable political situation in the Middle East and the tight supply and demand situation.

With the timely background of the energy environment, the Lee administration proposed 'Low Carbon, Green Growth' as a new paradigm for national development in August 2008, while establishing Korea's 'National Energy Master Plan' at the same time. The administration announced a vision for the long term energy policy to support green growth and prepare for the energy demand of the future generation and the 'post-petroleum era.' The 'Low Carbon, Green Growth' policy has three pillars, energy security, energy efficiency, and environmental protection. It has the objective of realizing the vision of transforming to a low energy-consuming, energy-independent society, and converting to a non-petroleum society. As a long term strategy in the aspect of demand, great effort was made to restrain the national energy demand as much as possible by the improved energy efficiency through technology development and facility investment, and also by maximizing energy-saving in the demand sector. The key goal in the demand sector was to improve energy intensity (TOE/ 1,000 USD value-added) comparable to that of developed countries by enhancing energy efficiency up to 46% by 2030. The long term strategy with respect to supply was to constitute the optimum energy mix by considering energy security, cost efficiency, and the effect on the environment. As for the political goal, the administration attempted to reduce the portion of fossil energy from the level of 83% in 2007 to 61% by 2030, and to gradually increase the portion of low-carbon energy including new and renewable energy (from 2.4% to 11%) and atomic energy (from 8% to 14.9%).

As the price of oil skyrocketed more than two-fold (from the average

price of 68.43 USD/barrel to a record high of 140.7 USD/barrel on July 4, 2008) continued due to unstable conditions, a reduced production policy of oil-producing countries, and the inflow of speculation funds, the government established measures to manage energy demand at a governmental level in June 2009. In particular, the administrative organization was extensively reinforced by establishing an 'Energy Efficiency Bureau' in June 2009 within the Ministry of Knowledge Economy, which is in charge of energy policy. This provided an opportunity to reinforce the existing system for a better management of energy demand and supply by establishing measures through its constant monitoring and analysis, followed by reporting at a meeting of Cabinet. Major projects included the introduction of the 'Energy Management System,' extended support for investment in energy-saving facilities by small and medium-sized enterprises, stricter taxation on low energy-efficient products, the replacement of lighting in public buildings with LEDs, and the obligated use of first-class energy-efficient products.

With the rapid change of power demand and the product market environment such as the sharp increase in power usage at homes and the appearance of new high energy-consuming, IT-integrated, the targeted products and standards of the efficiency management system became more stringent through the 'Comprehensive Measures for Energy Efficiency Improvements of Electronic Products' in September 2011. In particular, for major home appliances such as TVs and washing machines, a new 'energy frontier system' was prepared to assign the midterm goals for efficiency improvement. Also, with the purpose of suppressing seasonal power peaks, the Energy Efficiency Grading System and Minimum Energy Efficiency Standards were applied to electric heaters and electric heat pumps (EHP), thereby intensively managing the efficiency of high energy-consuming appliances. It is a fact that the biggest amount of electricity is used in industrial sites rather than in homes. In the current situation where the completion of power plants according to the Basic Plan for Electricity Supply and Demand are being delayed, the expansion of power-consuming facilities

in steel business and the wide spread of heating and cooling systems are aggravating the status of power supply. Therefore, energy-saving plans were prepared to preemptively cope with the power crisis in November 2011. Energy use by large enterprises was restricted during the peak hours, the use of low-efficiency electric products was restrained, and energy-saving in general homes were encouraged through a new nationwide program (i.e., a contest of selecting 10,000 exemplary energy-saving households).

(1) Innovation of the Energy Demand System by Sector

The Lee administration promoted the innovation of the energy demand system by each sector, including industry, buildings, energy consumption facilities, and electronic devices, while implementing energy demand and management measures. In the industry sector, large energy-consuming enterprises were intensively managed and investment on energy-saving facilities was promoted. In the building sector, new construction of highly efficient buildings was encouraged and energy-saving of existing buildings was reinforced. In the sector of energy consumption facilities and electronic devices, efforts were made to advance the efficiency management system in response to peak demand time.

① Industrial sector: Intensive management of large energy-consuming enterprises and promotion of investment in energy-saving facilities

The government drastically reinforced energy demand management through rational restrictions, such as the introduction of the 'Greenhouse-Gas and Energy Management System (GEMS)', as investment in energy-saving is the most effective means to improve productivity. The energy management system was newly introduced and disseminated to support enterprises for systemized energy-saving activities. Also, financial support and incentives were extended for small and medium-sized businesses which lack their own

capabilities.

To improve the aggravated trade balance due to the continued ultra-high oil price and the corporate structure vulnerable to increases in the cost of energy, the 'Demand Management Measures to Cope with the High Price of Oil' was prepared in June 2009, through which the target management system was introduced, focusing on high energy-consuming industries and buildings. It was a system based on the Article 42 of the Framework Act on Low Carbon, Green Growth, by which companies emitting GHGs beyond a certain level set the emission target, after consulting with the government on GHG reduction, energy-saving, and energy use efficiency. Target management for businesses in the industrial and power generation sector were designated firms whose average GHG emissions were greater than 125kt CO₂ and the energy consumption was more than 500 TJ for the past 3-years from 2011, and 382 business sites which exceeded 25kt CO₂ of GHG emission and 100 TJ of energy consumption for the past three years from 2011. The management standards became more stringent each year and the range of target businesses involved was extended. The introduction of the GEMS made it possible to systematically reduce GHGs and energy from high energy-consuming businesses which account for 67% of the national CO₂ emissions, while the improvement of corporate structure was accelerated with the investments in facilities to achieve the reduction goal and efforts to enhance efficiency.

<Target Management Businesses and the Portion of CO₂Emission>

In addition, efforts were made to introduce an advanced Energy Management System (EnMS). The EnMS was a top-down style energy management system involving the promotion of a company-wide energy management for which the CEO includes the energy management target for all highly energy-consuming business sites such as industrial, power generating and large buildings. As a new paradigm for new energy management was spreading centered on advanced countries, ISO50001, the international standard for the EnMS, was established in June 2011. Through this system, energy use could be optimized by the measurement and analysis of energy usage, and the strategy for energy reduction was established to reduce energy costs and enhance efficiency. If the introduction of the EnMS succeeds, companies will be able to properly apply it as a means of improving their energy efficiency, and systematically respond to the effective enforcement of the GEMS and introduction of the GHG Emissions Trading Scheme (ETS). Various support for small and medium-sized enterprises should also be provided in the future for the installation of systems required for the introduction of the EnMS using their own manpower, with the will of CEOs based on the 'Rational Utilization of Energy Act.'

The Lee administration improved the Energy Service Company

(ESCO) system to support the improvements of companies' old energy facilities by turning them into highly efficient facilities. The system effectively improved existing national projects in which the ESCO provides the energy users with the technology and funding for energy saving installation projects and recovers the investment cost from reduced energy at the invested facilities. To energy users investing in energy-saving facilities through the ESCO project, a tax benefit which provides a 10% reduction of the investment amount from the income or corporate tax is granted in accordance with the Tax Reduction and Exemption Control Act (Article 25, Item 2). Furthermore, the administration developed the 'New Shared Savings Contract' which combines the advantages of the 'Guaranteed Savings Contract' and 'Shared Savings Contract,' which have been the main forms of contract, to revitalize the ESCO projects and enforced the system since February 2011. The new contract method entails procuring investment funds for the installation of facilities through the ESCO company's own, private, political or other funds. The amount reduced by facility investment is then distributed to the client (energy user) by the ESCO pursuant to the agreement. When the investment cost is fully recovered by the ESCO, the cost of energy reduction returns to the energy user. If this 'New Shared Savings Contract' becomes wide spread, it is anticipated that the technology as well as the ESCO's profits will increase. Through system improvements, there are 222 ESCOs currently registered, as of May 2012, an increase from four companies in 1992.

Along with the ESCO system, the Lee administration implemented a mandatory energy diagnosis system for companies using a specified level of energy use, to strengthen the support for energy diagnosis of small and medium-sized companies every three or five years. Through this system, companies having difficulty in technology, manpower, and funding for energy-saving are supported with up to 70% of the diagnosis contract amount for the businesses with annual energy usage below 2,000 TOE.

② Transportation Sector: The Supply of High Gas Mileage Vehicles and Development of Infrastructure for Transportation Demand Management

Starting with passenger vehicles in 1998, the gas mileage and grade information of each model are required to be disclosed during the vehicle's advertisement and sale, in order to promote the development of and to encourage the purchase and sales of high-efficiency automobiles according to the Rational Utilization of Energy Act. The Lee administration improved the Automobile Fuel Efficiency and Labeling Program, and the grade system was revised in March 2008 to five grades in a single group from the separate grading method for each group by the amount of exhaust gas emitted. Labeling the amount of CO₂ emissions with gas mileage was also made a requirement. To make the labeling of gas mileage more practical from the perspective of the consumer, testing and labeling methods were improved by reflecting the real-life driving condition such as rapid acceleration and deceleration, driving with the air conditioning on, and driving at low engine temperature. This was done in addition to the current testing, so that the label indicates a similar gas mileage to that of the actual driving conditions. The revised gas mileage labels are to be placed in the rear or side of cars for better recognition.

<Revised Gas Mileage Labels by Grade>



As regulations on gas mileage became more stringent in advanced countries including the US and EU in response to high oil prices and GHG

controls, the Lee administration announced the ‘Automobile Gas Mileage and Greenhouse Gas Control Measures’ and reinforced the Automobile Average Fuel Economy System in July 2009. As a result, the average gas mileage for passenger cars and vans in the market were required to meet 17.0km/ℓ by 2015, and the gas mileage standard was set considering the vehicle’s weight, starting with 30% of cars sold in 2012 and gradually expanding to the goal of 100% in 2015. In addition, the feasibility of the application of the Average Fuel Economy System to medium and large trucks and buses, even though they are fewer than small trucks and yet passenger vehicles consume more gas, was requested to be studied in the future.

At the G8+3 Summit in July 2008, the International Energy Agency (IEA) investigated 25 energy efficiency policy recommendations by sector and urged member countries to implement them. Among which, the supply of high efficiency tires was suggested as a means to increase efficiency in the transportation sector. Thus, the Korean government conducted research including methods for measuring the energy efficiency of tires and determining the grading standards, tire company management, as well as consumer information, and announced regulations in order to introduce the Tire Energy Efficiency Standards. This system became fully effective from the end of 2012 and has been applied to tires mounted on passenger cars and light trucks, either manufactured in Korea or imported from abroad.

It was analyzed that 10-20% of fuel can be conserved with even a simple improvement in driving habits such as maintaining an economical speed (60-80km/hour). Thus, the Lee administration introduced the concept of ‘Eco-Drive,’ which synthesizes the various concepts of environmental friendliness, fuel economy, safety, convenience, driving habits to save energy, car maintenance, road improvements, switching to biking or walking, and the implementation of related systems and measures. The government enacted the Sustainable Transportation Logistics Development Act in June 2009 to prepare legislative foundation to vitalize and support economic

driving. In addition, with the enactment of the First Master Plan for Sustainable Transportation Logistics Development, the government tried to reduce GHGs through drivers' eco-driving. Hence, an Economic Driving Training Center (at the Korea Transportation Safety Authority) was designated in April 2010 to systematically train eco-driving and construct infrastructure, including the development of related training programs and the installation of eco-drive facilities. Also, as a preparation stage for disseminating the driving style to the entire society, demonstration training was conducted for bus drivers in Seoul city. Upon the results of the evaluation, the eco-drive training will be gradually extended.

The transportation system in Korea will be reorganized, centered on green transportation such as public transportation, green cars, biking, and walking by 2020, which will result in an annual reduction of 12 million TOE or 9.2 trillion Won. Thus, a goal was set to reduce GHG emissions to 34 million tons, which accounts for 34% of the 2020 BAU. For this purpose, the construction of the Intelligent Transport System (ITS) which integrates Korea's outstanding IT capabilities is the key project of green transportation. ITS refers to the environment-friendly, next generation transport system which enhances the efficiency of traffic use and punctuality, enabling energy-saving by combining state-of-the-art IT such as electronic, and control, as well as traffic information with transportation means and facilities. Representative examples are as follows: bus arrival information systems at bus stations, traffic signal system automatically switching by the traffic flow at intersections, and High Pass (Korea's electronic toll-collection system). Major elements of technology include enhanced vehicle navigation systems, electronic toll collection systems, and optimized road and traffic management systems. ITS has been applied to about 12% of paved roads in Korea as of 2010, and is continuously being installed on main roads such as the expressway, national highway, and urban roads with the goal of a 25% supply rate by 2020.

In addition, the Lee administration conducted a demonstrative operation of the Bus Rapid Transit (BRT) system from August 2009, to replace owner-driven commuter traffic cars and to expand the infrastructure of public transportation. The BRT, which stops at only four stations within 5km from each terminal, can reduce travel time by 15 minutes on average compared to existing buses, and combines the punctuality/travel speed of rail with the flexibility of the bus at a low cost. Currently, the BRT is operated mainly in Seoul with an approximate service distance of 98km as of 2009, which is expected to be extended to the entire Seoul Metropolitan Area and major cities of the nation with a goal of 768km by 2020. Also, existing transportation and logistics systems centered on roads were converted to green transportation such as railroads and coastal shipping to improve the efficiency of energy use. At the same time, railroads in metropolitan city areas were continuously expanded with more express lines to promote the convenience of travelers.

③ The Construction Sector: Reinforced Energy Conservation Design Standards (Building Energy Code)

Once built, buildings generally stand for a period exceeding 30 years, hence a fundamental energy conservation of the selection of superior energy-saving technology and equipment specified in the Energy Conservation Design Standards based on the Construction Act is critical. Considering the energy consumption characteristics of such buildings, an energy conservation plan is to be submitted in accordance with the Energy Conservation Design Standards for Buildings when applying for the construction permit for buildings that exceed a certain usage type and size. In order to promote the construction of new green buildings, the Lee administration introduced stricter standards for construction. In terms of the design criteria applied to new building permits as of July 2010, the criteria for the insulation of building parts such as windows, external walls, roofs,

and floors was raised by about 20% and the standard required the mandatory installation of energy conservation devices such as a standby power breaking apparatus, shut-off switches, and automatic temperature controls. The demonstration of a Total Building Annual Energy Usage System was introduced to quantitatively estimate the energy performance of buildings using the energy performance evaluation program for new business buildings exceeding 10,000 m² constructed in December 2012. In the future, insulation standards will be gradually reinforced for the zero-energy building requirements of 2025, and stringent standards will be made for the obligatory installation of LED lighting, as well as new and renewable energy facilities. In addition, all buildings with a floor area greater than 500m² are required to submit energy conservation plans to extend the scope of low energy consuming buildings.

Meanwhile, the Energy Efficiency Labeling Program for Buildings was revitalized to promote reasonable energy conservation by the owners or occupants of buildings through the objective evaluation of the energy efficiency level and provision of labels by grade. The item for apartment building energy evaluation is the reduced amount of energy used for heating purposes compared to that of standard housing. For commercial buildings, energy performance is evaluated together with energy demand for heating, cooling, hot water supply, ventilation, and lighting, combined with the generation of carbon dioxide, measured using a five-level grading system. This system is applied voluntarily. Building standards, including the ratio of floor area to site and landscape area were alleviated by up to 12% (depending on the energy efficiency label obtained) in order to promote the application of the system, and incentives such as acquisition and registration tax exemptions were provided.

For the expansion of highly efficient public buildings, the conception of regulations on the Energy Efficiency Labeling Program for Buildings was deemed necessary. Grade 1 building energy efficiency must be obtained for

new office buildings, and grade 2 or higher is required for newly constructed apartment buildings. In the case of office buildings for organizations relocating to the newly established 'Innovative Cities,' a public building landmark project is required for the construction of buildings with exceptional energy conservation characteristics. In April 2012, ten public institutions were selected, one for each area of relocation within the 'Innovative City.'

In addition to new buildings, the institutional basis was also reinforced for the high efficiency of existing buildings. The basis for Green Remodeling was developed to enhance the energy performance of the existing 6.6 million buildings, and much support was provided for the invigoration of the Green Energy Certification System. In June 2010, the scope of the ESCO funded projects was expanded to encompass the insulation work of existing buildings in order to revitalize green remodeling projects. Guidelines and a technical manual were developed for the revitalization of green remodeling, categorized by building use (administration, sales, accommodation, school, apartment and single housing, and mixed use). The application of the Green Energy Certification and Energy Efficiency Labeling programs will be gradually extended to all existing buildings by 2020. In order to encourage the active participation of the private sector, various incentives including reductions in property tax were explored and provided. A feasibility study is planned to explore the possibility of including energy performance documents in the conventional real estate sale process in addition to leasing transaction contract documents so that the energy efficiency can be properly reflected in the market value of properties and residences.

④ Energy Consuming Facilities and the Home Appliance Sector: Advanced Efficiency Management System in Response to Peak Electricity Supply

Advancing the efficiency management system for home appliances and other energy-consuming facilities to cope with peak electricity supply

is an essential factor in constructing the foundation of energy conservation. The Lee administration reinforced the Energy Efficiency Labeling and Standards to allow energy conservation to become a regular part of life. The Energy Efficiency Labeling System is a system designed to assist consumers in easily selecting and purchasing high efficiency, energy-saving products, by making mandatory the labeling of the product's energy consumption efficiency. This is now a compulsory system which has been in effect since 1992, requiring products not meeting the Minimum Energy Performance Standards (MEPS) to be banned from being produced and sold. As electric heating devices have had a greater effect on the electricity peak in recent times, seven items including electric fan heaters, electric stoves, electric pads, electric water mats, electric boards, electric beds, and electric radiators were added to the list of target products for energy efficiency grading requiring the labeling of applicable minimum consumption efficiency standards and cost of energy consumption. In particular, energy cost labeling was required to provide an accurate power consumption indicator for each product, as well as encourage rational use by consumers.

In addition, the electric heat pump (EHP) was re-classified as ineligible for high efficiency certification as it was blamed for contributing to the winter season electricity peak load. Instead, The EHP was transformed into an item for energy efficiency grading which led to the development of technology for a high efficiency EHP and the removal of low efficiency equipment from the market. TVs, which account for 17% of household power consumption, were newly added to the Energy Efficiency Labeling System. Major appliances including washing machines, refrigerators, and electric HVACs were mostly placed in Grade 1, and the intent of the system as well as distinctions between products have weakened. Therefore, the portion of Grade 1 will be gradually reduced to 10% to encourage the competitive performance of a product to obtain a high energy efficiency label and standard. Incandescent lamps have a low level of efficiency, and the criteria

for their minimum consumption efficiency were adjusted to the status of 'non production,' and as such products will be phased out of the market by 2013.

The electronics industry showed a trend toward placing more focus on the development of short-term technology in order to merely satisfy the efficiency standards set by the government, and did not have the intention of actively investing in technological innovation for more essential efficiency improvements from a relatively future-oriented perspective. As a result, the Lee administration introduced the 'Energy Frontier Program,' which provides mid- to long-term energy efficiency goals, as well as incentives for goals achieved within a certain period. In January 2012, four products including TVs, refrigerators, air conditioners, and washing machines were selected as priority target items for the program, due to the fact that they possess excellent technology and world-class energy efficiency. As the basic goal of the program, an energy efficiency that is 30-50% higher than the current Grade 1 level was set for every three years, and products meeting or exceeding the efficiency goal within the period were granted certification marks, which were intended to promote the manufacturers' technological innovation for energy reduction.

According to Standby Korea 2010, a national roadmap established in July 2005, the 1W policy has been implemented in phases for major appliances based on the Energy Utilization Act and the Standby Energy Reduction Program. Accordingly, the Lee administration first implemented the Standby Power Warning Label program in August 2008 for the TVs, among other home appliances, chosen for the program which at that time included TVs, computers, VTRs, and microwaves. If a product is selected as an item with the Standby Power Warning Label, the manufacturer or importer must report the standby power, and if the product does not meet the standard, a warning label must be attached. As a voluntary measure to reduce power consumption in the public sector, the purchase of products with a standby power lower than 1W becomes a top priority in the case where office and electronic equipment has been newly purchased or replaced

according to the Regulation on Standby Power Reduction Program. Following, in July 2012, the standard for the standby power of computers was improved. Also, a Typical Energy Consumption (TEC) standard was introduced, which converts the consumed power measured in each standby mode (idle mode, sleep mode, and off mode) to an estimated amount (kWh), which is designed as the 'standard annual power consumption.' In addition to the existing standby mode, international measuring methods such as the 'on-mode' measurement were newly introduced to the standby power reduction standard. On the other hand, the off mode standard for monitors became more stringent (from 1W to 0.5W), for the purpose of promoting the efficient usage of power for PCs and peripherals which are being increasingly used in daily life.

For the technological innovation market and creation of high energy efficiency devices, public institutions were requested to take the initiative in purchasing high efficiency products. According to the Regulation on the Implementation of Rational Energy Utilization by Public Institutions, public institutions were obligated to use high efficiency energy materials, and the purchase of high efficiency certified products was deemed a priority in terms of procurement purchases according to the Operating Standards for the Purchase of Energy Consuming Products from August 2009 (Public Procurement Service, Instruction No.1467). In cases where investments were made for energy conservation facilities using certified products made from materials with high efficiency, tax benefits were provided allowing 10% of the investment cost to be deducted from income or corporate tax. Certification standards were drawn up in considering the characteristics of energy consumption of products. Further, High Efficiency Certification Sunset System was introduced, which determines maintenance, removal, and effective management of the system after a certain period of time, to improve the effectiveness of high efficiency equipment certification.

(2) Power Conservation Measures for a Stable Power Supply

In response to the large-scale power outage that occurred on September 15, 2011, which was due to abnormal weather conditions, the Lee administration established powerful Measures for Stable Power Supply to restrain electricity demand during the summer and winter peak hours in the future. Accordingly, some 14,000 large-scale electricity users exceeding 1,000kW in usage were obligated to reduce their consumption by 10% compared with the same period of the previous year during designated peak hours, in order to lower demand at the power peak. Companies that reduce their consumption by more than 20% during the designated daytime hours are granted incentives depending on the performance with the daytime allocation system. In addition, the electric billing system was revised, and a differentiated fare system was introduced to curb the power peak according to the price signal. Action plans for energy conservation and public relations activities for the voluntary participation of citizens were implemented to limit energy usage, such as maintaining recommended temperature inside buildings and minimizing the use of unnecessary lighting, such as those used for advertising purposes. In response to the government's Measures for Stable Power Supply, a Social Agreement on Power Conservation in Economic Businesses was made in November 2011 by 12 industrial groups, including steel, IT, machines, non-ferrous metals, petrochemicals, petroleum, cement, paper manufacturing, vehicles, franchises, department stores, and chain stores, as well as the representatives of civic groups.

<Main Details of the 2011 Winter Energy Conservation Measures>

- Restriction of energy use, such as control of heating temperature
 - Restriction on heating temperature to 20°C or lower for 47,000 buildings with high energy consumption
 - Prohibition of the use of neon signs during peak hours, from 17:00 to 19:00

- Extension of the subway interval time by 1-3 min between 10:00 am and 12:00pm in the Seoul Metropolitan area to an extent that inconvenience is not caused to the general public
 - Intensified restrictions on false, exaggerated advertising for electric heat fans, electric stoves, and products of high energy consumption
- Constant demand management
- Adjustment of production hours of industrial enterprises, adjustment of heating & lighting and HVAC operation hours
 - Extended use of car generators and continuous power demand management
- Construction of energy conservation infrastructure
- Prompt power prediction and dissemination of the information to the public, along with the status of power supply and action plans during peak hours
 - Installation of power status indicators in areas of high transportation movement such as major airports, KTX (railway) stations, subway stations, and bus terminals. Enhance citizens' awareness of power conservation through the development of a bidirectional portal site for the enhanced participation of the general public
 - Public relations on the necessity of energy conservation and action plans using traditional media and social networking service (SNS). Customized education on energy conservation targeting elementary, middle, and high school students.
- Voluntary power conservation movement
- Voluntary pledge to save 5% or more in energy per year through social agreements with economic groups and industrial associations
 - Proliferation of a voluntary energy conservation movement with civic groups, such as the operation of energy conservation surveillance groups

<Main Details of the 2012 Summer Energy Conservation Measures>

- Restriction of air conditioning temperature in large buildings, and the sequential operation of air conditioning
 - Restriction of air conditioning temperature to 26°C or less in large buildings including department stores, hotels, and commercial buildings during peak hours between 14:00 and 17:00
 - Recommending sequential operation of air conditioning in large buildings and business sites (with 2,000 TOE or greater) for each region during peak hours
- Voluntary power conservation movement for multi-purpose facilities consuming large amounts of energy
 - Concluding social agreements with the association of each industry to practice energy conservation in multi-purpose facilities with heavy air-conditioning, carrying out inspections on the fulfillment of agreements and follow-up actions (disclose to the public examples of wasting energy)
- Leading the energy conservation movement in the public sector
 - Implement 5% electricity saving in 19,000 public institutions including central administrative agencies, local municipalities, education offices, and national & public schools
 - Movement of wearing energy-saving clothing by public officials, wearing light clothes while avoiding neck ties, and extension of such movement nationwide
 - Spread energy conservation through the 'Energy Conservation Center' under the guidance of municipalities and civic groups (formation of task forces for energy-saving of 16 major cities and provinces; 228 small cities, provincial districts, and municipal districts)

- Continual nationwide energy conservation campaigns
 - Construct policy networks through civic groups such as the launching of the '2012 Summer Energy Conservation National Conference'
 - Set and practice voluntary energy conservation goals in homes and at companies, and form national consensus by spreading outstanding examples of power conservation and action plans – Power prediction and real time notification on the status of power during peak hours
- Improvement of energy efficiency
 - Increase the efficiency standards for cooling appliances such as 'kimchi' refrigerators, air conditioners, commercial refrigerators, and refrigerated display stands
 - Spread and support high capacity energy storage systems to alleviate power peak, and enhance the efficiency of power usage

2. The Key to Green Growth: Industrialization and Dissemination of New and Renewable Energy

The importance of new and renewable energy is becoming more evident as not only a sustainable source of energy which procures energy security and combats climate change, but also as the next generation growth engine leading the advancement of 'Low Carbon, Green Growth.' As the first round of commitments (2008-2012) of the Kyoto Protocol is poised to end, advanced countries are actively seeking various response measures such as energy conservation, improvements in energy efficiency, carbon capture and storage, and the dissemination of new and renewable energy together with the preparation of cost-effective alternatives appropriate for each country, to

implement the commitments for reducing GHG. Even though Korea is a non-annex 1 country according to the Kyoto Protocol, it announced a voluntary 30% reduction in GHG compared to the BAU scenario by 2020, presenting itself as a global model for green growth. One of the areas gaining much attention for the implementation of compulsory reductions is the expansion and supply of new and renewable energy. Thus, the Lee administration designated the development of new and renewable energies as the core area for coping with climate change, and spared no effort in terms of investment and support.

*(1) Development and Supply of New & Renewable Forms of Energy,
Industrialization of Growth Engines*

With the advent of the environmental economic era including the introduction of the EU's ETS in January 2005, and the coming into effect of the Kyoto Protocol, the importance of new and renewable forms of clean energy has resurfaced. As many nations have expanded their supply of new and renewable energies in response to the changes in energy conditions, the new and renewable energy market is rapidly growing and emerging as a strategic new growth industry.

In response, the Lee administration planned to build a mass dissemination system based on the new and renewable energy sources which have high dissemination efficiency rates as compared to investment, such as new and renewable energy, bio energy, and marine energy which are expected to secure economy through prompt commercialization. To reach such objective, the strategic R&D for those areas with high industrial ripple effects and potential marketability, such as solar power, wind power, and hydro fuel cells, as well as continued governmental support for export and industrialization, establishing measures for cultivating next generation new

growth engines,

The Lee administration, according to the 'Third Master Plan for National Energy,' established the sub-master plan, the 'Third Master Plan for the Development, Use, and Supply of New and Renewable Energy Technology' in January 2009. In the 'Third Master Plan for New and Renewable Energy,' the policy vision was to realize the sustainable energy system based on new and renewable energy, with the sub-goal to extend the supply rate of new and renewable energy to 4.3% by 2015 against 2.4% of the current primary energy in 2007, to 6.1% by 2020, and to 11% by 2030. Along with the quantitative goal, qualitative growth was promoted to enhance the technology level in the new growth engine from 70% that of advanced countries in 2006 to a comparable level with advanced countries by 2030. To achieve this goal according to the master plan, strategic R&D will be strengthened focused on solar light, wind power, fuel cell, Integrated Gasification Combined Cycle (IGCC), and bioenergy. Also, leaping as a technology leader in the global market through the promotion of industrialization of those technologies and export industries, and the promotion of transfer to a green economy through the construction of infrastructure for new and renewable energy supply was to be implemented as the basic strategy. Major technologies in the key areas including fuel cell, wind power, and solar light were planned to be carried out as project-type technology development businesses for the early commercialization of new and renewable energy technology and procurement of market competitiveness. In the meantime, the commercialization evaluation project will be continuously extended to secure supply, commercialization, and connectivity with other related technologies.

(2) Measures to Achieve Policy Objective: Strategic Promotion Through System Reorganization, Selection and Concentration

For conversion to a green energy structure, the role of new and renewable energy has been extended to provide an effective means for responding to international environmental regulations such as the World Summit on Sustainable Development (WSSD), UN Framework Convention on Climate Change (UNFCCC), and the Kyoto Protocol. A new plan was also proposed to reduce the project cost by implementing a large-scale new and renewable energy project in connection with the clean development mechanism (CDM) which is one of the 'Kyoto mechanisms' in the Kyoto Protocol. Above all, the Lee administration expanded the budget for new and renewable energy and strengthened the support for bioenergy, ocean energy, and waste energy which are more effective over budget. The new and renewable energy areas with a big potential for industrialization in the future was explored and promoted for commercialization, and efforts were made to vitalize private participation in connection with clean projects. Technology development can be accelerated in the beginning stage under the direction of the government, but the ultimate goal was to induce free competition of the industry to induce the price of new and renewable energy to operate under the market mechanism in the long run. For this purpose, an institutional basis was prepared to disseminate new and renewable energy, institutions to reinforce market functions were implemented, and policies for the formation of an infrastructure for the conversion to a green economy were set, as well as those for the international standardization of new and renewable energy.

To achieve this goal, the Renewable Portfolio Standard (RPS) was introduced to promote the supply and dissemination of new and renewable energy which does not have price competitiveness, and energy businesses were required to supply certain ratio of new and renewable energy which will contribute to the supply and extension of the new and renewable energy. In addition, to induce free competition of the industry and price competitiveness of new and renewable energy, the transaction of the Renewable Energy Certificates (RECs) was revitalized. Also, the ratio of

obligatory use of new and renewable energy for new or renovated public buildings will be gradually extended, while incentives will be granted for private buildings for actively using new and renewable energy.

The Lee administration wanted to nurture a new growth industry through strategically supporting ten resource technologies focused on the key areas having big ripple effects for the industry, such as solar light, wind power, and hydrogen fuel cell to achieve the policy objective of making new and renewable energy 11% of the total energy supply by 2030. Through the strengthened support for R&D in strategic areas, the administration plans to enhance the level of technology to that of advanced countries by 2030, expand the industrial infrastructure through the domestic production of eight core parts and equipment, and secure in advance the economic efficiency of new and renewable energy by highly efficient, low cost technology. Most of all, active participation of conglomerates with capital and enterprises with technology were induced to actively advance into the global market with governmental support based on the accumulated technologies in the semiconductor and mechanical fields. In the long run, the supply of new and renewable energy was required by mass production which aimed for cost reduction of new and renewable energy. Considering the fact that the price of new and renewable energy is still high, a gradual advance to the mainstream market was promoted, while attacking the niche market as a midterm solution.

In addition, the effective connection between R&D and the industrialization of energy resources was implemented with the construction of local innovative infrastructure projects which were promoted by the municipalities. This was to develop, supply, and consume the energy and resources appropriate for the local area. In other words, it aimed for constructing a self-sufficient, sustainable energy supply system by producing and consuming energy in the area. In this context, the effect can be maximized by combining with the Regional Innovation Cluster Projects which are recently taking place by metropolitan cities.

3. A Practical Alternative form of Clean Energy: The Expansion of Nuclear Energy and its Export)

Nuclear power generation is regarded as the most practical alternative to actively cope with the era of new high oil prices and GHG reduction. Nuclear energy is thought as the core means for a stable power supply as it has a high supply stability, is economical, and emits little GHG. Even though there have been voices of concern about the risk of nuclear power after the Fukushima accident, currently, it is the best alternative for fossil fuels for major advanced countries which require stable power supply. Nuclear power is recognized as the 'bridge energy' to fill the gap between existing carbon energy which emits GHGs and new and renewable energy which is not economical yet.

With the lack of natural resources, Korea depends on energy import for more than 96% of its domestically consumed energy and has actively implemented the policy to develop non-petroleum power supply, focused on nuclear power after experiencing two severe oil crises in the 1970s. As a result, nuclear power facilities were increased each year, starting with the operation of Gori No. 1 Nuclear Power Plant in 1978. Nuclear power has played an important role in Korea's power supply, and despite its short history, much development has been made in the construction and operation of nuclear power plants.

<Ratio of Primary Energy Composition in 2010>

| Item | Nuclear Power | Coal | Oil | LNG | Hydroelectric Power | New & Renewable Energy |
|------|---------------|------|------|------|---------------------|------------------------|
| % | 12.2 | 29.2 | 40.0 | 15.7 | 0.5 | 2.4 |

In the case of Korea, nuclear energy among the energy mix accounts for 12.2% of the primary energy composition as of 2010, and nuclear power generation accounts for 31.3% based on the amount of generation, and 23.6% based on the facility capacity. In the National Master Plan for National Energy in August 2008, the weight of nuclear power generation, which has almost no CO₂ emission, was decided to be extended to 41% in 2030 from 26% in 2006. For energy security, efficiency, and the environment, a stable power supply basis was constructed by maintaining the proper size of nuclear power generation. The policy requirements necessary for the construction of sustainable nuclear power plants were carried out promptly to prepare safe management measures for radioactive wastes. Moreover, the safety of the power plants and social acceptability were reinforced as well as the infrastructure for stable supply of fuel for nuclear power was built, while the goal was established to advance to the overseas market and strengthen international cooperation.

Expanding the proportion of nuclear power needs to consider supply stability, response to CO₂ reduction, and economics; and need a gradual extension considering the operational characteristics as the base power supply and construction conditions. The proportion of nuclear energy generation in 2007 was at the 26% level based on facility capacity, and there was a need to increase the facility capacity to 55%, which is the minimum loading criterion of the total power consumption for economic operation of the nuclear power as the base power. However, the primary goal was set to the 41% level, which is the minimum annual loading level considering the condition of the available plant site, and technical and economical uncertainty.

To achieve such goal, the Lee administration composed an appropriate portfolio for each energy source, increased the share of nuclear power to a proper level, considering various conditions such as system operation and new site availability, and prepared to respond flexibly to future changes. Securing the construction site for new nuclear power plants and measures for the treatment of intermediate storage facility were also discussed as the spent fuel temporary storage facility is expected to reach its maximum capacity in 2016. Facility improvements, manpower training, and technology development were continuously implemented for the safety of the power plant, while and people's understanding in nuclear power was reinforced. In the mean time, in order to prepare a stable fuel supply basis, the concentration of uranium, which depends on foreign import, was planned to be procured by the optimum portfolio of long term contract and spot market sales. In the long run, participation in the overseas resource development and concentration project was pursued while the active participation in the stable supply system of international nuclear fuels, which was being discussed the International Atomic Energy Agency (IAEA), etc., was achieved.

In particular, core technology was secured while the export competitiveness of nuclear power was enhanced by procuring leading core technology through the early development of original technologies such as Korean-type Advanced Power Reactors (APRs) and reactor coolant pumps. Also, strategic partnerships with major nuclear power companies were made along with active sales diplomacy for nuclear power. Based on the trust from the international society, Korea also actively participated in international cooperation such as the Global Nuclear Energy Partnership (GNEP) and the IAEA to extend the peaceful use of nuclear power.

The nuclear power industry maintained safe without any severe accident after the Chernobyl nuclear accident in 1986, but the safety of nuclear power emerged as an issue once more with the large-scale nuclear accident in Fukushima, Japan, in March, 2011. Even though some countries are

reevaluating their nuclear power policies, most countries agree that there is no other energy source that can replace nuclear energy for the time being, considering the power demand and supply and response to climate change. It is anticipated that the nuclear power market will not drastically shrink as there is a demand for replacing deteriorated nuclear power plants as the safety issue became widespread and safety measures are reinforced for plants that are 30 years old or older.

To secure the safety and acceptance of nuclear power plants, continuous facility improvement and the optimization of facility management is required based on periodic safety evaluation, and technology development should be sustainably pursued to improve performance. For this purpose, the Lee administration continuously expanded professional staffs in the operation and maintenance areas, and have prepared preventive measures for human errors, through activities that boost the morale of employees working on nuclear reactors. The citizens' understanding of nuclear power plant was improved with intensified education and advertisements which include transparent information on the operation of power plants and interactive educational programs. Nuclear power plant construction that coexists with the community was promoted by improving neighborhood assistance projects so that the benefits from the construction and operation of nuclear power plants could be directly delivered to the community.

The history of nuclear power generation in Korea started with the operation of the Gori Nuclear Power Plant No. 1 in 1978 with the technology of the United States (US). Since then, Korea has made remarkable development in the construction and operation of nuclear plants for the past 30 years. As of 2010, the capacity of nuclear power generation in Korea is 17.72 million KW, ranking 6th in the world, and the utilization rate of nuclear power plants is 91.2%, higher than that of advanced countries such as the US (89.3%) and France (74.1%).

Based on the excellent capability and safety of nuclear power plants in Korea, the Lee administration launched a government-wide

three-dimensional support, including summit diplomacy, and succeeded in exporting four units of Korean nuclear power plants (APR1400) to the UAE in 2009. The winning of the contract for the UAE nuclear power plants provided an opportunity for Korea to change the direction from the previous type of export that was focused on materials and services to one that focuses on export of power plants. The project is worth 20 billion dollars, and 20 billion Won from additional contracts can be expected from the participation in the nuclear power plant operation for 60 years after the construction. Thus, the project was evaluated as providing a good opportunity for Korea's industrial and economic development. As a result, Korea made its global debut as an exporting country in the nuclear power market, which had been monopolized by five major countries, including the US, France, Canada, Russia, and Japan. Korea has made a groundbreaking enhancement of its national image as a nuclear power country with advanced technology.

4. Promotion of the Self-Development Rate and Procurement of Global Resources for Energy Security

As a country that imports most of its consumed energy, securing energy is indeed a national task for Korea which will determine the country's survival and economic growth. To address the worsening internal and external situation in which resource nationalism is expanding and the instability of the resource market is increasing, the Lee administration designated overseas resource exploitation as a national task, and changed the direction of its energy importation policy from 'stable energy importation' to 'aggressive exploitation of foreign energy sources for the purpose of self-reliance' to promote the strategic acquisition of foreign resources. To establish a stable supply system by the innovative promotion of the self-development rate of energy and resources by 2019, a step by step goal

aimed at increasing the self-development rate of natural gas and petroleum to 4.2% by 2007, 18% by 2012, and 30% by 2019, and increasing the self-development rate of 6 major minerals to 18.5% by 2007, 32% by 2012, and 42% by 2019 has been set.

To refine the overseas resources exploitation system, the Lee administration supported and managed promising resource exploitation projects and established a pan-government support system that can provide consultation regarding the acquisition of projects and other resource-related problems to help solve problems faced by companies involved. Companies with global competitiveness which specialize in resources exploitation were also promoted. For petroleum companies, capital was expanded to strengthen the competitiveness in exploitation area, and the enlargement of production size was promoted through the M&A of foreign petroleum corporations. After the synergy effect of M&A was increased and the competitiveness as a global resources development corporation was secured through the efficient management of prior merged companies, the Initial Public Offering (IPO) was promoted to gain the momentum for sustainable growth. On the other hand, the Korea Gas Corporation utilized its No. 1 LNG purchasing power to expand and diversify its resource exploitation program, substantially expanding its capacity as a resource exploitation corporation, while promoting its take-off as a global corporation by establishing a consistent linear system and taking part in related industries. As for the Korea Resources Corporation, capital was expanded, technology developed, and more experts were employed to build the foundation for growth. The corporation's function was reformed to focus on overseas resources exploitation to promote the take-off as one of the top 20 resource exploitation corporations in the world, by investing in mid- and large-scale projects. Private investment on overseas resources exploitation was encouraged by providing more tax benefits and training more experts. The Foundation for Overseas Resources Development (FOREO) was established to systematically manage overseas resources exploitation. Through the Energy & Mineral Resources

Development Association of Korea, which was established in 2008, an overseas resource exploitation symposium was held with the participation of related corporations, to share information and strengthen human networks.

To promote private participation in resource exploitation projects, financial resources for investment in resource exploitation were expanded. Education was provided to vitalize the policy of Reserve Based Financing for mining facilities, while establishing reserve amount assessment agencies, expanding political support, and increasing the guarantee capacity of the resource exploitation fund by expanding the finance of investment risk guarantee projects. A sequential expansion of investment of pension funds was promoted in selling shares of projects that are in the stable production stage, and support for national banking organization's foreign resources exploitation was strengthened, by expanding guarantee support of trade insurance companies and financing of import and export banks. Also, agreements were actively promoted with countries in the Middle East, Central and South Americas, and Africa where the double-taxation prevention agreement was not concluded, and the effectiveness and predictability of tax support were increased by improving the taxation policies on resource exploitation.

The Lee administration continually supported the establishment of the infrastructure of resources exploitation service industry, training of experts, and acquisition of critical technologies to improve the competitiveness of resource exploitation. Since mutual growth of related service industries is critical in strengthening resource exploitation capabilities of domestic public corporations and encouraging the involvement of private corporations, promising service industries were selected and supported based on the market perspective and feasibility. Also, on-site training and internship programs were strengthened for training of experts for resource exploitation, by selecting ' colleges specialized in resource exploitation. Also, in the long term, the establishment of a graduate school specializing in resource exploitation was to be pursued; moreover, the operation of a 'resource

development academy' was expanded, and short-term lectures by resource exploitation corporations were vitalized, while manpower supply and demand plans, considering the expansion of the corporations, were established.

Above all, a large-scale national technology development project was promoted through a technological innovation program, by establishing the Roadmap of Resource Exploitation Core Technology, recognizing the need for core technologies in resource exploitation. The ratio of sales to R&D of petroleum and mineral corporations was greatly increased, and the Overseas Exploitation Information System was established, which connects each department of the foreign resource exploitation association, effectively sharing and distributing information and also expanding investment of the trade promotion corporation.

To secure a stable supply of rare metals, which are expected to surge in demand and closely related to new growth industries such as IT and green industry, lithium and rare earth materials were selected as 'strategic minerals' and supported by the government accordingly. Mid-scale exploratory projects were promoted for minerals that require long-term strategic supply, while encouraging involvement in exploitation and production industry for the minerals that require stable raw-ore supply. Meanwhile, thorough the analysis of domestic regions with the potential discovery of rare earth minerals was conducted to continuously expand the rare earth metal reserve.

(1) The Promotion of Resource Exploitation in the Middle East through Summit Diplomacy

The Lee administration pushed ahead with the '100-year strategic partnership' together with the UAE, a country with oil reserves totaling 100 billion barrels. Korea, as a result, gained proprietary control of three undeveloped oilfields with a confirmed amount of 570 million barrels, signing

the contract on March 2012, making it Korea's largest oilfield exploitation project. Also, Korea's involvement in the UAE's oilfield exploitation is expected to be expanded with its priority participation right for the oilfields producing one billion barrels or greater. It was possible for Korea, with a mere 35-year experience in resource exploitation, to open the door to the UAE, a country with the world's 6th largest oil reserves, thanks to the mutual trust between the two countries developed by the Korea-Iraq Economy and Energy Collaboration Agreement and other forms of summit diplomacy.

In Iraq, Korea participated in the bidding held by the Iraq central government to obtain four production and exploitation mining rights. In Iraq, it was necessary for a corporation to have a daily production rate of 20,000 barrels in order to participate in the bidding. However, through summit diplomacy, it was possible for the corporation with only 9,000 barrels of daily production to participate in the bidding, resulting in the acquisition of four mining rights, which is the largest amount obtained among 25 corporations that bid on 14 mining rights. Also, the Korea National Oil Corporation signed an oilfield exploration agreement in November 2008, which concerns a 1.9 billion dollar SOC construction with Kurdistan, a project currently under way.

(2) Expansion into Africa, Non-Traditional Gas Fields, and Polar Regions

A large gas deposit of 30Tcf was discovered in Mozambique in eastern Africa. The Korea Gas Corporation has a 10% share in this project, acquiring 68 million metric tons of gas equal to a two-year supply of Korea's gas consumption. This was the largest gas deposit discovered in 2011, and the amount of gas is expected to rise with future drilling projects. In addition, a 'Memorandum of Understanding for LNG Liquidation Plant, Pipe Construction, Transportation, and Import' was signed with Mozambique in 2010, opening the door to the continuous development of foreign infrastructure and the import of products into Korea.

As for non-traditional gases such as shale gas, a daily import of

16,000 barrels was secured by the takeover of foreign property. In 2010, the basis for the exploitation of non-traditional energy resources in North America was established with the expansion into the West Coast Bank of Canada, the production region of tight and shale gases, while Coal Bed Methane (CBM) exploitation was also promoted in Australia with the GLNG project in 2010. In 2011, the properties of Eagle Ford of America were taken over, gaining know-how on shale gas exploitation, and in the same year, a mining lot in the Umiak region of Canada was purchased, expanding Korea's exploitation boundary to the Polar Regions. In 2012, President Lee Myung-bak signed the 'Korea-Greenland Memorandum of Understanding for Resource Exploitation' during his visit to Greenland, establishing the basis for exploitation in the Polar Regions. Through the MOU, the two countries promised on the collaborative analysis of the geological features of resources, development of exploratory technologies and investment promotion. The basis for expansion into the frontier of energy resources was established with the promise to establish a communication channel between the departments to establish a long-term collaboration system.

5. Smart Grid, an Economic System for Low-Consumption and High-Efficiency

To address global warming, the Lee administration announced in November 2009 the intent to reduce carbon emissions by 30% compared to the BAU scenario by 2020, and to increase energy efficiency by 2.6% per year to 46.7% in 2030. To realize this goal, a transition into a low-consumption society for sustainable growth is necessary. Smart grid is the core infrastructure for addressing climate change, increase energy efficiency, and to achieve sustainable development by producing the power for new growth. Smart grid integrates information and communication technologies to the

traditional power grid to allow a smart management of energy, through real-time information-sharing between suppliers and consumers. It is an innovative system that manages everything from household electronics, such as TV and refrigerators, to industrial machines in factories.

Energy efficiency is increased by the construction of smart grids as the demand for energy will be distributed and managed in real-time. To achieve this, a form of two-way communication between the power supplier and consumer needs to be established. Smart grid also requires new technologies such as real-time pricing, smart demand response, electric vehicles, and a virtual generation system. Also, smart grid is a new growth industry with plenty of growth potential as well as an opportunity for green job creations as it is still in the early stages of development. The International Energy Agency's (IEA) projection that the global energy market will reach 20 quadrillion dollars by 2031 shows the importance of electricity in modern societies, especially because the power industry is closely related to communications, electronics, construction, car, and energy industries.

(1) Building the Foundation for Smart Grid

The Lee administration made a few changes to its policy to build and vitalize the smart grid. The National Roadmap for Smart Grid (Smart Grid 2030) was adopted in January 2010, which invests 27.5 trillion Won (7 trillion for technological development, 20.5 trillion for infrastructure, 24.8 trillion from the private sector, and 2.7 trillion from the government) by 2030, to build the foundations for low-carbon green growth through the establishment of the smart grid. In addition, the Promotion Act of Smart Grid Construction and Usage was revised in May 2011 and has been in effect since November 2011, being the first national smart grid policy in the world. This revision made it possible to build a national fusion energy infrastructure necessary for green growth and systematically develop the industry itself.

This revision is significant as numerous experts have been pointing out that traditional laws limited the establishment and growth of a smart grid which integrates electricity and IT.

After the revision was made, the General Plan for Smart Grid was announced in July 2012. Objectives for each five-year period to form a foundation for low-carbon green growth through the construction of smart grid were set, with a plan to build a hosting city for smart grid by 2016 as the first stage and complete a national smart grid system by 2030. It is expected that energy consumption will drop by 10% through dispersion of energy demands with the construction of smart grid.

Korea is currently pursuing two demonstrative projects and two supply projects regarding smart grid. One of them, the Jeju Demonstrative Complex Project, is a national project running from December 2009 to May 2013, focusing on 7000 households in eastern Jeju Island. It is participated by 168 companies from the electricity, communication, automobile, and electronics industries with an investment of 249.3 billion Won (Government: 76.6 billion, Private Sector: 172.7 billion). Also, the Korean Micro Energy Grid Project is a demonstrative project carried out from July 2011 to June 2014, proving the concepts of energy distribution, BEMS, and DC grid, as well as building an energy-efficient system with an investment of 108.1 billion Won. The Smart Meter Display (IHD) Distribution Project was also promoted from 2010 to 2011, spending 16 billion Won on distributing 46,373 smart meter displays that provide information on energy consumption. As a follow-up project, 3.6 billion Won (from 2012 budget) will be invested in expanding the distribution of smart meters and other energy reservoir equipments from 2012 to 2013.

In developing the core technologies for smart grid, priorities were given to the technologies needed for the Electricity IT Project and the Jeju Demonstrative Complex Project. The Electricity IT Project started in 2005 with an investment of 253.2 billion Won to develop 10 core technologies by 2013, focusing on electric grid sophistication such as the Korea Energy Management

System, Flexible Alternating Current Transmission System, and smart distribution technologies. Starting in 2010, four projects including security technology and real-time electricity demand management system were launched with an investment of 7.1 billion USD, and High Voltage Direct Current Transmission System and Advanced Metering Infrastructure demonstrative projects were launched in 2011 with a 5.8 billion Won investment.

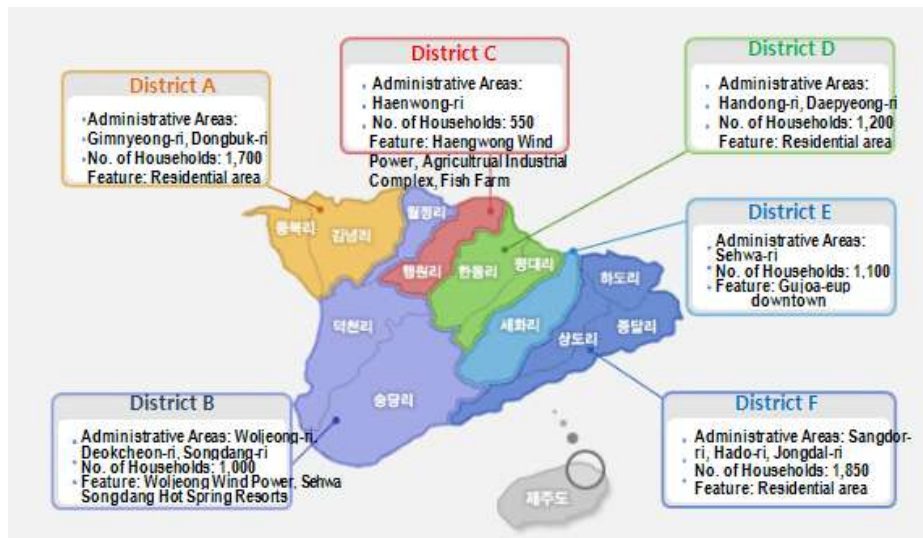
(2) Jeju Smart Grid Demonstrative Complex

As stated earlier, the Lee administration promoted a demonstrative commercialization of the smart grid technology by appointing the Jeju Island's Gujwa region as the Jeju Smart Grid Demonstrative Complex. This was done not only to test the new technologies and develop a business model, but also to establish the basis for commercialization and export of smart grid technologies and solidify Korea's status as a pioneer of smart grid.

The development area in the Jeju Demonstrative Complex was divided into five areas: Smart Power Grid, Smart Place, Smart Transportation, Smart Renewable, and Smart Electricity Service. The time period was divided into foundation and expansion periods. From the infrastructure establishment period from December 2009 to May 2011, networks of individual project area built for each consortium were expanded. During the expansion period between June 2011 and May 2013, the consortiums and integrated management center were connected to monitor the project's real-time status and achieve integrated management by providing new electricity services based on real-time pricing. Smart meters, along with the electricity distribution system, portal system, and cooling system that utilize power line communication as well as energy efficiency equipments will be installed in the Jeju Smart Grid Demonstrative Complex. Smart meters will show energy consumption, price, projected monthly electricity bill, and neighbors'

electricity consumption in real-time.

< Jeju Smart Grid Demonstrative Complex >



Moreover, measures to pull in electricity from three nearby wind power generators and install solar power generators for each household, selling the excess electricity to the Korea Electric Power Corporation has also been promoted. Electric cars were also distributed with five charging stations installed on different parts of Jeju Island, including the Gujwa region. Also, the measure to implement real-time pricing to encourage electricity usage during the cheapest time of the day has also been promoted.

6. Addressing the Shortage of Power and Energy Conservation through Public Participation.

If the supply of electricity is limited, than the quickest way to overcome the insufficient supply of electricity is to conserve energy. The

public's conservation of energy is the most fundamental and cost-effective way to overcome the energy crisis in a time when petroleum is costly; therefore, more active participation from the public should be encouraged. The Lee administration promoted several energy-consumption campaigns and have received positive feedback. For example, during the three winter months from November 2011 to February 2012, the energy conservation campaign has resulted in saving three million kW of total electricity and 3.5 billion kWh of total consumption, establishing a stable 500kW reservoir. Three million kW of energy is 4.1% of the maximum winter consumption of 73.83 million kW and equals to the capacity of six 0.5 GW power generators. Also, the saving of 3.5 billion kWh would require four 0.5 GW power generators to run for three months, and equals to a year's worth electricity consumption of Jeju Island in 2010. The increase rate in electricity consumption has also dropped significantly from 13.2% in the winter of 2009, to 7.7% in 2010, and 1.5% in 2011. Also, due to the atmosphere of conserving energy, the increase rate of natural gas usage was decreased, while there was a conversion to an energy-conserving pattern such as the reduction in heater sales and increase in the sales of undergarments..

Such a feat is the result of the active participation by the public and corporations. Energy conservation campaigns were performed to address the difficulties in energy supply during the time of high oil prices, and settling of the energy-saving lifestyles was encouraged. A culture of conservation was also promoted by continuously hunting for and distributing creative ideas selected from idea contests and model examples from the various parts of the society.

Section 2: Green Technology and Green Industry Policies for a Green Economy

1. R&D and Investment Expansion for the Development of Green Technology

Green Technology refers to new and renewable energy technology that either reduces carbon emission or creates new energy sources, as well as other integrated technologies that combine energy, Nano, environmental, and bioengineering technologies. Such green technologies are the key to achieving low-carbon and green industrialization, conserving the environment and boosting economic growth. Therefore, green technology is asserting itself as the main growth power of green growth, and is also drawing attention as a solution for the 'growth without employment' problem as it has greater job creation effects than other traditional industries.

Considering the importance of green technology, the Lee administration selected 27 core green technologies and promoted a three-staged development strategy (stage 1: -2012, stage 2: -2020, state 3: -2030). As the result, there has been significant improvement in the fields of rechargeable batteries, Carbon Capture and Storage (CCS), smart grid, and waste management. By developing core technologies for lithium rechargeable batteries, Korea has gained 2nd place in the global market share, and 3.3 metric tons of CO₂ reductions are projected by 2030 as a result of the development of core CO₂ capturing technology. As stated earlier, the world's biggest smart grid demonstrative complex was constructed on Jeju Island, and sophisticated waste treatment technology that utilizes membranes was developed, resulting in an annual import substitution effect of 120 billion Won.

(1) R&D Investment for the Development of Green Technology

Korea's cost for CO₂ reduction is higher than that of other developed countries, as manufacturing and other industries that heavily consume energy represent a large share of the nation's economy. There is a need to reduce the CO₂ reduction cost by transitioning traditional industries toward the low-carbon system and developing green technologies that will serve as a new growth power. However, the level of green technology in Korea is still only 50-70% that of developed countries. Therefore, the Lee administration adopted the Green Technology R&D Analysis Results and Improvements on R&D Support in January 2012, setting the goal of achieving a 90% level of core green technology compared with that of developed countries by 2020, greatly improving the support system for green technology development. Within the large framework of the R&D support system, overseen by the National Science and Technology Commission, trial projects were run by considering the characteristics of green technology R&D which requires integrative and innovative research, and improvements were encouraged by expanding exemplary policies of individual ministries to other ministries. In addition, the Green Technology Center Korea (GTC-K) was established to lead, manage, and support the development of green technology, providing support for the green technology roadmap, collaborative technology development, and technology standard assessments.

(2) Concentrated Investment for the Early Development of First-Class Technology

The Lee administration adopted the strategy of focusing investment in R&D projects able to achieve the early development of first-class green

technologies, allocating 20% of the government's R&D funds to green technology. To yield short-term results, result yield possibilities, R&D investment scale, and multi-department integration were taken into account when selecting and managing core technologies. As a result, ① Solar Cells, ② Bio Energy, ③ Rechargeable Batteries, ③ Wind Power, ④ Alternative Water Source Acquisition, ⑤ Fuel Cells, ⑥ LED Applications, and ⑦ Energy from Waste were chosen as core technologies, to put through thorough analysis of past strategies and make adequate improvements to adjust to the changing circumstances and market trends.

<Government R&D Investment Ratio>

| Item | 2009 | 2010 | 2011 | 2012 |
|-----------------------------|-------|-------|-------|-------|
| National R&D (trillion Won) | 12.41 | 13.68 | 14.90 | 16.0 |
| Green Technology R&D | 1.95 | 2.24 | 2.74 | 3.0 |
| Ratio | 15.7% | 16.4% | 18.3% | 18.8% |

The solar cell technology strategy was modified from the type which followed developed countries to one that took the lead in developing next generation technology. The Two-Track technological development of crystalline silicon and thin film silicon was given financial backing, and the mass production of core technology of high added value components and materials was promoted in the short-term. In the mid-term, focus was given to the development of the core technology of thin silicon and thin film multi-junction solar cells. Moreover, a goal was set in terms of the manufacturing cost of solar batteries reaching 0.6-0.65\$/w by 2016 and 0.45\$/w by 2020. In order to attain the installation cost of the solar power generation system of 1\$/w by 2020, support for research was extended to the Balance of Systems (BOS) that established the solar power generation system, the Building Integrated Photovoltaic System (BIPV) with the potential

to generate a new market, and Concentrating Photovoltaic (CPV).

In the past, biomass technology focused on technologies for establishing the basis of manufacturing and energy production. However, this was changed to promote the integration of core technologies to focus on developing core technology for securing biomass fuel, managing biological and chemical fusion of biomass, and bio refinement, to reach the technological level of developed countries by 2020 in biomass fuel and bio fuel production.

The focus of rechargeable batteries was shifted from the technological development of lithium batteries for supporting parts and core technologies to the strengthening of technology development for mid- and large-sized rechargeable batteries for energy storage, renewable energy, and integrated technology. The goal has been set for the development of new material for lithium rechargeable battery that can overcome traditional limitations by 2016; processes and design of rechargeable battery, simulation, and high precision real-time analysis technology development by 2017; and a new generation of rechargeable battery core technologies such as the redox flow mid- and large-sized rechargeable batteries by 2018.

Wind power technology, which had not been included in the national roadmap for technology development, was added to the roadmap for investing in technological development for the enlargement and expansion of oceanic wind power technology. While domesticating the technology of core parts and improving the system control technology, maintenance and performance analysis were promoted in parallel for technological development strategies for complex growth with oceanic energy. Furthermore, the development of 7MW large-scale wind turbines and domestication of those core parts was also encouraged.

To secure a substitute for water resources, technological development and core technologies were produced domestically. In addition, the strategy was shifted from developing small-scale highly-efficient facilities to providing support to desalination technology and technologies for the reuse, separation, and treatment of waste water according to phased priorities.

The strategy for fuel cells was shifted from a short-term system to the strengthening of the development of core techniques. Investment was expanded to support the acquisition of low-cost, high-resistant component technology and to develop diversified fuel and application technologies.

The strategy for the application of LED was shifted from developing source technologies for certain parts to the promotion of the domestication of core parts and growth in order to secure a share of the integrated market of LED light-related production. The goal for high-output LED light chip development was changed to develop 200lm/W chips until 2014 instead of 2016, and the domestication of LED related part production will be continuously promoted.

As for the energy-converting technology of waste resources, the investment direction which was focused on the area of solid fuel production was modified in order to increase the percentage of domestic complex waste resource energy conversion facilities, pyrolysis plant technology development, and waste resource energy conversion facilities. To achieve this, the combination of waste energy conversion technologies such as the manufacturing of complex waste resource Refuse-Derived Fuel (RDF), as well as standard facility units for the high-efficiency incineration boiler, thermolysis, gasification, refinement, and catalysts were used to promote their utilization on-site and early commercialization.

2. Selection and Support for Twenty-Seven Green Technologies

As the core element of low-carbon green growth, it was necessary to support green technology together with environmental sustainability and economic growth. In January 2009, the government finalized the Comprehensive Measures for Green Technology Research & Development, and selected 27 green technologies from among 73 candidates focused on core source technologies. Action plans were prepared at the federal level for

the technologies selected from 27 areas, taking into consideration the entirety of the cycle from development to commercialization. The main 27 green technologies are as follows:

| 1. Climate Change Predication and Modeling Development | |
|---|--|
| Outline | Technology which has the goal of identifying/tracing climatic/environmental changes, and predicting these climactic changes using a long-term prediction model for a global system, with the observation of climate change triggers and environmental parameters. |
| Trends | Advanced countries are conducting research on the restoration and causes of climate change for the purpose of predicting future changes in climate. In Korea, the National Institute of Meteorological Research recently commenced a research on the carbon cycle, vegetation, and other related technologies. |
| Necessity and Effects | Through the global system modeling technology, disasters which occur most frequently due to rapid climate change such as tsunamis, torrential downpours, and droughts, can be predicted to minimize the damage caused. |
| 2. Assessing the Influence of Climate Change and its Adaptation | |
| Outline | Technology that is used to evaluate the effects of climate change on national infrastructure and land, as well as for developing a monitoring/response system to deal with resultant effects. |
| Trends | The US has developed a nationwide climate change response system through the federal response plan, with its central institution being the Federal Emergency Management Agency (FEMA). |
| Necessity and Effects | Effective for the prevention of climate change, but long-term R&D investment and management is essential as the process of putting response measures into effect is sluggish. |

3. High Efficiency, Low-Cost Silicone Solar Cell Technology

| | |
|-----------------------|---|
| Outline | Can be divided into single/multiple and non-crystal, and includes manufacturing process technology, manufacturing technology, material technology for the purpose of creating highly efficient, low-cost solar cells and modules using thin silicon wafers. |
| Trends | Global solar cell companies produce 60% of all products using multiple crystal silicone panels, and the generation efficiency has increased to 20%. In Korea, conglomerates are beginning to participate in the market, following the example of small and medium-sized companies. |
| Necessity and Effects | Gaining an early foothold in the global thin film market through high-efficiency, low-cost technology using world-class semi-conductor technology infrastructure, is essential. Strengthening of economic feasibility up to a level equal to that of fossil fuels (150 Won/kWH) by 2020 is predicted through the increase in generation capacity to 400 MW by 2012. |

4. Mass Production of Non-Silicone Solar Cells and Core Technology

| | |
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| Outline | Low-cost materials, processes and equipment technology including high efficiency core source technology and mass production for solar cells and modules can be used for mobile communication and within the national armed forces without silicone materials such as CIGS (copper, indium, gallium, selenium), inorganic compound thin film, organic polymer and dye-sensitive types. |
| Trends | Many companies, both domestic and international, are concentrating on the mass production of CIGS compound, thin film solar cells. Technology is being developed for dye-sensitive and organic solar cells, with its objectives being low-cost and ultra-high efficiency in the future. |
| Necessity and Effects | As silicone solar cells have reached their limit in terms of low-cost due to the unstable supply of silicone material and wafer, non-silicone solar cells are anticipated to be utilized in many fields owing to their price-competitiveness and ease of application. |

5. Production of Bioenergy Elements and Systems

| | |
|-----------------------|--|
| Outline | Technology designed to procure energy sources from animals, plants, biomass, and marine sources for the purpose of replacing fossil fuels. |
| Trends | Major advanced countries are using materials using wood to solve problems relating to the supply of edible materials, or are studying next generation biofuel technology using hydrogen. In Korea, technology to produce fuel from wood or seaweed is being developed. |
| Necessity and Effects | Korea is the world's 9th largest country in terms of CO ₂ emissions, urgently requiring reduction measures. Biofuel is able to replace 4% (120 kL) of domestic transport fuel for 2012. |

6. Design and Construction Technology for Improved Light-Water Reactors

| | |
|-----------------------|--|
| Outline | Technology for design, construction, and operation of nuclear power plants which are safe, economical, and environmentally friendly, by upgrading power plants that produce power using fission energy. |
| Trends | Current international cooperation is active; however, Korea is lacking in sources and verification technology, which become an obstacle for self-development or future advancement into the overseas market. |
| Necessity and Effects | Contribution to the national economy through domestic usage and export (estimated total of production and exports is about 2.7 billion USD) as well as active international exchanges and increased influence in the global society. |

7. Green Nuclear Non-Proliferating Sodium-cooled Fast Reactor (SFR) and Closed-Loop Nuclear Cycle System Development

| | |
|---------|--|
| Outline | Technology for the recycling, removal, and safe disposal of used nuclear materials using the Pyro process and Sodium-cooled Fast Reactor (SFR) |
| Trends | Many countries are intensively investing in the development of green nuclear non-proliferating SFR, circulated nuclear cycle systems for high-level radioactive waste generated by nuclear fuel, and sustainable nuclear fuel. |

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| Necessity and Effects | Cost for nuclear fuel import can be reduced by recycling nuclear fuel, and the radioactive toxicity of used nuclear fuel can be reduced to 1/1000 of its normal level. The ultimate amount of waste to be disposed can also be drastically reduced, contributing to the safe management of nuclear fuel. |
|-----------------------|--|

8. Design and Construction Technology of Nuclear Fusion Reactors

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| Outline | Core analysis and design for nuclear fusion reactors, component manufacturing technology and accompanying plasma generation, confinement, heating, current driving, diagnosis/core operation control, integrated system operation technology, high magnetic field electromagnets, ultra-high temperature equipment, extremely low temperature, and high vacuum, as well as device/control equipment and other nuclear fusion reactor technology. |
| Trends | Korea constructed the Korea Superconducting Tokamak Advanced Research project (KSTAR) and participated in the International Thermonuclear Experimental Reactor (ITER) joint construction operation project, and is currently supplying the required manpower/parts according to the share (9.09%) of its construction. |
| Necessity and Effects | Safe, environmentally friendly, and contributing to non-depleting national sources of energy, guaranteed of the general public's acceptance. Also contributes to the development of promising future industries by combining derivative technology with cutting-edge technology. |

9. Technology for Highly Efficient Hydrogen Production and Storage

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|-----------------------|---|
| Outline | Technology designed to produce hydrogen using fossil fuels or water, safely and efficiently stored by vapor compression, liquidation, metal hydroxides, adsorption, and hydrogen compound. |
| Trends | Production of hydrogen via vapor reforming by fossil fuels is already commercialized in advanced countries including the US and Japan. Hydrogen storage technology is being industrialized with a focus on complex chemical hydrides and chemical hydrides centered in Japan. |
| Necessity and Effects | Hydrogen energy is a form of clean energy that does not generate carbon dioxide. If 15% of the total energy is replaced with hydrogen by 2040, a reduction of some 1.7 trillion tons of CO ₂ can be achieved. |

10. Next Generation Technology of Fuel Cell System

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| Outline | Technology designed to produce electricity and heat using the electrochemical reaction of fuels. Examples include high efficiency fuel cell systems concerning the Proton Exchange Membrane Fuel Cell (PEMFC), Molten Carbonate Fuel Cell (MCFC), and Solid Oxide Fuel Cell (SOFC); improvement of the core material of fuel cells and system durability including peripheral equipment, and cost-reduction technology. |
| Trends | The US is developing a 250kW molten carbonate fuel cell, a tubular SOFC fuel cell (200kW SOFC), and a turbine (20kW) hybrid system. In Korea, monitoring and durability is being verified, focusing on a 210 unit fuel cell system for homes. |
| Necessity and Effects | This highly efficient green technology has synergy effects for the invigoration of various energy-related industries. It is anticipated to create a 6.8 trillion Won market in Korea by 2030, 84,000 jobs, and export revenue of 60 trillion Won through occupying 30% of the world market |

11. Environmentally-Friendly Technology for the Promotion of Plant Growth

| | |
|-----------------------|--|
| Outline | Technology for the production of eco-friendly organic food, chemical fertilizer reduction technology, new bio-product protectors, utilization of wave-produced energy, and other technology to protect and promote environment-friendly plant growth. |
| Trends | The use of LED technology for agriculture is in the initial stages in terms of research and commercialization. According to the policies of advanced countries on the promotion of eco-friendly organic agricultural products, investment is being concentrated on the development of new bio-product protectors for the replacement of pesticides and industries which pose a threat to nature. |
| Necessity and Effects | The development of alternative materials, due to the poisoning of mammals and deteriorating environmental conditions caused by the excessive use of chemical fertilizers and pesticides, is urgently needed. The effect of replacing pesticides by the development of new bio-product protectors is anticipated to be more than 240 billion Won. |

12. The Technology of the Integrated Coal Gasification Combined Cycle (IGCC)

| | |
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| Outline | Exceptionally clean, highly efficient technology for the generation of electricity using gas or steam turbines by separating gas from coal through the reaction with oxygen, followed by the purification of impurities such as sulfur and dust. |
| Trends | Currently, the Integrated Coal Gasification Combined Cycle (IGCC) technology in foreign countries is at the demonstration stage, with about 140 commercial plants in operation. However, domestic technology is at an inferior level (56%). |
| Necessity and Effects | The maximum efficiency of the IGCC is 46%, higher than existing coal power (max. efficiency of 40%), desulfuration rate greater than 99.9%, NOx lower than 25ppm, which can reduce energy consumption and improve the environment. |

13. High Efficiency, Low Pollution Vehicle Technology

| | |
|-----------------------|---|
| Outline | Technology designed to minimize hazardous exhaust gas and maximize energy efficiency through the utilization of a new power source, as well as increasing the gas mileage of existing cars and trucks. |
| Trends | In the United States, a next generation vehicle development partnership initiated by the Department of Energy (DOE) is currently in operation, with participation by the industry and academic and research institutes. Japan has so far been successful in the commercialization of hybrid cars. |
| Necessity and Effects | Policy relating to vehicles is being implemented mainly in environment-friendly terms, and the majority of research is focusing on gas mileage and alternative fuel for cars. If gas mileage is improved by 10%, a reduction of more than 7 million tons of CO ₂ per year is forecasted. |

14. Smart Transportation & Logistics Technology

| | |
|---------|--|
| Outline | Technology preparing the foundations for the realization of effective transportation and logistics systems by linking, collecting, and providing traffic and logistics information. |
| Trends | A new electronically-controlled transportation system, which combines software, cell phone communication and the internet, is being developed worldwide. In Korea, each municipality is operating the Intelligent Transportation System (ITS). |

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| Necessity and Effects | Through the use of a systematic congestion and flow management system, the cost of traffic congestion is anticipated to be reduced by 5–10% (1.5–3.1 trillion Won). In addition, the costs of air pollution treatment are expected to be lowered by about 30% (5.3 trillion Won based on data in 2002). |
|-----------------------|---|

15. Eco-Spaces and Urban Restoration

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| Outline | This is a comprehensive technology, including the regeneration and restoration of damage to the natural and urban environments, improvements in the soundness of the urban eco-environment, and the construction of new concept green cities allowing for the coexistence of man and nature. |
| Trends | The construction of green cities and eco-spaces within cities, microclimate management, comprehensive water cycle control and management, as well as new and renewable energies are being developed through CO2 reductions, mostly in advanced countries according to the Kyoto Protocol. |
| Necessity and Effects | Carbon emission reductions in cities, the expansion of pleasant urban environments and environmental sustainability, and the rapeseed cultivation of 45,000 hectare have a substitution effect of import energy of 36 billion Won each year, while the utilization of idle farmland in the winter can improve the incomes of farming households by 82 billion Won each year. |

16. Eco-friendly, Low-Energy Building Technology

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|-----------------------|---|
| Outline | Technology for the construction of green buildings and homes for the purpose of reducing building energy consumption and minimizing CO2 emissions, through highly efficient HVAC facilities, ventilation and air purification apparatus for waste heat recovery, eco-friendly façade systems, as well as facility systems for new and renewable energy. |
| Trends | European countries are successfully operating low-energy, low-carbon building complexes, reducing energy use by more than 90%. However, green cities in Korea are still in the demonstration stage with the proportion of new and renewable energy being only 2–5%. |
| Necessity and Effects | Creates a pleasant, green indoor environment by economizing 40% of a building's regular power consumption, or 2.2 trillion Won per year, through the innovative improvement of the energy consumption structure of the construction sector, which accounts for 23% of Korea's total energy consumption. |

17. Green Process Technology that Takes Into Account Environmental Impacts and Predicted Energy Consumption

| | |
|-----------------------|---|
| Outline | Technology for materials, processes, products, and recycling in order to minimize effects on the environment and enhance energy efficiency throughout the entire industrial process including the material source, production, transportation, recycling, and disposal. |
| Trends | Advanced countries are actively applying green processes by the government as well as by private initiatives. In Korea, it is limited to the prevention of emitted pollutants by some conglomerates. Therefore there is an urgent need for an integrated design of green process and the development of required element technology. |
| Necessity and Effects | Is able to strengthen the sustainable growth capacity of the Korean economy, reduce more than 10,000 tons of non-ferrous metal and 2 million tons of CO ₂ per year, as well as reducing energy consumption to below 70%. Competitiveness can also be strengthened through the overcoming of trade barriers, effective utilization of resources, and the maximization of production efficiency. |

18. Green IT and Highly Efficient LED Lighting

| | |
|-----------------------|---|
| Outline | Technology for the maximization of power management efficiency through the application of core technology for high efficiency LED lighting designed to replace regular forms of lighting, and the heat control and low power technology for IT equipment. |
| Trends | The governments of the US, Japan, China, and Taiwan are conducting projects to develop next generation LED lighting. Private companies are taking the lead in the development of the technology for low power-consuming IT equipment in order to gain a foothold in the market. |
| Necessity and Effects | Strategies are required for IT fields to respond to changes in the international environment such as requests for energy and GHG reduction, as well as more stringent global environmental regulations. The reduction in energy is anticipated to be 17 billion kWh for LEDs and 1.9 trillion kWh for green IT equipment. |

19. Electricity IT and Improving the Efficiency of Electrical Equipment

| | |
|-----------------------|--|
| Outline | Technology designed to improve the efficiency of electric equipment, which can thus maximize the effects of energy reduction and create a process by combining electricity technology with IT to add value and reduce power loss. |
| Trends | The United States and Europe are realizing a method of energy transaction through the development of next generation smart grids. Some technology for efficiency improvements in electric equipment using superconductivity has passed the R&D stage, and demonstration testing is currently in progress. |
| Necessity and Effects | A paradigm shift through the transformation of the structure of the power industry and creation of a growth engine by combining both power and IT is necessary. If 70% of existing motors are replaced, 400 million Won can be economized and an anticipated added value of 18 trillion Won by the application of superconductivity to electric equipment can be expected. |

20. Highly Efficient Rechargeable Cell Technology

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|-----------------------|---|
| Outline | Energy storage technology for new growth engines which can improve the quality of power, maximize energy efficiency, and innovatively reduce GHG by storing and utilizing highly efficient electric energy. |
| Trends | Major advanced countries are conducting mid- to long-term projects through government initiatives for rechargeable, super capacitor development programs and a development program for a system using rechargeable cells. In Korea, research is being conducted on high efficiency rechargeable cells for use in electric equipment and vehicles. |
| Necessity and Effects | A large-scale market for small/medium size rechargeable lithium batteries totaling 214 trillion Won will be formed by 2019. If energy efficiency is improved 5% through the utilization of rechargeable batteries, more than 62 trillion Won can be economized on an annual basis. |

21. Technology for the Collection, Storage and Treatment of Carbon Dioxide

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|-----------------------|---|
| Outline | Technology designed to collect CO ₂ using new absorbing and separating membranes, transporting and storing in the ground or ocean, and also create catalyst reaction, chemical materials, and fuels utilizing long-term monitoring technology and CO ₂ . |
| Trends | Technologically advanced countries including the US, Japan, and EU are implementing large-scale demonstration stage R&D and core technology with the goal of demonstrating their CO ₂ collection technology by 2015 and commercialization by 2020. In the case of storage technology, initial research and demonstration experiments are being conducted in foreign countries relating to storage within deep brine aquifers located in the ground to overcome the problem of geological mis-distribution. |
| Necessity and Effects | After the Kyoto Protocol went into effect, the CO ₂ emission trading market grew rapidly to form an enormous market totaling 150 billion dollars in 2010. Advanced technology for the manufacturing of high-value basic chemical products was reinforced. Four million tons of CO ₂ is expected to be treated in Korea and the overseas, along with 10 million tons of polymer production, and a market of 25 trillion Won. |

22. Non-CO₂ (GHGs Excluding CO₂) Treatment Technology

| | |
|-----------------------|--|
| Outline | Technology for use as the information base for GHG reduction policy and Clean Development Mechanism (CDM) projects, with real time monitoring and a database of non-CO ₂ GHGs by their location of emission; the technology to restrain, collect, purify, and apply GHGs apart from CO ₂ ; as well as the technology to treat exhaust gas using a dry method |
| Trends | The Korea Energy Management Corporation (KEMCO) is developing technology to reduce N ₂ O and fluoride gases, while the Ministry of Environment (ME) is developing Non-CO ₂ reduction technology focused on CH ₄ . The US government's Climate Change Science Program (CCSP) is conducting research on the monitoring system and database for GHG. |
| Necessity and Effects | With the effectiveness of the Kyoto Protocol in the future, major environmental problems caused by incinerator plants, industries, and combustion businesses can be solved if treatment technology is developed, and 24 million tons of GHG converted into CO ₂ can be reduced annually. |

23. Management Technology and Water Quality Evaluation of Watersheds

| | |
|-----------------------|---|
| Outline | Technology which grasps wastewater discharge resulting from all inflow/outflow within the water environment and their course of movement and effects, evaluates the level of contamination of the water environment due to such factors, and controlling and managing water quantity and quality in an integrated manner. |
| Trends | The 1- and 2-dimensional stream pollution transport models have been commercialized; however, cases of interactive models between the macroscopic climate and microscopic water environment (streams, groundwater, etc.) remain rare. |
| Necessity and Effects | A water shortage of some 1.2 billionm ³ is expected in Korea beginning in 2011, and the rate of self-sufficiency in terms of sourcing Seoul's drinking water can be improved from 73% to 85% (i.e., an increase of 12%) by improving the water quality of Lake Paldang. |

24. Alternative Water Resources Technology

| | |
|-----------------------|--|
| Outline | Technology for securing water resources by utilizing new concepts such as water conservation, use of rainwater, wastewater treatment, desalination, and development of deep ocean water, in addition to existing methods including dams and surface water of rivers and streams. |
| Trends | The global market related to alternative water resources is constantly growing, and is expected to reach 24 trillion Won by 2015, up from 10 trillion Won in 2005. Therefore, the advanced development of relevant technology will contribute to national competitiveness and increase in exports. |
| Necessity and Effects | The global market related to alternative water resources is constantly growing, and is expected to reach 24 trillion Won by 2015, up from 10 trillion Won in 2005. Therefore, the advanced development of relevant technology will contribute to national competitiveness and increase in exports. The export of plants utilizing desalination technology is anticipated to amount to 1 trillion Won or greater in 2012, occupying a global market share of over 7%. |

25. Technology for Wastewater Reduction, Recycling, and its Transformation into Energy

| | |
|-----------------------|--|
| Outline | Technology designed to minimize waste generation by reducing waste and maximizing its reuse, processing generated waste into non-hazardous materials, converting waste with high moisture content or landfill gases to natural gas/alcohol and high quality energy as an alternative to oil. |
| Trends | In Korea, most waste is used for waste gas (46%), recovery of incineration waste heat (30%), and refined waste oil (9%). However, there little active investment in the energy industry. The EU is endeavoring to remove hazardous materials and develop substitute materials in response to the Restriction of Hazardous Substances (RoHS). |
| Necessity and Effects | With energy recovery from combustible organic wastes of 13.34 million tons/yr. in Korea, 1.64 million TOE (12 million barrels) of substitute energy for petroleum can be generated and 7.78 million tons of CO ₂ can be reduced. The commercialization of urban industrial technology can annually recover scrap iron, non-ferrous metals, and precious metals worth 200 billion Won from waste electrical and electronic products as well as disused cars. |

26. Technology for the Treatment of Hazardous Materials and Exposure Monitoring

| | |
|-----------------------|---|
| Outline | Technology designed to measure exposure of the human body to hazardous materials, as well as managing and treating such materials by establishing models for the exposure process. |
| Trends | Many nations are actively developing mid- to long-term technology for the reinforcement and implementation of international environmental regulations such as the Basel Accord and London Convention regarding the proper treatment of hazardous materials. |
| Necessity and Effects | Korea estimates that the initial cost of responding to the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) will be around 1–2 trillion Won. The cost of complying with environmental regulations and agreements can be reduced by developing strategies and response technologies at the national level. |

| 27. Virtual Reality Technology | |
|--------------------------------|--|
| Outline | Technology for the purpose of reducing physical energy and costs by expanding and sharing the cognitive experience of users through a computer-simulated 3D virtual space. |
| Trends | Major advanced countries have selected virtual reality as a strategic future technology and are working on its development. In Korea, basic research was conducted in the 1990s initiated by the Korea Institute of Science & Technology (KIST) and the Korea Advanced Institute of Science and Technology (KAIST). In the 21st century, research on applied technology for entertainment purposes is being conducted by the Electronics and Telecommunications Research Institute (ETRI). |
| Necessity and Effects | The employment inducement coefficient when 1 billion Won is invested is 13.9 persons, which is a more pronounced economic effect compared to the manufacturing (8.4 persons) and communication (6.9 persons) sectors. As a large growth engine, its market size is anticipated to reach 1.95 trillion USD in 2011. |

3. The Green Car Market and the Expansion of the Supply Base

Green cars are known for their efficiency in terms of energy consumption, as well as pollution-free and low-emission characteristics. They can be classified as ① electric cars and fuel cell vehicles that operate on electricity, and ② clean diesel cars and hybrid cars that operate by means of an engine. The Lee administration established the Green Car Industry Development Plan by putting together all related policies of the green car sector in December 2010. The administration set the vision of becoming one of the four major nations in green car technology, with the goal of producing 1.2 million cars for domestic use and the export of nine-hundred thousand cars by 2015. To achieve this goal, they have concentrated on the early creation of a relevant market, expansion of the supply base, technological development for eight core parts, and the reorganization of related

institutional systems.

The market in Korea and abroad for hybrid and clean diesel cars is continuously expanding. Therefore, growth can be achieved by the lead of private companies. However, electric cars were at an early stage in the market, and as such the financial and institutional support of the government including subsidies, tax relief, and the expansion of batteries become necessary. With respect to electric car production, the Hyundai-Kia Automotive Group released 'BlueOn' in 2012 and 'Ray' in 2012, and is planning to release mid-size electric cars in 2014.

The Lee administration implemented the construction of battery infrastructure along with the production of electric cars by companies. The goal has been set to install 1.3 million electric car batteries by 2020 and installation will be expanded nationwide to meet the trend of electric car supply. For this purpose, 491 batteries were installed in the first year (2011), and the goal was set to install 2500 batteries in 2012. In addition, legislation related to the infrastructure of electric car charging was revised to allow the installation of charging facilities in public parking lots, roads, and apartment buildings, and also prepared for the safety of charging facilities and registration guidelines for charging businesses.

In order to achieve the goal of introducing one million electric cars by 2020, the Lee administration focused on the construction of public infrastructure as the first phase (2012-2015). The second phase (2016-2020) aimed for nurturing the market for electric car charging service in the private sector. Considering the fact that electric cars are the symbol of green transportation, the administration set the goal of supplying 2,500 cars in 2012 by supporting the purchase subsidy of 15 million Won per car at administrative and public offices. In addition, to create additional demand, they extended the present subsidy target from local governments and the public sectors to recipients of transportation, universities, hospitals, and the communications sector which provide public services. Further, they prepared a common standard to secure the consistency of tax support on electric cars,

and allowed a tax cut of up to 4.2 million Won on specific consumption tax, acquisition tax, and education tax.

The Lee administration selected eight technology development projects for hybrid and electric cars, which included the improvement of the efficiency of power transfer units (hybrid cars), domestication of the common rail direct injection system (clean diesel cars), development of core technology for motor, heating & air conditioning, and batteries (electric cars), as well as stacks (fuel cell vehicles). The administration started the project by selecting businesses for technical development in July 2011. The development of five core technologies, which can be used in the mass production of mid-size electric cars in 2014, for electric cars will be finished by the end of 2013, and the three remaining tasks will be completed by 2015.

4. Green Certification and Expansion of Private Business Participation through Green Finance

To secure the competitiveness of green growth and the green industry, we need to expand the participation of private businesses in the green industry. Financial and tax support is also necessary to induce the rapid growth of green technology, green market, and the green industry. Therefore, the Lee administration introduced the Green Certification System in April 2010 to promote the expansion of private investment on the green growth sector by clarifying and certifying the target and scope of the green industry. The Green Certification System is a program that confirms and certifies whether a technology or business applied by the industry is a promising green area, for the purpose of supporting proper investment in the green industry. The type of green certification area can be classified as ① green technology, ② green industry, and ③ specialized green industry. The Green Certification System is composed of eight central offices which operate the

green certification policy; the organization (the Korea Institute for Advancement of Technology (KIAT)) in charge of all assignments related to green certification operation; 11 evaluation centers; and a Green Certification Review Committee. The certification application is received by the organization in charge, evaluated by the evaluation centers and evaluation committee, and then finalized by the Green Certification Review Committee.

From the aspect of a green certified industry, benefits to support green certification have been prepared for the invigoration of a certification system with differentiated incentives. A green certified industry can have benefits on green industry loans, sales and marketing support, development of technology commercialization, and the construction of promotion system for technology businesses. As of August 2012, 882 cases have been certified out of total 1,808 applications for green certification. Among the applications, 727 certifications were for green technology, 19 for green industry, and 82 for specialized green industry. Regarding the type of organization for green certification, there were 72 large companies, 994 small businesses, and 45 private companies. The registered members consisted of 2,146 general members and 2,551 organization members. The organization members were composed of 95 from large companies, 2,312 from small businesses, and 144 from private companies.

<Green Certification Marks >



Green finance has recently appeared as a new business paradigm. Green finance supports investment funding in green industry by selecting sustainable business and green growth as its main business strategy, which not only can lead to low-carbon green growth, but also can create new profitable opportunities through various financial derivatives. Finance is not just a function that supports environmental conservation, but it can also induce the green management of companies and lead the green industry, which is newly recognized as a survival strategy of the industry.

Advanced countries, mainly those in Europe where green finance is well-developed, are actively developing financial activities focused on social and environmental factors, such as 'sustainable finance' which encompasses concepts such as socially responsible investment. The reason why green finance is necessary is that there is a higher risk for investment in green industry and a long payback period compared to other industries, making it hard to secure investment funds. Therefore, there is a need for funding support to expedite the initial investment of the green industry and find a potential demand. The financial support for the green industry has already been reinforced with green finance such as the Green Fund Scheme in the Netherlands, Green Investment Bank in England, and the Clean Energy Finance Corporation in Australia. Also, the role of green finance is to support the new growth engine of green growth and green industry in order to become advanced green countries. At the same time, green finance is rising as a new financial paradigm that pursues environmental improvement, development of the financial industry, and economic growth.

The Lee administration suggested a roadmap for the greening of industry and finance through the Framework Act on Low Carbon, Green Growth and the Green Growth 5-Year Plan. In the midst of the greening process, the financial industry released various green finance products to satisfy the nation, businesses, and people through green finance. Further interest of consumers and businesses can be attracted by providing integrated information on the various finance products. The Comprehensive Green

Finance Portal was developed to contribute to the revitalization of green finance in the long run. In other words, the green growth of financial institutions, financial consumers, and the government and the revitalization of green finance were promoted by providing comprehensive information and operating counseling windows which cover the introduction of individual green finance and industrial products for green finance; information on green certification, green news, and storehouse. In addition, a midterm investment plan in the green growth sector was anticipatively proposed in the amount of 10.7 trillion Won (2009-2013, 2% of the GDP) and reflected in the budget. Even with the expansion of green R&D finance and tax support, and the construction of financial mechanism, the government preemptively prepared the base for the early stage market; yet green financing is still remaining as a premature area as only a few projects were developed in the private sector in the early stage.

Green finance contributes to industrial and economic growth through finance support for green businesses, securing the competitiveness of the green industry. It also induces eco-friendly production and consumption of companies and individuals through the development of green eco-friendly finance products, making efforts to improve energy efficiency and prevent environmental damage. A new source of profit is able to be found in the changes that have occurred in the industry environment such as the formation of a carbon market and environmental regulation. Therefore, it is considered a useful means in terms of improving the image of the financial institution and the aspect of sustainable management strategy. Also, strategic and continuous promotion is required as we can expect precedence effects since there is only a small difference in development level with advanced countries. Policies to induce the voluntary participation of private businesses should be elaborately prepared by providing tax benefits to investors who invest on green savings, green bonds, and green funds, which are funds to support green growth.

5. The Nurturing of Green, Socially Responsible Industries

The Lee administration designated top green business companies as green businesses according to the Green Business Designation Program, and provided incentives to those businesses to promote the expansion of green management. The Environment Friendly Business Designation Program, which had been enforced since 1995, was modified to the Green Business Designation Program with the implementation of the Framework Act on Low



Carbon, Green Growth in April 2010. Some 210 businesses were designated as green businesses as of December 2011. Since the introduction of the environmental information public system targeted for green businesses in December 2009, the Support for Environmental Technology and Environmental Industry Act was revised in April 2011 to prepare the basis to extend target businesses. Moreover, the Construction

of Environmental Information Evaluation System DB to Support Green Finance was implemented to prepare the foundation for the vitalization of green financing to outstanding green management companies. The purpose of such was to support green investment and green loan activities by providing information on the green industry.

In the Framework Act on Low Carbon, Green Growth, green management is defined as "the management taking full social responsibility to minimize environmental pollutants and greenhouse gas emission by encasing the efficiency of resource and energy use." In other words, the Green Business Designation Program encouraged existing green companies to grow as outstanding companies practicing green management based on the previous voluntary experience on environmental management, and the

system also supported industries to take full social responsibility in new business areas through the development of new innovative technologies.



Excellent Green-Biz Mark

Meanwhile, small and medium-sized businesses played an important role in the supply of core green parts and materials to promote the green industry as the nation's new growth engine. Without securing green technology of the parts and materials sector of small and medium-sized businesses, our green industry could have tumbled down to the level where only core parts and materials imported from foreign countries are assembled. Green

growth had to be supported through a systematic nurturing of small green businesses for job creation, improvement of green technology, and its expansion overseas. In July 2010, the Measures to Support Foundation and Growth of Small and Medium Green Businesses were established to support the foundation, growth, and stable management with the goal of vitalizing small and medium-sized green businesses. It was a customized support for small and medium-sized businesses in the areas of core green parts and materials, intended to intensively nurture specialized businesses step by step from their foundation, financing, manpower, to R&D, and finally to overseas expansion.

Additionally, the "Outstanding Green-Biz Selection System" was operated to support the diagnosis and improvement of the green management level of small and medium-sized businesses through green management evaluation. Through the evaluation, the businesses in the advanced class of the industry are selected as Outstanding Green-Biz and granted benefits including funds, manpower, R&D, public purchase marketing, and support on export. Also, professional consulting was conducted for tasks which needed mid- or long-term improvements through a green management

diagnosis project, to improve the green management activities of small and medium-sized businesses. In addition, the Green Management Improvement Program was operated to promote the selection of Outstanding Green-Biz. For the year of 2011, 106 small and medium-sized businesses were supported and provided with the guidance on task performance of green management and enhancement of green management capability.

For the nurturing of the green industry, green R&D investment should be expanded to increase the competitiveness in price and quality and widen the market bases for green technology products. However, if the early stage market is not formed and the uncertainty of market is not eliminated, the vicious cycle can occur and there would be no R&D investment made by the private sector. Hence, the Lee administration prepared the Public Green Market Expansion Plan to form an early market of green technology products using the purchasing power of public sectors. Through such endeavor, the bases were reinforced for the development of technology in related fields and the nation's power as a leader in green technology. In the public sector, the purchase of green products was expanded to induce private R&D investment and create a structure of virtuous cycle where the market in the private sector is extended by the application and proliferation of newly developed technology with an enhanced competitiveness in both price and quality. If the public procurement system is changed to a green procurement system as planned, the current size of a three trillion Won green public market will be increased to 6 trillion Won in size by 2013.

If green technology development policy is systematically connected and operated with financial and tax support, the public green market will be greatly expanded with a synergy of green growth policy. The Public Procurement Service can support the central government by putting forward the complaints or opinions it received while executing purchasing policies in the field, so that the green market policy can be balanced with the market. In the financial sector, a long-term cost reduction can be induced by the expansion of the Energy Efficiency Labeling and Standard and the Green

Building Certification System. In the green industrial sector, the risk of green technology investment can be mitigated by relieving some uncertainty of the green market through public purchase. In addition, by relieving the barrier for green products to advance into the public market and strengthening the green design of large-sized public buildings, it is expected that the demand of green energy-saving products or materials and the installation of new and renewable energy would be increased, thus contributing to the industrialization of green technology.

Section 3: Korea – Growing Green and the Dissemination of the Green Lifestyle

1. Efforts Made by Cities and Regions for Green Growth

Korea's GHG emissions rank ninth in the world, with its rate of GHG increase recording first place among the OECD member countries. In order to reduce GHGs, the system should be converted to an energy-efficient one and dependence on carbon energy must be decreased. As most GHG emissions occur in cities around the globe and are closely linked to urban development, there is an urgent need for attention and amelioration.

Over the last 40 year period, numerous cities have sprung up throughout Korea as a result of the urbanization phenomenon. The city environment has been gradually improved by urban planning and the development of design techniques, however inordinate commercialism has resulted in excessive consumption and increased development density as well as environmental pollution instigated by the conversion of urban structures centered on automobile transportation. In particular, most urban planning has so far had an energy-consuming trend rather than a low-carbon

energy-saving one in response to climate change.

The Lee administration recognized this problem and put forward proposals regarding the development of new cities which are environment-friendly and sustainable by reflecting urban planning techniques for a low-carbon energy-saving city structure in relevant laws and urban design standards in accordance with the low-carbon green growth policy. According to the government's green growth strategy, multifunctional administrative cities including Jeju-do, Dongtan 2 New Town, Asan New Town and other municipalities have actively implemented the development of carbon-neutral cities. Carbon emissions target levels were set by each city in response to climate change, and design methods in respect to urban planning were prepared to achieve zero-carbon emissions, pursuing the environmental sustainability of cities by minimizing pollution as well as saving energy and resources.

At a time when a low-carbon economic structure in response to climate change and urban planning paradigm was required, the Lee administration implemented the 'Green Growth Eco-Rich City Selection System' as an integrated model for green growth, for the coexistence of the environment, economy and society. The word 'Eco-Rich' is a shorten form of the phrase 'ecologically full of life,' meaning the abundance in live ecology, coined to differentiate from the existing ecological city. The Eco-Rich City was selected as an outstanding city for green growth after a comprehensive evaluation of seven different sectors, including new and renewable energy, green transport, water circulation, resource recycling, green industry, green space development, and the participation of citizens. For the purpose of tracking down and expanding outstanding examples of green growth, the administration selected 20 different local governments in 2009 and 11 in 2010 as Eco-Rich Cities. The selection system not only used the crisis of climate change as an opportunity for growth but also aimed to develop energy, transportation and industry. The purpose of this was the construction of a Korean green growth city model, in which the environment, economy and

society are able to co-exist. This induced an early settlement of green growth cities, promoted the nationwide expansion of green growth, and aimed for an integrated development model for the green environment and local economy, including improvements in the urban environment and job creation.

Meanwhile, the 'Low Carbon Green Town Demonstration Project' targeted for local cities, with the goal of increasing energy self-reliance up to 40% by developing 600 different towns by 2020, was enforced when the Lee administration established the 'Waste Resource and Biomass Energy Measures Action Plan' in 2009. Four government departments, including the Ministry of Public Administration and Security (MOPAS), Ministry of Environment (MOE), Ministry of Agriculture and Forestry (MOAF), and Korea Forest Service (KFS), have carried out demonstration projects in 10 different towns since 2010. Later, this project was proposed to be implemented by the MOE as the 'Low Carbon Green Town Construction Project' through an agreement with related authorities in December 2011 on the Improvement Plan for the Low-Carbon Green Town Construction Project. After securing a successful model in the early stages, the project was first implemented in areas where waste treatment facilities were installed. The project was then gradually expanded by increasing the rate of government grants to 70 percent until the project reached a stable stage. The project was carried forward with a voluntary participation of the local residents with their own initiatives. In particular, when selecting a target site, presentations on the project description as well as residents' poll were conducted through on-site visits, and consulting groups for the vitalization of resident participation and green town mentor systems were operated. The operation of facilities using social enterprises also made the continuous follow-up management possible.

Until the year 2015, the end year for the initial stage, emphasis is being made on the solution of environmental issues, recycling of internal waste resources, and utilizing existing facilities, and the design concentrated

on securing a successful model. A total of eight towns were selected, and they planned to invest 52 million Won for the total project cost with national support including local expenditure on the basis that 70% of the total expenditure for the project will be invested. During the mid-stage of the project from 2016 to 2020, some 235 towns, where plenty of waste resources were found to be present, are planned to be used for the creation of completely green towns with the goal of enhancing the rate of self-reliance. In the long-term period from 2021 to 2030, low-carbon green towns will not only be connected to one another, but also specialized as green towns for those with rich waste resources. Through the invitation of related companies to the town, jobs can be created and the town can be turned into a tourist attraction. In addition, green towns were planned to connect with the green technology development centers of local universities, in order to cultivate the towns into hub cities of R&D and education in new and renewable energy. With economic growth and increasing attention given to health and safe food, more city residents are becoming interested in 'urban farming' activities. In the case of foreign countries, urban agriculture was a food supply and a means of living. However, the same space is recently being used for leisure, well-being, and as a green space. This will help to improve polluted air, water, and an ecosystem deteriorated by rapid urbanization and industrialization. It will also assist in the improvement of urban life culture, an example being the enhancement of the notion of 'community' between those living in the same neighborhood.

The Lee administration constructed an environment-friendly urban environment and established the Act on the Encouragement and Support of Urban Farming in November 2011, to develop both urban and rural areas by enhancing urban residents' understanding of agriculture. Based on the law which came into effect from May 2012, the promotional and support system for related organizations was prepared. The 'Urban Farming Support Center' was installed with the purpose of training as well as advertising urban farming, the set-up/running of farming-related experience and practical

programs, and education/dissemination of urban farming-related techniques. When urban farmers voluntarily register for a related institution by forming an 'urban farming community,' or when an individual opens a 'private urban farm' for urban farming and registers to a related institution, they are eligible to receive support from the government.

2. Eco-Friendly Buildings Contributing to the Greening of Korea

When cities and buildings were being constructed during the period of industrial development, the natural environment was destroyed and people began to use a tremendous amount of energy inside the buildings. Due to a series of worldwide energy crises, advanced countries have studied performance and improvement measures to reduce energy used in such buildings constructed during the 1970s and '80s, and jobs able to enhance energy efficiency were also created. In the 1990s, with the emergence of environmental problems, the concept of eco-friendly buildings began to evolve. In the UK and the US, certification systems were established for eco-friendly buildings, and Korea also introduced the Green Building Certification System in 2002. The energy efficiency of new buildings in Korea is relatively lower than those in advanced countries. Therefore, the need to further actively reinforce energy efficiency standards of buildings when approved for construction became apparent. Although the annual energy usage in existing residences is not higher than that of advanced countries, the annual energy usage of newly built housings is twice as much as that of such advanced countries.

The role of the city, especially in the building sector, is very important in implementing the reduction goal of national GHGs and in realizing low-carbon green growth. Considering the fact that the construction sector produces over 25% of national GHG emissions, there is enough room to reduce GHGs through the construction of eco-friendly buildings. The Lee

administration put much effort in constructing a base for creating eco-friendly buildings, and announced the Measures for Activation of Green Buildings in 2009. Then in 2012, the Construction Support Act for Green Buildings was enacted. Through the legislation, energy standards for newly constructed buildings were reinforced with a goal to reduce 31% of GHG emitted from buildings by 2020. Also, the energy efficiency of existing buildings was promoted as well as energy-saving by building users, while a simultaneous effort was made to develop green construction technology and infrastructure. Since 2009, in particular, the Lee administration has made efforts to expand green homes through the 'One Million Green Home Supply Project.' A green home is an eco-friendly form of housing which self-sustains the energy necessary for the family residing in the house, also known as 'zero' carbon emission housing, by using new and renewable forms of energy such as solar lighting, geothermal heat, wind power, and hydrogen fuel. Green homes can be categorized into a 'passive houses' and 'active houses' based on their characteristics. A passive house is a dwelling that minimizes energy leaking from the house by using highly insulated windows and other insulation materials. On the other hand, an active house can self-supply energy by using small-sized wind power and solar energy generators, or other small-sized new and renewable energy generators. The government granted governmental subsidy for the installation equipment related with new and renewable energy to promote an early dissemination and expansion of green homes.

Also, in 2010, the administration obligated the Green Building Certification for public buildings, and in 2012 increased twofold the standard for window insulation performance for new buildings. The administration will also require the labeling of annual energy consumption of structures starting from 2013. Based on such measure, they prepared a long-term plan which requires a gradual enforcement of zero-energy for new buildings by 2025. Through the supply and expansion of green buildings, it is expected that some 6.3 million TCO₂ of GHG can be reduced in the building sector

alone. When this reduction is converted to carbon emission trading (assuming €13), it is equivalent to over 1.4 billion Won. In addition, if converted to gas prices, it corresponds to 17.6 million TOE of reduction or about 7.9 billion dollars of reduction in energy cost. Through green building projects including green homes and offices, not only can the green building market be expanded but also the overseas market entry be expanded and newly emerging markets, such as India and China, can be dominated through developing the global model of green architecture.

3. Strategy for Nurturing the Water Industry and Promoting the Green City Export

The Lee administration maintained a policy for the active promotion of the ‘water industry’, an industry of the future as well as of new growth. Due to the social awareness of water as a public good, the water industry had no chance to grow as a profitable industry. However, severe water shortages in many countries resulting from climate change provided an opportunity to expand the industry. For the ultimate purpose of the advancement of Korea’s water resources and water management, the administration intended to nurture water commodities and service industries. Thus, the ‘Green Growth 5-Year Plan’ and ‘Plan to Nurture the Water Industry and Advance into the International Market’ were announced in July 2009, to support and nurture the water industry and promote entry into foreign markets, while the advanced water treatment project was selected and supported to create a new growth engine. Following this in October 2010, the ‘Water Industry Promotion Strategy’, ‘Future Water Resource Strategy Prepared for Climate Change’, and ‘Strategy for Expansion of the Water Industry into Overseas Markets’ were finalized and implemented to make water the source of a future growth engine. Through these strategies, the

long-term goal, as a core task of the future, was set as achieving 6 billion USD in exports allowing the Korean water industry to acquire a 1% share of the global water market by 2017 and creating 130 thousand jobs accordingly. Mid-term goals were set to reach domestic sales of 15 trillion Won, export sales of 2 billion USD, and create of 5,000 jobs.

The objective of governmental support was ultimately to develop the core technology related to water and to extend the application of the three core technologies of water treatment which include integrated river management, water ecology restoration technology and intelligent water management technology. The magnitude of water-related R&D investment in 2017 will be extended to twice that of 2012, in order to develop and apply core technologies to secure global competitiveness in the three core technologies of water treatment. In addition, to achieve the development of core water technologies, commercialization, and accumulation of experience for domestic businesses to enter the overseas market, a water industry demonstration complex will be constructed at the Environment Research Complex in Incheon starting from 2013, to serve as an advanced export base. Meanwhile, the government supported the development of the foundations for the spring water drinking industry relevant to water industry exports, and supported the expansion of deep sea water export. At the same time, the government developed the technology to use deep sea water energy through comprehensive plant research, the development of HVAC technology using sea water, and the Ocean Thermal Energy Conversion (OTEC) system for the industrial use of deep sea water. The commercialization of clean deep sea water energy will be implemented by applying the resource to ice links and HVACs for the Pyeongchang Olympics in 2018.

Through the nurturing of Korea's water industry, upgrades will also be made to water and sewage treatment - which is the most urgent problem in the water treatment area. As a basis for the advancement of water and sewage treatment, the structure of water and sewage was planned to be reorganized with consideration of the sources of water supply, population

served, economic and others factors. In order to obtain professional management capabilities, 39 water business owners will be integrated into 10 regions by 2014, and they will be entrusted to manage large water-related projects or public organizations. In addition, sewage businesses operated by individual sewage facilities will be converted to an integrated system which manages 30 basins by 2015, to prevent overlapped investment between cities and countries by establishing a basin unit maintenance plan that surpasses administrative boundaries. Further stringent standards for discharge water are also to be established.

Furthermore, in May 2012 the 'Public Sewer Management Contractor Registration System' was introduced to strengthen operational efficiency and professionalism by improving the private commission system, which contributed to creating jobs. In addition, the domestic membrane filtration market was expanded by replacing old water treatment plants with membrane filtration plants, which resulted in the expansion of the membrane filtration market in Korea. As part of the invigoration of the water recycling project, advanced sewage treatment technology was applied to medium and large-size facilities, which can treat up to 20,000 tons a day, to commercialize the technology through demonstration.

In the future water market, a high added-value market including a membrane filtration technique and an IT based water main management system, will be expanded and focus on advanced countries and the Middle East region. Multi-purpose dams and sewer system construction projects are expected to continue according to the industrialization and urbanization in developing countries. Consequently, a differentiated strategy is necessary for Korea's water industry and water treatment technologies. According to the condition of water sector investment (GDP) of interested countries, conditions of water resources and water quality, and market outlook on water and sewer systems, a customized strategy was prepared by four major regions. Korean companies should focus on traditionally strong areas including the water and sewer systems and seawater desalination plants, but also need to diversify

into basin management, waterfront development, and other integrated water management systems in the future.

To promote the convergence of all water-related studies and collaboration between the water industry and academia, an institution which trains professionals in the water industry will be established by 2013, and a research and education center will be established by 2014 to conduct long-term educational programs for civil servants from strategic countries. In addition, an advanced course for water industry project managers was expanded to train competitive manpower, and other courses were prepared to provide necessary professional knowledge on international orders and biddings, crisis management ability, exploration of ODA businesses, and other programs, to secure professionalism as well as management.

The water industry is both a mechanism industry and a service industry, and there is a limitation for an individual company to enter the overseas market due to the high risk involved. Therefore, we need to promote overseas expansion through collaboration with large/small & medium companies and public/private companies to secure competitiveness in the water industry. The result of the 2012 survey conducted by the government in respect to 450 water-related businesses showed that the industry is considered a sector which requires high publicity and trust. Therefore, a private company's individual entry into the global market was evaluated as being exceedingly difficult. Thus, the government supported the construction of a collaboration platform for overseas expansion on a national level, and provided integrated information including bidding/national information, trade, and advertisement of domestic water industry's technologies, which can play a leading role in the development of the foreign water market. In addition, as a diplomatic effort for developing a new international water market, the 'Global Green Biz-Partnership' in the green project sector was extended to strengthen personal networks with domestic companies specializing in water. Also the 'Global Project Plaza' event, where high officials of major project companies are invited to increase the chance to win

contracts for water-related projects, will be hosted every year starting in 2012. Through the collaboration of related government offices and water export companies, the 'Private and Governmental Collaboration Water Market Development Group' and 'Overseas Construction Contract Support Group' were established to support the winning of new water-related projects at the government level. Considering the fact that the water industry requires a large amount of investment, the Asia Water Fund (AWF) was founded with the total amount of 150 billion USD in order to support the target countries of China and other Asian countries. The International Finance Corporation (IFC), Global Infra Fund (GIF), Korea Water Resources Corporation (K-water), private investors, and overseas investors were allowed to participate in the fund so that a cooperative investment could be made in the overseas investment project.

Such water industry exports are highly related to city exports which was also what the Lee administration had aimed for. In particular, the export of green cities with advanced water resources and water/sewer systems is certainly an ideal export product, on which Korea's economy should concentrate on. The 'Green Town' is the aggregation of the knowledge industry which includes green life, green industry, and technology. With the existing urban infrastructure and convergence of advanced technology with increased energy efficiency, an environment-friendly city that minimizes burden placed on the environment and applies advanced technologies should be built. It should also be a future-oriented city which can adapt to climate change and have potential for continuous growth. Korea is already in possession of some previous experience in the knowledge industry relevant to urban projects. Even though such experience was not intended for the realization of green cities, recently implemented projects are that of the knowledge industry which constitute green cities. The combination of recent and previous construction experience regarding modern cities enabled Korea to build a better and new package of green cities in the knowledge industry. This will play an important role in the export of green cities in the future.

- A) The export of the green city is differentiated from simple construction exports and real estate development businesses, as it is an export of the knowledge industry in the full spectrum of city construction and development. It means planning, designing, and constructing our national green growth policy and the global requirement of environmental value through the 'city,' which is the comprehensive consumer of the industry, as well as exporting the green industry and green product that are linked together. The export of cities is of a more advanced industrial model that includes green value, new technologies, and new industries, offering Korea's experience and knowledge to other nations by commercializing successful Korean growth models. Ultimately, we can secure economic and social profit at the same time through the export of green lifestyle and the Korean Standard (KS). Beyond merely exporting buildings, specific technology, or products, the export of the green city is essentially the export of advanced goods and services in the wide areas of industry and technology. Korea should compete with advanced countries, with the ultimate goal of its green cities becoming the model for urbanization in developing countries.
- B) In particular, as Korea has accumulated technology and experience in integrated water management through its Four Major Rivers Restoration Project as a form of anticipative action for climate change, Korea is able to make use of such technology and know-how to position itself in the new markets of comprehensive river maintenance, water ecology restoration, water quality improvement, and integrated water management system in order to promote the export of the green city – a new future growth power. Thus, Korea has successfully exported new technology in the early stage to the two countries of Thailand and Algeria, which showed the most interest, and now is planning to expand into other regions and areas of business. At the time, the business method was

chosen according to the developmental status of the country concerned and the market was entered in a phased manner. The first step was to discover the target market through collaboration with the government, and the second was to strengthen the advanced base by constructing a cooperative system with the country itself. Steps 3 and 4 were to prepare a master plan or feasibility study at no cost with the countries which had signed MOUs with Korea as the foundation for the acquisition of future contracts. Finally, the Global Infrastructure Fund (GIF) and Asia Water Fund (AWF) were founded to strengthen financial support. In addition, official development assistance (ODA) and funds from the Economic Development Cooperation (EDCF) were made available, flexibly with each country's project characteristics, and synergy effects were increased through the connection with related projects.

4. Expansion of the Railroad Network, Vitalization of Public Transportation and Construction of the Green Transportation System

With reinforced international environmental regulations, the importance of green transportation increased and the paradigm which can determine the competitiveness of transportation business appeared. Recently, biodiesel, bio-fuel, hybrid cars, electric cars, and fuel cell vehicles were developed to enable eco-friendly transportation and the usage of renewable fuels. Through this progress, pollution and GHGs were significantly reduced, greatly diminishing environmental pollution. Above all, eco-friendly transportation activities protect the environment, while allowing sustainable development and create green values. Therefore, the change in the paradigm of transportation activities appears along with stringent international environmental regulations, but it is a trend which cannot be countered by

anyone. Thus, developing a new transportation system is required for gaining global competitiveness.

According to the statistics of the Korea Energy Economics Institute (KEEI), Korea's annual energy consumption increased 1.43 times (75 million to 180 million TOE) during the period of 1990 to 2009. However, the energy consumption of the transportation sector was 36 million TOE in 2009, which account for 19.7% of total fuel consumption. Further, the consumption of petroleum in the transportation sector, which is the main fuel for cars, accounted for 36% of total petroleum consumption in Korea. According to the forecasted GHG emissions of the transportation sector in 2010, GHG emissions, when applying the GDP forecast to the recent trend line, were estimated to be 120 million tons. Thus, Korea's economy is at a point where the existing transportation paradigm of transportation and logistics, focused on roads and vehicles, needs to be converted to one that is more centered on eco-friendly transportation means. Also, the development and supply of green technology, including green cars, is essential to achieve the goal of GHG reduction and to strengthen the nation's technological competitiveness in the global market. Through the establishment of R&D development strategy, there was a need to increase investment on green transportation and related facilities, equipment and system development; and promoted the commercialization of technology as well as the advancement into the overseas market.

According to the social and economic demand, the Lee administration prepared the Master Plan for Sustainable National Transportation Logistics Development (2011~2020,) which included roads, railroads, airlines, shipping, walking, biking, and other transportation means; and passenger sector and logistics/cargo based on the Article 7 of the Act on Sustainable Transportation Logistics Development and Article 53 of the Framework Act on Low Carbon, Green Growth enacted in 2009. In other words, it proposed a long-term goal and strategy for a sustainable transportation logistics policy, while suggesting a direction for a sustainable

local transportation logistics development plan so that the basic principles of low-carbon green growth and its national strategy can be harmonized. Thus, the government planned to reduce 3.45 million tons of GHG emissions, which is 34.4% compared to 106 million tons compared with BAU (Business As Usual) in the transportation sector by 2020, through the execution of sustainable transportation logistics policy and improvement of fuel efficiency. The government planned to reduce approximately 14.26 million tons of GHG through the policy implementation and 20.24 million tons through technology development including gas mileage. For the midterm goal in 2015, the government aims to reduce 9 million tons which is 9.6% of BAU (93 million tons). With this effort, the ultimate goal was to become the global leading country in the sustainable transportation logistics sector.

Policies were actively implemented for the advancement and commercialization of railroad transportation, which has significantly better energy efficiency than road transportation. The Lee administration finalized the 'Second National Railroad Network Construction Plan' in April 2011, which contained the plan to connect major cities within 1.5 hours through the KTX express railroad network by 2020. This plan was a 10-year mid- to long-term investment plan according to the Railroad Construction Act, containing railroad related construction plans and funding procurement plans. It was aimed to respond to low-carbon green growth and 5+2 broad region economic development plan, as well as to suggest detail action plans for the 'KTX Railroad Network Construction Strategy for Future Green Land Realization' which was announced in September 2010, after collecting a wide range of opinions from related organizations and experts based on the results of research conducted by a professional research institute.

According to the 'Second National Railroad Construction Plan,' the current 368.5km-long express railroad which has so far only been constructed between Seoul and Busan with an average speed of 230 km/hr. will be extended to a length of 2,362.4km by 2020. As a result, the range of express railroads with a total travel time within 1.5 hours will be extended to 83%

of the population from the current level of 60%. In addition, the total length of railroads will be extended from 3,557km to 4,934km, and the length of double tracks will be extended from the current 49.6% to 79.1%, with an increase in the subway system from 60.4% to 85.0%. To achieve this, the existing railroad construction project was planned to be completed at a suitable time, with the Honam railroad system from Osong to Gwangju section planned for completion in 2014, and the Gwangju to Mokpo line by 2017. The section from Suseo to Pyeongtaek, which is a part of the Seoul Metropolitan Area Railroad, and the Daejeon to Daegu section on the Gyeongbu Express Railroad, will be completed by 2014. The construction of other railroads will be finished earlier than planned. In addition, to address the traffic congestion problem in large cities, the construction of the metro railroad network will be expanded in a continuous manner. In order to do so, an objective was set to construct railroad networks enabling access to the downtown area within 30 minutes by planning the promotion of regional railway systems including the Yongsan - Munsan sector on the Gyeongui Line, Yongsan - Gangnam on the New Bundang Line, Ansan - Yeouido on the New Ansan Line, the Seoul Metropolitan Area Express Railroad, as well as other metro railroad projects are planned to be implemented in a timely manner. In the meantime, a mass transportation railroad logistics network connecting industrial complexes and logistics hubs will be constructed with the aim of alleviating traffic congestion in major cities.

On the other hand, a mass transportation railway logistics network which connects industrial complexes and inland cargo bases was also planned for construction. Inland railroads connecting the core logistics hubs – ports, industrial complexes and inland container depots – with the mainline railway network were to be continuously expanded, newly promoting five new projects including the inland railroad system for Donghae Port, Masan New Port, Yeosu Yulchon Industrial Complex, Gumi Industrial Complex, and Ansan Industrial Complex, as well as the completion of four other projects including the inland railroad system for Gwangyang Port, Ulsan Port, Pohang

Youngil New Port, and Gunjang Industrial Complex as planned.

When this government-led railroad expansion is completed according to plan, the passenger proportion that railway transport accounts for will increase from 15.9% in 2008 to 27.3% in 2020. The ratio of cargo transportation is anticipated to increase from 8.0% to 18.5%, which will result in a benefit to society equivalent to 6.8 trillion Won per year in addition to a reduction of 7.74 million tons of CO₂. Furthermore, the increased accessibility thanks to the extension of the railroad system will contribute to an increase of 91 trillion Won per year to the local GDP (from 974 trillion Won to 1065 trillion Won), and is expected to create 1.98 million jobs while spurring a surge in production worth 233 trillion Won. Simply speaking, the transportation system will be converted to a railroad-centered transportation and logistics system, which will construct the base of green growth. Meanwhile, instead of expanding railroads for green transportation, the number of allowed trucks, which is an obligatory agreement by the government, was adjusted from 3,800 to 2,200 by 2014 to increase the energy efficiency of the logistics sector. The companies were encouraged to voluntarily participate in the 'Logistics Energy Target Management System,' and 28 existing logistics companies were to be extensively increased to 200 by 2015, granting the benefit of integrated energy consumption measuring meters. Also, those logistics companies discharging over 2,000 TOE will be gradually obligated to participate through the 'Energy Consumption Reporting Demonstration Project'.

To deal with high oil prices continuing with unstable international politics such as the sanctions of the international society against Iran - one of the main oil producing countries - the Lee administration hosted a 'Crisis Management Meeting' in May 2012, and announced the 'Oil Consumption Reduction Measures to High Oil Prices' while making plans to continuously reduce fuel consumption in the transportation sector, which accounts for 32.7% of total energy consumption. In particular, restricting the use of private cars and encouraging the utilization of public transportation was thought

to be the most effective solution to reduce fuel consumption in the transportation and logistics sector. In order to promote the use of energy efficient green transportation such as public transportation including buses and subways as well as limiting the use of private cars, the expansion of public transportation zones and car sharing in addition to improving the traffic congestion charge system were to be promoted.

Above all, providing prompt and convenient public transportation was the most urgent task for the alleviation of traffic congestion during rush hour in Seoul and other major cities. Therefore, differentiated services were provided, which include limited stops, the prohibition of buses carrying people without seats, and the increase in M-Bus (Metropolitan Bus) lines, which are popular for commuters living in the outskirts of Seoul. For this purpose, three additional lines (Gimpo Han River - Seoul Station, Goyang Siksa - Seoul Station, and Namyangju Hwado - Jamsil Station) were operated in addition to the existing three lines (Suwon Gwanggyo - Seoul Station, Goyang - Gangnam Station, and Incheon Cheongna - Seoul Station). In the first half of 2013, the extension of three more lines of the M-Bus (Metropolitan Bus) was discussed with the local governments and bus companies, as an effort to continuously extend the system. Meanwhile, comprehensive transfer centers were planned to be developed by combining the functions of culture, commerce, and offices at major transportation hubs. With this development and the convenience of public transportation transfers, it aimed to increase the use of public transportation. Hence, the 'Comprehensive Transfer Center Demonstration Project' was finalized in 2012, followed by other development projects in a consecutive order. Targeted areas include Dongdaegu Station, Iksan Station, Ulsan Station, Gwangju Songjeong Station, Bujeon Station, Dongrae Station, Daegok Station, and Namchuncheon Station, where the project will be implemented starting in early 2013.

Additionally, information on the operation of intercity buses, including 138 terminals, will be provided by a single portal website. Online

ticketing will be integrated into the intercity bus ticket dispensing system, which will include additional lines for internet booking. In addition, the width of heavily-used roads in old downtown areas will be reduced and general traffic allowed in the area will be limited. The 'Demonstration Project for Exclusive Public Transportation Zone' was to be implemented to provide a more convenient public transportation. Demonstration projects were planned to be conducted in Daegu Jungangro in 2009 and Busan Dongcheonro from 2010 to 2013. The project for Daegu increased bus passengers by 43.6% in two years, reducing CO₂ by 54%. With such excellent result, the Exclusive Public Transportation Zone will gradually be expanded to provide a safe walking environment with a wider walking space.

As fixing incorrect driving habits can have substantial effects on fuel reduction and GHG emissions, the government promoted various transportation programs and advertisement campaigns, as well as green driving experience with the participation of citizens. Preferentially, 6- to 8-hour economic driving experience training was conducted for 4,000 buses, trucks, and individual drivers. Economic driving was included in all legal transportation safety training sessions, with some 8,000 people per year taking advantage of the economic driving training. Economic driving education centers were also installed in driver education troops, such as the army and the air force, to encourage participation. In addition, economic driving information centers equipped with visual experience simulators were opened to visitors allowing them to experience the program first-hand. A website has been developed and is run for the purpose of providing education and information on economic driving in a cyber-environment for general public. In addition, a contest on economic driving fuel efficiency held three times year, UCC and slogan contests, internet portal advertisement, and other various activities were conducted to promote the citizens' participation in economic driving.

The Lee administration's construction of cycling infrastructure for the creation of green public transportation received a good response from

the public and dramatically advanced the development of the cycling culture. The advancement of Korea's cycling culture was largely contributed by the connection of bicycle roads along the whole national territory, which was promoted along with the Four Major Rivers Restoration Project. The 'Bicycle Festival' has been taking place every year since 2009 to attract the citizens' participation in green transportation and increase bicycles use. The domestic regional bicycle festival was connected to the international event, 'Tour de Korea,' which provided an opportunity to expand the user base of bicycles as a kind of green transportation. Connecting bicycles with public transportation such as subways and buses provided a big opportunity for the expansion of bicycle users, which contributed to the advancement of the bicycle culture and establishing cycling as a national leisure sport as well.

5. The Green Start Movement and Vitalization of Green Living

After the declaration of 'Low Carbon, Green Growth as the future vision of Korea by President Lee Myung-bak in 2008, the government has jointly constructed a network for the mutual promotion and cooperation on green growth with the citizens, industry, science circle, and local government organizations in order to successfully implement green growth in Korea. The administration also induced the participation of the citizens through the 'Green Start' movement. In the national assembly, a special committee was created to cooperate with both parties for green growth and response to climate change. Thus, the vision of low-carbon green growth rapidly expanded. Korea's long-term national was to be the 7th green power in the world by 2020 and the 3rd by 2050. A prompt enactment of the Green Growth National Strategy and Five-Year Plan which encompasses the environment, economy, and life policy; and the legislation of a series of laws including the Framework Act on Low Carbon, Green Growth allowed the international arena to assess Korea as a successful model of green growth.

However, the reduction of GHGs in non-industrial sectors is essential in achieving the GHG reduction goal by 2020 and in realizing low-carbon green growth. The non-industrial sector accounts for 44% of all GHG emissions (2009). As there is much potential for reduction compared to the industrial sector, efficient measures could be made in a short period of time. In other words, the settlement of green life practice is an important and essential factor required for achieving the GHG reduction goal and success of low-carbon green growth.

Even though the policy and system are important, the most important factor for green growth to settle in is the green lifestyle of the citizens. The establishment of an institutional basis in which the people's awareness could be enhanced through green lifestyle practice movements was desperately in need. Therefore, the Lee administration implemented 14 specific green lifestyle projects in four sectors, to increase people's awareness of green lifestyle, practice green lifestyle, and revitalize green consumption.

<14 specific projects for green life>

- ① Nurturing and expanding subjects practicing green lifestyle
 - train citizens to voluntarily practice low-carbon green lifestyle
 - implement green campus campaigns within universities
 - promote voluntary reduction of GHG in non-industry sectors (residential and commercial)
 - reinforce networks for the practice of the green lifestyle
- ② Promotion of citizens' awareness and participation in the green lifestyle
 - disseminate action plans for green living and practice campaigns
 - carry out cool clothing (Cool Mapsi) and green office campaigns
 - induce green promotion agents by category

③ Promotion of green consumption

- extend organizations and products requiring the purchase of green products of the public sector
- extend the participation of the industrial sector on green consumption
- supply green cards to encourage green consumption
- stimulate green consumption in all aspects of life

④ Promotion of low-carbon green products

- expand the supply of green products through incentives
- extend and reinforce the carbon label system (low-carbon products)
- introduce green store certification and extend green logistics

In order to encourage further interest and participation in green growth and provide residents with various opportunities and practical education to experience, learn, and feel green growth, life-style green growth projects for local residents' were implemented. For example, the Ministry of Public Administration and Security (MOPAS) allocated 1.5 billion Won in funding since April 2011 (100 million Won per city) for green education to match the local characteristics of the citizens of 16 cities. Through the project, rather than forming large scale facility projects related with green growth, spaces around the town where one can directly experience the principles of green growth or vegetable farmland in households and educational programs for children were to be implemented to enable a resident-centered education. Based on the project, various grassroots-type growth policies specific for each area were implemented to help develop a continuous base for green growth. In the meantime, many examples were shared through presentations given by the municipalities, and outstanding models were disseminated through demonstration projects.

The interest and understanding of citizen participation in green growth was raised through various green lifestyle projects organized by local

governments. The ‘Local Green Growth Promotion Projects’ started in 2011, supported a total of 33 sites by 2012. The provision of facilities and actual experiences for residents, particularly for elementary and middle school students, received positive responses overall. In 2012, 30 green lifestyle projects including the introduction of a food waste reduction household measuring system in Gwangju and the green roofing of study rooms in Daegu were selected as the ‘Local Green Growth Promotion Projects’ through a competition, and the cost for implementation was provided by the local governments.

(1) Reinforced Campaigns for the Expansion of Green Lifestyle Practice Such as Green Start, etc.

Practicing green living is the most fundamental way for citizens to cope with the rapidly progressing global warming and climate change. The Green Start movement was introduced as a practical movement for a nationwide green lifestyle, aiming to reduce GHGs and pollutants generated in daily life through efficient energy use. .

The Green Start movement was a practical movement for reducing GHGs and realizing low-carbon green growth, by settling green lifestyles in the non-industrial sector including homes, transportation, and businesses through the cooperation with among the government, industries, and civic groups. As Korea, in the past, overcame absolute poverty with the ‘Saemaul Movement’ and prepared the national foundation for an industrial country, the nation aimed at developing the Green Start movement as a new citizen’s movement in the 21st century by public-private governance. To introduce this movement, the Green Start National Network was established in October 2008 (Joint Representatives: Lee Man-ui, Minister of Environment; Son Gyeong-sik, President of the Korea Chamber of Commerce and Industry; Lee Jin, Standing Chairman of the Local Sustainability Alliance of Korea; Lee

Jae-chang, President of the Korea Saemaul Undong Center), with cooperation of 10 different government offices, civic groups, and industries. Afterwards, for the nationwide spread of the Green Start movement, a network in which 266 regions and 4,200 groups participated was built.

The Nationwide Green Start Network was initiated for GHG reduction, the 'Low Carbon, Green Growth' vision, and all national movements to settle and disseminate the culture of green living. First of all, the vitalization of green education was promoted for the practice of nationwide green lifestyle by developing and supplying green contents. The textbook *Understanding Climate Change* was published for teachers and students who will become future green citizens, and it was provided to elementary, middle, and high schools. Applications, such as the 'Carbon Footstep Calculator, Carbon Household Account,' which can be freely downloaded from the internet or mobile devices such as smart phones were developed. They were developed for students and the general public to measure the GHG emitted from daily living and figure out ways to reduce it. Through the online education center, customized educational contents according to the subject and level were provided, while the offline education center developed and provided practical educational courses that require direct participation.

The Nationwide Green Start Network recruited and trained Green Leaders to perform a key role as green activists for the dissemination of low-carbon green life, with the objective of leading the 'Green Start' movement, a nationwide movement to reduce GHGs. Some 43,920 green leaders from 16 cities were trained through the 'Climate School Operation Project' by the end of 2011, and the plan to train 50,000 green leaders by 2015 could be achieved earlier by the efforts in 2012. The Nationwide Green Start Network was focused on green education and the spread of green atmosphere. The Network conducted practical events so that the citizens can participate in and practice low-carbon green lifestyles. In celebration of the Earth Day on April 22, the week before and after the date were designated

as the Climate Change Weeks, during which various events take place throughout the nation. Moreover, education on climate change and GHG diagnosis and consulting are conducted twice a year for schools and homes across the nation. To be specific, about 85,230 cases of diagnoses and consulting were provided. Therefore, those could enable a natural practice of green living. The Nationwide Green Start Network also induced the labeling of all GHGs emitted from the entire process of manufacturing the product used in daily living, starting from the raw material, production, manufacturing, to distribution, in order to spread the practice of green lifestyle. Furthermore, the Network promoted the settlement of a low-carbon consumption culture as well as companies' voluntary GHG reduction by initiating the incentives of reduction performance.

The Green Start movement achieved remarkable performance after four years since the Green Start National Network was launched. First, the public-private partnership (PPP) was rapidly expanded nationwide for GHG reduction. Sixteen metro networks and 230 local networks were developed, and practicing groups and organizations jointly implemented green living campaigns. In this process, 50 enterprises and groups signed MOUs on green living practice, and also implemented green travel, teen camps, and other joint campaigns. Second, green life programs designed for the citizens' practice were explored and disseminated. A contest for green lifestyle practice program was promoted for private groups, supporting and providing various programs such as home energy consulting, building green cities and offices, reducing carbon, and others. In December 2011, the 'Green Touch,' which is a PC standby power-saving program, was developed, of which 20,000 units were provided to the Korea Airports Corporation, Korea Federation of Housewives Clubs, Busan Seogu District Office, and other enterprises, organizations, and facilities. Third, 'green leaders' who practice and spread green living from every region of the country were nurtured and their systematic actions supported. More than 50,000 green leaders were trained, who diagnosed more than 50,000 homes for GHG and offered climate change

education to 340,000 participants. Fourth, a support system was prepared for the education on climate change for all citizens. Through the contest on the metro network educational project, the operation on climate change was supported. In the meantime, the Climate Change Education Hub was constructed to develop and supply customized educational contents according to the students' levels. Finally, citizen participatory green lifestyle promotions and campaigns were conducted. During the green holidays (New Year's Day and Korean Thanksgiving Day), climate change week (April), Creative Children's Song Contest (June), Green Travel (July-August), cool clothing (summer season), and warm clothing (winter season), many events and campaigns were carried out to support green life. In addition, the practice of green lifestyle was advertised through websites, blogs, SNS, and other types of media.

(2) Green Lifestyle Incentives: The Introduction of Green Cards and Activation of Carbon Points)

According to the Fourth IPCC Assessment Report submitted in 2007, there was much potential for GHG reduction in residential and commercial facilities. Subsequently, the Lee administration adopted the 'Green Card System,' 'Carbon Point System,' and the 'Carbon Labeling System,' presenting citizens with incentives for practicing green lifestyles with the intention of reducing GHG.

The 'Green Card,' which gained a positive response from the general public, is a type of credit card introduced to promote green lifestyles and green consumption, as well as to contribute to climate change adaptation. If green lifestyle is practiced through the conservation of energy and purchasing of green products using the credit card, points are given by the government, local governments, or enterprises with the purpose of establishing the 'green lifestyle' culture among the citizen body. Initially there

was limited participation due to the fact that green lifestyle and green consumption were thought to be complicated and time-consuming, even despite the wide awareness of climate change. However, it was soon realized that there was a need to reduce carbon emissions from the industrial sector (including homes and industries) by 43%, and as an effort for such need, the government allowed financial institutions to introduce the Green Card in July 2011 to provide incentives to those who practice green lifestyle. The biggest feature of this system was to provide actual incentives for the practice of the green lifestyle, and more than 200,000 Won in the form of points can be accrued within a single year. In addition, some points are able to be donated for environmental protection. Points can be accumulated according to the performance of GHG reductions from the electricity, gas, and water used in residential and commercial buildings. The benefits can also be provided through the carbon point system, green consumption, public sector incentives, and the specialized services of regular cards.

<Examples of the 'Green Card' (Samples)>



The 'Green Card' utilizes a credit point system similar to that of a credit card, and the central government, local governments, and enterprises grant points whenever green lifestyle is practiced, such as energy conservation and purchase of green products. It was welcomed by citizens as a method of establishing the green lifestyle culture domestically. After it was released in June 2012, three million citizens joined the program to expanded green consumption and the practice of green lifestyle. According

to a survey of 1,445 'Green Card' holders conducted in May 2012, efficient results were achieved in terms of the increase in green lifestyle indices regarding the use of public transportation (50%), purchasing of green products (46.6%), and household energy conservation (66%). Above all, for the expansion of Green Card use, a green logistics network was completed as the first step, granting eco points to 747 green products manufactured by 71 enterprises. Stores that allocate points were also expanded, even to small neighborhood supermarkets or convenience stores. In May 2012, a green POS (Point of Sales) system was installed in 3,800 supermarkets and stores, which can automatically identify and accrue points. As of 2012, 10 financial institutions, 45 enterprises, and 182 public facilities are voluntarily participating in the 'Green Card System.' It is expected that four million green cards will be issued at 30,000 participating supermarkets and stores, and the number of green points distributed will equate to 1.5 billion Won by the end of 2012.

Another benefit of the 'Green Card' is that it acts as an opportunity for triggering green finance, something which can be sensed acutely by the public. The Green Card was selected as an outstanding example by the Prime Minister's Office and evaluated by the Financial Supervisory Service as the most outstanding case of green growth, placing it the 5th bestseller in the credit card sector in 2012. The government, above all, was positively evaluated as they succeeded in promoting the issue through the media, suggesting that the 'Green Card' is a part of green finance that is close to the citizens who participate in green growth. In another words, the outcomes have been fruitful as the tone of green lifestyle changed from 'complicated and hard' to 'easy and economically beneficial' regarding the awareness of the public's participation. Based on the performance of the green card over a one-year period, the objectives have been set to issue five million cards and gaining the participation of 400 businesses by 2015.

The Lee administration adopted the 'Carbon Point System' to encourage voluntary GHG reduction by expanding the GHG reduction policy

to the non-industry sector in 2008, which was initially focused on the industrial field, before introducing the 'Green Card System.' The 'Carbon Point Policy' allocates points depending on the reduction of electricity, gas, and water in residential housing and commercial businesses. The program also aims to provide incentives for the reduction of GHGs by resolving problems through demonstration projects carried out from November 2008 to June 2009, which were fully implemented on July 1, 2009.

Carbon points are given according to the performance of GHG reduction, and incentives are offered depending on how many points have been accrued. Incentives vary depending on the reduction performance in electricity, water, and gas. Incentives may be granted and used in different ways by the local government. In the case of apartments, points may be given in the form of apartment maintenance fee reductions, cash, 'Green Card' points, gift cards, garbage bags or transportation cards. Therefore, a household could theoretically receive up to 70,000 Won in incentives if they were to reduce their consumption of energy resources such as electricity, water, gas and others. Based on the average usage for the past two years before joining the 'Carbon Point System,' there are two options in regards to how benefits can be given: a 5-10% reduction or a 10% or more reduction. When an individual registers for the 'Carbon Point System' in connection with the 'Green Card System,' they may receive benefits whenever they use the card.

In fact, the carbon point system was evaluated to be effective due to the fact that 34,980 tons of CO₂ in 770,000 houses within 182 local government areas was reduced, achieving the GHG reduction objective. Participation in the system increased exponentially thanks to the connection with the newly supplied 'Green Card.' Construction of the automatic linking system, with data including electricity and water consumption details of carbon point participants, provided significant benefits to these participants as well as to local governments.



As trends shown the increasing preference for green enterprises among consumers, and as interests are becoming focused on the policies for the prevention of damage occurring from abnormal climatic conditions and global warming, the 'Carbon Labeling System' was

expanded in developed countries including the UK, Sweden, USA, and Canada. The Lee administration, creator of the green growth strategy, introduced the 'Carbon Labeling Certification System' in 2009, to indicate the level of carbon emissions on the product's label, allowing consumers to freely choose eco-friendly products. Many enterprises were interested in having the carbon labeling certificate applied their products, and as of 2011, there were 201 products (an accumulated number: \ 98 enterprises producing 502 products) which were certified.

The Lee administration provided various support measures to assist the 'Carbon Labeling Certification System' to be accepted by the public. In 2011, standards relating to low-carbon products were reorganized in order to create an institutional basis for the enforcement of the system, and the first low-carbon product was certified soon after. In September 2011, the notice released by the Ministry of Environment (MOE) for the 'Regulations on Carbon Labeling Certification' was revised; in December 2011, a certification award ceremony was held for nine products produced by nine separate enterprises. Along with the follow-up management of the 'Carbon Labeling System,' field inspections were made to check the amount of emissions and were also conducted for various media and logistics products. As the expiration of the certification period for carbon-certified products came closer, notifications were sent out to 33 enterprises producing 111 products to advise them of renewal. The 'Carbon Labeling System' supported small

and medium businesses through the ‘Support Project to Estimate Carbon Emissions from Small and Medium Business Products,’ in addition to nurturing experts in the field. The government contributed 50% of the certification fees for small and medium businesses for the purpose of relieving the burden of the certification cost.

(3) Improvement of Institutions such as the Volume–Rate Garbage Disposal System and the Practice of Resource Conservation, Including the Reduction of Food Waste

The ‘Volume-Rate Garbage Disposal System’ has been implemented every year since it was introduced in 1995. It has been adopted as a lifestyle habit by the general public, through which their awareness of waste recycling improved, also invigorating the ‘separate collection’ system. According to research, considering the economic value of recycled products and reduced costs of waste disposal achieved by reducing the amount of waste between 1995 and 2009, the total economic revenue over the 14 years amounted to 20 trillion Won. Social benefits gained through the ‘Volume-Rate Garbage Disposal System’ and ‘separate collection’ are both environmental and economic, and this system has become a representative feature of green growth policy. Therefore, the Lee administration decided to increase public participation in the existing ‘Volume-Rate Garbage Disposal System’ as well as the ‘Separate Collection of Domestic Waste,’ in order to enhance relevant environmental and economic benefits. Public relations activity and education were reinforced, while improvements were made to the existing system through the analysis of its advantages and disadvantages, in order to set an example for green lifestyle. Firstly, the ‘Volume-Rate Garbage Disposal System,’ including adjustments to the methods of garbage collection suited to each region, heightened promotion regarding the time and method of

waste and recycling items, while the free collection of recyclable items were improved. With this improved consciousness of waste reduction, efforts were made to reduce waste and spur the utilization of secondhand market exchange markets, as well as changing public habits to disuse disposable products, use personal shopping bags and products that can be refilled, and promote purchase of items at flea markets.

Thanks to the reinforcement of the policy, the amount of waste produced per capita on a daily basis was reduced from 1.02kg in 2007 to 0.96kg in 2010, and the recycling rate was increased from 57.8% in 2007 to 60.5% in 2010. In the meantime, landfill levels decreased rapidly from 23.6% in 2007 to 17.9% in 2010. In addition to the industrial success, the development of recycling technology and recycling treatment were invigorated, allowing for the development of recycling industries including colored glass bottles, colored PET bottles, and separation technologies for other forms of mixed waste, in addition to technology that utilizes materials obtained from various forms of waste.

On the other hand, as the public became increasingly interested in domestic waste, the necessity of improvements at the political level also became evident. The main problem which arose from the increased quality of life was food waste, with the potential of highest social cost. Based on figures in 2008, the amount of food waste in Korea had already exceeded 15,000 per day. The traditional Korean food culture, with its high consumption of rice and side dishes, was the main reason for the production of 0.35kg of food waste per capita/day in 2009, which is higher than Germany's (0.27kg) and the UK's (0.26kg). In particular, about 70% of total food waste came from small restaurants and general households, and the major reason for the increase was blamed on the population, households, and the increase in national income as well as excessive amount of side dishes served in restaurants. A solution to the problem was urgently required, as the majority of food waste was composed of organic elements, which have problems concerning cost and environmental damage.

Therefore, the Lee administration and related departments prepared a policy in the year 2010 for a 'Comprehensive Plan to Reduce Food Waste,' shortly after implementing the policy to efficiently improve the situation. Firstly, the 'Volume-Rate Garbage Disposal System', which charges a fee dependent on the amount of food waste disposed, was to be implemented until 2012 for the control of waste disposal. There was no fee charged or a fixed cost was applied for 144 regions where food waste has been separated and disposed, but starting from 2012, the disposal charge was applied according to the disposed amount, enabling the sustained food waste reduction effect through economic incentives. As a result, the 'Volume-Rate Garbage Disposal System', which had been implemented by 58 local governments in June 2011, was expanded to 74 local governments as of June 2012. Also, the measures for waste food solutions for each source of waste food, such as restaurants and foodservice establishments, were spread nationwide, increasing the number of participating local governments from 100 in 2011 to 192 in June 2012. For instance, the result of the food waste reduction strategy showed that 40% of food waste was reduced in the case of integrated government building cafeterias, while food waste at military base cafeterias and five demonstration schools was reduced by 48% and 36%, respectively.

Currently, 13,000 tons of food waste is generated on a daily basis in Korea, which increased until 2008 and decreased thereafter. When comparing the level of food waste in 2008 with that of 2011, the 2011 level of food waste was shown to be 12.8% less than the 2008 level. Such reduction in food waste occurred not only as a result of federal government policy, but also thanks to the amended standards of local governments as well as the performance of their role in implementing the policy for the reduction of food waste levels and change in policy to a preventing and restricting one.

With improvements in the life quality of Korean citizens along with growth of national economy, food waste and other forms of waste are on

the increase. Political efforts for the proper management of waste materials became necessary, since the improper treatment of generated waste has caused environmental pollution, as well as negative effects on the efficient use of resources and national competitiveness. The purpose of the existing 'Waste Disposal Charge' system was to restrict the production of waste materials and prevent the dissipation of resources, by requiring manufacturers or importers of specific materials which pose a hazard to the air or water, whose materials and containers that are hard to recycle, and that possess toxins or have the potential to cause problems in terms of waste disposal, to pay for the cost of waste disposal according to the 'polluter pays principle.'. Targets for initial waste disposal charge included products which are hard to recycle such as cosmetic containers, batteries, and fluorescent lamps, or have the potential to cause problem in terms of waste processing. All plastic products were classified as hard-to-recycle materials and a fee was charged for 'synthetic resin,' the raw material of plastic. However, as the recycling of plastic waste is becoming increasingly active, debate continues on the appropriate fee, and even regarding whether the charge is valid. Therefore, the Lee administration adopted the voluntary agreement system in 2008 to stimulate the recycling of plastic materials and reduce the burden on plastic businesses. Participation in this system was more active, since when the required rate of waste recycling was met, exemptions were made in terms of waste allotment. The waste allotment policy was also adopted for small- and medium-sized businesses. In bringing into fruition the waste allotment policy, which imposes fees based on the final product and not the materials from which it is made, revenue of over one trillion Won was made from recycling 110 tons of plastic annually, through differentiating the types of plastics in the recycling process. Furthermore, since the amount of waste was less than the total amount recycled, 300 billion Won in waste disposal costs were saved annually. In addition, a bonus effect of this was the establishment of new incineration and reclamation plants.

6. Green Lifestyle Education and Training of Green Growth Experts

The green lifestyle can best be promoted by educating the public on the concept of green growth. It is important for the public to understand that environmental protection and growth are not mutually exclusive, that green growth is something that must be integrated into our society, and that green growth is something that should be actively managed for the benefit of future society. Green education that educates the public on the concept and importance of green growth and assists citizens in the adoption of the green lifestyle was a part of Korea's civil education program. Another element of green education was training of experts who, in the near future, will be able to utilize creative and amalgamative technologies and knowledge to prepare for the coming green growth-oriented society.

The Lee administration pushed policies focused on green lifestyle education and expert training, regarding green education as an important part of the green growth policy. The administration also pushed policies able to make improvements on the environment in general for the purpose of green education. Firstly, in the 'Green School Program', non-eco-friendly elementary, middle, and high schools were turned into eco-friendly ones, serving as a place of emotional cultivation and assisting in the formation of the students' identities as well as one that is shared with local residents for education on green growth. In order to promote the Green Growth Program, each local educational office set up a project budget using a grant (environment improvement project) allowed for by the Local Education Subsidy Act to pursue projects designed to improve the educational environment and to apply eco-friendly technologies and construction methods. Green schools were chosen with a priority given to newly-built and decrepit schools - particularly those in farming, mountain and fishing villages - for the sake of balanced development.

To ensure that the nurturing of green growth human resources is

realized in a stable manner within the educational sphere of elementary and middle schools, starting January 2010 a subject entitled green growth was added to a curriculum which includes the pre-existing subjects of ethics, social studies, and family studies, and a new subject named 'Environment and Green Growth' was introduced in 2009 to the middle and high school curriculum, to strengthen the foundation of green growth education. In addition, study abroad programs supported teachers in visiting and receiving training in foreign countries with an emphasis on green growth in preparation for a green growth society starting within the classroom environment. A research school was also set up to develop and run green growth-related curricula. Moreover, green growth educational programs in and outside of the school system were connected by opening regional museums and green growth experience corners in local science museums, for the purpose of assisting students and parents to correctly understand the concept of green growth and practice a green lifestyle. Furthermore, green growth educational materials and experience journals were shared on the Creativity and Personality Education Network (www.crezone.net) to provide an easy access to schools and families.

Universities are institutions at the highest level of the tertiary education spectrum as well as doubling as research organizations, with the responsibility of demonstrating the vision of green growth and focusing on the development of technology and human resources. However, out of 190 heavy energy consumers, 23 (12%) are universities. In such a situation, universities showed an initiative toward the greening of campuses and developing green educational programs. In November 2008, the Korean Green Campus Council consisting of 61 universities was formed with the support of the Presidential Committee on Green Growth. Along with the initiatives of universities in greening the campus environment, the Lee administration announced the Green Growth Education Plan to support and vitalize the 'green campus movement.'

In the green campus vitalization strategy, the goals of ① eco-friendly

campus development, ② green education and strengthening of research efforts, and ③ collaboration with the local community were set and universities were to be financially and politically supported in greening efforts. For the development of eco-friendly campuses, the establishment of green management systems and GHG emission reduction plans were supported, integrated management systems and inventory construction established, while the usage of eco-friendly structures, facilities, and vehicles was expanded. Furthermore, the establishment and standardization of the capability assessment system of climate change response was also given support. In order to encourage the adoption of the green lifestyle among students and faculties, energy conservation, recycling activities (green club, green scholarship), and local food vitalization efforts were given backing. The expansion of green-related curriculum was also support for the strengthening of research and education on green growth. In particular, classes related to sustainability, ecology, and energy were expanded and mandated, focusing on the training of experts on energy, earth science, and other specialized science and engineering fields to cultivate green experts, and encouraging the establishment of an interdisciplinary area that connects economics, management, finance, policy, and law. By assisting universities in becoming more connected with their local communities and to establish a collaboration system with elementary, middle, and high schools, the co-development of locally specialized curricula and experience/exploration programs, as well as the training of faculty members on green education were facilitated. The following departments were created to actively pursue the listed policies in order to enable such political and financial assistance to run smoothly.

<Main Policies Supporting the Green Campus Movement>

| Department | Main Policy Content |
|---------------|--|
| Department of | Support in establishing university-level integrated GHG emission control system. |

| Department | Main Policy Content |
|---|--|
| Education, Science, and Technology | – Trial run on 25 universities in 2012, to be expanded to 80 universities by 2015 |
| | Promotion of technical universities specializing on green growth |
| | Development of green growth curriculum – Led by the Korean Council for University Education; Consortium of Seoul National Univ., Sungkyunkwan Univ., and Hanyang University |
| | Green campus indicator posted on university information announcements – The necessity of using announcements and related topics are under examination |
| Ministry of Environment | Selection and support of green campuses – 10 universities supported in 2011, and five to be added in 2012 |
| | Assistance for the establishment of college GHG inventory – Support and education to provide guidelines on establishing the greenhouse gas inventory and forming a reduction plan |
| | Development of green growth educational programs (Asian Institute for Energy, Environment, and Sustainability at Seoul National University) – Developed 15 green leadership curriculums, with three of them currently running |
| | Supporting universities that specialize in climate change – 10 universities supported |
| | Supporting universities that specialize in the conversion of waste recycling into energy – 3 universities supported |
| Ministry of Land, Transport and Maritime Affairs | Energy and GHG Target Management System – Target management system projects conducted with nine universities that are GHG-emitting (including Seoul National University) and three model universities (including Pusan National University) |

The nationwide green campus movement is significant in that it was the universities' voluntary initiative for effectively and systematically realizing green growth, which, through governmental support, resulted in a joint effort. However, only about 70 (19%) of the 370 universities were

involved in green campus councils such as the Korean Green Campus Council, showing a general lack of awareness. Even for the universities that were involved, focus was placed on on-campus greening and the improvement of old facilities. It is hoped that more universities will voluntarily involve themselves in a more active and fundamental green campus movement.

<Examples of Voluntary Green campus Movements by Universities>

| University | Title | Main Topic |
|---------------------------|--|---|
| Sangji University | Local Food | Runs eco-friendly organic student cafeteria (Local organic produce) – Reduction of energy consumption and carbon emission in the transportation process – Benefits the local economy and the environment as a stable consumer |
| Seoul National University | Establishment of the GHG inventory | Announcement of a sustainable, eco-friendly Seoul National University in 2008 – Analysis of GHG emissions in 216 facilities on campus and establishment/execution of a reduction plan |
| Chosun University | Building a green village, solar energy demonstrative research facility | Goal to be energy self-sufficient – Green village: Solar power generator and solar water heaters to supply 80% of power and warm water (total of 111 households) – Solar energy demonstrative research: Renewable energy use in campus buildings and offering informational tour sites through the school's public relations department |
| Dongguk University | Rooftop greening project | Forming green spaces on the rooftops of six buildings on campus (10,764m ²) – Reduction of the heat island effect and energy-savings through sound-proofing and insulation. |

| University | Title | Main Topic |
|-------------------|------------------------|---|
| Yonsei University | Campus sharing project | Sharing of discarded resources with external organizations – Opening a green market place to recycle resources with the local community and donate profits to local welfare facilities |

As for green education efforts at the individual student level and not the school level, the ‘Green College’ program was launched in 2009 to provide green training to those interested in green growth. ‘Green College’ is a program that helps students become ‘green experts with a vision’ by facilitating the understanding of the low-carbon green growth concept through the completion of education offered by experts, educational camps, and various mission projects.

The first term of the green college program was participated in by a total of 85 people, or 20 teams, to develop their talents through green camps and projects, consisting of researching past examples and the current status of green growth in public and private organizations, and presenting and executing green growth promotion ideas. For the second term of the green college program, the role was divided between 20 teams, a total of 88 people, and 10 journalists, who participated in a 4-week green project focused on understanding the concept of green growth in the college and local community settings.

In the third term of the green college program in 2011, with the goal of nurturing university students as future experts, achieved enhancement of understanding (through education), growth (on green growth concept and ego), and communication (mutual communication through SNS). Ninety two people, in 24 teams, and 10 journalists were trained as future experts through book discussions and project participation. Starting with the third term, the green college program became settled, and a total of 2,783 people, consisting of 634 teams, from all corners of the country applied for the program. By

being recognized as a public, college student participatory program, green college served not only as a promoter of green growth policy but also as an enhancer of the image of green growth concept for the public.

In the fourth term of the green college program in 2012, more active participation was encouraged through a greater number of participants, support areas, and regional distributions. Thirty 30 teams (120 people), five journalists, and five green mentors were chosen for this program. The field topic of the program was divided into Art & Tech. (science & engineering, nature, arts) and Business & Policy (liberal arts, social science, business & economics). Through a strengthened application process, participants with passion and genuine interest towards green growth were selected. With the basic understanding of the green growth concept from the camp, 12 weeks of college and local community green growth projects were executed. Capacity training of the participants and enrichment of the project were pursued throughout three missions (Mission 1: Green growth reading & discussion and battle; Mission 2: Green lifestyle elementary school education; Mission 3: Free mission based on personal major/interest) to increase personal talent and program effectiveness. Also, previous participants joined in as green mentors to help the project run smoothly.

The Lee administration determined that the growth potential in green management, technology, industry, and other green growth fields and related new growth energy fields started with the training of talented green experts; thus, its efforts were focused on establishing an expert training curricula to realize the low-carbon green growth vision. Starting in 2010, graduate schools specializing in green growth were selected, which were supported with research grants, and scholarships, and experiment costs. Furthermore, President Lee Myung-bak, through a special announcement at the Global Green Growth Summit (GGGS) held in May 2012, asserted the importance of training master's and doctoral level experts. As a result, the administration established the Graduate School of Green Growth in the Korea Advanced Institute of Science and Technology (KAIST), Hongneung Campus, Seoul. The

Graduate School of Green Growth at KAIST will admit its first wave of students in autumn 2013, offering diverse curricula including green management and green policy, which will be provided in cooperation with other prestigious institutions, such as the London School of Economics and Political Science (LSE) and Harvard University, to train green growth experts. The Graduate School of Green Growth will be a resource allowing Korea to take permanent leadership in the green growth field, along with the organizations that have been strategically conceptualized and realized by the Lee administration. Those organizations include the Global Green Growth Institute (GGGI), in charge of global green strategies; the Green Technology Center Korea (GTC-K), responsible for green technology; and the Global Climate Fund (GCF), a global green growth financial resource successfully invited to Songdo, Incheon.

Chapter 4 | Global Leadership in Green Growth and Green Diplomacy

Korea, as one of the first countries to embody the national vision of low carbon green growth, was in a leadership position for the transformation of green growth policies into international assets. Korea's green growth vision was regarded highly by the global community even before the green growth policies were actually implemented in Korea. Furthermore, Secretary-General of OECD Angel Gurría praised President Lee as the 'father of green growth'.

<Evaluation of Green Growth by the Global Community>

'I must praise the Korean government and its president for offering green growth as a solution to the financial crisis'. – Achim Steiner UNEP (May 2012 at the GGGS)

'Korea is becoming a role model of green growth policy, and has played an important role in launching the OECD green growth strategy.' – Angel Gurría OECD Secretary-General (May 2011 at the OECD Council)

'Korea has supported green growth not just with words, but in practice. Many developing countries are looking up to Korea as a role model and taking a keen interest in the changes that are happening in Korea'. – Rachel Kyte Vice President of the World Bank (May 2012 at the GGGS)

'In presenting the global leadership award to President Lee Myung-bak, I must

express my praise for Korea's role as a pioneer of green growth in the global community'. – Zayed International Prize for the Environment (March 2011 at the Zayed Awards Ceremony)

'Korea is the 'fast mover' of green growth. It has transformed itself from one of the poorest countries in the world to a global economic giant. Korea is a country that has set the high goal of reducing CO2 output by 30% by 2020, while also maintaining a high economic growth rate'. – Lars Lokke Rasmussen, Prime Minister of Denmark (May 2011 at the Launching Ceremony of the Korea-Demark Green Growth Alliance)

'The third industrial revolution will be led by Korea with its geographical and technological advantages. Other countries should follow Korea in discarding the carbon economy and preparing for the future'. – Jeremy Rifkin (May 2012 at the GGGS)

Section 1: Expansion of Green Growth as a Global Agenda

Green growth as a global agenda is discussed in the OECD Council, UNEP, UNESCAP, and at other UN organizations along with G8 and G20 Summits. The 'Stockholm Declaration' of 1972 was the first effort for global collaboration in overcoming environmental threats, and the first time that the topic of environmental threat had appeared on the global stage. 20 years on in 1992, the 'Rio Declaration' introduced the concept of sustainable development to the global community. Another 20 years later in 2012, green growth has become the central topic of discussion in the global community. In August 2008, after the President's announcement of 'low-carbon green growth' as Korea's vision, green growth has become a hot topic all around the globe. In fact, this is the first time an international agenda proposed by

Korea has been recognized by the global community. As the first country to announce green growth as a national vision, the vision and policies of Korea were recognized as a model case, while Korea and President Lee were seen as its leading figures.

1. OECD Green Growth Declaration

The OECD Council that met in June 2009 in France adopted the ‘Ministerial Conclusions’ and ‘Green Growth Declaration’ with the vision of green growth and overcoming of the economic crisis. Korea served an important role as a chair country at the Ministerial Council Meeting (MCM), proposing that the MCM adopt 6 drafts of declaration including those for green growth, and on several occasions formed an agreement with the Council through negotiations regarding the adoption of various green growth declarations apart from the Ministerial Conclusion.

<Main Points of the OECD Declaration on Green Growth>

- ① Shared awareness of overcoming the economic crisis, as well as of environmentally and socially sustainable growth being the main challenge faced by all countries, agreeing to promote green growth strategies for economic development after overcoming the crisis.
- ② Agreed to expand investment in low-carbon facilities and the development of clean technology, and to promote the sustainable control of resources.
- ③ Agreed to promote policy reforms for the improvement or abolition of policies that hinder green growth.
- ④ Agreed to integrate the labor market and human resources policy with green growth policy for the creation of green jobs.
- ⑤ Agreed to strengthen international cooperation to develop clean technology such

as green IT, establish a market mechanism, and promote green growth in developing countries.

- ⑥ Agreed to focus efforts on reaching an agreement on a post-2012 climate change pact after the Copenhagen meeting in December 2009.
- ⑦ Agreed to strengthen international collaboration on promoting green growth in developing countries through developmental assistance.
- ⑧ Agreed to pass the 'OECD Green Growth Strategy' in order to assist each nation in its efforts regarding green growth.

The OECD Council has, until now, been reporting the results of the meeting summary form, not requiring the consent of member countries. This was the first time that a statement was announced with the consent of the member countries. It is particularly significant in that the 'Green Growth Declaration' proposed by Korea was adopted, proving the importance of the green growth strategy in the 21st as a new growth paradigm in the global community. Korea, which joined the OECD in 1996 for the purpose of studying the policies of advanced countries, has become the country pioneering the main issue being discussed at the OECD. This is a monumental event, demonstrating how Korea has changed from a minor member country to a country in a leadership position.

Through the green growth declaration, the Council acknowledged that 'green' and 'growth' can both be pursued simultaneously, and announced that a green growth strategy will be promoted as part of the post-economic crisis response measures. With OECD member countries confirming the effectiveness and importance of the green growth strategy in response to the economic crisis and post-crisis sustainable development, as well as agreeing to strengthen their efforts in putting such strategies into practice, green growth has established the position of becoming a dominant growth paradigm in the global economy of the 21st century. In addition, Korea has gained the reputation as a benchmarking country with its promotion of the 'Green New Deal Policy' and enactment of the 'Framework

Act on Low-Carbon, Green Growth’.

OECD has also published the ‘2050 Environment Prospect Report’. The report warns that the earth will sustain irreparable damage if the current economic system and structure of production/consumption is maintained. Environmental ministers have made it clear that green growth is the solution to the problem and Angel Gurría, OECD Secretary-General, has emphasized that green growth is not ‘a way’ but ‘the way’ to overcome the environmental crisis, while Janez Potocnik, EU Environmental Commissioner, has assessed green growth to be a ‘globally sustainable strategy’.

2. UNEP Korean Green Growth Policy Overview

The United Nations Environment Program, leader of the Green Economy Initiative, an organization that develops strategies for overcoming global economic crises and post-crisis sustainable development, released the ‘Global Green New Deal Policy Brief’ (GGND) in March 2009, which advised countries to invest in green economy infrastructure. In this report, UNEP recommended that 1% of GDP to be spent on building green economy infrastructure focusing on 5 main topics of energy efficiency, sustainable transportation, renewable energy, sustainable agriculture, and fresh water resource control for the next two years. Following the GGND, an overview and analysis of the policies of each nation for a green economy was published, with Korea being the first to be introduced as a case study.

As a result, the ‘Overview of the Republic of Korea’s National Green Growth Vision’ was published by UNEP in September 2009. This report assessed Korea’s green growth policy to be a worthy effort that transformed the country’s growth paradigm from that of ‘quantitative growth’ to ‘qualitative growth’. The report stated that the systematic and bold investments in green infrastructure, such as the 4 major-river revitalization project and investments in green technology were exemplary cases that

exceeded the level recommended by UNEP. It also recognized the importance of the simultaneous promotion of the strategy for green growth as well as the GHG reduction plan, and said that "Korea's green growth vision and strategy goals are intended as a form of generalized environmental restoration to improve the responsiveness to climate change, energy security, development of new growth energy and quality of life". The final analysis suggested that if Korea's green growth policies work, it would transform the economic system and achieve both growth and act as a response to climate change. Furthermore, it stated that Korea's green growth strategies that promote the reforming of policy structure, including green economy, welfare, financial, and tax policies, are expected to yield significant results if they are successful. This report pointed to the fact that UNEP had selected Korea as the central paradigm of green growth vision in terms of national development, and introduced the 'Green New Deal Policy' of January, 2009, as well as the mid-to-long term green growth master plans 'National Green Growth Strategy' and '5 Year Plan' as specific examples of the realization of this vision. UNEP assessed Korea's investment in green infrastructure and quick execution of its plans as positive, and viewed its efforts to improve policies and system for green growth as being significant. This UNEP report was later distributed to some 20 countries that attended the Green Economy Initiative.

3. The Los Cabos G20 Summit

In June 2012, the G20 summit was held in Los Cabos comprising 20 member countries and 6 non-member guest countries, as well as 8 global organizations. In terms of the summit's outcome, G20 leaders agreed on the 'Leaders Declaration' and the 'Annex'. In addition to the inclusion of 'green growth' as the topic of focus in the 'Summit Declaration' of 2011 Paris and

2010 Seoul G20 Summits, ‘tolerant green growth’ and ‘growth-linked green’ were proposed as topics of focus, and were discussed as an alternative means of qualitative and sustainable economic growth.

<From a Declaration Made at the 2010 Seoul G20 Summit>

Climate Change and Green Growth

66. Addressing the threat of global climate change is an urgent priority for all nations.

We reiterate our commitment to take strong and action-oriented measures, and remain fully dedicated to UN climate change negotiations. We reaffirm the objective, provisions, and the principles of the UN Framework Convention on Climate Change (UNFCCC), including common but differentiated responsibilities and respective capabilities. We thank Mexico for hosting the UNFCCC negotiations to be held in Cancun beginning at the end of November 2010. Those of us who have associated with the Copenhagen Accord reaffirm our support for it and its implementation. We all are committed to achieving a successful, balanced result that includes the core issues of mitigation, transparency, finance, technology, adaptation, and forest preservation. In this regard, we welcome the work of the High-Level Advisory Group on Climate Change Financing established by the UN Secretary-General and ask our Finance Ministers to consider its report. We also support and encourage the delivery of fast-start finance commitments.

68. We are committed to supporting country-led green growth policies that promote environmentally sustainable global growth along with employment creation, while ensuring energy access for the poor. We recognize that sustainable green growth, as it is inherently a part of sustainable development, is a strategy of quality development, enabling countries to leapfrog old technologies in many sectors, including through the use of energy efficient and clean technology. To that end,

we will take steps to create, as appropriate, the enabling environments that are conducive to the development and deployment of energy efficient and clean energy technologies, including policies and practices in our own countries and beyond, including technical transfer and capacity building. We support the ongoing initiatives of the Clean Energy Ministry, and encourage further discussions on cooperation in R&D and regulatory measures together with business leaders, and ask our Energy Experts Group to monitor and report back to us on progress at the 2011 Summit in France. We also commit to stimulating investment in clean energy technology, energy and resource efficiency, green transportation, and green cities by mobilizing finance, establishing clear and consistent standards, developing long-term energy policies, supporting education, enterprise and R&D, and continuing to promote cross-border collaboration and coordination of national legislative approaches.

Korea was praised for its strengthened role in terms of global leadership it played during the 2012 Los Cabos G20 Summit, where many green growth topics proposed by Korea were heavily discussed and later resulted in the forming of agreements. Korea has also built the foundations and gained the support of other summits for future discussions on the topics of energy, green growth and development by becoming a co-chair country in a working group for green growth discussion. Korea is beginning to acquire leadership status within the G20 as a country proposing topics concerning green growth development, and has become the main nation in terms of the pioneering of green diplomacy by acting as a facilitator on global green growth issues.

<From a Declaration Made at the 2012 Los Cabos G20 Summit>

Promoting Longer-Term Prosperity through Inclusive Green

69. The long-term development and prosperity of current and future generations requires us to look beyond the immediate economic crisis. We acknowledge the importance of finding ways in which economic growth, environmental protection and social inclusion can complement and reinforce each other. Inclusive green growth in the context of sustainable development and poverty eradication can help achieve our development and economic goals, while protecting our environment, and improving social well-being on which our future depends. Inclusive green growth should not be used to introduce protectionist measures.
70. We commit to continuing to help developing countries sustain and strengthen their development through the appropriate measures, including those that encourage inclusive green growth. We will reaffirm our commitment to sustainable development at the 2012 United Nations Conference on Sustainable Development (Rio +20). We commit to maintaining a focus on inclusive green growth as part of our G20 agenda, and in the light of agreements reached at Rio +20 and the United Nations Framework Convention on Climate Change (UNFCCC).
73. We highlight that green growth and sustainable development have a strong potential to stimulate long term prosperity and well-being. We welcome the report prepared by the OECD, the World Bank and the UN on incorporating green growth and sustainable development policies into structural reform agendas, tailored to specific country conditions and level of development. We also acknowledge the G20 efforts to voluntarily self-report on current actions taken to integrate green growth and sustainable development into structural reform agendas. We will self-report again in 2013, on a voluntary basis, and ask appropriate officials to report back on countries' efforts and progress on incorporating green growth policies in structural

reform agendas and in relevant national plans to promote sustainable development.

75. In Cannes we committed to promoting low-carbon development strategies in order to optimize the potential for green growth and ensure sustainable development in our countries and beyond. We therefore welcome the report on clean energy and energy efficiency technologies and acknowledge the G20 countries' efforts to foster investment in these technologies through the sharing of national experiences regarding challenges for technology deployment.

Section 2: The 'Green Triangle,' Turning Green Growth into a National Asset

The Lee administration focused its efforts on applying the green growth vision and policy as 'Architecture for All' without making distinctions between developed and developing countries. To achieve this goal, the administration acknowledged that the 3 aspects of strategy, technology, and finance must first be established, following which all political efforts were devoted to the building of this 'Green Triangle'. As a result, the Global Green Growth Institute (GGGI) and Green Technology Center in Korea (GTCK) were founded, and the Green Climate Fund (GCF) hosted in Korea, thus completing the 'Green Triangle'.

1. Strategy: Promote the Global Green Growth Institute (GGGI) as a Global Organization

In June 2010, the Global Green Growth Institute (GGGI), a global organization created for the purpose of leading the world in green growth

and raising the national status of Korea, was founded. GGGI is significant in that it is the first global organization to be founded with Korean leadership, and also as a global symbol of Korea's low-carbon green growth vision. President Lee Myung-bak announced the establishment of the GGGI at the East Asia Climate Forum in June, 2010, in addition presenting a plan to transform the institute into a permanent mutual asset of the global community by 2012. GGGI focuses on assisting green growth in developing countries, public private cooperation, as well as green growth research, and is in partnership with public and private organizations worldwide such as the OECD, World Bank, Asian Development Bank, World Economic Forum, and the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). GGGI is comprised of 21 member countries including the founding country Korea. Among the member countries, 10 countries including Korea, Japan, Australia, Denmark, UAE, Germany, England, Mexico, Norway, and Qatar are receiving financial aid. After the retirement of the first chairman Seung-soo Han in July, 2011, the former Prime Minister of Denmark Lars Lokke Rasmussen took the reins. Apart from its Seoul-based headquarters, there are also branches located in Copenhagen, Abu Dhabi, and London. Although there were pre-existing organizations such as the 'Korea China Japan Cooperation Bureau' and the 'International Vaccine Institute', GGGI is the first global organization founded solely by Korea without the help of the UN and the neighboring countries.

On the 20th of June 2012, the signing ceremony confirming GGGI as a global organization was held as a separate event accompanying the UN Sustainable Development Summit in Rio de Janeiro, Brazil. This feat was achieved only 2 years after the founding of the GGGI, and 6 months after the declaration of its goal to become a global organization, made in December 2011. Among the attendees were Korean President Lee Myung-bak, Prime Minister of Denmark Helle Thorning-Schmidt, Prime Minister of Australia Julia Gillard, UN Secretary-General Ban Ki Moon, and other leaders from

the founding countries. As a global organization, the GGGI was launched with 7 donor countries including Korea, Denmark, and Australia, and 8 recipient countries including Ethiopia and Papua New Guinea. This ceremony marked the Korea-founded GGGI's ascension into a global organization 2 years after its founding on June 21st with 15 member countries. GGGI went through the ratification process between member countries and was officially launched with the general meeting and board of directors on October, 2012. The GGGI differs from United Nations Environment Program (UNEP) or the United Nations Framework Convention on Climate Change (UNFCCC) in that it is an organization that deals not with the environment in general, but specializes in green growth serving as a bridging role between developed and developing countries. After being founded in 2010, the GGGI has assisted green growth projects in about 10 developing countries including Brazil, Cambodia, Vietnam, The Philippines and Ethiopia. In most cases, the developing countries first approached with a request for assistance. In addition, taking into consideration that the GGGI has been in operation for the short period of 1-2 years, it has already achieved the significant feat of improving waste treatment systems in agricultural regions of Kazakhstan, and has proposed a method of increasing household energy efficiency. The GGGI is also acting as consultant for different countries by proposing green growth strategies specific to each country, such as proposing that Ethiopia address climate change by expanding small irrigation facilities rather than depending on precipitation. Global interest in Korea's experience as a founding country spread quickly, and additional countries such as Rwanda, Peru, and Indonesia are now requesting assistance. The GGGI will continue to advance as a permanent asset of green growth in the global community by expanding the public private partnership and its number of member countries, as well as developing new and innovative green growth technologies.

The transformation of the GGGI into an international organization, along with becoming the 7th member of the '20-50 club' (nations with a per

capita income of over \$20,000 and population exceeding 50 million) has solidified Korea's status as an advanced country. It is also significant from the perspective of world history in that the GGGI was founded by Korea, a country that underwent colonization and imperialism, whereas other global organizations such as the UN, International Monetary Fund (IMF), General Agreement on Tariffs and Trade (GATT, currently WTO) were founded in the late 1940's by the United States and the other victors of World War II. The GGGI is headquartered in Seoul, and is planning to employ up to 200 full-time staff by 2014, with a quarter of them being Korean citizens, thus providing high-level jobs and opportunities to experts and those from the younger generation wishing to work in a global organization as have the change to work internationally.

*2. Technology: Founding of the Green Technology Center Korea (GTCK),
a Global Center for Green Growth Technology.*

Green technology is a legacy for future generations in the form of a growth engine propelling the nation into the status of an advanced country at the same time as creating jobs, and is the hope for a qualitatively better future. The green technology market accounted for 1.5 trillion dollars in 2007, and is expanding at a rate of 10.2% annually, expected to reach 5.7 trillion dollars by 2020.

In light of this, an organization able to pioneer green research and manage green technology R&D became necessary. With the birth of the green growth vision, President Lee, a staunch proponent of the importance of technology, announced the foundation of the Green Technology Center Korea (GTCK) in a speech made at the Global Green Growth Summit (GGGS) in June 2011. The government placed GTCK under the supervision of the National Science & Technology Commission in August 2011, after considering

the management of green technology policies and their integration with the science business belt and in December of the same year launched the GTC Task Force with the Korea Institute of Science and Technology (KIST) at the center. After a preparation period of 3 months, the GTCK was established in March 2012, and the president of Inje University, Chang-mo Sung, was appointed as head.

GTCK's founding vision was to be the pioneer fusing global green technology, creating new growth energy and helping in the building of an advanced country, and its goal is to build the foundations for turning Korea into a global power in green technology. In order to fulfill this goal, the GTCK will focus on managing public opinion and developing indicators, establishing a global green technology network, expanding the foundations for green technology and invigorating public relations activities. First of all, the green technology R&D plan, roadmap, and development strategy were established, consultation on green technology R&D and related businesses supported, and a Green Parity Index Model that rates the level of green technology based on technology, industry, and the country itself was developed and utilized in order to propose indicators for global green technology and future policies. In addition, by analyzing the prospects of green technology, future-oriented research will be conducted and related issue papers published and distributed.

Moreover, as one of the corners of the Green Triangle', a cooperation system with the GGGI will be established, green industry know-how and technological development transferred to developing countries, and work will be conducted as an international bridge for consultations necessary for the establishment of the Green Climate Fund (GCF) and development of a first-class collaborative research program for the promotion of global R&D efforts. In addition, a 'Global Green Technology Award' will be awarded for the purpose of expanded the base of and promoting green technology, while efforts will be made for the utilization and distribution of green technology to encourage the adoption of the green life style among the general public.

Furthermore, the organization will serve as the supervisor for the hosting of the GGGS.

3. Finance: Attracting the Headquarters of the Green Climate Fund (GCF)

The Green Climate Fund (GCF) is a specialized fund created to assist developing countries in reducing their GHG emissions while addressing climate change. At the COP16 held in Cancun, Mexico in December 2012, a group of developed countries agreed to establish the GCF to assist developing countries address climate change, and in December 2011 at COP 17, the method for the establishment of the fund was agreed upon. At COP16 it was agreed that a long-term fund will be established by 2020 with an annual sum of 100 billion dollars, with the majority of the establishment and activities of the fund managed by the Green Climate Fund. The method of fund establishment was to be devised by the GCF, comprised of 15 developed countries and 25 developing countries. Although there were other funds in existence tackling traditional global issues such as environmental protection and sustainable development, these organizations were either assisting other pacts such as bio-diversity and prevention of desertification, or were too small and/or specialized in other fields. However, the GCF was established for the particular purpose of assisting developing countries reduce GHG emissions and to address climate change, a goal that shares common ground with Korea's green growth vision and strategy. The GCF will play a pivotal role in future by assisting developing countries address the future climate change.

The Lee administration was aware that the success of the low-carbon green growth strategy, announced in August 2008, would only be possible through adequate strategy, technology, and finances, and as such focused

its efforts on acquiring such resources. President Lee strongly asserted the importance of the GCF at COP 16, and left a lasting impression on other global leaders. Following this, the President resolved bring the headquarters of the GCF to Korea after the 'Minster's Meeting on Foreign Economy', and decided that the GCF should be based in Incheon after also considering other cities such as Seoul and Busan. After one month, in January 2011 the President officially announced his intention to bring the GCF to Korea at COP17, and proposed or promised to provide for its establishment fees, such as temporary bureau management fees. In February, 2012, the 'Plan to Bring the GCF Headquarters to Korea' was announced at the 'Minister's Meeting on the International Economy', and in the following April, the intention to bring the GCF to Korea was reinforced through discussions of the plan at a cabinet meeting.

In April 2012, Korea, Germany, Switzerland, Mexico, Poland, and Namibia submitted applications for the headquarters of the GCF. In June 2012, President Lee attended 10 bilateral talks during the R+20 in Rio de Janeiro, Brazil in order to gain support for the GCF to be based in Korea. In addition, other bilateral talks with the Norwegian Minister of Environment, Egyptian Minister of Environment, Danish Minister of Foreign Diplomacy, Georgian Minister of Environment, the Vice President of Burundi, and the Secretary-General of the UN Convention to Combat Desertification (UNCCD) also took place. Moreover, Park Jae-wan, Minister of Strategy and Finance, personally met with the Minsters of Finance from Brazil, Mexico, and South Africa during the 'Seminar of Ministers on Green Growth Finance' where he explained why the GCF should be based in Korea, and asked for their support on the matter.

Most importantly, Korea is a good role model in that it had joined the OECD while it was still a developing country, transformed itself into an advanced country in a period of 50 years, and is the only country in the world to have switched over to the green economy. In addition, it

emphasized that Song-do, the city where the GCF was intended to be based, was designed and constructed in an environmentally-friendly manner, is located only 20 minutes from an international airport, and already possesses the 'I-tower' ready to be used by the GCF in September. Moreover, the success stories of Korea's green growth policies, such as the forestation and 4-major-river vitalization projects were explained in full. In addition, the national vision of Korea is green growth, and it was the first nation in the world to have enacted an ETS, as well as founding the GGGI and GTCK, leading organizations in the field of global green growth. In reflecting on the country's successful industrialization, Korea can lay claim to the fact that it has a deeper understanding than other nations of developing countries, and therefore can play a bridging role between advanced and developing countries.

In August 2012, 12 developed and 12 developing countries convened at the first board of directors meeting held in Geneva, Switzerland. Presentations were made by each of the candidates, and 6 member countries were selected to serve as judges. In the presentations, the German Chancellor Angela Merkel, a strong candidate, asserted her will to bring the GCF to Germany using only a picture. On the other hand, President Lee asserted his intention through a 15 minute video presentation, leaving a strong impression among the member countries. In September, 2012, the evaluation committee convened in Washington DC, and later confirmed that only Korea, Germany, and Switzerland were fit to host the headquarters of the GCF. In October 2012, with the support of many developed and developing countries and the elaborate strategy of the Lee administration, in the second board of directors meeting it was voted that the GCF be based in Song-do. At the COP 18 held the following November in Qatar, the voting result was approved.

Having the headquarters of such a large international organization based on Korean soil is a monumental success, particularly considering the fact that Korea had beat off competition from Germany, the second largest

foreign aid provider in the world, as well as Switzerland, where many global organizations are concentrated. This goes to show how highly the administration's green growth efforts are regarded, and how much our national and diplomatic power has grown. Support from the developing countries of Africa and South America demonstrate the global recognition of our green growth strategy. By hosting a global environmental organization formerly focused in Europe and non-existent in Asia until the present time, Korea's reputation was yet again boosted.

The influence of the GCF, which is expected to grow into an organization comparable to the IMF, is expected to be significant. Above all, along with the GGGI and GTCK, the GCF completes the Green Triangle of strategy, technology, and finance necessary to achieve the vision for green growth and its policies. This solidifies Korea's global image as the pioneer in addressing climate change, a hot topic in the global community, and the center of the green growth movement. Korea's soft power and leadership will be strengthened through its heightened diplomatic and political power and status. Along with such intangible benefits, GCF will also bring with it significant economic benefits. While the economic benefits obtained from the hosting of global meetings, the Olympics, and the World Cup are only temporary, having the GCF headquarters based in Korea will invigorate the international meeting, accommodation, touring, convention, and transportation industries, and also bring increased spending by the employees and their families. The GCF is expected to hire anywhere from 500 to 1000 employees, with thousands of visitors entering Korea for business trips. In addition, having the base of a large global organization such as the GCF in Korea will provide first-class job opportunities to Korean youth and experts. Estimating the number of resident employees at 500, the economic benefit from of the GCF headquarters is calculated to be 380 million dollars, while the Incheon Development Institute calculated the local economic benefit to be 190 million dollars.

Section 3: Strengthening of the International Network for the Expansion of Green Growth

1. The World's First Green Growth Alliance: Korea and Denmark

The Korean green growth movement is drawing much attention as a diplomatic topic not only in large meetings of multiple nations, but also in small meetings with several nations or in a bilateral format, providing the country with soft diplomatic power. In other words, Green Diplomacy is born when the country is in control of crucial topics in forming diplomatic relationships with foreign countries. One example of this Green Diplomacy is the 'Green Growth Alliance'.

In May 2011, Korea and Denmark formed the first of its kind 'Korean-Danish Green Growth Alliance' in Copenhagen, Denmark. President Lee and Rasmussen, who was at the time the Prime Minister of Denmark, held an inauguration ceremony with 200 attendees from governments, corporations, and research organizations. With the Green Growth Alliance as its foundation, the two countries agreed to develop the alliance by encouraging political, industrial, and academic cooperation. As the first step, nine memorandums of understanding were signed, among those a memorandum between the Korean Ministry of Knowledge Economy and the Danish Ministry of Climate, Energy & Building, between Hyundai and the city of Copenhagen, and between KAIST and the Technical University of Denmark. In the time of climate change when clean energy and efficiency is of utmost importance, the two countries acknowledged that the best way to promote both economic growth and environmental preservation is through green growth, and agreed to actively cooperate in promoting the international expansion of the green growth paradigm. In order to achieve this, the Korean

government has established a branch of the Global Green Growth Institute (GGGI) in Copenhagen to support developing countries in responding to the changing climate, and the Danish government has agreed to launch the Global Green Growth Forum (GGGF) to strengthen the public-private partnership.

In May 2012, a year after the launch of the alliance, the second 'Korean Danish Green Growth Alliance' conference was held in Seoul. The conference was attended by around 150 guests, including Minister Kim Hwang-sik and HRH Crown Prince Frederik, along with officials from governments, corporations, and research organizations. The conference was held during the Crown Prince's visit to Korea for the purpose of reviewing the alliance's performance over the past year, and to discuss expanding the field of future cooperation. Denmark already achieved energy self-sufficiency in 1997, (from an energy sufficiency of 1% in the early 70's to 132% in 2007) and is working toward a fossil fuel-less 2050 by setting the ambitious goal of replacing 35% of energy consumption with renewable energy and half of total consumption with wind power by 2020. Meanwhile, Korea has successfully devised laws, organizations, strategies, and infrastructure to promote green growth, only a few years after declaring in 2008 the national vision of realizing low-carbon green growth. In May 2012, congress overcame its political differences and passed a bill regarding emissions trading, which was a dynamic boost for green growth. Subsequently, 14 collaboration agreements were signed between public and private organizations at the second conference in order to strengthen the permanence of the alliance between the 'first mover' Denmark and the 'fast mover' Korea, and to expand the fields of cooperation to the science and technology, shipbuilding and husbandry sectors, among others.

Firstly, the two countries agreed to institutionalize the Green Growth Alliance into a law-binding treaty in the future. In October 2012, the treaty will be formally signed at the Global Green Growth Forum, to be held in Denmark. The collaboration between two the countries was expanded in the technological fields in particular, resulting in the signing of 6 memorandums

of understanding (MOU). The Korean Ministry of Education, Science and Technology together with the Danish Ministry of Science, Innovation and Higher Education signed the 'Korea-Denmark Science, Technology, Innovation, and Higher Education Memorandum of Understanding' following an agreement made at the first conference, establishing the basis for research collaboration and the exchange of human resources. The Green Technology Center Korea and Danish Council for Strategic Research signed the 'Research Collaboration Memorandum of Understanding' to contribute 3.6 million US dollars per year from 2013 to 2014 in the form of aid to research organizations in the two countries for green technology research efforts. The Korean Advanced Institute of Science and Technology (KAIST) and the Denmark Technical University, while currently working on collaborative research for E-Mobility and green transportation based on the MOU signed at the first conference, signed 4 additional MOUs regarding dual degree program among other topics. The collaboration in green manufacturing, which was already active since the first conference, was again strengthened thanks to past successes. The Ministry of Knowledge Economy and the Danish Ministry of Economic and Business Affairs reacted to the recent tightening of environmental regulations on the shipbuilding industry and rise in the demand for fuel efficient ships by signing the 'Memorandum of Understanding for Green Ship Building'. The Federation of Korean Industries and Confederation of Danish Industry signed the 'Memorandum of Understanding for Industrial Collaboration' to share the experience and know-how of Danish industries with Korean industries in respect to green management. Furthermore, the livestock industries of both countries signed 4 MOUs, agreeing to strengthen green collaboration, in order to introduce the advanced stock-raising system of Denmark to Korea, as well as its environment-friendly butchering system. Korea and Denmark agreed to further strengthen their cooperation on the international stage such as the GGGI based on the Green Growth Alliance.

2. Global Green Growth Summit and the Green Growth Knowledge Platform

The Lee administration has focused its efforts on sharing its green growth vision, policy, and experiences with the global community as the founding country of green growth, and to use such knowledge as an international asset. The reason for this is that the Lee administration believed that sharing its knowledge and own experiences in the global community would lead to the arousal of public interest, and also due to the fact that the administration had recently gained confidence from the success in green diplomacy. The administration thus resolved to hold the Global Green Growth Summit for the purpose of joining the ‘Davos Forum’ of green growth, where knowledge will be shared within the network of national representatives.

As a result, in June 2011 Korea co-hosted the Global Green Growth Summit in Seoul together with the Organization of Economic Cooperation and Development (OECD). This summit also served as a commemoration of the previous year's launching of GGGI, the first international organization founded by Korean leadership, the 15th anniversary marking Korea joining the OECD, and the 50th anniversary of the establishment of the OECD. The Global Green Growth Summit 2011 was held with a phrase ‘Building a Planet-Responsible Civilization’ as its central theme. The summit was held for the purpose of reforming and expanding the support for climate change in East Asia, to share the vision and global prospects of green growth pioneered by Korea, and to discuss the means of global cooperation. The summit began with a video message from Ki-moon Ban, Secretary-General of the United Nations, and was attended by Angel Gurría, Secretary-General of the OECD, Noeleen Heyzer, Executive Secretary of United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), Abdoulaye Janneh, Executive Secretary of the Economic Commission for Africa

(ECA), Inger Anderson, Vice President of the World Bank, and Trevor Manuel, President of the National Planning Commission of South Africa, among other important attendees from various governments and international organizations. Attendees from the private sector included Zhengrong Shi, Executive Chairman of Suntech, the world's largest solar power company, Masayoshi Son, Executive Chairman of Softbank, the company that introduced Japan to wind power, and Jorgen Clausen, President of Danfoss, a Danish global energy-efficiency company.

The topics of discussion for the sessions included green growth and development governance, GGGI and the new collaboration system, green growth from the perspective of civil societies, and global collaboration for the building of a planet-responsible civilization. The sessions were held for the purpose of sharing green growth strategies, composing future global governance, and to seek the means of strengthening global cooperation. In addition, at the 2011 GGGS discussions were held on the present and future challenges of the Korean economy, and on the means of the G20's continuing support for the mid-to-long term issues of global governance under the title of 'New Partnership and Leadership' to strengthen the partnership between Korea and the OECD.

<Global Green Growth Summit 2011 Program>

Session 1. Building a Planet-Responsible Civilization

Sub Session 1-1. Technologies for Planet-Responsible Green Growth

Sub Session 1-2. Partnership Roundtable for the 2011 East Asian Climate

Session 2. Green Growth and Sustainable Development Governance

Session 3. Global Green Growth Institute and New Collaboration System

Press Moment – OECD Publishing Ceremony for the 'Report on the Social Policy
for Korea'

Session 4. Future Vision of the Korean Economy

Session 5. G20 and Global Governance

The Lee administration again co-hosted the second Global Green Growth Summit together with the Global Green Growth Institute in May 2012. The spotlight of the global community was firmly fixed on this summit, as experts from a multitude of countries gathered under the topic of ‘Green Growth and Global Governance’ to discuss how the global community should cooperate to maximize the synergy effect, whether each country is responding effectively to climate change, and how to achieve continuous results in job creation and in the fight against poverty.

The ‘Global Green Growth Summit 2012’ was attended by both political and industrial leaders including: Anote Tong, President of Kiribati, Crown Prince Frederik of Denmark, Achim Steiner, Executive Director of UNEP, Kandeh Yumkella, Director-General of UNIDO, Rachel Kyte, Vice President of the World Bank, Loic Fauchon, President of World Water Council, Masayoshi Son, President of Soft bank, Jeremy Rifkin, world renowned scholar, and professor Jeffrey Sachs. The summit consisted of four general sessions with discussions on new momentum of global green growth governance, success stories, and mid-to-long term visions and strategy.

<Global Green Growth Summit 2012 Program>

Session 1. Green Growth as an Industrial Revolution : Vision and Challenges

Sub Session 1-1. New Collaboration Model for Water Security

Sub Session 1-2. Financial Support for Sustainable Energy

Sub Session 1-3. Food Security and Sustainable Agriculture

Press Moment – World Bank Publishing Ceremony for the ‘Report on Green Growth’

Sub Session 2-1. Green Growth and the Role of the Media

Sub Session 2-2. Green Growth and Research Topics for the Knowledge Platform

Sub Session 2-3. Global System for Green Growth Research, Development, and

Expansion

Press Moment – ‘OECD Report on Korean Economic Policy’

Session 2. Global Governance of Green Growth

Session 3. Strengthening of Global Green Growth Governance through National Leadership

Sub Session 3-1. Policy and Support for Developing Countries

Sub Session 3-2. Collaboration on Oceanic and Fishing Industries

Sub Session 3-3. Trade of Sustainable Energy

Session 4. Action Agenda for 2012 and Beyond

The goal of the Lee Administration was to share the knowledge and experiences gained through the building of the Green Growth Knowledge Platform (GGKP) with the developing countries outside the Global Green Growth Summit. In January 2012 the GGGI, OECD, UNEP, and World Bank met in Mexico to sign a memorandum of understanding for the launching of GGKP, a platform where green growth theories, policies, research, and success stories will be shared. This had particular significance as the GGGI, an institution established primarily by Korean leadership, was officially a part of the collaboration. As a global knowledge network, GGKP will close the gap between theory and practice and serve as a global network of expertise for green growth research and analysis to assist each nation in its push towards becoming a green economy, as well as in the passing and enforcement of new policies.

Section 4: Global Green Growth and the Expansion of Official Developmental Assistance to Developing Countries.

1. East Asian Climate Partnership (EACP) and the Global Green Growth Partnership (GGGP)

Developing countries have a greater susceptibility toward environmental changes, and in particular to disasters such as drought and flooding caused by climate changes. Some parts of Asia are suffering from a lack of basic infrastructure such as living space, energy, drinking water, and sewage systems. The '2010 Asia Pacific Disaster Report' stated that the Asia Pacific region has suffered 4 times more damage from that inflicted by natural disasters in Africa, and 25 times more than in Europe or North America. The report emphasized the insufficiency of the response to changing climate. In addition, with energy demands increasing due to industrialization, there was a strong need to decrease dependence on fossil fuels, to increase energy efficiency, and to develop renewable forms of energy.

In 2008, President Lee proposed the East Asia Climate Partnership (EACP) at the G8 Summit to support developing countries in responding to climate change. Starting in December of 2008, the East Asia Climate Partnership Coordinating Committee was launched with the Prime Minister as chairman. The goal of the EACP's was to aid developing countries in developing the capabilities to respond to climate change, and to promote green growth in Asia as a Korean collaboration effort toward global development. For the five years from 2008 to 2012, 200 million dollars were spent in the form of Official Development Assistance (ODA).

The 'East Asia Climate Partnership' was led by the Korean Foreign Aid Department and Korean International Cooperation Agency (KOICA), for the purpose of providing technology, policy counseling, development aid enterprising, collaborative enterprising with the UN, as well as research enterprising. The EACP focused on reducing damage caused by climate change, while decreasing the GHG emissions of partner countries to assist them in becoming independent in terms of responding to climate change. In addition, the green growth movement was promoted among partner countries as a new economic growth paradigm for sustainable growth, helping them simultaneously achieve economic growth and sufficiently

respond to climate change. The five main support areas of water, low-carbon energy, low-carbon cities, waste, forest and biomass were chosen to increase the effectiveness of the aid. Aid was then distributed after considering the geographical and environmental characteristics of each country. Partner countries showed a positive response as a thorough analysis of each country's requested aid was made in order to determine the effectiveness, benefits, domestic situation, controllability, and reliability, along with on-field analysis before determining whether to proceed with a project and distribute aid. Since 2009, aid has been allocated to 10 countries in the form of projects (31 projects in 13 countries counting those performed by the Korea Energy Management Corporation in 2008).

< List of East Asia Climate Partnership (EACP) Projects >

| Country | Project Title | Focus |
|-----------|--|---------------------------|
| Indonesia | Demonstration Project for Power Plant Construction Applying Fuel Cells | Low Carbon Energy |
| | Environmentally Friendly Treatment of Palm Oil Waste (Wastewater and By-products) | Forest & Biomass |
| | Collaborative Project for a Forest Biomass Development Model in Korea and Indonesia | Forest & Biomass |
| Vietnam | Improvement and Expansion of the Drinking Water System in the Buon Ho Region | Water Management |
| | Building of an Electronic Harmful Waste Management System | Waste Treatment |
| | Analysis of the Implementation of the Bus Rapid Transit (BRT) System in Ho Chi Minh City | Low Carbon City |
| Mongolia | Construction of Heating and Hot Water Systems in Baruun-Urt | Low Carbon Energy |
| | Construction of an Urban Waste Recycling Facility in Ulaanbaatar | Waste Treatment |
| | Restoration of Lake and Water Resources in the Bayannur Region | Forest & Water Management |

| Country | Project Title | Focus |
|-----------------|---|-------------------|
| | Field Survey and Development of an Information System for Mining Pollution | Water Management |
| | Water Supply and Efficient Usage of Water Resources for Newtown in Ulaanbaatar | Water Management |
| The Philippines | Construction of a Seaweed Bio-ethanol Research Center in the Bohol Region | Low Carbon Energy |
| | Fabrication of Wooden Pellets and Development of Sustainable Industrial Forestry | Water Management |
| | Construction of a Small Scale Water Reservoir to Secure Agricultural Water and Reduce Flood Damage | Water Management |
| Cambodia | Construction of Solar Heat Co-generation Power Plant | Low Carbon Energy |
| Tajikistan | Feasibility Study and Construction of a Hydraulic Power Plant | Low Carbon Energy |
| Sri Lanka | 500kW Grid System Connected to Solar Power Generation | Low Carbon Energy |
| | Development of a Data Analysis System for Communication, Ocean & Meteorological Satellite | Low Carbon City |
| Bangladesh | Solar Light Powered Irrigation Pump and Home System Support Project | Low Carbon Energy |
| Fiji | Renewable Energy Development Project | Low Carbon Energy |
| Azerbaijan | Comprehensive Project Related to Water Focused on the Development of Recycled Water Sources on the Apsheron Peninsula | Water Management |

The Lee administration, with its improved national recognition, status of the Korean economy from the global perspective, aid received after the Korean War, and the confidence from the fact that Korea has changed from being a recipient of aid into a provider of it, is planning to continuously

increase ODA until 2020, while lifting the percentage of green ODA to 30% at the same time. To achieve this goal, President Lee announced in May 2012 at the Global Green Growth Summit that following the 200 million dollar EACP which began in 2009 and will end in 2012, another green ODA will be established for the period from 2013 to 2020, with a total amount of 5 billion dollars. With this fund, a Global Green Growth Partnership will be formed to contribute more to the global collaboration. Based on the experience gained from the EACP, the GGGP will systematically form bilateral and multinational collaboration programs to focus on supporting energy efficient power plants and power grids, energy storage systems, renewable energy, green transportation and buildings, as well as water resource infrastructure. In addition, the administration will be able to offer more effective foreign aid as a founding country of green growth by having the Green Technology Center Korea (GTCK) serve as a bridge for technological cooperation, while strengthening educational and training programs to nurture international talent.

2. Green ODA, Quantitative and Qualitative Augmentations of Foreign Aid

The 'Green ODA' is a concept derived from the Korea's internal green growth vision and policy, designed to reduce environmental destruction and minimize contamination. Aid distributed to foreign countries is turned into a driving force for economic growth or for the efficient use of energy and resources, and growth capable of reacting to climate change thus leading to continuous development. There is also a strategic goal to strengthen the national image as a leader of green growth by supporting developing countries with insufficient capabilities so they can respond to climate change and follow the path of low-carbon green growth.

The 'Green ODA' is composed of the EACP, which is provided free of charge, and the Economic Development Cooperation Fund (EDCF) which is provided at a cost. From 2008 to 2012, the EACP spent 200 million US dollars on water management, forestry, renewable energy, and other forms of technological collaboration and development. The EDCF focused on green growth, which is strategically important in developing countries and something that Korea has expertise in, based on the 'EDCF Green Growth Industry Support Plan' signed in September 2009. To achieve this goal, six major green growth areas including solar power, wind power, biomass, water and sewage, waste treatment, and small hydro power plants have been established, to which EDCF will focus 30% of the budget, while also supporting transportation, energy, governance, and human resources. The 'Green ODA' has shown an increasing trend since 2007, growing both qualitatively and quantitatively as the Lee administration pushed green growth vision and policies. After its launch by the Lee administration in 2008, the Green ODA grew exponentially from 55 million dollars in 2007 to 127 million dollars in 2010, an average annual growth rate of 35%. Such a rate of growth, higher than that of any other country, contributed greatly to enhancing the national reputation. Korea will continue to assist developing countries in responding to climate change and achieving green growth.

After 2009, with the EACP and improvements made to assist requirements for the EDCF, support for renewable energy increased. In the case of free-of-charge aid, the portion of renewable energy rose from 1.2% in 2008 to 23.7% in 2010. The effectiveness of aid that was required to be repaid was increased by giving priority to supporting solar power, wind power, bio, and new growth engines, providing aid with no interest to countries with a per capita GNI of 3,975 US dollars or less, decreasing the rate by 0.05% for other countries, and extending the term of the loan from 5 years to 15 years.

The Lee administration plans to establish 'General Planning of EDCF' from 2011 to 2015 from the general planning of the ODA that passed in

December 2010 at the International Development Cooperation Committee, and to spend 65% of the 4.2 billion US dollar fund in 26 priority partner countries, with 45% being spent in the top 10 countries. In addition, 80% of all financial resources were distributed regionally, with 20% being allocated as syndicated loans from Multilateral Development Banks. The Lee administration is realizing green collaboration by incorporating green goals in establishing partnership strategies with 26 priority partner countries. In 2011, a green growth project was brought to fruition by assisting Vietnam to achieve green growth, establishing smart grids and power supply infrastructure in Ghana, and responding to climate changes by building the foundations for permanent development and creating areas of 'green' forest in the Solomon Islands, as well as providing analysis of feasibility and development investigation projects free of charge to ascertain the demand for green businesses in developing countries. In 2011, 10% of the Knowledge Sharing Program was dedicated to green growth, and six projects were given support, such as the water management program in India and energy/water resource infrastructure in South Africa. In addition, the network was strengthened with the collaboration of Green ODA public and private sectors and related organizations to change the frequency of meetings between free-of-charge and repayable (KOICA) aid programs from a semiannual to bi-monthly basis. Furthermore, the international expansion of green business was encouraged by vitalizing the public-private partnership and dispatching collaborative enterprise research teams to enhance the synergy effect.

Other than the direct ODA, contributions to important green multinational organizations also helped Korea live up to its recently heightened national reputation. Korea gave 7.5 million US dollars (1.85 million annually) to the Global Environmental Fund from 2010 to 2014 to aid developing countries in responding to climate change, and 20 million US dollars (5 million annually) to the Future Carbon Fund from 2010 to 2013, a total sum of 27.5 million US dollars. In September 2011, Korea signed the 'Memorandum of Understanding for Green Growth Collaboration' with the

World Bank to establish a green growth partnership between Korea and developing countries, aiding in green research. The World Bank has in turn agreed to create a green growth collaboration trust fund in Korea, providing 40 million US dollars over a period of 4 years. Apart from the points mentioned above, Korea has actively provided funding to multinational environmental organizations such as the UNFCCC, UNEP, and UNCBD.

Chapter 5 | Results and Future Challenges towards becoming a Green Developed Country

‘Green growth is the first global problem we have embraced as our own. It is the central vision towards a ‘Stronger Korea’. If we aim to discern the changes in world history and become a global leader, green growth should be pushed ahead with consistency and without faltering.’ – President Lee Myung-bak, in his memorial speech made on the 66th anniversary of Korean Independence.

Session 1: Realization of Low-Carbon Green Growth, from Vision to Regime

The ‘Low-Carbon, Green Growth’ began as a futuristic vision of the Lee administration. In the beginning it was just two simple phrases, but the ambitious vision embedded within showed the way towards a ‘Stronger Korea’, and a shift in the developmental paradigm that all other developed and developing countries must universally accept. It can be said without exaggeration that many social and political policies pushed by the Lee administration were intended to realize the ‘Low-Carbon, Green Growth’ vision, and to leave a green growth regime as a lasting legacy for Korea and the world.

In order to establish a green growth promotion system within 5 years, the Lee administration appointed the Director General of Green Growth as the president's secretarial staff and launched the Presidential Committee on Green Growth (February 2009) to allow governmental policy

planning and promotion to be conducted at the federal government level. In addition, 16 regional committees on green growth were established to promote green growth at the regional level, and green growth overseers were appointed to 33 departments and offices in 16 cities and provinces as general managers to supervise the operation of the departments. Furthermore, five private consultation groups were formed in the areas of finance, industry, technology, IT, and livelihood in order to collect diverse opinions.

Specific goals and motivations were established to improve the effectiveness of the policy, namely the 'National Green Growth Strategy and 5 Year Plan' (July 2009) and the 'Greenhouse Gas Reduction Goal' (November 2009). The national strategic goal was to transform Korea into one of the world's top seven green countries by 2020 and top 5 by 2050, with ten major policies and 3 major strategies: 1) climate change response and energy sufficiency, 2) creation of new growth engines, and 3) improvement of the quality of life and national reputation. The 5 year plan consisted of specific goals, investment plans, as well as other measures conceived in order to achieve national strategic goals within the time frame from 2009 to 2013.

To support these green growth plans and goals, the 'Sustainable Transportation Logistics Development Act' (June 2009), 'Framework Act on Low Carbon Green Growth' (December 2009), 'Act on the Creation and Facilitation of Use of Smart Grids'(April 2011), and 'Act on Allocation and Trading of Greenhouse Gas Emissions Allowances' (May 2012) were passed with support from both political parties, forming a legal and institutional frame to effectively reduce national GHG emissions to 30% of the BAU by 2020. By institutionalizing the green growth vision and policies, the opportunity to promote investments in facilities, renewable energy development, and green technology research for the reduction of GHG emissions was prepared, and the basis for acquiring new growth engine technology and industrial development was established, making provisions for the change from the energy consuming, carbon-dependent economic structure to the green growth development system where the economy and

the environment flow together in a virtuous cycle.

In the process of the systematization of green growth, Korea has shown unprecedented leadership and introduced the world to green diplomacy, working as a middle-power playing a bridging role between advanced and developing countries. After President Lee's declaration of the intent to become a leader in the global collaboration effort on climate change, called the 'Early Mover' announcement (July 2008), the first Korean-led global organization, the Global Green Growth Institute (GGGI) (June 2010) and a green technology development center, the Green Technology Center Korea (GTCK) (March 2012) were launched. Furthermore, by successfully attracting the green finance-providing Green Climate Fund (GCF) to Korea, a feat previously deemed impossible, the Green Triangle of Korea was formed. The green growth vision of becoming a 'Stronger Korea' was realized as a green growth regime, leaving a lasting legacy for the nation, preparing make its way into the ranks of the developed nations as well as into a global community pursuing continuous development.

<Realization of the 'Low Carbon Green Growth' Vision>

| | |
|---------------|---|
| July 2008 | Declaration to become the 'Early Mover' in the field of climate change |
| August 2008 | Announcement of the 'Low Carbon Green Growth' Vision |
| February 2009 | Launching of the Presidential Committee on Green Growth |
| June 2009 | Enactment of the Sustainable Transportation Logistics Development Act |
| July 2009 | Green Growth National Strategy (2009-2050) Green Growth Five-Year Plan (2009-2013) |
| November 2009 | Setting and Announcement of the Goal for Greenhouse Gas Reduction |
| December 2009 | Enactment of the Framework Act on Low-Carbon Green Growth |

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| April 2010 | Enforcement of the Implementation of the Greenhouse Gas Energy Management System |
| June 2010 | Launching of the Greenhouse Gas Inventory & Research Center of Korea (GIR) |
| | Launching of the Global Green Growth Institute (GGGI) |
| April 2011 | Enactment of the Act on the Creation and Facilitation of the Use of Smart Grids |
| | Formation of the Korea-Denmark Green Growth Alliance |
| June 2011 | Hosting of the Global Green Growth Summit (GGGS) 2011 |
| December 2011 | Enactment of the Construction Support Act for Green Buildings (bills sponsored by legislators) |
| March 2012 | Launching of the Green Technology Center Korea (GTCK) |
| May 2012 | Enactment of the Greenhouse Gas Emission Permit Distribution and Trade Act |
| June 2011 | Hosting of the Global Green Growth Summit (GGGS) 2012 |
| October 2012 | Construction of the Green Climate Fund (GCF) Headquarters in Korea (Song-do) |
| | Launching of the Global Green Growth Institute (GGGI) as a Global Organization |

Section 2: Outcome of the Low-Carbon Green Growth Policy and its Implications

The Lee administration has focused its efforts on strengthening the foundations for a green Korean economy, and on disseminating green growth as a new paradigm for the sustainable growth of the global economy. The administration's green growth policy has created jobs and expanded growth potential in the process of reducing GHG emissions and facilitating

adaptation to climate change, as well as improving the quality of life of the nation's citizens as well as improving Korea's reputation in the global community. Numerous achievements have been accomplished during Lee's 5 years in office, and his administration has gained wide acceptance and support in regards to humanity's future paradigm of 'Low-Carbon Green Growth'. Green growth has also been accepted by the global community, which began to discuss environmental problems before Korea, as a strong alternative for sustainable global development. In the process, Korea has been recognized as the founding country of a new development paradigm in 'Low-Carbon Green Growth'.

'Low-Carbon Green Growth' was a necessary strategy for the global community as the environmental problems and dwindling supply of fossil fuels threatened to result in a global energy crisis. We have now realized that, although we have spent the last 60 years working towards modernization and not looking back, the development style of the past is no longer valid in terms of preparing for the next 60 years. We can no longer be blinded by 'development' and ignore the 'environment'. Although the situation has required us to change, we have found an opportunity in the midst of the crisis. Preparation of the platform for Korea's second emergence by providing a vision asserting that the environment and development can be balanced is perhaps the greatest achievement of the Lee administration.

Korea has again demonstrated its will to make history through expanding the influence of green growth throughout the global community, and is promoting strategic green growth policies with definite goals and plans of action. A national response to climate change has also been established and promoted. Capabilities of responding to the effects of climate changes on water resources, natural disasters, and agriculture have been improved. One of the most notable achievements is that the stable water resources, which act as contingency for the droughts occurring at a frequency of 200/year in addition to flooding, have been secured through the Four Major River project and building of small and large environmentally friendly dams. A

new type of agricultural product with a higher resistance to heat has been innovated, while harvesting and managing technologies have been developed and propagated to secure the food supply. The accuracy of weather forecasting has been improved, and more credible predictions of climate change on the Korean peninsula have been estimated as a result. The quality of life has risen as air and water quality in urban areas has improved, and the number of environmentally friendly living spaces has also increased. In 2007, the proportion of good quality of water was 75%, while in 2011 that figure rose to 78%. In 2007, air particles were measured at 65 micrograms, but had dropped to 54 micrograms by 2011. The project to improve the hydro-ecology and water quality of the 4 major rivers and streams that had been in a damaged and contaminated state is now in progress. In addition, 1800 km of bicycle paths will be created along riversides throughout the country in order to promote health and the green lifestyle.

The biggest achievement of the Lee administration is the increased interest of citizens in the environmental and natural resource-related problems, and the fact that they have started to take action. It was also proven that the environment and development are not mutually exclusive, and can be balanced if we are willing to make the effort. Citizens' lifestyles are becoming increasingly 'green' through the promotion of green education, bicycle riding, green cards, increase in the production of fuel-efficient cars, green consumption, and environmentally friendly leisure activities. Some of the efforts made by the government to promote green lifestyle are the 'Carbon Cash-Back System' of 2008, the 'Carbon Point System' of 2009, and the 'Low Carbon Product Certification System' of 2011. Green cards were also issued in the same year. Other efforts were made in the field of green construction such as the 'First-Class Energy Efficiency Requirements' of 2010, the 'Environment-Friendly Building Certification Requirements', and the 'Construction of the Korean Green Home Park' of 2011.

The survey shows that most citizens are supportive of the green growth, as it can be seen from the fact that preparing for the future through

green growth placed second following international trade, which reached a total of 1 trillion US dollars. According to a survey conducted by 'Korea Research', 96% of citizens are aware of the seriousness of climate change, and believe green growth to be an effective method of response. Furthermore, 43% of the respondents said that Korea is leading the global community through green growth, and 97% agreed that the green growth policy should continue. Having 95% of respondents answer a particular survey question affirmatively is not so different from saying that in real terms all respondents have answered 'yes' to that question. By asking whether any other policies have previously gained such popularity, one can assume how supportive citizens are of green growth policy.

Most importantly, green growth policy has given a boost to the development of green technology and green industry. Twenty-seven green technologies have been chosen for investment and have received financial and tax benefits, while ten of them are in receipt of support by a massive R&D fund conceived to promote further research on related fields. By starting the 'Green Certification' program and establishing financial supply and distribution systems, investments in green technology and industry are being promoted. Furthermore, loan and guarantee-related support for green economic activities has been expanded via financial institutions. In addition to this, various incentive programs have been established to attract green investment from the private sector.

The success of such a policy can be seen clearly in the statistics showing that the renewable energy industry has grown 2.2 times in terms of the number of companies since 2007, 3.6 times in terms of employment, 5.9 times in terms of exports, and 5 times in terms of private investment. An increase in collective green purchasing to two billion dollars in 2009 was a small but meaningful change. Government investment in green R&D has greatly increased, and the technological gap between Korea and more advanced countries has been substantially reduced. Moreover, private green investment has been invigorated with green investment from the top 30

businesses predicted to reach 22.4 billion dollars by 2013.

The field showing the most notable achievements is the new growth engine field, which includes the completion of the world's largest electric car battery factory, placing 2nd in terms of LED production, acquisition of the world's leading CO₂ collection technology, and the launching of Korea's first mass produced electric car. This demonstrates the fact that investment in green industries has increased, and that the renewable energy industry has grown considerably. The production and use of energy efficient products is increasing, while a smart grid is being established. Green management is also becoming more popular at enterprises. The performance of the production and export of OLED TVs and LED lighting, secondary batteries, solar and wind power, and nuclear is a big encouragement for the creation of new growth engines. In 2011, the world's biggest tidal power plant and electric car battery factory were constructed, and Korea has risen to the rank of number 7 climate-modern country, and has become a prospective oil-exporting country. The Four Major Rivers Revitalization Project was successfully completed, and the water industry took the spotlight as a new growth industry. 'Water Landmark Projects' were carried out in Azerbaijan, Mongolia, Thailand, Algeria, Indonesia, Vietnam, while China is attempting to gain the know-how of the Four Major Rivers Revitalization Project. Furthermore, the effort poured into the water export industry is bearing fruit in North Africa and the Middle East.

The Korea Development Institute predicts that 1.21 million green jobs will be created during the period of the 5 year plan. As of 2011, 760 thousand jobs had been created, which is 240 thousand more than the number of jobs that would have been created if the same amount of money was invested in a non-green industry. Among the green industries, climate response and energy sufficiency industries have seen the most jobs created. However, the main benefits of this rise in employment show an improvement in quality of life and national reputation. Although such numbers cannot be completely trusted due to imperfections regarding estimation methods,

they are still meaningful as a rough form of estimation.

Another achievement of the green growth policy is that within the space of four years, Korea has emerged as the global leader in green growth. President Lee's declaration as a 'green growth early mover' at the 2008 G8 Summit, and the 'GHG reduction, me first' proclamation at the 15th climate change conference was both followed by actual policy changes, which led to an increased sense of confidence in the green leadership of Korea. In addition, Korea has set an example to developing countries by promoting EACP.

In August 2009, based on the Lee administration's green growth policy promotion and green diplomacy, UNEP announced Korea as the example case of green growth in the Overview of Republic of Korea's Green Growth National Vision. In addition, in June of 2011 the OECD announced low-carbon green growth to be a central future strategy in the Green Growth Strategy Synthesis Report, and in April 2011, Denmark and Korea formed the Green Growth Alliance. Green growth was selected as a topic of discussion at the G20 summits held in 2010 and 2012. Low-carbon green growth is now an agenda discussed and promoted by the global community and led by the Korean green leadership.

In December 1996, Korea joined the OECD for the purpose of studying the practices of developed countries, but soon faced the financial crisis brought on by the weaknesses of the former development paradigm and the financial banking that was falling behind. However, 12 years after joining the OECD, Korea has become the founding country of the green growth paradigm 'Low Carbon Green Growth', exhibiting leadership at both the OECD and G20 summits in leading the green growth paradigm into becoming a global asset.

Section 3: Future Challenges for the Green Growth of a Stronger Korea

On August the 15th 2008, President Lee Myung-bak announced green growth as the new national growth paradigm, on the same day as the 60th anniversary of Korea's foundation. The ultimate goal of green growth is sustainable, mutual growth from which everyone can benefit, leading the nation to becoming a 'green culture country' respected worldwide. To achieve this goal, in addition to the green growth in which the environment and growth are in balance, the mutual growth of both economic growth and welfare, the mutual development of welfare and environment, and the mutual prosperity of present and future generations, as well as the management of humanity as a whole, must be achieved. Furthermore, sustainable development should be achieved by strengthening the virtuous cycle of growth, environment, resources, and welfare.

For the past 5 years, the Lee administration has shown leadership in building a Global Green Growth Regime which will lead to the global shift toward the green growth paradigm, saving the world from the effects of climate and environmental change, as well as the resources crisis, and lead the globe toward sustainable growth. There's still a long road ahead of us, and uncertainty from the global economic crisis still remains. However, many changes and innovations have occurred in Korea over the past 5 year period. It should be noted that green growth is not the achievement of one government alone. It is only in its infancy. However, a small achievement that has been made is the establishment of the basis of public opinion and policies that will allow continuous green growth. This was only possible due to the fact that the majority of politicians and citizens supported the government's proposition. Despite this, green growth, which will provide mutual benefit happiness to all, is something that will change the very foundation of the country and is not something that can be achieved by one administration or in one generation. It will be a slow process that takes place over several generations and administrations.

President Lee has stated that green growth will be a 50 to 100 year-long task faced by not only Korea, but the whole world. The green growth paradigm has now become an asset to Korean citizens, not of just this particular administration. Korea will continue to promote green growth internally with the support of its citizens, and also continue its diplomatic efforts internationally to solidify the global green growth system so that this new paradigm can be reinforced as a global asset. The green growth system is not something that will be established in a short period of time, and will require a continuous effort. Internally, the public and private sectors, experts, technicians, and businessmen should be embraced and externally, like-minded countries should be collaborated with.

In this era of green growth, we have turned a challenge into an opportunity and are working towards a 'Stronger Korea'. The paradigm of the industrial revolution is shifting, and our lives along with it. A cultural change can be a crisis to humanity as well as an opportunity. It is what allows us to dream and hope. Green growth is a beautiful force, changing Korea, humanity, and the world. Green growth now remains as a legacy and mission for future administrations.

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