

# Korea Environmental Policy Bulletin

## Korea's Adaptation Strategy to Climate Change

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### Summary

Climate change caused by global warming has a wide-ranging impact on the atmosphere, marine environment, plants and animals, glaciers, land, and human system. It has come to the fore as an environmental problem that jeopardizes the sustainable development of the country. To adapt to those such climate changes, Korea has focused on the harmonious combination of mitigation and adaptation as specified in the UN Framework Convention on Climate Change. Korea's adaptation strategy and plan are linked with green growth, which is envisioned by the country as a new growth engine; it has been mapped out and implemented as a mandatory plan in accordance with the Framework Act on Low Carbon, Green Growth. Developed in 2010 jointly by 13 government departments (with the Ministry of Environment playing the leading role), Korea's national climate change adaptation plan envisions the establishment of a safe society and support for green growth through climate change adaptation. The plan consists of measures in 7 sectors - health, disaster, agriculture, forestry, coastal/marine resources, water resources, biodiversity - and

measures in 3 sectors designed to lay the cornerstone for adaptation - monitoring/prediction of climate change, adaptation of industry/energy, education/promotion (PR) and international cooperation. Specifically, Korea's climate change adaptation plan is a mandatory rather than a voluntary plan; it specifies the area of climate change adaptation among the national strategies for green growth and serves as a master plan that provides guidance for the central and local governments to lay out detailed action plans for implementation. In addition, Korea's national

climate change adaptation plan is adjusted every 5 years considering the uncertainty of climate change. The results of monitoring and evaluation of climate change are annually reflected so that the plan can be revised and complemented accordingly. Metropolitan and local governments are setting their climate change adaptation plans in line with the already established climate change adaptation plan of the central government, based on which an organic climate change adaptation system involving both central government and local governments will be put into place.

## I. Background

The temperature of the Earth's surface began to rise from the late 19th century as a result of increased emissions of greenhouse gases (GHG); in fact, it has been rising faster since the 20th century, and it is expected to rise by up to 6.4°C by the end of this century. Having gained speed, global warming affects the atmosphere, marine environments, plants and animals, glaciers, and land system; it is expected to have a huge impact on the human system. Recognizing climate change as a pressing problem that can jeopardize the sustainable development of humans, the international community is making multifaceted efforts to cope with climate change.

Basic strategies to respond to climate change require simultaneous approaches from both the mitigation of greenhouse gas emissions and adaptation. Global warming can be clearly alleviated to a certain degree by mitigating greenhouse gas emissions, but global warming in

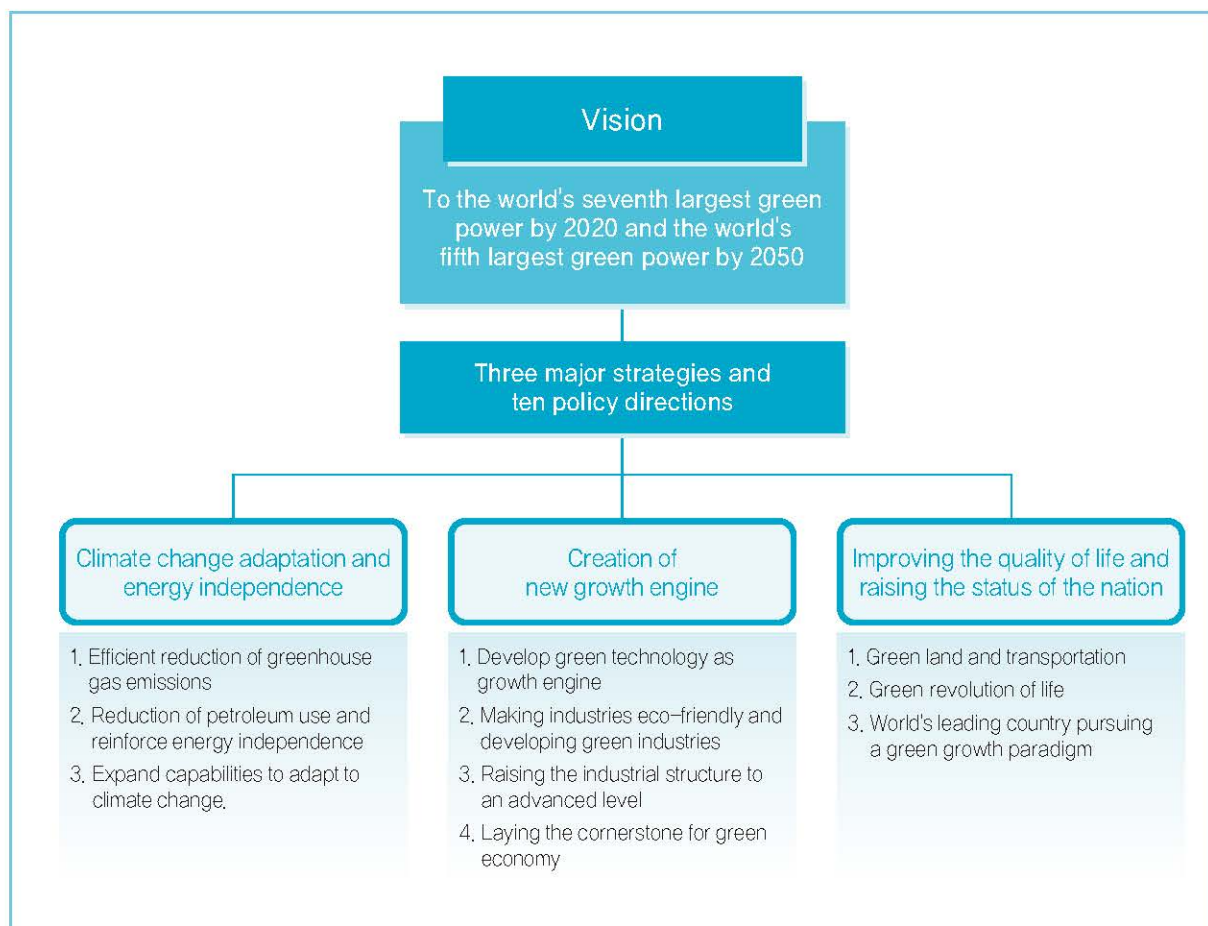
the 21st century is expected to be unavoidable because of the difficulty in slashing greenhouse gas emissions and the inertia of the climate system. Therefore, it may be essential to develop and establish adaptation strategies - along with the mitigation of green house gas emissions - to ensure effective response to climate change at the regional level as in Korea. At the Conference of the Parties to the UN Framework Convention on Climate Change held in 2009, an agreement to stabilize the green house gas concentrations to 450ppm and prevent the global annual temperature rise from exceeding 2°C was reached. Even if the global mean surface temperature increase is prevented from exceeding 2°C, however, over 2 billion people worldwide will suffer from water shortages, and approximately 20% to 30% of the entire species on the planet will be at risk of extinction. In addition, the probability of achieving the objective is said to be

lower than 50%, according to the 4th IPCC Assessment Report. Therefore, there has been a consensus that efforts need to be made at national level to ensure adaptation to climate change.

The pace of climate change in Korea has been and is predicted to be faster than the global average rate, and Korea has seen the temperature increase of 1.7°C over the last century (compared to the global average temperature increase of 0.7°C). In 2100, Korea is expected to see the temperature increase of 4.2°C (increase by 2.7°C, A1B scenario). The current trend of variation in precipitation as observed in Korea is that the total number of rainy days decreased but the total amount of precipitation increased, and this has led to the extreme pattern of rainfall; this trend is expected to be aggravated in the period ahead. The rise in sea level and water temperature in Korea has been higher than the global average. Thus, establishing countermeasures to cope with the risk arising from climate change is a matter of urgency to protect the lives and properties of the people from the harmful effects of climate change and make the Korean Peninsula safe. Along with that, there has been widespread consensus as to the increasing need to adopt countermeasures for ensuring adaptation to climate change.

To date, Korea has made multifarious efforts focusing on the mitigation of greenhouse gas

emissions in combating climate change. However, the country has embarked on full - fledged efforts to come to grips with climate change while setting itself on the path to green growth, which is envisioned by Korea as a new growth engine. Green growth aims at maximizing the synergy of environment and economy via a virtuous cycle between them and making such synergy a new growth engine. In other words, green growth is based on the concept of pursuing an eco-friendly pattern of economic growth with the objective of creating new opportunities for growth, representing a policy for realizing an advanced society. The Korean government has mapped out national strategies and set the direction for policies that seek to realize green growth. Green growth strategies at national level specify the action plan for implementing the green growth including achievement goal for each year, investment plan and main agent for each action. And Framework Act on Low Carbon, Green Growth (enacted in January 2010) is set forth to ensure the systematic implementation of the aforesaid strategies. As a result, Korea's strategies for adaptation to climate change are aligned with the nation's top objectives of development and have been established as mandatory plans in accordance with the Framework Act on Low Carbon, Green Growth.



## II. Korea's Adaptation Strategy to Climate Change

### 1. Establishment of National Climate Change Adaptation Plan

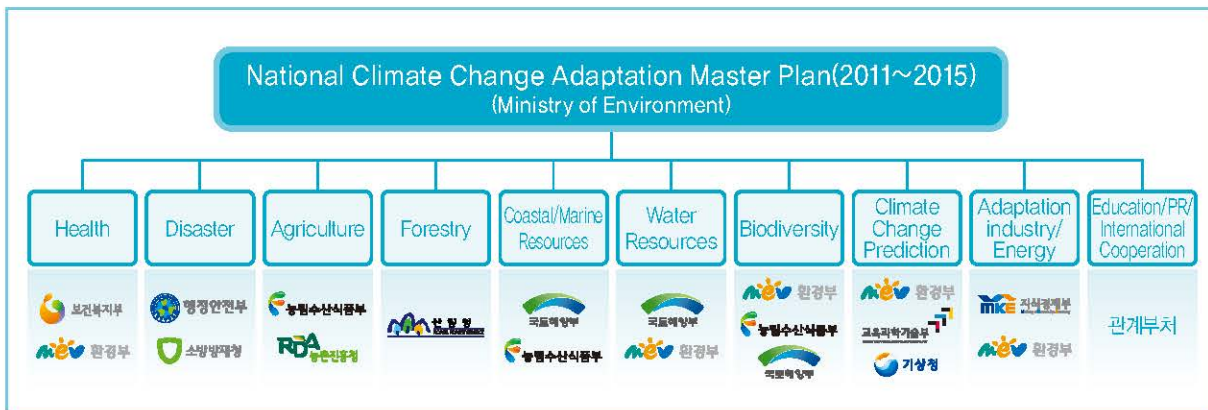
The Korean government enacted the National Climate Change Adaptation Plan (2011-2015) through the collaboration of 13 government departments (with the Ministry of Environment playing the leading role) in accordance with the Framework Act on Low Carbon, Green Growth (Clause 4, Article 48 and Article 38 of its

Enforcement Decree) in 2010. The National Climate Change Adaptation Framework was enacted through the working - level council composed of officials from each government department as required by the Green Act, which established the system of the adaptation measure and organized the expert advisory group for major items. The draft adaptation measure was prepared by the 13 aforesaid government departments and around 70 experts from various sectors, based on which a wide range of ideas

were collected through public hearings and consultations with related organizations.

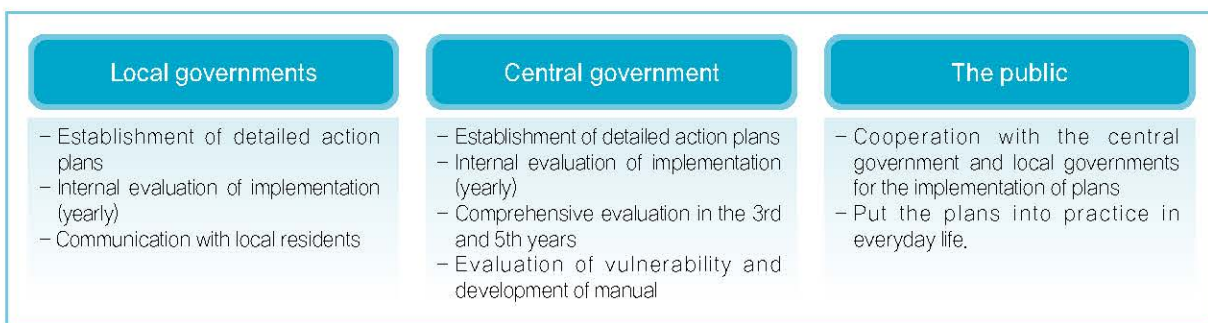
Specifically, National Climate Change Adaptation Plan is a mandatory rather than a voluntary plan; it specifies the area of adaptation to climate change among the national strategies for green growth as a master plan that provides guidance for the central and local governments to map out

detailed plans for implementation. In addition, National Climate Change Adaptation Plan is adjusted every 5 years considering the uncertainty of climate change. The results of monitoring and evaluation of climate change are annually reflected so that the plan can be revised and complemented accordingly.



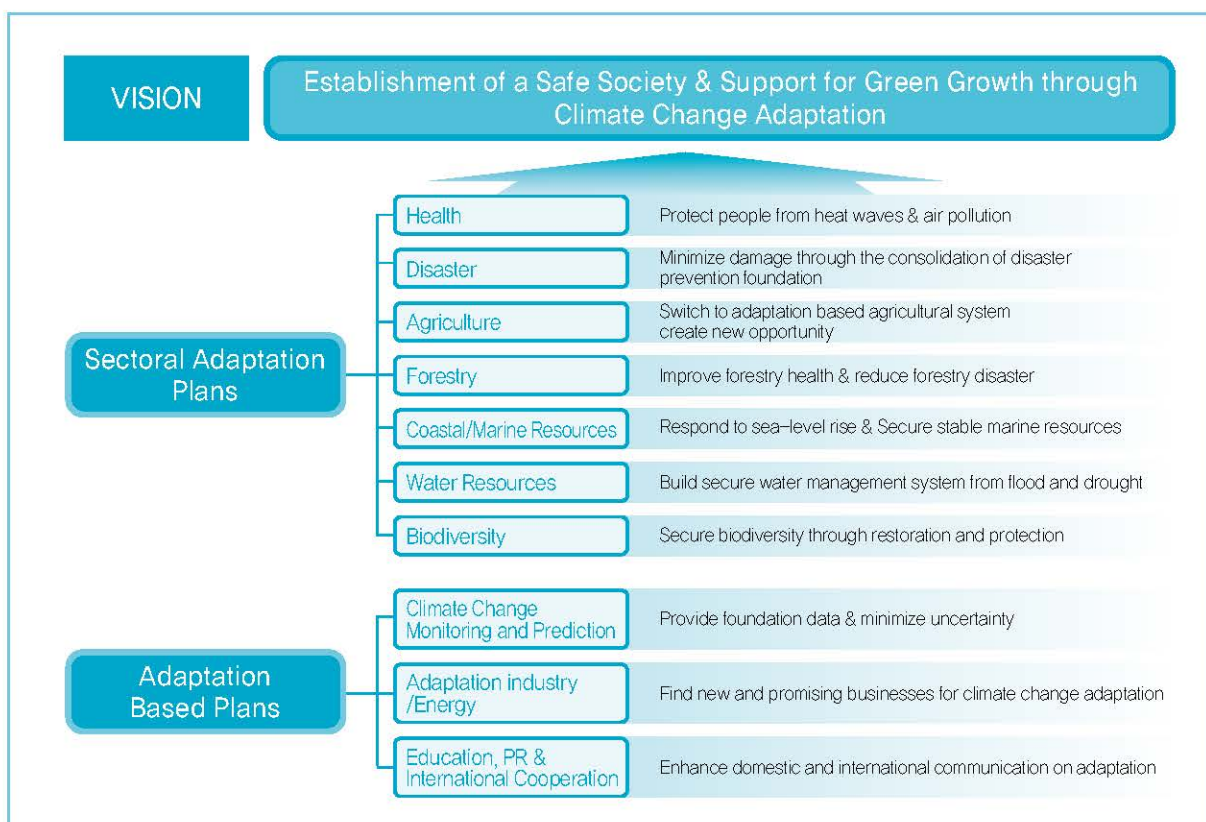
To ensure the efficient implementation of the National Climate Change Adaptation Plan, the Korean government has allowed the central government departments, the local governments, and the public to be involved and clearly defined the roles of the entities involved. Moreover, the Korean government requires the central government offices and local governments in the

metropolitan areas to lay out detailed action plans for the National Climate Change Adaptation Plan to ensure its effectiveness. The implementation of the National Climate Change Adaptation Plan will be internally evaluated yearly, and the results of comprehensive evaluation in the 3rd year and the 5th year will be published in the form of a report.



Korea's National Climate Change Adaptation Plan envisions the realization of a safe society and support for green growth through climate change adaptation and consists of sectoral adaptation plans targeting 7 sectors - health, disaster/calamity, agriculture, forestry, marine/fishing

industries, water resources, biodiversity - and 3 adaptation-based plans such as monitoring/prediction of climate change, adaptation industry/energy, and education/promotion (PR) and international cooperation. The diagram below shows the objectives of each sector.



## 2. Korea Adaptation Center for Climate Change (KACCC)

The Korean government established the Korea Adaptation Center for Climate Change (KACCC) (in July 2009) to ensure effective progress in the implementation of climate adaptation plans and support and develop climate change adaptation policies. KACCC was set up as an organization

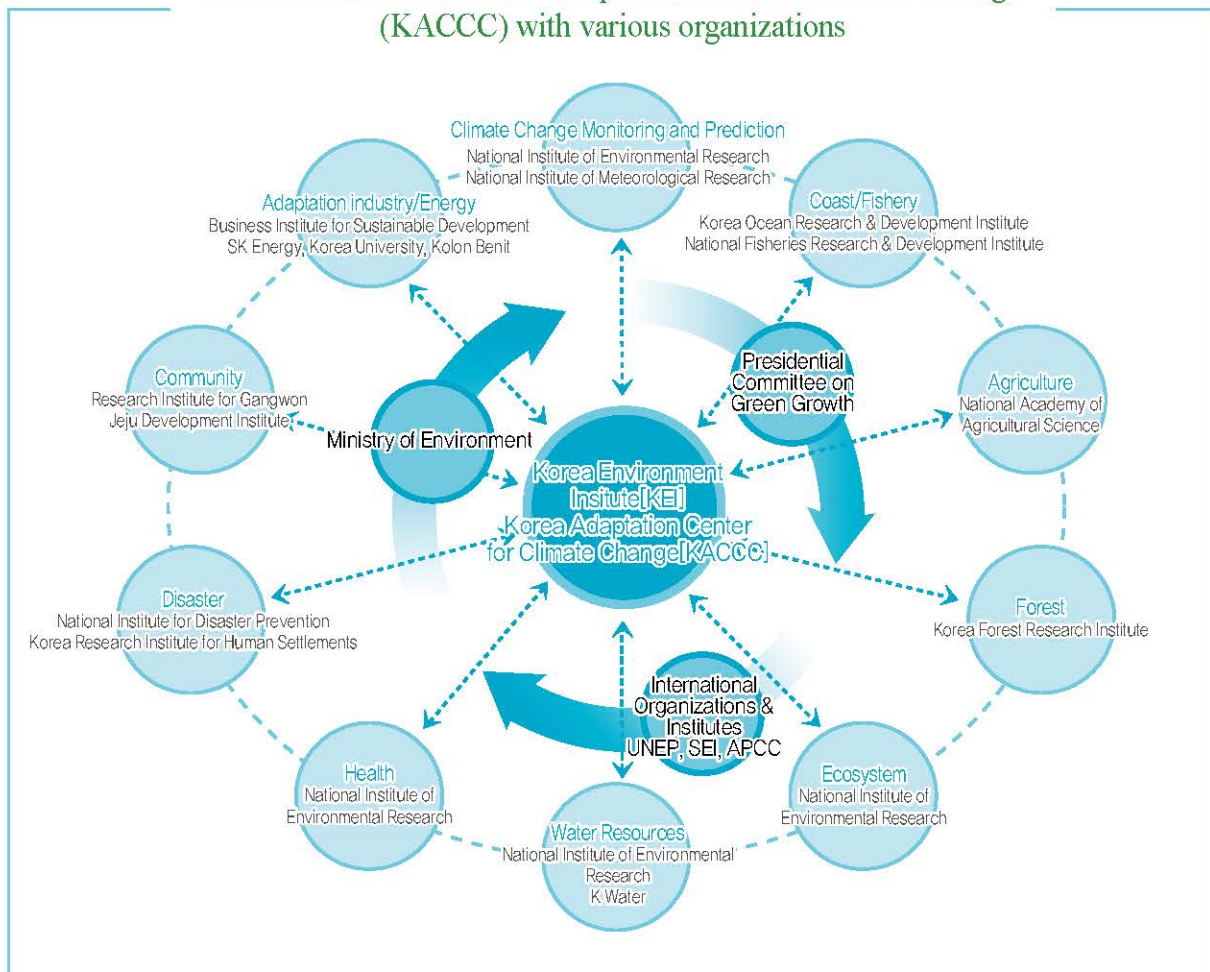
within the Korea Environment Institute (KEI) and is funded by the government (Ministry of Environment).

KACCC is composed of 3 teams - policy research team, adaptation cooperation team, and information & knowledge team - and is staffed by around 50 researchers with master's or doctoral degrees and who are dedicated to research on climate change adaptation. In addition, KACCC has concluded

MOUs (Memorandum of Understanding) with research institutes that undertake government projects, private - sector research institutes, academic circles, etc.; thus paving the way for close ties and collaboration with domestic and overseas

experts based on which it has effectively conducted research and provided support in relation to climate adaptation policies covering 10 sectors including disaster/calamity.

Collaboration of the Korea Adaptation Center of Climate Change (KACCC) with various organizations



As a central agency for the research on domestic climate change adaptation, the Korea Adaptation Center for Climate Change (KACCC) supports the establishment and implementation of National Climate Change Adaptation Plan and carries out a wide range of research including the

production of manuals pursuant to the adaptation plans and establishment of adaptation policy inventories, etc. Likewise, KACCC builds and operates a system dedicated to the dissemination of adaptation information and generates the Korean edition of the Stern Review on the

Economics of Climate Change (economic analysis of Korean climate change), which provides rigorous and comprehensive analysis of the extent of economic damage caused by climate change. KACCC is also pouring its energies into the development of educational contents and programs designed to help the public have better understanding of climate change adaptation while proceeding with the transfer of technologies to ASEAN countries that are vulnerable to climate change along with training.

#### **Establishment of and Support for Adaptation Policies**

- Assisting the central and local governments in drawing up and carrying out adaptation plans
- Evaluating adaptation policies and researching on the plan for building the inventory
- Facilitating local governments' efforts to evaluate the consequences of and vulnerability to climate change
- Conducting joint research with domestic and overseas organizations with which it forged partnerships

#### **Provision of Adaptation-related Information**

- Building and operating a system dedicated to the dissemination of adaptation - related information
- Developing web-based contents such as adaptation newsletters, etc.
- Conducting an economic analysis of Korea's climate change

#### **Education/Promotion and International Cooperation**

- Developing the capability of public servants, etc., and educating them in connection with climate change adaptation
- Promoting adaptation policies by producing promotional brochures and videos, etc.
- Training the personnel concerned in the ASEAN region and transferring the technology to them
- Building collaborative systems with international organizations such as IPCC, UNFCCC

## **III. Climate Change Adaptation Strategies**

### **1. Health**

To protect the people from the consequences of climate change such as heat wave infectious diseases, air pollution, and allergy, the Korean government established several countermeasures for preventing damage to the disadvantaged class caused by heat wave, strengthening the alert,

monitoring and warning system for infectious diseases and air pollution, strengthening the monitoring of allergens, and expanding the facilities to combat such consequences.

To build a system for evaluating and monitoring the effect on health and protect the disadvantaged amid the scorching heat wave that sets a new all - time temperature record, the



government has taken a series of measures including on-site health management programs for the disadvantaged, mandatory heat break (taking a break from the sweltering heat), operation of rest area for the heat, distribution of health management guidelines and manuals designed to help the disadvantaged cope with the heat wave, modeling for urban planning and construction of buildings capable of adapting to the heat wave, pilot projects (urban eco-network), etc. To strengthen the system for managing the spread of vector-borne disease (e.g., malaria, etc.), food-borne illness and waterborne endemic caused by climate change, it has strengthened the monitoring system (vectornet, vibrionet, enternet) in tandem with the operation of an alert and warning system to establish disease prevention systems tailored to the needs of regions. It is also pursuing the development of vaccines against vector-borne disease (Tsutsugamushi Disease) and diagnosis kit (malaria).

The government plans to put in place a system for enhancing the air pollution alert/warning system, providing behavioral guidance for the public, and providing information (via mobile phone) in an attempt to reduce the dangerous effect of air pollution and chemicals for the disadvantaged. Furthermore, the government plans to beef up the monitoring of pollens that cause allergy, establish an information-provision system, designate more environment health centers to cope with allergic diseases, and strengthen the operation of atopic eco-care centers.

## 2. Disaster

For strengthening the cornerstones for

preventing the disasters and building social infrastructures in relation with the adaptation, Korean government is establishing several countermeasures including the analysis of regions vulnerable to climate change, more stringent enforcement of disaster/calamity prevention standards, repair of facilities at risk of disaster, establishment of system for the dissemination of disaster/calamity-related information, improvement of urban sewage treatment plants, establishment of climate-friendly land usage management system, and reinforcement of the capacity of cities to adapt to climate change.

Parallel to that, the government plans to produce a "climate change vulnerability map" that shows the risk of climate change borne nationwide by type of disaster, expand the design capacity for facilities built to reduce damage from natural disaster, redefine the design standards as part of efforts to reinforce the disaster prevention standards, introduce flood protection standards for each region, and strengthen the pre-review system regarding the effect of disasters. Furthermore, the government plans to go ahead with the windstorm and flood insurance pilot projects for small and medium-sized enterprises to stimulate the adoption of windstorm and flood insurance - based on which it aims to promote the adoption of said insurance across the country - and intends to introduce a national disaster insurance scheme. Finally, the government will develop the necessary manuals to enable responding better to major types of disasters and strengthen the promotional campaign and education to raise awareness of the public and public servants.

To enhance the safety of the nation's land from disaster, the government will repair and

strengthen facilities at risk of disaster, carry out an analysis of the risks faced by small streams, build a database, undertake eco - friendly maintenance, build a system to monitor the signs of impending disasters, increase accuracy in alerting and warning of localized torrential downpours, and develop the technology for disseminating disaster prevention information using IT (information technology).

Additionally, the government will develop methodologies for evaluating the vulnerability of the nation's land and cities for application to major facilities to put in place a national land management system that facilitates climate change adaptation and to improve the capabilities of to adapt the urban climate changes. It also plans to revise the current national land usage plan through the evaluation of vulnerability, build a model for land use adaptable to climate change, and reflect the adaptation factors through environmental evaluation. Finally, effective adaptation measures shall be laid out for urban infrastructures based on the results of the evaluation of vulnerability to climate change, and indices for monitoring urban adaptation shall be developed and applied.

### 3. Agriculture

The adaptation measure in the agricultural sector aims to reduce the damage and create opportunities by facilitating the switch to an agricultural production system adaptable to climate change. Toward that end, the government will develop and disseminate new techniques for cultivating crops and new species adaptable to climate change and take measures to promote the efficient use and stable supply of agricultural

water, and establish a system to prevent damage from storm and flood or the outbreak/spread of blights and livestock diseases.

The government will map out national strategies through developing a model for evaluating and forecasting the effect of climate change on major crops to develop and disseminate new techniques for cultivating crops and new species adaptable to climate change. It plans to develop new species adaptable to high temperature and resistant to disasters and blight/damage caused by insects along with the development and supply of tropical and subtropical crops. In addition, the government will distribute biotic season variation maps, optimal cultivation management guidelines, and cropping system adaptation guidelines. To develop a technique for managing livestock adaptable to climate changes and establish a stable forage supply system, a standard on management of livestock shed for improvement/breed of livestock adaptable to high temperature will be set and related guideline will be distributed. And new species of forage adaptable to environment will be developed and the system for producing the seed will be established.

Furthermore, the government plans to disseminate agricultural water management techniques, expand the infrastructures for saving water, and strengthen agricultural water facilities to ensure efficient use and stable supply of agricultural water.

It will analyze geographical zones vulnerable to climate change by type of disaster by evaluating the vulnerability of the livestock industry caused by climate change, redefine the boundaries of cultivation based on the type of crops to respond to abnormal climate better, and establish and carry out adaptation measures based on the type

of agricultural infrastructures such as developing technologies for alleviating damage from meteorological disasters and strengthening related facilities. The government will also disseminate early disaster - prevention techniques and technologies necessary to prevent the unexpected outbreak of blight and damage caused by insects as a result of climate change, produce meteorological charts showing the outbreak of blight and damage caused by exotic insects, and provide web-based, real - time information predicting the outbreak of blight and damage caused by exotic insects.

#### 4. Forestry

The climate change adaptation measure in the forestry sector seeks to increase the health and productivity of the nation's forests and reduce the possibility of forestry disaster. For that, the government has established action plans for preserving the forest animals and plants species/resource, evaluation of vulnerability and promotion of the countermeasures to maintain/increase forestry productivity, and promotion of plans to prevent forestry damage due to the forest fire, landslides and blight.

The government will expand the "forest genetic resources reserve area" to help conserve plant and animal species and resources in forests, shore up their management, and expand national arboretums based on vegetation and climate to increase protection outside the region. Additionally, the government plans to cultivate the basin forests in the vicinity of around 40 dams nationwide and create alpine agricultural fields and forests for the conservation of water supply in landslide-prone areas to restore, preserve, and

manage the devastated forests in the basins around the dams and upper streams.

Modeling will be developed for the growth and development reaction of major tree species to lay the groundwork for the accurate prediction of forestry productivity and evaluation of vulnerability and come up with measures for ensuring adaptation, distribute species adaptable to climate change, and improve the soil to maintain productivity and predict better the variation in the productivity of chestnut trees, shiitake (mushroom), and pine mushrooms. Furthermore, the government will distribute customized forest maps showing the appropriate timing of afforestation and regions suited for afforestation and expand the supply of tree species that grow in south temperate zones, warm temperate zones, and subtropical zones. By evaluating the vulnerability of forests to disasters, preventing disasters, and upgrading the disaster reduction system to the next level as part of efforts to reduce damage, the government plans to reinforce the prediction of variation in the risk of disaster caused by the soil and rocks being washed down and the risk of fire, and create and distribute maps showing the high - risk regions vulnerable to such disasters. Along with that, it plans to increase the operational deployment of helicopters and forest fire squads to extinguish forest fire, improve accuracy in the prediction of landslide, and expand the construction of debris barrier and disaster-damage prevention forests in the coastal area.

#### 5. Coastal/Marine Resources

The climate change adaptation measure in the marine/fishing industry sector aims at ensuring

effective response to the rising sea level and stable supply of marine food resources. To achieve these objectives, the Korean government took measures to manage the change in coastal areas resulting from the rising sea level, set adaptation plans, monitor and predict the change in the fishing ground as a consequence of climate change, and secure marine fishery resources for the future and devised countermeasures to reduce infectious diseases affecting the fish and damage from acidification and curtail the damage to the fishing industry.

The government will develop a coastal disaster assessment system, establish an adaptation portfolio tailored to the needs of the respective coastal areas, local governments and projects, and revise and complement coastal management plans and marine environmental impact evaluation for evaluating and managing the vulnerability of coastal areas to climate change. Furthermore, it plans to proceed with pilot projects for restoring and creating a new - concept coastal area adaptable to climate change while performing precise observation of external load. In addition, the government intends to draw up strategies to predict and manage geographic change occurring as a consequence of climate change in coastal areas.

To establish a system for monitoring the fishing conditions and fishery resources and forecasting and managing the change in fishery resources, the government will also develop modeling for monitoring and forecasting change in the breeding ground for fish in the coastal area and mud flats, build a system for forecasting the fishing conditions, and introduce a system for the strategic evaluation of coastal area resources management measures and environmental

impact. To secure the fishery resources of the future, the government will develop technologies for farming new fish species and technologies for the optimal haul of new fish species living within the coastal area and develop marine forest and ranch, artificial fishing banks and seaweed, discharge technologies, etc.

In relation to the countermeasures for reducing infectious disease, the government will develop techniques for monitoring the seawater and diagnosing diseases in animals living in seawater, techniques for diagnosing the pathogens in fishes that are newly introduced, and develop vaccines against infectious diseases in fish raised in hatcheries. To tackle the problem of ocean acidification, surveys will be conducted for current conditions and prediction, evaluate the damage, establish countermeasures, and provide education to fishermen. In addition, to reduce disaster for the fishing industry in coastal area, the government plans to develop technologies for mitigating damage from large harmful animals (jellyfish, etc.) to the fishing business, enhance the safety of fish hatcheries, etc., to better cope with natural disasters and develop the technologies for catching the targeted fish species, and ensure hygienic management of new marine products.

## 6. Water Resources

The adaptation measure in the water resources sector seeks to put in place a safe water management system that is not vulnerable to climate change such as flood, drought, etc. Toward such end, the government established a set of measures such as laying the cornerstone for reducing vulnerability in water management,

improving the ability to cope with flood by pushing ahead with facility improvement projects as well as the 4 Major Rivers Restoration Project, securing water resources such as alternative water source, strengthening water quality in rivers and small streams, and preserving/restoring the ecosystem in rivers.

To ensure effective analysis of vulnerability to climate change by sector, the government will expand the infrastructures for monitoring water management in view of climate change, build a system for leveraging IT, assess the impact of climate change on floodgates, and produce maps (including maps showing the areas vulnerable to flood and drought and exposed to risks). To lay the cornerstone for increasing the national land's resistance to flood, it will create a flood forecast system leveraging state-of-the-art technologies and expand the water control ability of flood control facilities. To secure the stable supply of water resources, the government has taken measures to reassess the water supply ability of the existing dams, push through with the construction of small and medium-sized dams, shore up underground water resources management, expand waterworks facilities, develop alternative water resources (seawater desalination, reuse of water, etc), expand the installation of facilities in vulnerable regions and provide support for the installation of such facilities, develop and distribute the apparatuses and facilities designed to save water, and strengthen the management of the demand for water by launching promotional campaign and education to raise awareness with regard to the conservation of water.

The government has pursued the 4 Major Rivers Restoration Project to maximize the ability of the

rivers to cope with the impact of climate change based on which it has enhanced the ability of the 4 major rivers with regard to irrigation and water control, create eco and water-friendly space, and establish a real-time river management system using IT; thus restructuring the river management system. To strengthen the management of aquatic environments (water quality and aquatic ecosystem) of rivers, swamps and lakes amid climate change, the government plans to reduce proactively non-point sources pollution such as nutrients, soil loss, and algal occurrence, reduce significantly the sources of pollution such as water-borne pathogenic microorganism, tiny quantity of harmful substances, sediments, etc., in the basins, restore the aquatic ecosystem, secure ecological flow in rivers, and put in place a water circulation system.

## 7. Biodiversity

The objective of climate change adaptation in the biodiversity sector is to secure the biodiversity of the Korean Peninsula through the protection and restoration of the ecosystem. For that, a series of strategies have been drawn up to strengthen the monitoring of ecosystem and indicator species, evaluate the vulnerability, conserve and restore biological species and genetic resources, implement projects associated with the ecosystem of the Korean Peninsula, and prevent and manage the damage arising from the emergence of exotic species and unexpected appearance of exotic species in massive quantities.

To monitor actively the impact of climate change on the ecosystem, the government has aggressively implemented the nation's long-term

ecological research projects related to the ecosystem and biological species, strengthen the monitoring of the marine and forestry ecosystem, and designate and monitor biological indicator species that are among the species most sensitive to climate change. Additionally, it will conduct surveys and increase monitoring to determine the current conditions of regions with excellent ecosystem, swamp, uninhabited islands, etc., build and provide a database related information from the database, and assess the vulnerability of each sector to climate change.

Furthermore, to preserve and restore biological species and genetic resources and ensure the link in the ecosystem, the government will proceed with the implementation of measures for conserving and restoring the biological species vulnerable to climate change and build genetic resources banks and network of information by region. The ecological reserve area will also be expanded and managed. The government plans to implement projects that aim to establish links in the ecosystem through the restoration of the damaged area in the 3 core ecological networks (Baekdu big mountain range, civilian passage restriction line, maritime forest) straddling the

Korean Peninsula and installation of the ecological corridor, restore the damaged habits of major plants growing spontaneously, and actively manage the ecological corridors of wild animals.

To promote prevention of and countermeasures for the emergence of exotic species and unexpected appearance of such species in massive quantities, any change and spread of exotic species will be monitored; analysis will also be performed on the ecological environments in regions where exotic plants or animals emerge, and further spread of the damage will be prevented by putting in place a system that ensures early warning of the unexpected appearance of species and disaster-prevention system. In addition, to reinforce governance for the management of biodiversity and strengthen the promotion to raise awareness, the government has established a series of measures such as implementing biodiversity observation network pilot projects, establishing and promoting guidelines for the adaptation of the ecosystem to climate change based on the vulnerability map, and setting up and operating a council consisting of the government departments to enhance efficiency in the management of the ecosystem.

## IV. Conclusion

Basic coping strategy of Korea to climate change is the combination of mitigation and adaptation as specified in the UN Framework Convention on Climate Change. In addition, Korea's adaptation strategy is linked with green growth, which is envisioned by the country as a new growth engine. Developed in 2010 jointly by 13

government departments (with the Ministry of Environment playing the leading role), Korea's the first national climate change adaptation plan envisions the establishment of a safe society and support for green growth through climate change adaptation and consists of 7 measures by sector - health, disaster, agriculture, forestry, coastal/marine

resources, water resources, biodiversity - and 3 measures designed to lay the cornerstone for adaptation - monitoring/prediction of climate change, adaptation of industry/energy, and education/promotion (PR) and international cooperation. Specifically, Korea's climate change adaptation plan is a mandatory rather than a voluntary plan; it specifies the area of climate change adaptation among the national strategies for green growth and serves as a master plan that provides guidance for the central and local governments to lay out detailed action plans for implementation. In addition, Korea's national

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