

Forest Policy and Reclamation in the Republic of Korea

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FORESTS AND FOREST ADMINISTRATION IN THE REPUBLIC OF KOREA

The Korean peninsula is located between 33° 7' and 43° 1' N Latitude, and 124° 11' and 131° 53' E longitude at the heart of the North Western Pacific, sharing a border with China and Russia to the north and lying near the Japanese archipelago to the south. It extends about 960 km southward and its width is about 170 km from east to west, It is surrounded by three oceans and nearly 70% of its terrain is mostly mountainous so terrestrial and marine ecosystems have a variety of species with high biodiversity.

The Korean peninsula encompasses 221,000 km², 45% of which makes up the Republic of Korea (ROK, South Korea). About 20% of the total land area in the ROK is used for agriculture while forests cover 63%. The Korean peninsula lies in the east of the distinct seasonal temperature and precipitation. The main mountain range of the Korean peninsula is the Baekdu-daegan Mountains. It stretches 1,400 km from Mt. Baekdu in North Korea all the way down to Mt. Jiri in Republic of Korea, forming the great backbone of the Korean peninsula.

Korea has a temperate climate characterized by four distinct seasons. The seasons change gradually but each has a significant seasonal characteristic. Spring and autumn are relatively short while summer and winter are rather long. With high temperature and humidity, summer begins in June and lasts until August accompanied with monsoon typhoons and rains. Winter is dry and cold due to the northwesterly winds sweeping down from Siberia. An annual average temperature is 12~14°C in the central region and 3~20°C in the northern region.

Annual mean rainfall ranges from 600mm to 1,800mm with uneven seasonal distribution and regional differences: 1,000mm to 1,800 mm in southern region; 1,100 mm to 1,400 mm in central region. The rainy season begins in late June and lasts approximately 30 days, and two or three typhoons from the northern Pacific Ocean affect Korea between June and October every year. 50~60% of the annual rainfall is likely concentrated during summer causing great concerns for unstable water supply.

State-led forest rehabilitation projects were implemented for rehabilitation of the degraded forests. Further, the legal and institutional preparations were made for forest management. As stipulated in the Framework Act on Forest (2001), the national forest plan is established and upgraded every 10 years. Under the national forest plan, the KFS enhances a systematic foundation for sustainable forest management and provides forest benefits for the public.

Table 1. Forest area in the Republic of Korea >

(Unit : 1,000 ha)

Year	Total	National forest				Public forest			Private forest
		Total	Indispensable	Dispensable	Other	Total	Provincial	County	
2006	6,389	1,497	1,274	91	133	489	152	337	4,403
2007	6,382	1,509	1,296	80	133	489	154	335	4,384
2008	6,375	1,518	1,317	70	131	488	154	334	4,368
2009	6,370	1,530	1,339	60	131	489	154	334	4,353
2010	6,369	1,543	1,354	56	133	488	154	333	4,338
2015	6,335	1,617	1,437	33	146	467	162	304	4,250

(Korea Forest Service, 2015)

The Korea Forest Service (KFS) has the overall responsibility for establishment and implementation of forest policies and laws. The KFS consists of 5 bureaus, 23 divisions, 2 teams, 1 department, 11 Regional Office of Forest Service and 27 National Forest Stations. It also has affiliate agencies like the Forest Aviation Headquarters, the National Institute of Forest Science, the National Arboretum, and the National Recreation Forest Office. Each province and metropolitan city have their local forestry administrative organizations

Korea's new national vision for the forthcoming 60 years is 'Low Carbon Green Growth'. The Korean government has elaborately designed a new paradigm of a green society, aiming to transfer the current energy system inevitably emitting a large amount of greenhouse gases into a low carbon society with high power-efficiency. This forward-looking vision for national development is surely to help address environmental issues including global warming and facilitate sustainable development.

Forest is the key resource, and recognized as a sole carbon sink under the United Nations Framework Convention on Climate Change. Korean forests sequestered 43 million tons of carbon dioxide in 2009, which accounted for 7% of the total carbon emissions in Korea. Forest also has great potentials in developing green technologies regarding a wide use of forest bioenergy and industrialization of forest bio-resources. To maximize this forest value as a key resource, Korea has been working on pursuing Green Growth in various fields such as bioenergy technology development, the biotechnology industry, and other energy businesses.

The KFS has been implementing forest policies with the view of providing the public with an improved quality of life by offering recreation forests, healing forests and mountaineering services and expanding urban green spaces. As part of the forest policies, it contributed to revitalizing Korea's economic depression, locally referred to as the IMF, by creating green jobs under forest tending projects.

As the country whose successful rehabilitation projects were internationally recognized, Korea continues to take part in global activities addressing climate change and to build a

bridge between developed and developing countries through cooperation projects of forest rehabilitation in developing countries. Therefore, Korea can make advances in sustainable development as a green growth model nation.

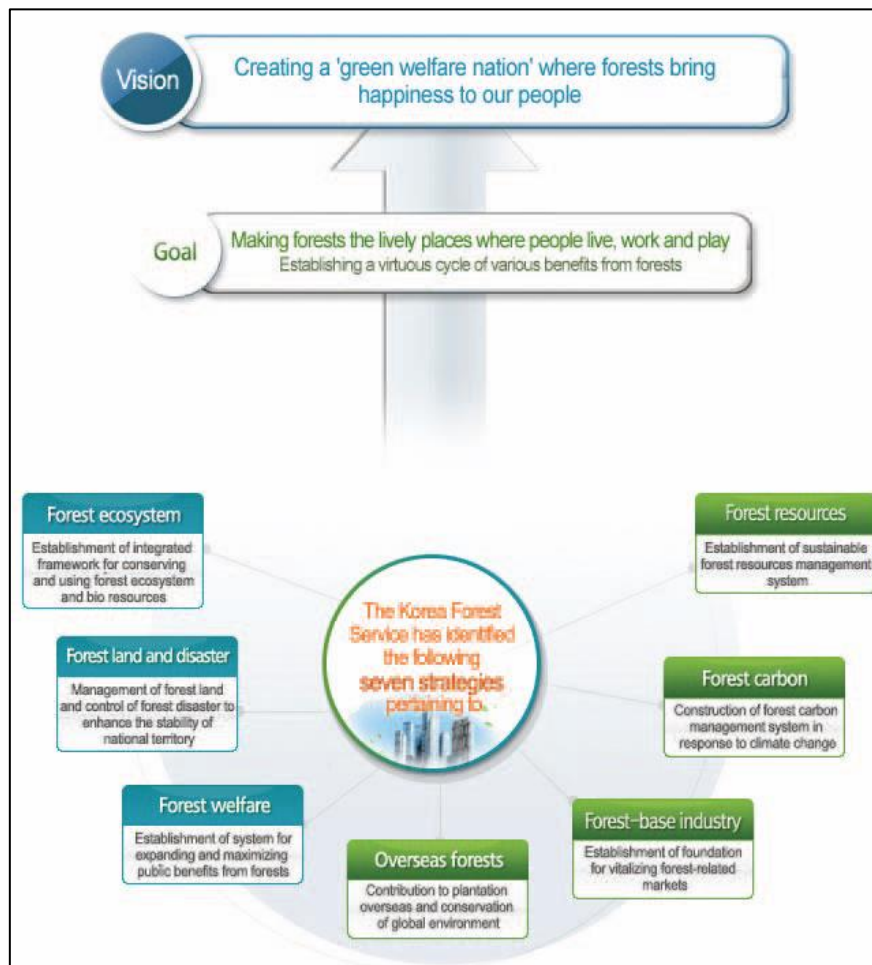


Fig. 1. Vision and goal of the Korea Forest Service

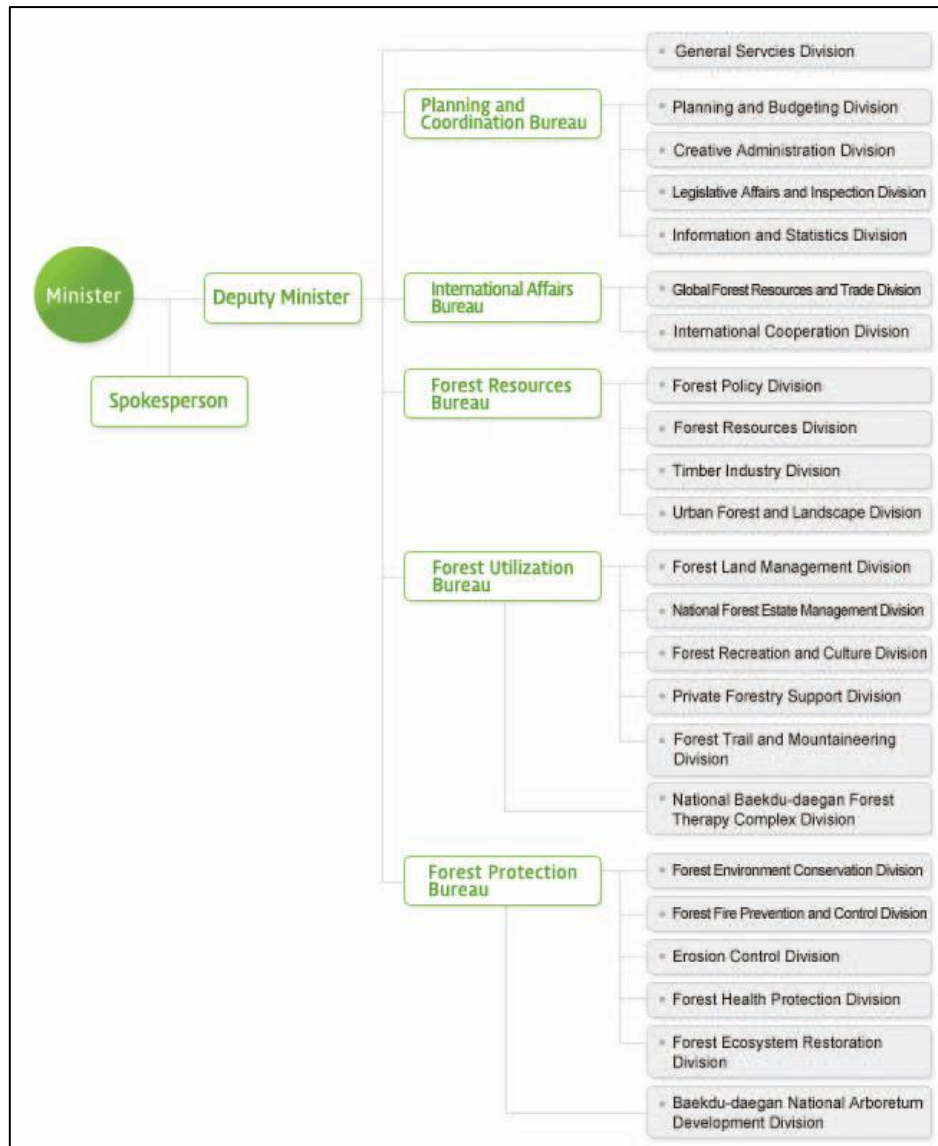


Fig. 2. Organization chart of the Korea Forest Service

DEPLETION OF FOREST ON THE KOREAN PENINSULA

Much of Korea's tree and forest began to be destroyed in the early 15th century. Historical records from the late 19th century described their conditions as "All the mountains across the country were barren, except the ones that were left untouched by humans because of their remote location". Such situation was continued until the late 20th century.

During the 500 years of Joseon Dynasty, all the mountains of Korean peninsula were owned and directly managed by the Dynasty (state). People were allowed to cut trees for wood consumption without any restriction. There was indiscriminate use of forest resources and no one recognized the need for reforestation. During this period, Korean people utilized woods as a source of energy to prepare food, to feed livestock and to heat home for long winter. Wood was also the main material used for construction at that time. Making the consumption was inevitable, and this gradually disappeared trees in the forests.

Prior to Joseon Dynasty, people used broad-leaved trees as a main source of wood. But, forest policy focused on protecting pine trees due to the depletion of broad-leaved trees during this period. This was persevered pine trees very well even on bare lands and developed many uses. In the mid-15th century, King 'Sejong' promoted planting pine trees on the mountains, and introduced pine-conserving forest policy and policy on prohibition of red pine cutting, which prohibited people from entering maintains and cutting down pine trees.

During the early 19th century, King 'Sunjo' initiated pine conserving forest policy, which banned people entering 282 designated mountains. However, these polies failed to protect the preserved forests. Planting pine trees was recommended but not practiced. And the pine-conserving policy and policy on prohibition of red pine cutting were just implemented as means for the state to continuously harvest pine trees. Thus, the state actions were inadequate to prevent forest devastation.

At the beginning of Japanese occupation in 1910, the Japanese conducted on the survey of Korea's forests and natural resources. At that time, the forest cover was about 71%. Dance forests were largely concentrated in the northern regions that are difficult to access as they are very mountainous regions. Most lands were under poor conditions, and at southern part, mountains were bare of any trees. The depletion of Korea's forests was very severe at that time.

The Japanese designated all the mountains that were previously owned by Joseon Dynasty as national forests and established regional forest offices to manage the national forests nationwide. They also gradually predated the remaining virgin forests. For instance, they exploited forests in Mt. Baekdu in order to use for construct projects around Machuria. The forests at central part (capital city) of Korea were also exploited to build home for the Japanese. The big trees at southern parts were plundered and shipped to Japan by railways and ships. The 36-year long occupation and the Second World War further devastated forests in Korea.

Full-fledged exploitation of virgin forests began after the Second World War, with the ultimate goal of supplying was resources. Large diameter logs from old trees were coveted and plundered from Korean mountains. Key target areas included national forest areas that were controlled by the regional forest office. Regional forest offices were installed by Japanese in the national forests to facilitate mass forest exploitation.

Although Japanese destructed Korea's forests, they also established and implemented forest policies. However, most of them were just formality. For instance, they initiated fuel-wood forest establishment and erosion control project, but failed to carry out any large scale of reforestation efforts. The depletion of trees steadily continued.

The project of erosion control was conducted on 200,000ha of land from 1932 to 1945. In 1947, however, after the Korea's liberation from Japan, there were still 440,000ha of eroded land left that was in urgent need of work, which was accounted for 6.5% of the total forest area. The depletion of trees and the destruction of forests were intensified during the 36 years of Japanese occupation, resulting more frequent drought and flood. During the Joseon Dynasty, drought and flood occurred every 20 to 30 years, but the frequency increased every 10 years and then 5 years. Drought and flood began to occur every 2 to 3 years during Japanese occupation. The main cause was a degradation of forests.

When forests are destroyed, a drought occurs when there is a little rainfall, and flooding occurs when there is heavy rainfall. Healthy forests with full of trees the soil and leaf litter layer under forest ground are supposed to help absorbing soil water from rain and preventing drought and flood. But these functions of forests are unable to proceed at that time.

In 1945, Korea was liberated from Japanese occupation lasted 36 years. But the Korea War was broken in 1950 and continued for three years bringing even more devastation to the remaining forests. Also social chaos, poverty and absence of administration left in the war created the situation where people were cutting down trees just to survive. The state of prevention was useless. Also since most of building was wood at that time, there was a sharp increase in demand for wood to reconstruct buildings that were damaged or destroyed during the war. This worst and bad condition of Korea already depleted forests.

During this period, the country was in a chaos. After liberation from Japan, the Korean War left people in desolation, forcing them to eke out a living by any means necessary. To help protect the forests, the first Korean government organized annual Arbor Day events, making the start of great reforestation efforts. However, people lived in extreme poverty and everyone depended on wood to fuel the floor-heating system, called 'Ondol'.

Fuel wood was also used for cooking and making feed for cattle, which were the life force of farming villages. Under such circumstances, people did not concern themselves with reforestation. They only cared about cutting wood for their livelihood. People could get quick cash and avoid starvation by cutting wood from mountains and selling it at nearby markets. Most people thought that mountains were ownerless and had a confidence for cutting trees on a first-come first-served basis. They did not feel guilty about cutting down trees on other people's property. Also the follow-up management was another problem. When the weather turned cold in winter, people routinely cut down young trees before they had a chance to grow.

Another cause of forest depletion was collecting leaf litter from the forest ground. In the rural areas, there was often lack of the source of energy, so they collected leaf litter and tree branches from mountains, and burn them to heat their home winter time. Leaves play important environmental role after falling on the ground and they decomposed and acted as a fertilizer. The leaf litter layer underground also helps to store and release water slowly nearby preventing flooding and soil erosion. However, as people at rural areas continued to collect leaves, the ground became barren and more likely desert.

The first Korean government established after the liberation recognized needs for forest reclamation and initiated some of the reforestation and forest protect policies. For example, the national Arbor Day created to encourage tree planting. In 1948, the ten-year reforestation and erosion control plan was established. However, these plans were not implemented due to the outbreak of Korean War, which continued three years. Despite this situation, the government enacted the temporary forest protection act in 1951, the five-year mountain erosion control plan in 1953, and the second ten-year private forest reforestation plan in 1954. The late 1950s, forests were mostly divested with 686,000 ha of erode land in 1956, accounted for over 10% of the total forest area in Korea.

The government formulated the ten-year upstream soil and water conservation plan in 1958, and the five-year fuel wood forest establishment plan a year later in 1959. But due to social instability, the government failed to establish the framework to implement forest reclamation projects and the objection of forest policy could not be obtained due to governmental budget and administrative capacity.

FOREST POLICY FOR RECLAMATION IN SOUTH KOREA

In 1969, the UN reported that the forests in Korea were devastated and barren just five decades ago, with more than fifty percent of mountains being treeless. The devastation on the

Korean forests was chronic and could not be helped at present. However, this all changed with the success of the reforestation projects, which is regarded as one of the rare cases of successful forest reclamation in the world.

World-renowned environmental analysis ‘Lester Brown’, who has authored numerous books on global environmental issues, considers Korea to be the most successful case of forest reclamation. He wrote “South Korea is in many ways a reforestation model for the rest of the world. When the Korean War ended half a century ago, the mountainous country was largely deforested. Beginning around 1960, under the dedicated leadership of President Park C.H., the South Korean government launched a national reforestation effort”. Korea is actually the one and only developing country where the total forest area decreased by only four percent while pursuing economic development and forest reclamation simultaneously.

Role of forest is critical to mitigating climate change as the trees absorb and store greenhouse gases. Reforestation is defined as the forest that has been depleted naturally or by man (target) is restored through tree planting and erosion control projects (method) to create a dense forest and achieve economic, public and environmental outcomes (objective) in the end. Situation in majority of developing countries, the growth of economic and population generally reduced the area of forest. Growing concerns about global warming and climate change, it has emphasis on the need for reforestation.

Background of the policy implementation

In 1959, Korea was one of the world’s poorest countries and Korea’s GDP per capita was 119th out of 120 UN registered countries. Korea also had low self-sufficiency in food production and relied heavily on foreign aid. Considering these aspects, the lack of awareness toward reforestation was probably inevitable. Despite these, however, the Korean government devoted its efforts economic growth and forest reclamation.

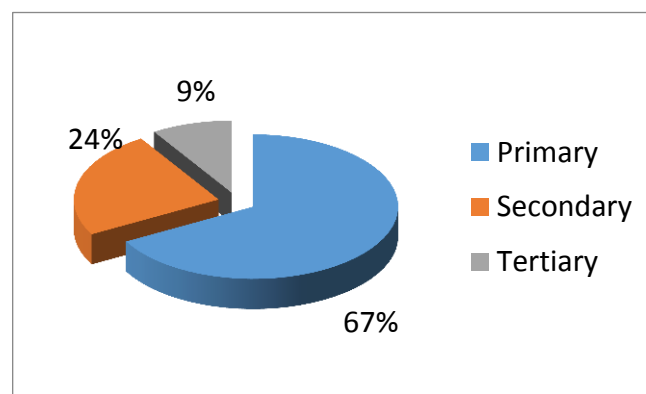


Fig. 3. Industrial structure in the early 1960s in Korea

Before the reforestation police was fully implemented, Korean forests looked like a barren desert. A high dependency on trees as a source of energy for inefficient heating method and for boiling livestock feed contributed to the depletion of tree. On top of that, the absence of forest conservation policy led to the acceleration of forest degradation. In fact, 10% of Korean mountains looked like a desert in the cities, and nearly 50% were barren with little or no trees. This caused rivers to dry up even during a minor drought and consequent damage was severe leading the frequent poor harvest. The rain also washed the red soil, stone and

sand from the mountain into the river. The stream embracement was causing floods.

Between 1957 and 1961, the total losses from the floods were 1,300 casualties, 220,000 displaced people and 199,000ha lost or buried farmland which was about 20% of the total farmland of Korea. The economic impact resulting from the damage or loss farmland was substantial. The primary industry accounted for 67% of Korea economy in the early 1960s.

Chronic floods and droughts led poor harvest which further intensified Korea poverty to the extent but it was difficult to overcome the poor economic situation. To address that, the Korean government under President Park, C.H. decided to plant trees in the barren mountain. It was believed that reforestation efforts will helpful to prevent poor harvest and in turn help the country and Korea people overcome poverty. At the same time, while resolve the lack of energy, the first five-year economic development plan was initiated in 1962. The government pushed for police department as a part of national economic development efforts. After that, the budget for tree planting projects was allocated.

Characteristics of the reforestation policy

The implementation of Korea reforestation policy can be divided into three different phases by time period including 1960s, 1970s and 1980s. In the 1960s, legal and institutional changes were made and an administrative basis was formed to implement the policies. In 1961, the Korean government legislated the forest law. The five-year reforestation plan was established in 1962 as a part of the first five-year economic development plan. Moreover, in 1967, the government established the Korea forest service in order to strength the forest ministration.

Until the middle of 1960th, the main focus was on preventing soil erosion and establishing fuel-wood forests because the damage to Korea forest was so severe at that time. Also, fruit trees were cultivated as a mean to increase income for farmers. This increased public interests and encouraged public participations and reforestation efforts. However, there were barely any noticeable changes in the beginning due to the severe forest destruction and the lack of technology and awareness in tree planting.

In the 1970s, the Korean government formulated and implemented a comprehensive forest policy that would help increasing income and improve the quality of life so ask inducing public participation. In 1973, the first 10-year forest rehabilitation plan was introduced which provided tree planting procedures and methods and other details such as total area targets for reforestation areas and species of tree to be planted. In addition, from 1974 to 1979, the fire pits used for cooking and heating were completely replaced to reduce using fuel-woods as a source of energy at rural regions. This helped to reduce fuel-wood consumption by 30%. Some completions of the first stage of national reforestation were planting of fast-growing trees, reforestation by erosion control, reinforcement of the forest protection system and regulation of slash and burn farming. The goals of reforestation policy were obtained four years earlier than expected in 1978. A key factor behind the success was the forms in governmental ministration for period of implementation.

In 1973, the government moved the forest service from the Ministry of Agriculture and Forestry (MoAF) to the Ministry of Home Affairs (MoHA). The MoAF oversaw agricultural and forestry industries, while the MoHA was in charge of the social security issues and domestic administrative affairs including rural areas and also oversaw the Semaoul-Undong. It seemed that this kind of governmental re-organization was not pleasant. Then, why was the forest service moved to the MoHA? There were three main reasons. The first was to utilize

the regional administrative organization of the MoHA so as to concentrate on the reforestation project. The second was to combine the Semaoul-Undong, which was launched and embraced by the entire nation, and the reforestation project in order to start a national tree planting movement. Third, the power of police that was under the MoHA was needed to stabilize the illegal timber harvest. Thus, the Forest Service experiences a complete overhaul and mover from the MoAF to the MoHA.

In 1980th, the main objectives of the reforestation policy were turn into increase forest resources and to establish commercial forests, while it was to pave the foundation for forest rehabilitation in 1970th. Therefore, under the second 10-year reforestation plan, some of the key goals were included such as plating new tree species, establishment of commercial forest, provision of technologies, and designation of developable forests. These contributed to establish 80 large-scale commercial forests and to improve the environment for growing trees as an extension of the first plan. The second plan was completion of the first phase of reforestation project for putting efforts to establish commercial forests.

To understand the success of implemented forest rehabilitation project, it is needed to examine economic, social, cultural and political backgrounds at that time. Economically, as income level increased in urban and rural areas, it was possible for people to procure alternative sources of energy. This, in turn, dramatically reduced dependency on fuel wood. Socially, the abundant of worker at rural regions may be possible to mobile at low labor cost to establish large-scale forests. Culturally, the long tradition of farmer's forming cooperative, Durae (cooperative spirit) was critical and mobilizing farmers to cooperate and work together and reforestation efforts. Politically, the government's strong-will and support of the project were important as such a huge amount of financial, administrative and human resources were allocated to reforestation efforts. In 1961, the Korean government designated illegal timber harvesting as one of the five social ills. It took strong action against illegal cutting at mountain Jiri in 1964.

The five social ills were smuggling, narcotics, illegal cutting, gangster and quasi-reporters. This list was announced by the President Park's administration to focus on eradicating social ills. The report of illegal cutting in Mt. Jiri sent a shockwave throughout the country. The prevailing trend in the region promoted rampant illegal cutting in Mt. Jiri. At that time, a construction project was about to begin on a military road crossing the mountain. While conducting the project, an engineering officer encountered many cases of illegal timber harvesting.

Vigor and righteous indignation led the young officer to report his observations to the President Park C.H. He was very angry at the severity of illegal cutting practices when he visited there. President Park directly ordered the police chiefs in the three provinces to clamp down of illegal cutting and deforestation around Mt. Jiri in first priority. More than 1,400 squad officers had gathered and confiscated nearly 750 truckloads of illegal forest products. Around 400 public officials and dealers were put into jail. The crackdown was not limited to Mt. Jiri but spread to near districts and provinces. Eventually, it led to a general crackdown throughout the country.

For the successful forest reclamation in Korea, the background can be summarized from the view-points of economy, society, culture and politics. First, economically, forest reclamation projects could reduce the reliance on fuel wood and increase income in urban and rural areas. Second, it was possible to establish large-scale forest due to abundant manpower in the country sides, which was very low labor cost. Third, Korea has a traditional culture such as farmer's cooperative, forest's cooperative groups, and this culture encouraged

cooperating and participating sprit in the forest projects and the Semael Undong. Finally, the Korean government allocated the huge amount of financial, administrative and human resources into reforestation due to strong will of the Korean government.

IMPACT OF THE FOREST REHABILITATION POLICY

Reforestation has positive impact for people and planet. Trees maintain a healthy soil filtration system that helps ensure water quality, and restore soils by enriching the organic content and preventing erosion and landslides. Forests are the lungs of the Earth, producing oxygen through the process of photosynthesis. They play a key role in generating air moisture content, generating air flow, and improving air quality. Especially, tropical forests are critical for regulating the climate because they absorb carbon and increase cloud cover through transpiration, which helps cooling the planet down.

Table 2. Growing stock in Korea forests

(Unit: 1,000 m³)

Year	Total	National forest				Public forest			Private forest
		Total	Indispensable	Dispensable	Other	Total	Provincial	County	
2006	525,832	159,070	139,818	8,371	10,881	41,903	14,243	27,661	324,859
2007	624,398	187,072	161,502	13,454	12,116	47,447	15,778	31,669	389,879
2008	659,120	196,521	172,282	11,611	12,628	50,056	16,775	33,280	412,543
2009	659,120	206,983	182,196	11,417	13,370	52,862	17,683	35,178	436,983
2010	800,025	229,113	205,986	7,541	15,585	60,179	19,553	40,626	510,734
2015	924,809	264,191	238,190	5,090	20,910	72,831	25,521	47,309	587,787

Korea Forest Service, 2015

What were the benefits of the reforestation policy in South Korea? First, economic perspective, the growing stock was only 9.5 m³/ha in 1960 and increased by 22.18 m³/ha in 1980, and increased 125.6 m³/ha in 2015, which was 12 times increase. This brought a wide range of benefit such as forest recreational activity, air purification, water conservation, prevention of soil erosion and prevention of landslides.

Along with the public's increasing demand for quality of life, recreational activities in forests are becoming more popular evident with the growing number of forest visitors. Since 1988, the recreation forest project has been implemented to meet the public demand on forest recreation. 133 recreation forests are on operation as of 2009. To enable the visitors to enjoy nature as much as possible, the recreation forests are equipped with eco-friendly facilities to a minimum unlike other outdoor recreation places. Visitors are guaranteed to spend some quality time taking a relaxing walk through forests and enjoying forest-bathing and nature.

Moreover, diverse environmental education programs are provided to help visitors have a better understanding of forest and nature. The KFS implements various mountaineering policies for creating and maintaining hike trails and operating mountaineering schools so as to ensure forest visitors and mountaineers have a safe and enjoyable hiking.

The public benefit of worth with monetary term would be about 93 billion USD and this is equivalent the 10% of Korea' GDP reported 2015.

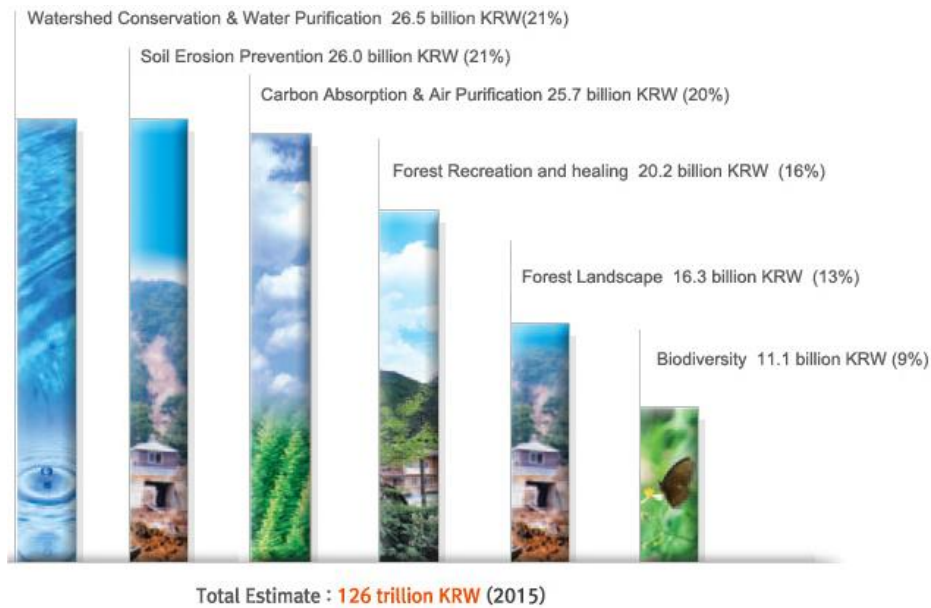


Fig. 4. The worth of forest public benefits in Korea (Korea Forest Service, 2015)

Environmental concerns have been raised recently due to rapid urbanization and increasing population. More urbanities tend to get more interested in well-being and quality of life, and there is a growing demand for green spaces in urban areas. Therefore, the KFS has been endeavoring to provide more green spaces for the people in urban areas, meeting one of forest management objectives, which is 'greening for tree-full city'.

Benefits of urban forests include reduction of pollution and noises, enhancement of air quality, improvement of healthy lifestyle, protection of ecosystems, and improvement of city landscapes. To provide greener and more restful areas, roadside trees are being planted and urban and school forests are being created.

Lets' take a look at the environment benefit of trees! When a forest is dense with trees, the amount of carbon dioxide (CO₂) can be absorbed higher. The carbon dioxide is known as rise in atmosphere temperature. High concentration of CO₂ atmosphere accelerates global warming. According to the statistics in 2009, forests absorbed about 7% of total CO₂ emission, demonstrating that the forests play import roles in mitigating global warming.

Lastly, let's evaluate some of the outcomes of reforestation projects implemented in Korea. Forest rehabilitation may be possible to supply and manage water stably. This in turn allowed Korea to come self-sufficient in rice production in 1976. Also, with the effort of government and public, the mountains which had been barren became dense with trees. This heightened national pride. Moreover, Korea is well known as only country to achieve both economic growth and forest rehabilitation in just half century despite deforestation caused by Japanese colonization and the Korea war. This is one of the reasons that the reforestation project implemented in Korea is considered as an idle environmental restoration model for

developing countries. Through these efforts, Korea has marched as an example of contributing to prevention of global warming and global leader and green growth in the 21st century.

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