Supplemental Complaint

of the Constitutional Complaint

-The severity of climate change and the progress of international discussions-

Case	2020- hun-ma-389 Unconstitutionality of Article 42(1)1 of the Framework Act on Low Carbon, Green Growth
Petitioners	Do-Hyun KIM and 18 teenagers
Respondents	1. The National Assembly of the Republic of Korea 2. The President of the Republic of Korea

To the Constitutional Court

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1. Introduction

The petitioners are young people under the age of 19, who filed this case on March 13, 2020 because of the widespread and serious damage caused by climate change, and because the Petitioners' rights to life, health, environment, equality, extinction and happiness are infringed.

The causes of climate change, the current situation, and the prospects for future climate change are matters of fact that require a scientific approach. Since 1992, when the United Nations Framework Convention on Climate Change (UNFCCC, hereinafter referred to as the “UN Climate Change Convention”) was signed, remarkable scientific progress has been made on climate change, and many questions that were unclear have been resolved. However, as scientific

studies accumulate and the understanding of climate change increases, the speed and degree of climate change has been found to be at a serious level. The projected climate change is a “climate catastrophe” that will cause enormous damage on a level that humankind have never experienced before.

The international community recognizes the situation as a "climate emergency" and is taking urgent action. However, the Republic of Korea's response to climate change is so complacent that it is taking the lead in *negating* the urgent action of other countries. The damage will be borne by the people of the Republic of Korea, especially the next generation of petitioners who have to go through the climate catastrophe.

This is an objective fact that is evidenced by figures and data. The government of the Republic of Korea recognizes all scientific facts about the climate change. This document focuses on the facts of the government's recognition of the climate change: ① Causes of the climate change, the current situation, and the prospects for damage. ② Progress of international negotiations on the climate change and the contents of the international agreements centered on the Paris Agreement. ③ Current Status and the Prospect of the climate change on the Korean Peninsula ④ Current state of the climate change on the Korean Peninsula and the contents and assessment of Korea's greenhouse gas reduction targets.

2. Scientific Facts about Climate Change

A. Greenhouse gas and greenhouse gas effect

Greenhouse gases are gases that absorb Earth's radiant heat from the atmosphere. The greenhouse gases contained in the Earth's atmosphere absorb Earth's radiant heat and then send it back to the surface to keep the Earth warm like a "greenhouse." The gases that cause the "greenhouse effect" of the Earth's atmosphere are only a small fraction of the atmosphere. Carbon dioxide (CO_2), a typical greenhouse gas, constitutes only 400 out of a million (1,000,000) air molecules (400 ppm), but it is responsible for about 76% of the greenhouse effect, and is the most important greenhouse gas because it stays in the atmosphere for a long time and continues to produce greenhouse effect.

In addition, methane (CH_4), nitrous oxide (N_2O), hexafluoride (SF_6), perfluorocarbon (PFC), and hydrogen fluoride (HFC) also produce a greenhouse effect. These substances have a higher degree of greenhouse effect than carbon dioxide, and each of these greenhouse gases is assessed by the Global Warming Potential (GWP) based on the greenhouse effect of carbon dioxide. When calculating the amount of various types of greenhouse gases collectively, Carbon Dioxide Equivalent (tCO_2eq) is used as the term of the amount of the equivalent carbon dioxide calculated by taking into account the GWP.

Type	Global Warming Potential (GWP)	Staying in Atmosphere Period	Contribution
CO_2	1	Decades – Thousands of years	76%
CH_4	21	12 Years	16%
N_2O	310	114 Years	6%
SF_6	23,900	3,200 Years	2%
PFC	6,500 – 9,200	1,000 – 50,000 Years	
HFC	140 – 11,700	1.4 – 270 Years	

Table 1. Types and Characteristics of Greenhouse Gases

In the natural state, the amount of greenhouse gases in the atmosphere remains constant, and a stable climate is maintained. It is because in the natural state the carbon dioxide, which are generated by the oxygen-breathing plants or by the substances containing carbon burned, are released into the atmosphere and subsequently fixed by plants through photosynthesis or dissolved and absorbed in the seawater. However, after the industrialization, enormous amount of carbon dioxide were discharged while burning fossil fuels buried underground such as oil, coal, and natural gas in large quantities, and the area of forest absorbing carbon dioxide was greatly reduced, and the greenhouse gas concentration increased significantly.

As humankind began to use fossil fuels in earnest, the “hypothesis” that the rapid increase in greenhouse gas emissions could lead to the increased greenhouse effects and to the changes in the Earth's climate, was raised as early as the late 19th century. Since then, in the middle and late 20th century, systematic greenhouse gas concentration measurement has been

conducted, and research has been continuously conducted. And now, there is no scientific doubt about the fact that the climate is changing because of the increase in greenhouse gas concentration due to human activities. This is accepted as a matter of fact.

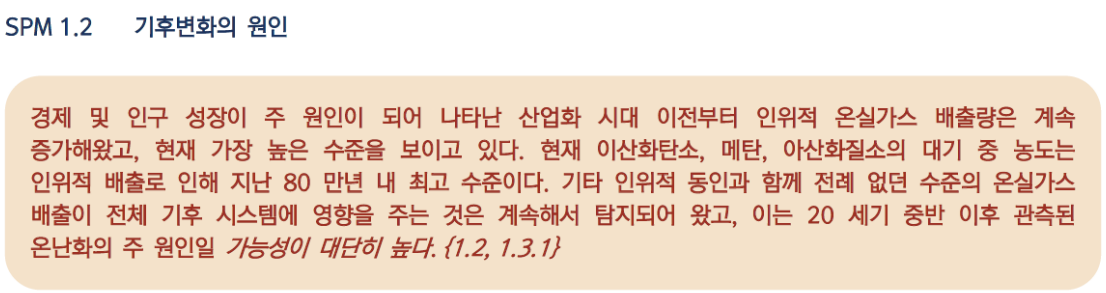
B. Intergovernmental Panel on Climate Change (IPCC)

The Intergovernmental Panel on Climate Change ("IPCC") is the most important institution in relation to the scientific facts about the climate change. IPCC was founded by the United Nations in 1988 to prepare reports and recommendations on the socio-economic impacts of the climate change and to recommend potential countermeasures that could be included in future international agreements. Since its establishment, IPCC has published five 'Assessment Report on Climate Change' to date, and has received various methodology reports and special reports according to the requests of the information from the United Nations Convention on Climate Change, governments and international organizations.

It is noteworthy that IPCC is not an institution that performs independent research functions. IPCC conducts a so-called "meta-analysis" that comprehensively evaluates and publishes scientific research related to the climate change. In other words, it examines how the world's scientific community analyzes and explains the phenomenon of the climate change, and evaluates which viewpoint is the most influential and which research is widely accepted as an objective scientific fact. For this reason, the scientific facts published by IPCC are not the opinions based on particular opinions or controversial facts, but can be accepted as a generally accepted and recognized scientific facts.

For example, the so-called "Climate Change Skepticism" or "Climate Change Negotiation" once suggested that greenhouse gas reduction is meaningless because the climate change, currently underway, is a part of "natural" climate change rather than a "artificial" climate change caused by the human activities. However, nowadays, a super majority of scientists have recognized greenhouse gas emissions from human activities as the cause of the climate change. In the 5th Assessment Report published in 2014, IPCC estimates that human greenhouse gas emissions are "extremely likely" to be a major cause of global warming. According to the IPCC standard, "very high" evaluation means that 95 to 100% of the

research results under review agree to be true (Exhibit 3, IPCC 2014 the 5th Assessment Report, page 4, page 2, footnote 1). In other words, there is no more scientific controversy about the cause of climate change.


SPM 1.2 기후변화의 원인

경제 및 인구 성장이 주 원인이 되어 나타난 산업화 시대 이전부터 인위적 온실가스 배출량은 계속 증가해왔고, 현재 가장 높은 수준을 보이고 있다. 현재 이산화탄소, 메탄, 아산화질소의 대기 중 농도는 인위적 배출로 인해 지난 80 만년 내 최고 수준이다. 기타 인위적 동인과 함께 전례 없던 수준의 온실가스 배출이 전체 기후 시스템에 영향을 주는 것은 계속해서 탐지되어 왔고, 이는 20 세기 중반 이후 관측된 온난화의 주 원인일 *가능성이 대단히 높다. {1.2, 1.3.1}*

Figure 1. IPCC 5th Report (Page 4)

One more noteworthy aspect of the report published by IPCC is the summary located at the beginning of each report, as the "Summary for Policymakers" ("Summary Report"). This Summary Report is important because each government representative participating in the IPCC reviews and approves each sentence of the Summary Report. The Summary Report, which contains the core contents of the IPCC report, means that governments have gone through the process of consent and approval to recognize that it is an objective scientific fact and to use it as a factual basis for each government's policy.[1]

Korea is also actively participating as a member of IPCC. IPCC's "Global Warming 1.5℃ Special Report" was published in 2018, when the IPCC general meeting was held in Songdo, South Korea.

All reports published by the IPCC are open to the public on the IPCC website (http://ipcc.ch), and the Korea Meteorological Administration provides a translated version of the IPCC reports in Korean on the website.[2] IPCC received the 2007 Nobel Peace Prize in recognition of its contributions towards uncovering objective and reliable scientific facts about the

[1] 정부 승인 절차는 "IPCC 보고서의 준비, 검토, 수용, 채택, 승인 및 발표에 관한 절차 규정"의 4.4, 4.5, 4.6절에서 규정하고 있습니다. https://www.ipcc.ch/site/assets/uploads/2018/09/ipcc-principles-appendix-a-final.pdf

[2] http://www.climate.go.kr/home/bbs/list.php?code=76&bname=climatereport

climate change.

The following IPCC reports reflects the most recent scientific facts.

- 2014 Fifth Assessment Report ("Fifth Assessment Report")
- 2018 Global Warming 1.5℃ Special Report ("1.5℃ Report")
- 2019 Climate Change and Land Special Report ("Land Report")
- 2019 Special Report on the Ocean and Cryosphere in a Changing Climate ("Marine and Ice Report")

Below, we would like to explain the current situation, prospects, and expected damages of the climate change based on the scientific facts recognized by IPCC. We also would like to submit the scientific studies and materials cited, including IPCC reports, as evidence, along with translations of excerpts from those parts where necessary. For the cited materials such as academic papers and press reports on other relevant facts, the source is specified in each footnote, and a URL link is provided for the easy reference by the court.

C. Current status of the climate change

According to IPCC, it has been estimated that about 2,200 billion tons (2,200 $GtCO_2$) of carbon dioxide have been artificially emitted from 1750 to 2017 after industrialization, and in particular, about half of these emissions have occurred during the past 40 years of intensive population and economic growth. (Exhibit 7, IPCC 1.5℃ Special Report Summary Report p. 14). The concentration of carbon dioxide, which had been at 280 ppm before the Industrial Revolution, increased to 407.4 ppm in 2018 (Exhibit 1, page 10), and the current greenhouse gas concentration has reached an unprecedented level that is the highest within the last 800,000 years (Exhibit 3, page 4).

As a result, the Earth's temperature is estimated to have risen by 1.0°C from before industrialization, and is now increasing at a rate of 0.2°C per 10 years (Exhibit 7, page 6).

Especially since the 1950s, when the global industrialization began, the indicators of the climate change, such as the temperature and sea level rise, have been rapidly progressing to the unprecedented levels (Exhibit 3, page 2).

The last 10 years (2010 – 2019) are recorded as the hottest 10 years of all time since the weather observations began, and furthermore, the last 5 years (2015 – 2019) is also the hottest five years of all time (Exhibit 18, page 83 of the 2019 Abnormal Climate Report). The atmosphere temperatures continue to rise, breaking records every year.

When the global temperature rises by 1°C in average, the local and seasonal temperature fluctuations are much greater. The rise in average temperature is accompanied by changes in the various factors that make up the climate, including wind, precipitation, snowfall, and glacier area, and as a result, extreme weather fluctuations such as heat waves, heavy snow, cold waves, heavy rains, typhoons, and droughts increase. For example, the summer of 2018 was the hottest year in Korea since 1973, but the winter of 2018 was also recorded as the second coldest winter since 1973 (Exhibit 1, page 7) The average change of the atmosphere temperature of the Earth is the average value of these unstable fluctuations, showing an overall trend of global warming, while the actual climate will experience furthermore fluctuations within that trend.

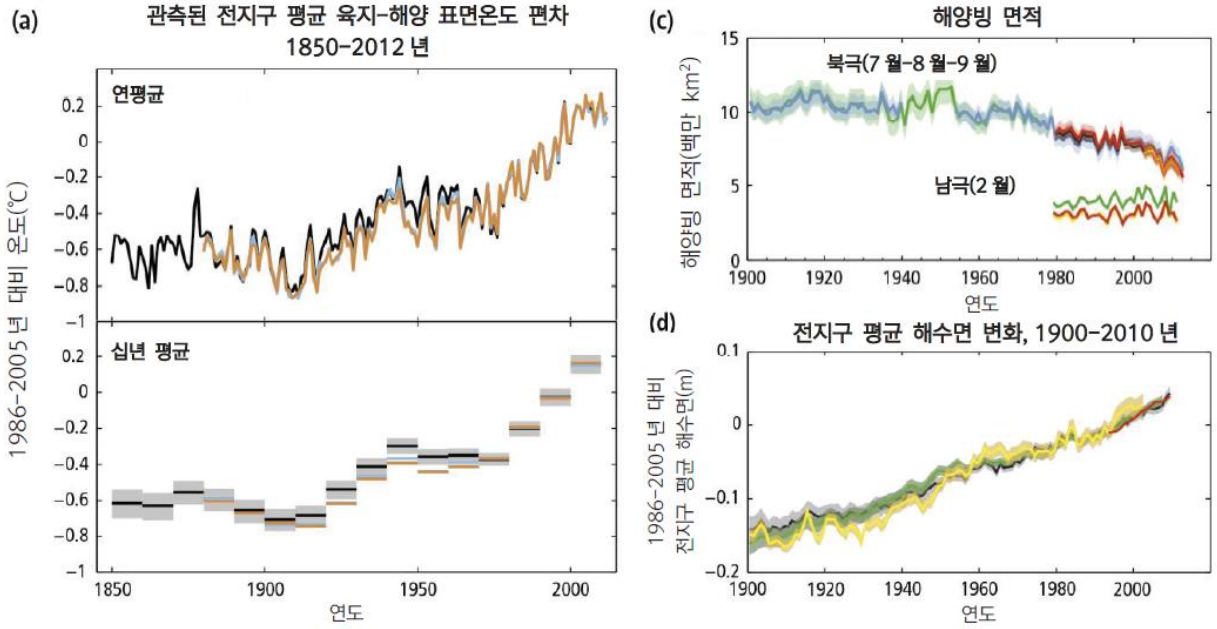


Figure 2. The Effect of Observed Climate Change on IPCC 5th Report (Exhibit 3, page 41)

Due to the rise in long-term average temperatures, sea ice areas in the Arctic decreased by approximately 40% over the period of 1900 to 2010, and more than 600 glaciers were lost in alpine regions (Exhibit 4, IPCC Fifth Assessment Report, pages 36 and page133 of the Working Group 1 Technical Summary Report). During the same period, the average global sea level had risen 0.19 meter, due to the loss of glaciers and the thermal expansion of the sea water, and the current rate of rise is higher than the average rate for the 2,000 years prior to industrialization (Exhibit 3, page 42).

The climate change due to the greenhouse gas emissions is irreversible (Exhibit 3, page 64). Because carbon dioxide, the main culprit of the greenhouse effect, stays in the atmosphere for thousands of years and continues to produce greenhouse effects, the effects of climate change from carbon dioxide emitted to date will continue for more thousands of years to come. In addition, as long as any additional carbon dioxide is released from now on, the greenhouse effect will increase further on. And thus, only when the greenhouse gas emission is "0", then the climate change can be stabilized at that same level. (here, "0" emission means "net emission zero" situation where the amount of carbon dioxide naturally absorbed (-) into

the forest or sea is the same as the amount of carbon dioxide emitted (+), and there is no net additional emission.

If we can artificially remove carbon dioxide that exists in the atmosphere, it may theoretically be possible to reduce the greenhouse effect a little bit less than it is today. But this "Carbon Capture and Storage" technology is still in very rudimentary level, and it is not technically or economically feasible to apply it so widely that it can affect climate change trends. So, realistically, reducing greenhouse gas emissions is the only way to minimize climate change.

D. Prospects and Damage of Climate Change

1. Forecast of Temperature Increase in IPCC 5th Report

IPCC 5th Report presented the outlook for future climate change under four scenarios called "Representative Concentration Pathway (RCP)" as the concentration of greenhouse gases in the atmosphere changes throughout the 21st century. The scenarios presented by the IPCC are 1) strictly reduced scenario (RCP2.6), 2) substantially reduced scenario (RCP4.5), 3) somewhat reduced scenario (RCP6.0), and 4) high emission scenario (RCP8.5). IPCC predicted that greenhouse gas emissions will be between RCP6.0 and RCP8.5 if there is no further reduction efforts from the current state (Exhibit 3, page 8).

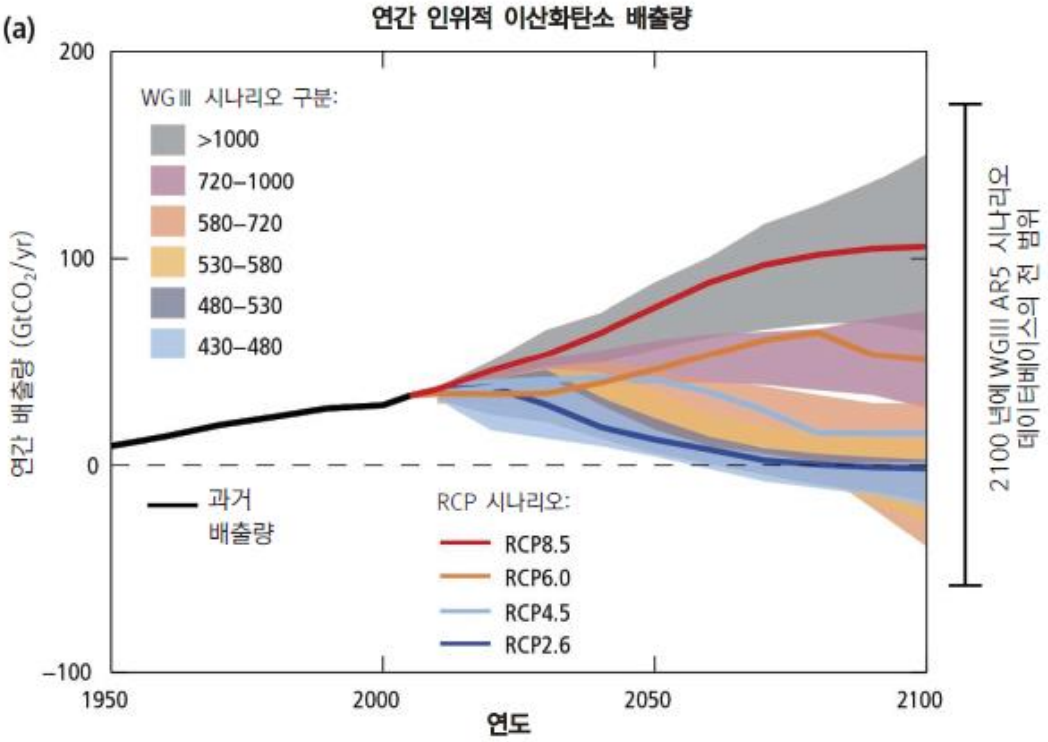


Figure 3. GHG Emission Scenarios for IPCC Fifth Report (Exhibit 3, page 9)

For each scenario, IPCC predicted the expected increase in temperature at the end of the 21st century compared to pre-industrial temperatures as follows (Exhibit 3, page 60).

Scenario	Average Temperature Rise	Temperature -Rise Ranges
RCP 2.6	**1.6**	0.9 – 2.3
RCP 4.5	**2.4**	1.7 – 3.2
RCP 6.0	**2.8**	2.0 – 3.7
RCP 8.5	**4.3**	3.2 – 5.4

* The original text lists the values compared to 1896 – 2005. However, this table has added 0.6°C to compare the temperature rise in comparison with the pre-industrialization era.

Table 2. Temperature-rise ranges by IPCC 5th report RCP scenario

According to IPCC, as the standard scenario of the current trend of greenhouse gas emissions is between RCP 6.0 and RCP 8.5, the temperature increase is expected to reach 2.8 to 4.3°C by the end of the 21st century.

After IPCC 5th report was published, according to the UN Framework Convention on Climate Change and the Paris Agreement, countries around the world have set goals to reduce greenhouse gas emissions (NDC) and submitted them to the UN. The United Nations Environmental Plan (UNEP) collected and evaluated greenhouse gas reduction targets submitted by each country in 2019 and predicted that the average temperature would rise by 3.2°C by the end of the 21st century, even if all of the current reduction targets are fulfilled (Exhibit 9, page XIX of the UN Environmental Plan 2019 emissions gap report). Even if countries around the world implement their current plans to reduce greenhouse gas emissions, climate change will still proceed between RCP6.0 and RCP8.5 as suggested by IPCC.

Even with the temperature increase of 1°C in comparison with the pre-industrialization era, damages from the climate change are already being observed at a serious level. Thus, the above trend of temperature rise is so much greater that it has an unparalleled adverse impact on society, economy, and the ecosystem, as well as the risks directly posed to human life and the health of the body. Below we will discuss the damage caused by such rise in temperature.

2. Damage caused by rising temperatures and abnormal weather conditions

Extreme weather phenomena, such as heat waves, floods, droughts, and forest fires, are most directly affecting human life, body, and health as the climate change continues.

Heat Waves IPCC analyzed that the risk of heatwaves caused by the climate change has quadrupled between 1999 and 2008 in Europe, and the 2003 heatwaves in Europe, which caused 15,000 deaths in France alone, are also attributed to human-induced climate change. (Exhibit 5, IPCC 5th Report, Working Group 2 Report, Chapter 11, page 720). If the temperature continues to rise in the future, the risk of heatwaves is expected to increase furthermore. In Australia, as of 2070, 33 to 45 days of the year are predicted to be too high for external activities to be safe (Exhibit 5, page 721). The European Commission has

announced that if the current temperature trend continues, 90,000 deaths from heatwaves in Europe are expected to occur annually (Exhibit 10, European Commission's Green New Deal presentation. page 1).

Typhoons and floods The frequency and intensity of heavy rainfall and typhoons is also expected to increase continuously. IPCC estimated that between 1980-2009, at least 2.8 billion people were affected and 500,000 were killed by flooding. It is predicted that in 84 developing countries, flood damage from the climate change will affect 30,000 km^2 and 52 million people by the end of the 21st century (Exhibit 5, page 722). According to the United States Oceanic and Atmospheric Administration (NOAA), the top five typhoons that caused the greatest damage in the United States all occurred during the period of 2005-2017, with Hurricane Katrina in 2005, and the total amount of damage was over 600 trillion won (KRW)[3]. The fourth national climate assessment report released by the U.S. government in 2018 predicts that the climate change will make typhoons stronger.[4]

Increase of the Diseases The threat of life and health caused by the increase in the infectious diseases is also an important issue. In particular, “vector-borne diseases”, such as malaria, dengue fever, and pandemic hemorrhagic fever, which are transmitted by mosquitoes and mites, were found to be of great risk, as the range and duration of the activity of the disease carrier of such diseases vary depending on the changes in temperature, precipitation, and humidity. According to the 2019 annual report of the medical journal Lancet, all of the 10 most severe dengue fever outbreaks occurred in the period 2000-2019, was attributed to the climate change.[5] IPCC predicts that the population exposed to the risk of malaria could increase to 5 billion by 2050, considering the effects of the climate change, and the distribution of dengue fever will also increase with increasing temperatures (Exhibit 5, page 725)..

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[3] NOAA, Costliest U.S. Tropical Cyclones, https://www.ncdc.noaa.gov/billions/dcmi.pdf

[4] 4th National Climate Assessment, Chapter 2, https://nca2018.globalchange.gov/chapter/2/

[5] https://www.lancetcountdown.org/2019-report/

The climate change also increases the risk of new infectious diseases. Ebola infections, the Middle East Respiratory Syndrome (MERS), avian influenza, Zika virus, and the COVID-19 virus, which have been prevalent since late 2019, are all known to have originated from wild animals. If the existing habitats of wild animals are destroyed, the range of living area is changed, or the movement paths are changed due to the climate change, the risk of contact with wild animals that have not been in contact with humans will increase and risk of exposure to new common infectious diseases will rise (Exhibit 11 Disease Management Headquarters, World Trend Analysis of Future Infectious Diseases, page 121). Humanity is currently suffering from unprecedented and massive damage due to the pandemic of the COVID-19 virus, and this increase in risk is never a mere possibility.

3. Sea level rise and destruction of marine ecosystems

The most important effects of climate change on the ocean are the acidification of seawater and rising seawater temperature.

Acidizing seawater Acidification has a fatal effect on the marine ecosystem. About a quarter of the carbon dioxide (CO_2) released into the atmosphere is absorbed into the sea and combined with water (H_2O) to become carbonic acid (H_2CO_3). As the concentration of greenhouse gases in the atmosphere increases, the amount of carbon dioxide dissolved in the sea increases, and consequently, the concentration of carbon dioxide in the seawater increases, increasing acidity. IPCC has already reported a 26% increase in seawater acidity (a decrease in pH 0.1) from pre-industrialization era (Exhibit 3, page 41). As seawater becomes more acidic, coral, crustaceans, sea urchins, sea urchins, and shellfish that make up the body with calcareous (calcium carbonate, $CaCO_3$) struggle to produce biochemical reactions that form their body and shell, resulting in fatal damage to their growth and survival as species. If the range and population of these species decrease, all marine species in the ecological food chain will suffer a huge blow. As this damage is occurring today, IPCC Special Report on Ocean and Cryosphere warns that the oceans will continue to acidify until 2100 and that with the RCP 8.5 scenario, acidity could increase by 100 percent (decrease of pH 0.3) from the

current level (Exhibit 12, IPCC 2019 Special Report on Ocean and Cryosphere Summary, page 19).

Rising sea temperature As the temperature rises, the sea temperature rises as well, which is another cause of disturbance to the marine ecosystem. In particular, rising sea temperatures cause temperature-sensitive coral blending, destroying the coastal marine ecosystem that relies heavily on coral reefs. It's particularly problematic because 25% of all marine species depend on coral reef ecosystems, and the coral deterioration is already at a serious level. Australia's Great Barrier Reef, the world's largest coral reef ecosystem, lost 50 percent during the 2016-2018 period alone (Exhibit 8, IPCC Special Report on Global Warming 1.5°C, page 229). According to IPCC, a 1.5°C rise alone will destroy 70 to 90 percent of tropical coral reefs, and 99 percent of the tropical coral reefs are expected to be destroyed at 2°C temperatures.

Figure 4. Coral reef departmental phenomena in Great Barrier Reef, Australia [6]

Sea level rise The rise in temperature caused by the climate change causes sea level rise. The rise in sea temperature causes the volume of seawater to expand, and the melting of the

[6] https://www.nbcnews.com/news/world/great-barrier-reef-devastated-severe-coral-bleaching-study-n744521

Greenland and Antarctic ice sheets, which hold vast amounts of water, also leads to sea level rise. According to IPCC's Ocean and Ice Sheet Report, at RCP8.5, sea levels may rise 0.84 meter on average and 1.1 meter to the maximum above current sea levels by the end of the 21st century. And because of the time-gap due to the slower ocean response speed compared to that of the atmosphere, the see levels are expected to continue to rise for more hundreds of years, even if greenhouse gas emissions reach zero (Exhibit 12, page 20).

It is already well known that small island countries such as Kiribati, Nauru and Tuvalu, the island nation of the Pacific, are heavily exposed to constant flood damage due to rising sea levels. Recently, the UN Human Rights Commission confirmed that in principle it is necessary to recognize refugee status for people in island countries who are under threat of life due to the rising sea levels.[7]

However, the rising sea levels can directly affect up to 680 million people living in coastal lowlands as well as small island countries (Exhibit 12, page 5). In particular, IPCC warns of "extreme sea level phenomena" in which rising sea levels combined with waves, typhoons, and floods to create encroachment. IPCC predicts that by 2050, extreme sea level phenomena, which in the past would have occurred once every 100 years, will occur more than once a year in coastal low-lying areas (Exhibit 20 , page 12).

4. Water, food and ecosystem

Water Shortage IPCC 5th Report stated that the climate change would increase the proportion of the population affected by water shortages and floods throughout the 21st century (Exhibit 3, page 73). As the average atmosphere temperature rises, more water vapor is present in the atmosphere, which may increase rainfall locally and increase flood damage around rivers, while drought damage may increase as the temperature increases, causing constant evaporation. As such, both extremes can increase simultaneously.

In addition, there is a risk of widespread water shortages as mountain glaciers and snowfields,

[7] UN인권위원회 2020. 1. 7.자 결정 CCPR/C/127/D/2728/2016, https://tbinternet.ohchr.org/Treaties/CCPR/Shared%20Documents/NZL/CCPR_C_127_D_2728_2016_31251_E.docx

which are important sources of major rivers in the world, decrease with rising temperatures. Representatively, the population relying on the Ganges, Indus, Mekong, Yangtze, and Huanghe originating from the Himalayan glaciers amounts to 1 billion people. IPCC said that it is expected that by the end of the 21st century due to the climate change, the Himalayan glaciers will lose 45% (RCP4.5) to 68% (RCP8.5) (Exhibit 6, IPCC 5th Report, Working group 2 report, chapter 3, page 242).

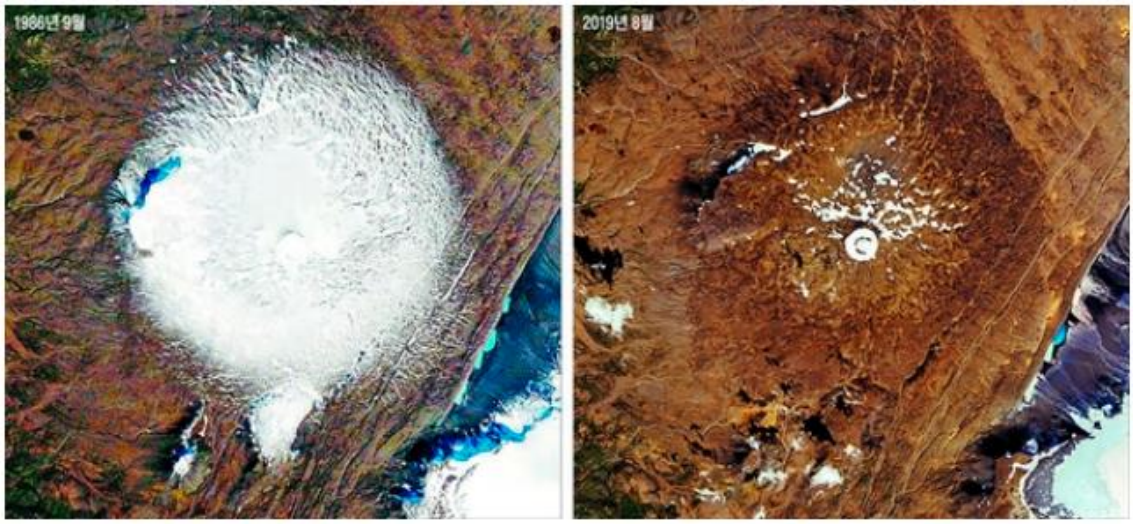


Figure 5. 1986 vs. 2019 of the Oak Glacier in Iceland (Okjokull)[8]

Food production Temperature increases and changes in precipitation have a direct impact on food production. IPCC compared the areas where the yield increases and the areas where the yield decreases due to the climate change. In aggregate, agricultural production decreases significantly as the climate change progresses. In the case of a 2°C temperature rise, it was predicted that 80% of farm land would be negatively affected, with about 20% experiencing less than half crop yield (Exhibit 3 page 69). In the case of a temperature rise of 4°C, a huge amount of damage is expected, far beyond that expected of a 2°C increase (Exhibit 3, page 73).

[8] https://news.chosun.com/site/data/html_dir/2019/11/06/2019110601506.html

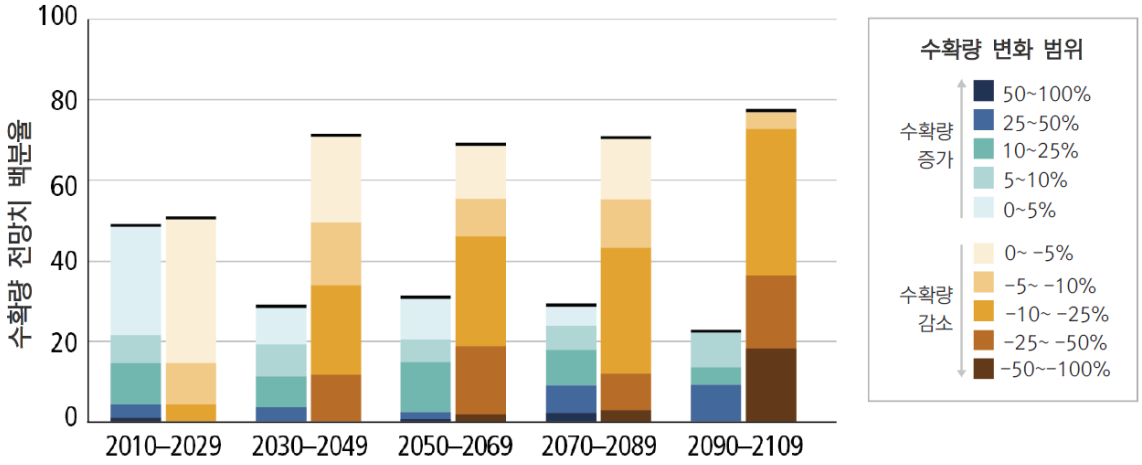


Figure 6. Changes in agricultural yields due to climate change (Exhibit 3, page 69)

Land degradation also has an impact on food production decline. IPCC Special Report on Climate Change and Land, released in 2019, shows the deterioration of the land itself due to rainfall intensity, flooding, drought frequency and severity, heat stress, dryness, wind, and sea level rise because of the climate change (Exhibit 14, IPCC 2019 Climate Change and Land Special Report Summary Report, page 8). In the case of 3℃ temperature rise, it is predicted that the population affected by land degradation will reach 270 million by 2050 (Exhibit 14, page 16).

The destruction of marine ecosystems due to the climate change also leads to a decrease in catches, which in turn exacerbates human food problems (Exhibit 3, page 68). IPCC Marine and Ice Coverage Report predicts a 20 to 24% drop in catches by the end of this 21st century in the RCP8.5 scenario (Exhibit 13, IPCC 2019 Marine and Ice Cover Special Report Chapter 5, page 505).

Bio-diversity The damage caused by climate change increases the risk of extinction for the entire ecosystem. IPCC analysis indicates that reduction in biodiversity occurred due to the direct effects of the global warming due to climate change, precipitation fluctuations, river flow reduction, and ocean acidification. And the risk of additional species extinction occurs due to the disturbance of the existing ecosystem such as the influx of exotic species as habitats of organisms change because of the environmental changes (Exhibit 3, page 68). In the 2019

report, the Intergovernmental Cooperation Organization on Biodiversity and Ecological Services (IPBES) evaluated that the risk of species extinction due to climate change reached 5% of all species at 1.5℃ temperature rise and 16% at 4.3℃ temperature rise.[9]

5. Tipping Point

"Tipping Point" refers to the point at which sudden and irreversible changes in the climate system result in great disruption between humans and the natural world (Exhibit 4, page 68). This is because there is a risk of triggering a kind of chain reaction that triggers faster and more serious climate change when the change due to the increase in greenhouse gas reaches the critical point.

Ice and Sea Ice As the temperature rises, the area of ice sheets in Greenland and Antarctica and sea ice in the Arctic decreases, and the Earth absorbs more heat. This is because the white color snow and ice reflect a lot of light, but the bare ground and the sea have lower reflectivity. As the area of ice decreases, more heat is absorbed by the Earth, and as a result, the temperature rises faster and more rapidly. If this "positive (+) feedback" phenomenon occurs, ice sheets can be lost at a much faster rate than previously predicted. The amount of water frozen in ice on Greenland's glacier corresponds to an amount that can raise the world's sea level by 7 meter. And the amount of water that can raise the world's sea level by 3 to 4 meter is fixed in the Antarctic ice sheet. Both Greenland's glaciers and Antarctic ice sheets are currently observed to be unstable due to the effects of the climate change (Exhibit 12, page 10), and it is predicted that irreversible glacial and ice sheet decreases may occur if the global temperature rises around 2℃. (Exhibit 8, page 257).

Current Flow Current flow is also closely related to the tipping point risk. Current is a key factor in maintaining the climate, including wind and precipitation, as it circulates the polar cold seas and the tropical hot seas to move and disperse the Earth's heat. The power to circulate these currents is greatly influenced by temperature and salinity. In the case of Atlantic Meridian Overcoming Circulation (AMOC), which circulates the Atlantic Ocean, it is

[9] https://ipbes.net/sites/default/files/2020-02/ipbes_global_assessment_report_summary_for_policymakers_en.pdf

observed that as the glaciers in Greenland melt and fresh water flows into the Arctic, the water became “light” with a lowered salinity of surface water and thus the “cycling” power of AMO has been weakened. Slowing down this "cycling" system has a global impact, including increased storms in northern Europe, severe droughts in the Sahel region of Africa, and reduced monsoon rains in South Asia. IPCC predicts that there is a very high probability that the flow of AMOC will continue to weaken in the 21st century (Exhibit 12, page 19).

Forest Loss If forests are lost due to the climate change and human deforestation, not only will carbon absorbent be lost, but carbon, which has been fixed in the form of organic matter in forest biomass, will be released as carbon dioxide, resulting in double greenhouse gas emissions. In particular, if the weather becomes dry due to rising temperatures, the frequency and intensity of forest fires increase, and the risk of forest loss increases on a large scale. The record-breaking forest fire in Australia in 2019 took eight months to completely extinguish[10], and in the process, about 120,000 square kilometers of forest and more than 1 billion wild animals were lost.[11] In addition, it is estimated that 400 million tons of carbon dioxide (400 $MtCO_2$) were emitted during the forest fires, which is equivalent to the amount of carbon dioxide emitted throughout Australia in a year. Similarly, 15 of the 20 worst-ever wildfires in California have occurred since 2000, indicating a significant increase in the risk of the climate change[12]. Carbon dioxide emissions from large forest fires again lead to a vicious cycle of accelerating climate change and raising the risk of forest fires.

Permafrost Permafrost in the high latitudes is also considered to be vulnerable to the tipping point risk. In the permafrost layer, a large amount of carbon compounds, such as methane (CH_4) and organic matter are fixed. When the permafrost melts due to global warming, microorganisms become active and a large amount of methane and carbon dioxide, which were previously fixed, are released into the atmosphere, accelerating the climate change. IPCC predicts that if the global warming continues, the permafrost will decrease by up to 81%

[10] ABC News 2020. 3. 4.자 보도, https://abcnews.go.com/International/australias-south-wales-free-fires-1st-time-240/story?id=69366905
[11] 한국경제 2020. 1. 20.자 보도, https://www.hankyung.com/international/article/202001186408i
[12] https://www.cecsb.org/wp-content/uploads/2019/11/Health-Wildfires-and-Climate-Change-in-California_October-2019.pdf

(RCP8.5) (Exhibit 3, page 12).

As to the time of occurrence of the tipping point, the speed of arrival increases as the temperature increases. In particular, serious awareness and response to critical risks is needed, as the result is a large-scale disaster that can lead to fatal dangers to most species, including humanity, beyond the level of general disasters. IPCC has already predicted that tropical coral reefs will virtually become extinct due to a 2°C temperature rise, warning some of the tipping point risks are already very high.

6. Poverty and Security

If the human living environment worsens due to the climate change, social, political, and economic changes will occur as well. IPCC notes that climate change will intensify competition for limited resources, increase the risk of internal conflicts due to inequality, and increase the risk of refugees and armed conflict (Exhibit 74, page 74-75).

The Syrian civil war, which began in 2011 and has so far generated more than 5 million refugees, is a dramatic example of how climate change can affect social, economic and military affairs. The climate change and the worst drought ever has led to a massive influx of 1.5 million Syrian rural residents into the cities to survive since 2007. Studies have shown that the development of overcrowded urban conflicts into the ethnic conflicts has been a major cause of civil war, indicating that worsening living conditions triggered by the climate change can further exacerbate existing socioeconomic conflicts and expand international conflicts to more acute and uncontrollable levels.[13]

7. Economic damage

IPCC predicts that the total amount of economic losses will increase sharply as temperatures rise (Exhibit 3, page 74). Data from international organizations and individual countries that estimate the damage caused by climate change show the magnitude of economic damage

[13] Kelley et al., Climate Change in the Fertile Crescent and implications of the recent Syrian drought, https://www.pnas.org/content/pnas/early/2015/02/23/1421533112.full.pdf

caused by the climate change.

In December 2019, the European Commission announced a "Green New Deal" policy to respond to climate change at all European levels, estimating that a 3°C rise in temperature would result in an annual loss of 190 billion euros (about 250 trillion KRW won) in current value (Exhibit 10, page 2).

The United States had published the Fourth National Climate Assessment report, the government's official report on the climate change in 2019, which estimates that under the RCP 8.5 scenario, the loss of labor, death from heat waves, property damage from coastal flooding, and destruction of infrastructure will result in annual damage of USD 500 billion (about 600 trillion KRW won) at the end of this century (Exhibit 15, the Fourth U.S. Report on Climate Change, page 1349).

3. International Legal Response to Climate Change

A. UN Framework Convention on Climate Change (UNFCCC) in 1992

Founded in 1988, IPCC published its first comprehensive report on the climate change in 1990, confirming that greenhouse gas emissions caused by human activities are affecting global warming. The United Nations (UN) executed the United Nations Framework Convention on Climate Change (UN Treaty No. 1213) in 1992 to counter the threat of climate change caused by greenhouse gas emissions, and the agreement took effect in 1994. The United Nations Framework Convention on Climate Change currently includes 195 countries, including South Korea, and the European Union (EU).

The UN Framework Convention on Climate Change is most meaningful in that the international community has reached an agreement on "the stabilization of greenhouse gas concentrations in the atmosphere at a level where the climate system is not subject to dangerous artificial interference." (Article 2). And the key agenda to be discussed in the UN Framework Convention on Climate Change is; what is the "level that would prevent dangerous anthropogenic interference with the climate system" and to what extent the international community should reduce greenhouse gases.

Another important point is that each government party has declared the principle of "common but differentiated responsibility" (Article 3) on the burden of responding to the climate change. These are: ① the developed countries have more responsibility because it achieved industrialization earlier and have historically released more greenhouse gases; ② Equity is given to developing countries by providing opportunities for economic growth through energy consumption; and ③ there is an international consensus on the need for distribution considering the different economic, technological and social capacities for GHG reduction in each country.

The United Nations Framework Convention on Climate Change itself provided a "framework" for achieving detailed consensus on the climate change rather than defining "specific" rights and obligations. Since the entry into force of the Convention, the annual Conference of the Parties to the Convention ("COP") has been held since 1995. Some agreements through UNFCCC has been reached in the form of "protocol" or "accord" for specific legally binding implementation.

For reference, South Korea could have been viewed as a "developing" country with agriculture as the center until the 1970s. However, since the 1980s, South Korea has rapidly industrialized and participated in the ranks of "developed" countries that joined the OECD since December 1996. As its industrial and technological developments became more remarkable, it became the world's No. 1 powerhouse in major industries such as electronics, semiconductors, and shipbuilding. As of 2020, it is the world's fifth-largest industrial export country following the United States, China, Germany, and Japan. It has become one of the countries with the strongest economic, technological and social capacities.

B. 1997 Kyoto Protocol and climate negotiations progress

The Kyoto Protocol, which set out a concrete agreement on the reduction of greenhouse gases for the first time, was adopted at the 3rd Conference of the Parties held in Kyoto, Japan in 1997. The Kyoto Protocol imposes binding obligations to reduce greenhouse gas emissions by at least 5% compared to 1990 emissions to the early industrialized countries (Annex I Parties) listed in Annex I of the United Nations Framework Convention on Climate Change.

In addition, for the rest of the countries, only the obligation to prepare and report statistics, which is a common obligation, was imposed instead of the obligation to reduce emissions. The Kyoto Protocol did not provide specific temperature targets as to what extent climate change should be prevented. Since the Kyoto Protocol required binding obligations to the Annex I countries, whose list was prepared based on the economic level the countries in 1992, the Republic of Korea did not have a binding reduction obligation under Kyoto Protocol because it was not classified as an “Annex I” country even though it had already joined the OECD in 1996.

The Kyoto Protocol was agreed in 1997, but it did not take effect until 2005. The Kyoto Protocol began to regulate greenhouse gas emissions in each country, and it is of great significance that various international market mechanisms such as the carbon emission trading system and the clean development system were introduced. However, due to the clear differences in positions between developed and developing countries, the United States, a major emitter, refused to ratify the Protocol, and later Japan, Canada, and Russia resigned from the Protocol, exposing limits to its effectiveness as an international treaty.

Meanwhile, whenever IPCC published a report, the rate and extent of climate change became increasingly serious, and the parties to the UN Framework Convention on Climate Change continued to discuss the new regime since the Kyoto Protocol. The main agenda of climate negotiations during this period was the question of how to create a system in which both developed and underdeveloped countries participated, and how to set the target to prevent the climate change.

Regarding the target setting, IPCC's 4th Assessment Report was released in 2007 and the 15th Conference of the Parties held in Copenhagen in 2009 recognized the scientific view that “the increase in global temperature should be suppressed to at least 2℃”. The “Copenhagen Accord” was released, and the 16th General Assembly of the Parties in Cancun then confirmed that 2°C should be the minimum target, while aiming to limit the temperature increase to 1.5°C. As such, the discussion on the severity of climate change had been raised.

C. Paris Agreement in 2015 – New Climate System launched

It was the 5th Report of IPCC released in 2014 that prepared a breakthrough in the climate negotiations that had stagnated due to conflict of interests between the Government Parties. IPCC 5th Report presents the concept of "carbon budget" and scientifically confirms that there is little time left to respond to the climate change. As a result, the international community has increased awareness of the urgency and severity of the climate change.

In the following year of 2015, at the 21st Congress of the Parties held in Paris, a "Paris Agreement" was finally reached, imposing obligations on all parties to reduce greenhouse gases. The Paris Agreement was ratified by 189 countries, including the Republic of Korea, and came into effect on November 4, 2016. Unlike the Kyoto Protocol system, which shared whether or not to impose obligations on a country-by-country basis, the climate system under the Paris Agreement is called the "new climate system" in the sense that all countries are obliged to reduce greenhouse gases.

Under the Paris Agreement, all Contracting Parties agreed to establish and implement their Nationally Determined Contributions ("NDC"), and the international community agreed to jointly verify the implementation, and in the process, the Parties agreed to a new NDC every five years. In response, the Paris Agreement stipulated the so-called "principle of progression" that new goals should be higher than the previous goals.

In contrast to the Kyoto Protocol, which had imposed obligations on the basis of the economic level of each country in 1992, it is clear that under the Paris Agreement, Republic of Korea is an internationally recognized industrial leader with significant industrial and technological development, and is obliged to bear its obligations as a developed country party. Republic of Korea became an OECD member in 1996, and since then has achieved continuous economic growth. It is now ranked in world trade (5th in the world), gross domestic product (GDP, 12th in the world), and greenhouse gas emissions (OECD 5th). Thus, regardless of any indicators such as historical GHG emissions, Republic of Korea ranks high in the responsibility and response to the climate change. This will be explained in more detail in Section 5 later..

Another important reason for the Paris Agreement is that the parties have reached a formal agreement on what is called "at a level that would cause dangerous artificial interference with the climate system" in Article 2 of the United Nations Framework Convention on Climate Change.

Article 2

1. This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:
   (a) Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;
   (b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production;
   (c) Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.
2. This Agreement will be implemented to reflect equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.

Figure 7. Article 2 of the Paris Agreement.

Article 2 of the Paris Agreement has agreed to pursue efforts to limit the average global temperature rise to a level that is significantly lower than the pre-industrial level of 2°C and further limit the average temperature rise to 1.5°C.

The Paris Agreement went a step further from the level discussed in Copenhagen in 2009 and the Cancun Conference in 2010 and agreed that 2°C was not sufficient as a minimum standard for limiting climate change, so it was necessary to decrease "levels significantly lower than 2°C" and further limit them to 1.5°C. In other words, the international consensus through the Paris Agreement is that artificial interference that causes a temperature rise above 1.5°C constitutes a "dangerous level" and should be limited to a level significantly below 2°C to the best extent possible.

D. Limit temperature rise to 1.5°C / 2°C

However, the Paris Agreement's agreed target of temperature rise limits "significantly below 2°C" and "below 1.5°C" does not mean scientifically "safe" for mankind. Scientists, including IPCC, point out that climate change (1°C rise) has already caused a lot of damage, and that further increases in temperature will cause a lot more damage. In fact, many scientists have a scientific view that not only 2°C (450 ppm) but also 1.5°C (430 ppm) global warming is very dangerous, and even if it is difficult to return to pre-industrial concentrations (280 ppm), only limiting carbon dioxide concentrations to 350 ppm can prevent dangerous levels of climate change.[14] In this regard, it is necessary to understand that the international community's agreed target for limiting temperature rise through the Paris Agreement is not a scientifically proven “sufficiently” safe level standard, but a “minimum necessary” standard agreed upon by the international community through coordination of various interests in coping with the climate change.

The criteria for limiting temperature increases to 2°C have been widely cited as a standard for responding to the climate change negotiations since the mid-1970s, when first presented by an environmental economist named William Nordhaus, before scientific research on the climate change was accumulated. As for the 2°C standard, the temperature change in the last 7,000 years since the civilization of mankind has never exceeded 2°C, so it can be interpreted that it is the limit of climate change experienced by mankind, or the limit of temperature change that can be adapted to.

Since the 2000s, the international community has also discussed setting specific temperature targets as extreme weather conditions, glaciers, sea level rise, etc. have been observed, and the accumulation of scientific research has revealed the profound impact of temperature rise on the global ecosystem. As a result, the 2°C goal was presented at the Copenhagen Conference of Parties in 2009, and the 2°C goal was officially adopted at the Cancun Conference of Parties in 2010. However, from small islands that are already suffering serious

[14] 대표적으로 James Hansen, “Assessing “Dangerous Climate Change”: Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature” PLOS ONE 8:12 (2013), https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0081648&type=printable

damage from climate change, there have been persistent opinions that the 2°C target is too loose. As a result, the 2015 Paris Agreement went a step further, setting "well below 2°C" as a minimum standard, and agreeing on "pursue effects to 1.5°C."

Instead of presenting a single temperature target, the Paris Agreement presents both 1.5°C and 2°C as a result of serious legal and political efforts by the Conference of Parties to achieve a minimum agreement. After the execution of the Paris Agreement, the Conference of the Parties requested IPCC to prepare a special report on how the effects of the average temperature rise of 1.5°C and 2°C are different and how to reduce greenhouse gas emissions to achieve each temperature goal. Thereafter, on October 6th, 2018, IPCC announced the Special Report on Global Warming (Special Report on 1.5°C) in Songdo, Incheon, Korea, under the auspices of Lee Hoe-sung, chairman from the Republic of Korea.

IPCC 1.5°C report predicts that a 2°C rise compared to a 1.5°C rise will significantly increase the risk of extreme weather, biodiversity loss, sea level rise, and infrastructure damage caused by climate change. IPCC reported the following additional major damages expected if the global temperature rises by 2°C compared to 1.5°C.

- Sea level rises by 0.1meter, resulting in an additional 10 million people affected.
- Double the number of species that lose more than half of their habitat
- Loss of additional permafrost of 1.5 million to 2.5 million km^2
- Complete loss of Arctic sea ice once every 10 years (once every 100 years for 1.5°C)
- 99% of coral reefs destroyed, fish catch decrease to 1/2 then the 1.5°C level

• By 2050, the number of poor and socially disadvantaged people exposed to health, livelihood, food and water supply issues increases by hundreds of millions at 2°C compared to 1.5°C.

It has also been noted that a 2°C rise in temperature compared to a 1.5°C rise increases the

risk of "tipping point" occurring in important elements of climate and ecosystem. As mentioned earlier, tipping point means when sudden and irreversible changes occur, and IPCC predicts that rising from 1.5°C to 2°C could trigger a point of increased instability on Greenland and Antarctica (Exhibit 8, page 257), and in the case of a 2°C rise, 99% of tropical and subtropical coral reefs would be depleted beyond the threshold (Exhibit 8, Box 3.4, page 230).

The conclusion from IPCC 1.5°C report is that a 2°C rise compared to a 1.5°C rise in temperature results in significant climate change damage, which is a "dangerous artificial interference" to the climate. Combining the findings of the IPCC 1.5°C report, it is scientifically clear that the rise in temperatures beyond the Paris Agreement's limited target and the resulting climate change are "dangerous levels" and that the passive greenhouse gas reduction targets that neglect or promote these dangerous levels of climate change are not sufficiently protective of the citizens.

E. Carbon Budget

As discussed in previous section, the degree of global warming is proportional to the amount of accumulated carbon dioxide, and it is possible to make scientific predictions about how much temperature rise will occur depending on the amount of accumulated carbon dioxide. The 1.5℃ report calculates the cumulative amount of carbon dioxide that can cause temperature rise of 1.5℃ and 2℃, and calculates and presents the remaining amount of carbon dioxide that can be emitted in the future by subtracting the amount of carbon dioxide emitted by humans since industrialization. . This is called the “carbon budget”.

The concept of “carbon budget” has three important implications. First, it is clearly confirmed that there is not much time left to respond to the climate change; second, the speed and timing of the reduction of greenhouse gas emissions is specifically identified; third, it shows the generational inequality structure of the climate change problem.

1. Urgency

Below is the residual carbon budget for each temperature target presented in the IPCC 1.5℃ special report adopted at Songdo in 2018.

Temperature Target	Probability of Achievement	Residual Carbon Budget (As of the end of 2017)	Time remaining (As of 2020)
1.5℃	66%	420 billion tons (420 $GtCO_2$)	8 Years
2℃	66%	1,170 billion tons (1,170 $GtCO_2$)	26 Years

Table 3. IPCC 1.5℃ Report - Carbon Budget

According to IPCC, about 42 billion tons (42 $GtCO_2$) of carbon dioxide are emitted annually (Exhibit 7, page 14). Therefore, after the publication of IPCC 1.5℃ report in 2018, the carbon budget of 84 billion tons (84 $GtCO_2$) has already been exhausted from the above carbon budget for two years until 2020. If the carbon dioxide emissions of CO_2 continue, the 1.5℃ carbon budget, which has a 66% probability of limiting the temperature increase to 1.5℃, will be exhausted after 8 years, and the 1.5℃ climate change will be irreversibly confirmed. And after 26 years, the carbon budget at 2℃ will also be exhausted. Recalling that the world hasn't reduced greenhouse gas emissions at all for 28 years from 1992 to the present when the United Nations Framework Convention on Climate Change was signed, if urgent action is not immediately taken, the current generations and children will not be given a practical opportunity to limit the climate change.

2. Reduction path

At the same time, the carbon budget sets the standard for how carbon dioxide emissions should be reduced. Since global warming stops when it converges to “net emission 0”,

which equals the amount of carbon dioxide emitted and absorbed, an arithmetic calculation that reduces the total amount of carbon dioxide emitted so as not to exceed the carbon budget in the process of reducing the current carbon dioxide emission level to zero at a constant rate is possible. This can be determined by calculating the area of the horizontal and vertical areas in the case of a straight path, and by calculating simple integrals in the case of a curved path.

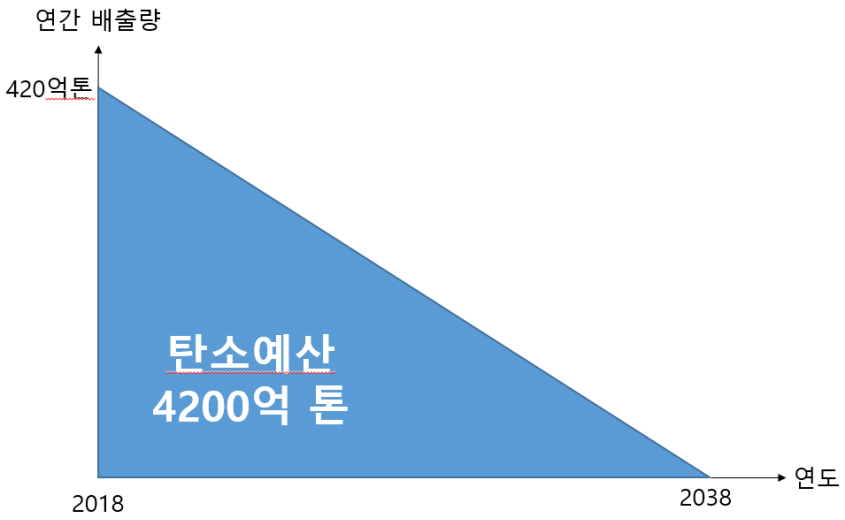


Figure 8. Schematic diagram of the reduction path according to the carbon budget.

For example, as of 2018, in order to reduce global carbon dioxide emissions in line with the 1.5℃ carbon budget, 42 billion tons ($42GtCO_2$) must be gradually reduced to 0, and the amount of carbon dioxide emitted in this process (triangle area) should not exceed 420 billion tons (420 Gt CO_2). This calculation means that carbon dioxide emissions should converge to zero from 2018 to 2038, 20 years later. Once the global carbon budget has been distributed to each country and the carbon budget has been established for each country, it is possible to calculate the path of greenhouse gas reduction by country in a similar manner.

IPCC 1.5℃ report suggested a more detailed reduction path through an integrated evaluation model (IAM) analysis based on the carbon budget, and concluded that we had to cut the carbon dioxide emission by 45% of the 2010 emission until 2030, and by 2050 we had to achieve “Net-Zero” carbon dioxide emission (Exhibit 7, page 14).

3. Inequality

The limited carbon budget means that if we do not reduce greenhouse gas now, we will have to reduce much more later. It is obvious that when you use a limited amount of resources for a long period of time, if you consume a large amount right away, then the amount you can use later will disappear.

(그림을 위한 여백)

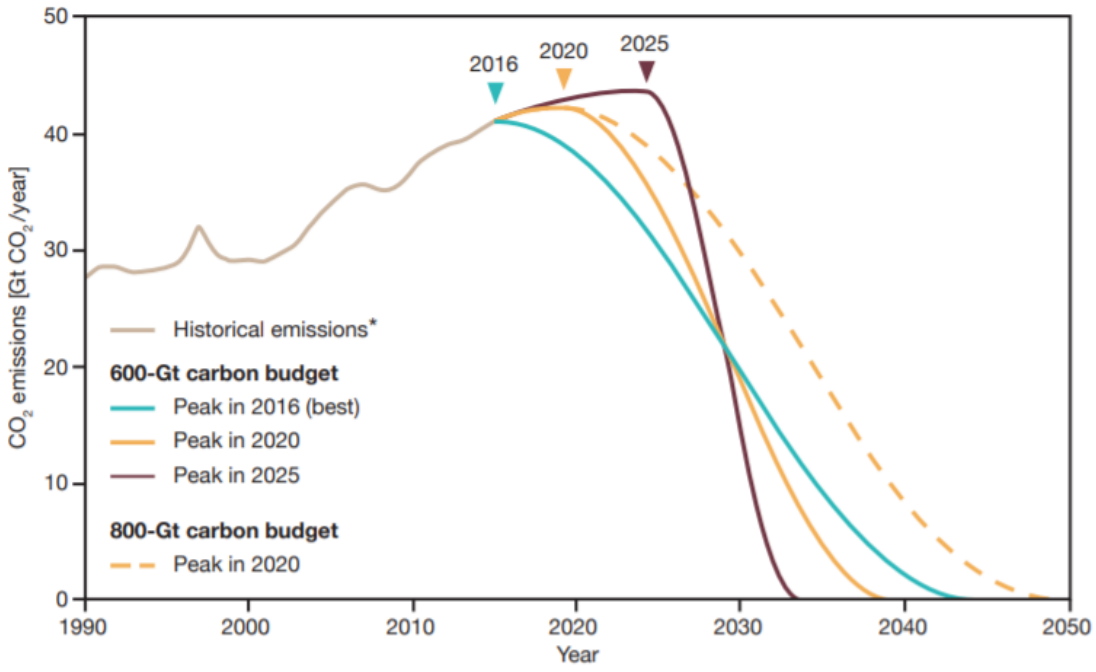


Figure 9. Reduction routes by reduction period under the same carbon budget [15]

As can be seen in the figure above, the faster the greenhouse gas emissions are reduced, the more gradually the reduction curve can be reduced, and the more you continue to increase the current emission trend, the more you need to reduce it later.

According to the United Nations Environment Program (UNEP) Emissions Gap Report

[15] German Advisory Council on Global Change, WBGU, Policy Paper September 2018, https://www.wbgu.de/fileadmin/user_upload/wbgu/publikationen/politikpapiere/pp9_2018/pdf/wbgu_policypaper_9.pdf

released in 2019, if we had started to properly respond to climate change in 2010, the world would need to reduce GHG emissions by 3.3% annually until 2030 to achieve the 1.5℃ target. As a result of delays by each country, it was evaluated that it is now necessary to reduce GHG emissions by 7.6% annually from 2019 emission levels until 2030 to meet the same target (Exhibit 9 page 26). This is the obvious reason why we should make serious and effective greenhouse gas reduction efforts as quick as possible.

This also makes a significant difference in the total cost of responding to climate change. This is because the total cost of achieving the same temperature rise limit goal is much greater when making a drastic reduction later, compared to starting reduction earlier and reducing moderately. This difference becomes even clearer, especially considering that the slower the greenhouse gas reduction, the lower the probability of achieving the reduction target itself, and the greater the risk of increasing damage caused by climate change. For example, IPCC 5th Report states that unless full-fledged preparations are made for greenhouse gas reductions by 2030, costs for reductions will increase by 44% in the mid-term (2030-2050) and 37% in the long-term (2050-2100) compared to the current period (Exhibit 3, page 25).

The carbon budget clearly shows why Korea's current greenhouse gas reduction target violates petitioners' right to equality in this Constitutional Complaint. Currently, Korea's carbon budget is rapidly being exhausted by the passive greenhouse gas reduction goal of Korea, and the opportunity to prevent the climate change is rapidly disappearing to the minimum safety standards proposed by the Paris Agreement, which are "under 2°C increase". As a result, far more social resources will need to be invested to reduce greenhouse gases rapidly at a time when petitioners, who are currently Korean teenagers, become the nation's social and economic leaders. Furthermore, despite such efforts, there is a high possibility that serious damage to the climate change will have to be tolerated by the next generation even with such efforts. Therefore, the current goal of reducing greenhouse gas emissions in the Republic of Korea imposes far greater burden and damage on future generations for the benefit of the current generation, which constitutes a discrimination violating the equality among generations, which is constitutionally unacceptable.

E. GHG emissions trends / Sub-conclusion

Despite the rapid progress of climate change and the enormous damage expected, greenhouse gas emissions are not being reduced. Since the Paris Agreement was signed in 2015, each government party, including Republic of Korea, has decided and submitted a National Reduction Contribution (NDC) including the greenhouse gas reduction target according to the Paris Agreement. The United Nations Environment Program publishes an "Emissions Gap Report" to evaluate whether NDCs submitted by countries are sufficient to meet the Paris Agreement goals. According to the most recent report, the 2019 Gap Report, the global average temperature will rise by 3.2°C by the end of the century, even if all the Nationally Determined Contributions submitted by each country have been achieved.

This is certainly insufficient for the "significantly lower than 2℃" target, not to mention the "1.5℃ target" agreed to in the Paris Agreement. This is the situation where the RCP6.0-RCP8.5 level of climate change is being expected.

In sum, the Petitioners in this case are faced with an average temperature rise of more than 2°C to 3.2°C and the overall climate change therefrom. Below, we would like to explain whether this kind of climate change will cause specific damage in Korea, whether the Petitioners' basic rights are infringed, and whether Korea's greenhouse gas reduction target does meet the minimum level necessary to protect Petitioners' basic rights.

4. Current Status and Prospect of Korea's Climate Change Damage

The Korea Meteorological Administration and the National Institute of Science and Meteorology have been continuously analyzing how the climate of the Korean Peninsula will change according to the greenhouse gas emissions using the climate model used in the IPCC report. Based on this analysis, the government of the Republic of Korea has analyzed the expected damages by sector according to climate change and has issued "adaptive measures".

- Korea Meteorological Administration, Special Climate Report (2010 ~ 2019)

• Korea Meteorological Administration, Korea Climate Change Assessment Report (2010, 2015)

• Meteorological Administration, Climate Change Forecast Report on the Korean Peninsula (2012, 2018)

• National Institute of Meteorological Science, Climate Change of the Korean Peninsula 100 Years (2018)

• 1st National Climate Change Adaptation Countermeasure (2010) and Detailed Implementation Plan (2013)

• The 2nd National Climate Change Response Plan (2015) and Detailed Implementation Plan (2018)

• First Climate Change Response Basic Plan (2016)

• Second Climate Change Response Basic Plan (2018)

I would like to talk below about the damage to climate change that is already occurring or expected in the future and infringement of the Petitioners' basic rights based on the scientific facts shown in the above data released by the Korean government. Currently, the predicted average temperature increase is 3.2°C when the global greenhouse gas reduction targets, including Korea's greenhouse gas reduction goals, are realized, and RCP 6.0 – RCP 8.5 in IPCC scenarios, so the above data summarizes the criteria.

1. Clear changes in temperature and precipitation

As of 2017, the average temperature in Korea rose 1.8°C from 1912, which is 0.8°C higher than the global average temperature rise of 1.0°C over the same period. As a result, compared to the early 1900s, summer increased by 19 days, and winter decreased by 18 days, and global warming is clearly observed (Exhibit 1, page 77).

The Korea Meteorological Administration analyzed the prospects of climate change based on

the IPCC model and specified it on the Korean Peninsula. According to this, the annual average temperature of the Korean Peninsula in the second half of the 21st century is expected to rise by 3.0℃ ~ 5.7℃ (RCP 6.0 ~ RCP 8.5) compared to the average temperature in 2010 (A-16) (2012 Korean Peninsula Climate Change Forecast Report, p. 70). This is equivalent to an increase of 3.6℃ to 6.3℃ when calculated as compared to pre-industrialization, and 10 to 20% higher than the global average temperature increase (RCP 6.0 to RCP 8.5) and 20 to 40% higher than the East Asian average (RCP 6.0 to RCP 8.5). It is predicted to be large.

Precipitation also increased by an average of 16.3 mm every 10 years from 1912 to 2017. However, there was no change in the number of days of precipitation, so the polarization of precipitation increased (page 1, page 7). The annual precipitation of the Korean Peninsula is also expected to increase by 6.8% ~ 17.6% (RCP 6.0 ~ RCP 8.5) in the second half of the 21st century (Exhibit 16, p. 53; Exhibit 17, page 71).

As with the climate change above the global average, Korea's greenhouse gas concentrations are well above the global average. As of 2018, Korea's CO_2 concentration was 415.2ppm, which is 8ppm higher than the global average of 407.4ppm. In particular, in terms of speed, Korea has increased its greenhouse gas concentration at a level higher than the global trend of growth (Exhibit 1, page 10).[16]

2. Extreme climate phenomenon (weather change, abnormal climate) increase

Due to global warming and increased climate variability, extreme climate phenomena (abnormal weather, abnormal climate) have occurred in the past 10 years. Heat waves, which indicate a daily maximum temperature of 33℃ or higher, occur every year, and the intensity has been strengthened and the frequency has increased recently. Despite the overall warming tendency, cold weather and heavy snow are frequent because extreme weather phenomena have increased. Local heavy rains are frequent in the short term, while long-term drought (2015-2017) is also a problem (Exhibit 16, page 13).

[16] 대한민국 10년 동안 증가량 2.4ppm/yr(안면도 측정소 기준), 전 지구 증가 추세 2.24ppm/yr.

This trend is also reflected in the prospects of the second half of the 21st century. For example, in the case of heat wave days, the average (1980~2010) is 7.3 days per year, whereas it is about 17.2 ~ 30.2 days (RCP 6.0 ~ 8.5) per year in the second half of the 21st century. It is expected to increase by 2 to 4 times or more (Exhibit 16, page 54; Exhibit 19, page 72). Considering that the number of heatwave days in 2018, which had recorded the worst heat wave since meteorological observations began, was 31.4 days, it means that this record level of heatwave could become common in the late 21st century (Exhibit 16, page 46).

In the case of tropical night, as of 2010, the average occurrence of tropical night is 2.8 days per year in Korea, with 7 days in Seoul and 25.4 days in Seogwipo, Jeju. It is expected to increase to 13.7 – 37.2 days per year by the latter half of the 21st century(Exhibit 16, page 54, page 17, page 72).[17] In other words, average occurrence of tropical night in the Korean peninsula will be 1.5 times the number of tropical nights on Jeju island today.

Looking at the overall seasonal variation, the summer becomes longer and the winter shorter. The Korea Meteorological Administration predicts that in the second half of the 21st century, the length of summer will increase by 40 days – from 96.4 days to 135.1 days (RCP 6.0). "The number of freezing days" when the daily maximum temperature does not exceed 0°C is currently expected to be "0" (Exhibit 16, page 55) in the second half of the 21st century. It means that it will be difficult to see ice in winter in Korea.

3. Seawater temperature and sea level rise above the global average

Seawater temperature around the Korean Peninsula has risen by about 1.19℃ from 1968 to 2013, which is more than three times higher than the global average surface temperature rise rate of 0.37℃ (Exhibit 2, page 38).

The annual average rate of sea level rise around the Korean Peninsula from 1971 to 2010 is 2.64mm, which is higher than the global average of 2.00mm (Exhibit 2, page 38). In addition, in the second half of the 21st century, the sea level of the Republic of Korea is expected to rise

[17] 2018년 전국 열대야 일수는 17.7일(평년 5.1일), 최대는 제주로 28일이었습니다(Exhibit No.18호증 2019년 이상기후보고서 46쪽).

65cm in the South and West coasts and 99cm in the East coast compared to the present based on RCP 8.5. This corresponds to 1.1 times the global rise of 88.5 cm over the same period (Exhibit 17, page 82; Exhibit 2, page 40).

B. Climate change damage forecast

These changes will have a profound impact on the health and life of the Korean people, natural disasters, ecosystems, security, the economy and society as a whole. The Korean government is also well aware of the damage caused by climate change in Korea (Exhibit 19, Exhibit 2, National Climate Change Adaptation Measures).

Based on the facts recognized by the government of the Republic of Korea, I would like to explain in turn the danger areas most closely related to the infringement of the Petitioners' basic rights, divided into (1) health (2) food security (3) disaster and (4) ecosystems.

1. Health

Heat wave: One of the health damages caused by climate change is the increase in heat waves. Exposure to high temperatures increases the heart's burden to maintain normal body temperature and reduces body temperature control, increasing the risk of heat stroke and cardiovascular disease (Exhibit 19, page 5, 8).

The heat wave in 2018 caused 4,526 heat-related illnesses and 48 deaths, so the risk of life and health from the heat wave is already considerable. However, as temperatures continue to rise in the future, the death toll from the heat wave is expected to more than double from 0.7 per 100,000 people today to 1.5 between 2036 and 2040, (Exhibit 2, page 87).

Epidemic · Infectious diseases Temperature increases cause shorter insect development periods and increase in population, and increase in precipitation is particularly a cause of increased vector-borne disease because it affects the expansion of larval habitat and increased viability. Even now, the incidence of median transmission diseases such as malaria and bush typhus has already increased due to the increase in temperature (Exhibit 19, p. 15, 17, 21).

Furthermore, as seen in the past SARS (Acute Respiratory Syndrome) and MERS (Middle

Eastern Acute Respiratory Syndrome) epidemic and the ongoing COVID-19 epidemic in 2020, the risk of epidemic and infectious disease is not limited locally, and new epidemics occur anywhere in the world. This is a situation that could pose a serious threat to Korean health. As explained earlier, changes in wildlife habitat due to climate change are increasing the risk of emerging epidemics.

Allergic diseases Climate change affects the timing and duration of pollen exposure to allergen-causing plants, so as the climate changes, the number of people with allergies increases. In particular, even if the lowest temperature in March rises by only 1℃, patients with tree pollen allergy increase by 11.6%. Already, people with environmental diseases such as rhinitis, atopy, and asthma have exceeded 30% of the total population, and social costs have increased significantly. In the case of allergic diseases, recurrence is frequent, and even a slight worsening of symptoms leads to infringement of the right to health, such as limited physical activity such as work, school work, or a decrease in the quality of life, such as sleep disorders (Exhibit 19, page 29 and 31).

Calamity. Disaster Due to climate change, patterns of meteorological factors such as temperature and precipitation are changing, and large-scale disasters such as floods and typhoons are increasing, and the average number of deaths per disaster is also increasing. In particular, damages to disasters are concentrated in socially vulnerable groups such as low-income residents, women, children, the elderly, low-income people, and the disabled, increasing inequality. In addition, if the infrastructure and services such as electricity, water and sewage, gas, transportation, and medical services are cut off due to a disaster, not only will it cause additional human damage, but it may also trigger water-borne, foodborne disease and vector epidemics (Exhibit 2, page 94; Exhibit 19, page 12).

2. Food security

Lack of water The government of the Republic of Korea said that even if it is based on current water demand, it is predicted that due to climate change, a water shortage of about 3.3 billion tons is expected in the 2060s, and the demand for water in each area of life, industry, and the environment will also increase due to rising temperatures. (Exhibit 19, page 196) In particular,

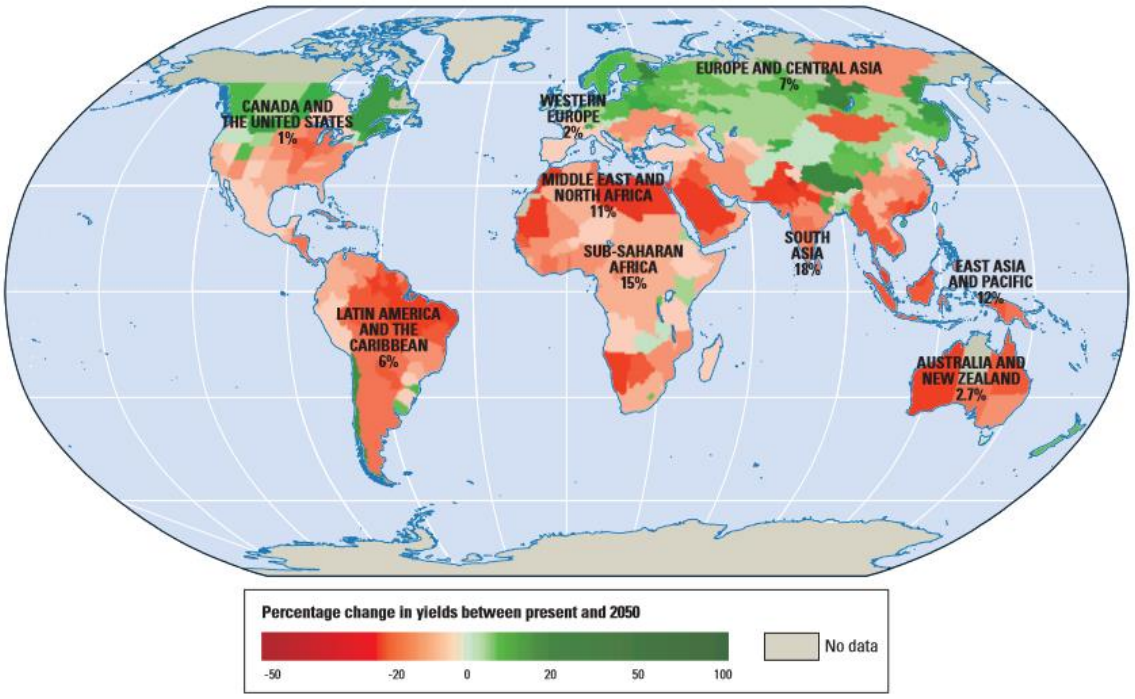
as the variation in annual precipitation increases due to climate change, the frequency and duration of drought increases, which directly affects agricultural production.

Reduced Agricultural Production Due to climate change, food production is expected to decrease and instability in food supply and demand is expected to increase due to a decrease in cultivation areas of major crops, changes in catches, and increase in pests and hazardous organisms.

The World Bank predicted that, due to climate change, agricultural yields in 2050 will decrease in most countries. In particular, yields are estimated to decrease more than 20% in the Republic of Korea (Exhibit 20, World Bank 2010 Report, page 5).

(Margin for picture)

Map 1 Climate change will depress agricultural yields in most countries in 2050, given current agricultural practices and crop varieties



Sources: Müller and others 2009; World Bank 2008c.

Note: The coloring in the figure shows the projected percentage change in yields of 11 major crops (wheat, rice, maize, millet, field pea, sugar beet, sweet potato, soybean, groundnut, sunflower, and rapeseed) from 2046 to 2055, compared with 1996–2005. The yield-change values are the mean of three emission scenarios across five global climate models, assuming no CO_2 fertilization (a possible boost to plant growth and water-use efficiency from higher ambient CO_2 concentrations). The numbers indicate the share of GDP derived from agriculture in each region. (The share for Sub-Saharan Africa is 23 percent if South Africa is excluded.) Large negative yield impacts are projected in many areas that are highly dependent on agriculture.

Figure 10. World Bank 2010 Report Food Reduction Areas in 2050 (Exhibit 20, page. 5)

The government predicts that crops such as summer potatoes and Korean-style garlic will continue to decrease in cultivatable area and then disappear in the 2090s. It is predicted that the number of temperate fruits such as apples, grapes, and persimmons will decrease rapidly by 2050 (Exhibit 2, page 100).

This is no anomaly to the livestock. High temperature stress will also degrade livestock productivity and quality. For example, cow's milk production decreases at 27℃ or higher due to rapid evaporation and increased respiratory rate. Pigs are sensitive to high temperatures due to degeneration of sweat glands and thick fat layers accumulated in the body. In the case of chickens, egg laying also experience a decrease in the number of eggs laid at 28℃ or higher, an increase in blue color, and a decrease in feed intake (Exhibit 19, page 96).

Reduced catch The increase in seawater temperature and acidity (pH) caused by climate change causes changes in the marine environment and ecological disturbances, and decreases overall marine biological resources due to a decrease in coastal spawning and growth sites. This is expected to cause an increase in invasive species, and an increased risk of new diseases (Exhibit 19, page 163, 170). As of 2016, people in the Republic of Korea consume 58.4kg of seafood a year per capita, the world's largest intake of seafood per capita, and get about 40% of animal protein from seafood[18]. Therefore, the decrease in catches has no choice but to directly affect the health of the Korean people.

Food security Korea's food self-sufficiency rate is the lowest among OECD countries, and food is highly dependent on foreign countries. Korea's food self-sufficiency rate is only 48.9 percent as of

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[18] UN 식량농업기구(FAO), 세계수산양식현황(SOFIA), 세계 주요국 수산물 섭취량, 2016, 노르웨이 수산물 위원회 연구 보고서 1쪽에서 재인용. 동물성 단백질의 40%를 수산물에서 얻는다는 사실은 해양수산부의 2005년 연구를 기준으로 합니다.
https://norge.co.kr/contentassets/f77cd3f4658e475b9f22b1024eb6e90a/nsc_seafood-study-2017%EC%88%98%EC%82%B0%EB%AC%BC-%EC%86%8C%EB%B9%84-%EC%97%B0%EA%B5%AC-2017-%EC%B6%95%EC%95%BD%EB%B3%B8.pdf

2017[19], with grain self-sufficiency at 23.4 percent, which is significantly lower than other major OECD countries that maintain food self-sufficiency at around 60 percent. The decline in food production due to climate change is expected to occur similarly not only in Korea but also in other countries, and if food production decreases, the cost of food supply and demand through trade can increase significantly or the supply and demand itself can be difficult, which poses a very significant risk in terms of food security.

When wheat production was expected to decrease significantly in 2010 due to record heat waves, droughts and forest fires in Russia, Russia, the world's third largest wheat exporter, banned wheat exports for its own food supply, and international wheat prices nearly doubled in the coming months. At that time, the surge in Russian wheat prices led to political unrest in Arab countries in the Middle East, and the fact that this was the real trigger for the Jasmine Revolution that swept through the Middle East, including Egypt, Libya, and Tunisia, shows how much climate change affects not only food security but also changes in society and the international situation.

[19] 식량자급률은 곡물의 자급률에서 사료용을 제외한 식용만 계산한 것이고, 곡물자급률은 사료용을 포함한 것입니다. 대한민국의 경우 사료용 곡물의 대부분을 수입하는 실정이라 곡물자급률이 식량자급률에 비해 떨어지게 됩니다. 농축산신문 2019. 5. 31.자 보도, "[창간특집기획]8.식량자급률 이대로 좋은가-전문가 좌담회-농업분야", http://www.aflnews.co.kr/news/articleView.html?idxno=157517

Figure 11. International wheat price trends during the 2010 ban on wheat exports to Russia.[20]

Considering that Russia's wheat production decline was caused by abnormal climate change, food production instability and international instability due to abnormal weather are likely to continue to increase in the future.

3. Calamity and Disaster

Sea level rise As climate change intensifies, the problem of flooding due to rising sea levels and tsunami cannot be avoided. According to a study conducted by the Korea Institute for Environmental Policy and Evaluation, a national research institute, in the RCP 8.5 scenario, the sea level will rise to 1.36m in 2100 and 3,805.7 km^2 will be submerged, which is 3.8% of the total area of Korea. This is a huge area equivalent to 6.3 times the area of Seoul. The population of the flooded area is 3.9% of the total population and about 5.6% of the total residential area, and it is estimated that the economic damage caused by flooding will reach 156 trillion won. (Exhibit 21, RCP Climate Scenario-Based Coastal Impact Assessment and Development of Adaptation Strategy, page 84].

[20] 조선일보 2010. 8. 10자 보도, "러시아(세계 3대 밀 수출국), 가뭄·산불에 신음… 세계 곡물파동 오나" https://news.chosun.com/site/data/html_dir/2010/08/10/2010081000084.html

Even in areas that are not constantly flooded due to sea level rise, the damage from “extreme sea level events”, such as floods, typhoons, and waves, increases. The IPCC predicts that in the East Asia region, extreme sea level phenomena that are expected to occur only once every 100 years are expected to occur once a year by 2060 (based on RCP 8.5, Exhibit 12, page 28). The following shows the “100-year frequency coastal flooding” area of Busan Metropolitan City in the spatial information system produced by the Ministry of Land, Infrastructure and Transport. (Exhibit 22-1,2, 100 years of coastal flooding in Busan Metropolitan City)

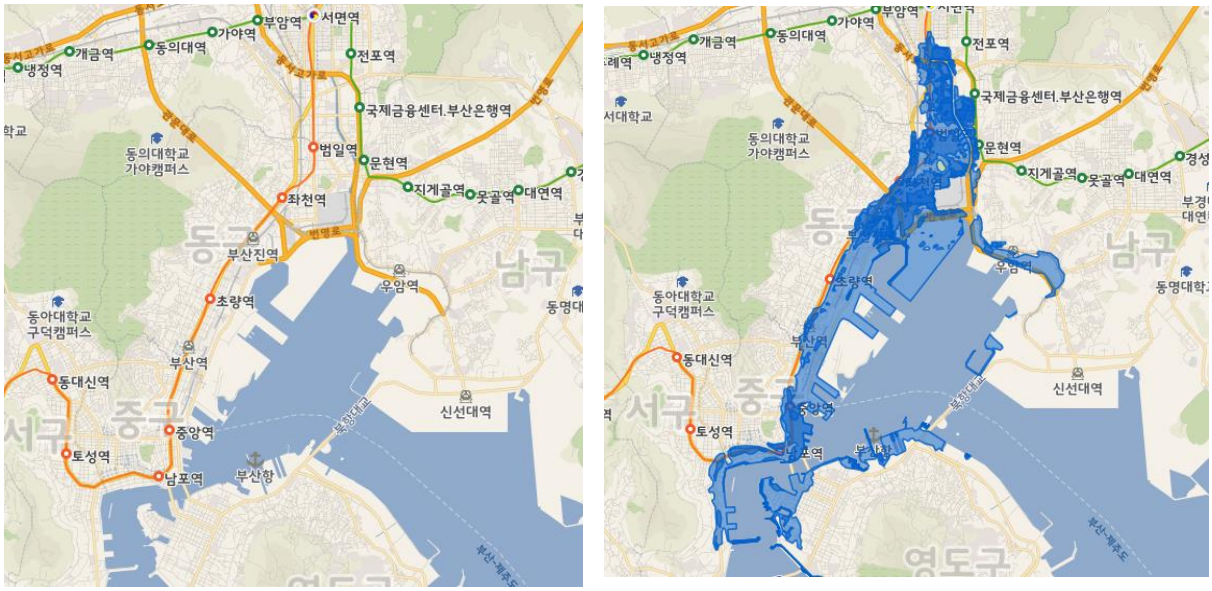


Figure 12. Coastal flooding area with a frequency of 100 years in Busan Metropolitan City (Exhibit 22-1,2)

As the IPCC predicts, a 100-year coastal flooding event will occur every year. It is likely that all buildings and facilities will need to be demolished and moved.

Typhoon and heavy rain Increases in precipitation, daily rainfall, and rainfall frequency due to climate change causes landslides and road loss in mountainous and coastal areas, causing human and property damage. According to the Korea Meteorological Administration the damage caused by drought, heatwave, heavy rain, and typhoon reached 16 trillion won in 2002-2011, representing a 262% increase over 1992-2001 levels. The damage is expected to continue to increase due to climate change (Exhibit 23, 2012 abnormal climate report, page vii).

● 최근 빈발하는 기록적인 호우, 태풍의 강도 증가, 폭설과 한파의 잦은 내습, 폭염, 강풍 피해 등은 인위적인 온실가스의 농도 증가로 발생한 전지구적인 기후변화의 일부임. 이러한 이상기상 및 이상기후 현상의 증가 추세는 온난화의 진행과 함께 미래에 더욱 심화될 것으로 전망됨(IPCC 2013).

Figure 13. Meteorological Agency 10 pages of climate change forecast report on the Korean Peninsula (Exhibit 16)

Due to the increase in precipitation, daily rainfall, and rainfall frequency caused by climate change, the annual average landslides in 10-year increments have also increased rapidly from the 2000s and have tended to increase in size (Exhibit 19, page 139).

(Margin for picture)

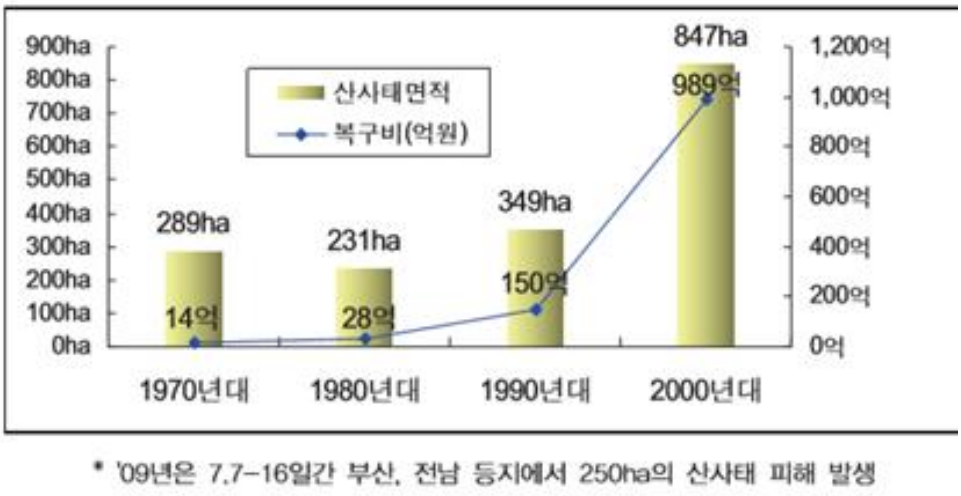


Figure 14. Landslide damage trend (Exhibit 19)

Forest fires As the evaporation increases due to the increase in temperature due to climate change, it is expected that the drying period of spring and autumn will become more dry and the frequency and scale of forest fires will increase. Already over the past 10 years from 2001 to 2009, an average of 523 forest fires have burned 37,263ha of forest, causing 91 deaths and 37 injuries, and 99.3 billion won of property damage. In particular, if you look at statistics on large forest fires, 53 fires in the past 10 years caused 32,895ha of damage. These fires account for only

1% of the number of forest fires, but 88% of the land area, indicating that forest fires are increasing in magnitude. (Exhibit 19, page 139). As evidenced by the record-setting forest fires in Amazon and Australia in 2019, the increase in forest fires is one of the major damages of climate change not only in Korea but also worldwide.

4. Destruction of the ecosystem

Forest Ecosystem Changes in temperature and precipitation have a significant effect on the vegetation of plants and bring structural and functional changes throughout the ecosystem along the food chain, leading to accelerated extinction of species (Exhibit 19, page 221). The Government of the Republic of Korea cited the article published in the 2004 Nature Journal and stated in the climate change adaptation policy that "if climate change proceeds as it is now, about 15 to 37% of the species may be extinct by 2050." (Exhibit 19, pages 224, 227).

Currently, on the Korean Peninsula, representative alpine and sub-alpine plants at a height of 1,500 – 2,000m above sea level are experiencing a decrease in population due to an increase in temperature and CO_2 concentration (Exhibit 19, page 129). The representative trees of Hallasan and Jirisan are rapidly decreasing in population due to the rising temperature and extreme weather, and it is found that this trend leads to danger of extinction.

Fig. 15. A community of globular trees in Mt. Halla [21]

[21] 제주의 소리, 2013. 11. 20.자 보도 “기후변화로 금세기말 한라산 구상나무 멸종” http://www.jejusori.net/news/articleView.html?idxno=137119

Likewise, due to high temperatures and drought in winter, the death of evergreen broad-leaved trees, including pine trees, is increasing. For example, over 1 million pine trees were killed in the southern region in 2009 (Exhibit 19, page 145). In addition, it is presumed that the infiltration of alien species into Korea is accelerating due to climate change, and the spread of alien species can disrupt the order of our native ecosystems, and the growth or habitat distribution of native species, including native species, may be reduced. (Exhibit 19, page 237).

Marine Ecosystem The acidification of marine surface water due to the increase in the concentration of carbon dioxide in the marine ecosystem adversely affects marine life (shellfish and crustaceans) with exoskeletons (Exhibit 19, page 172), and the rise in sea temperature also contributes to the destruction of the ecosystem.

In particular, the destruction of the Korean coastal ecosystem due to the "sea desertification" is occurring. Seaweed is disappearing due to the rise in water temperature and lime algae is turning the marine rocks white. According to a 2014 Ministry of Maritime Affairs and Fisheries, sea desertification is serious or ongoing in 62% of the total rock area off the coast of the East Sea. (Exhibit 24, Ministry of Oceans and Fisheries press release, page 1).

Climate change is also causing the populations of subtropical marine species that have not inhabited the Korean ocean in the past to significantly increase due to rising seawater temperature. Representatively, the highly toxic Nomura Jellyfish jellyfish began to appear in Korea's oceans in the 2000s and rapidly increased in population, causing fishery and human damage.[22]

C. Sub-conclusion

The climate forecasting models proposed by the IPCC and the Meteorological Administration generally include climate change up to the end of the 21st century, up to 2100. Unlike those

[22] 국립수산과학원 해파리 속보 페이지, http://www.nifs.go.kr/bbs?id=jellynews

in their 40s and 50s, who are currently in charge of political and policy decisions in Korea, Petitioners will live beyond the mid-21st century and into the second half, and the children that Petitioners will raise will live through the end of the 21st century and into the next century.

According to evidence concerning the future of the Korean peninsula presented by the government of the Republic of Korea as a scientific fact, Petitioners are at greater risk of disasters in the future than they are now, and they are at greater risk of heatwaves and infectious diseases, and water and food scarcity. It is predicted that record heatwaves will become an everyday occurrence. At the same time, more societal resources than ever will need to be poured into greenhouse gas reduction efforts to prevent greater climate change and to survive and adapt in a different climate. This change is a clear infringement of Petitioners' right to life, health, happiness, and the environment. And the state has a clear constitutional obligation to protect Petitioners from such infringement.

5. Assessment of Korea's Greenhouse Gas (GHG) Reduction Targets

As noted above, the Korean government is well aware of the enormous damages that are expected to occur when the climate change continues with the current trend. Such damage can be prevented by reducing greenhouse gas emissions. To this end, the international community, including Republic of Korea, has signed the Paris Agreement and has reached an agreement to reduce greenhouse gas emissions to limit the temperature rise to at least "well below 2℃" and further to "1.5℃".

However, Korea's GHG reduction targets do not meet this goal at all. In 2009, Korean government set the goal of "reducing 30% of the emission forecast by 2020" (hereinafter referred to as the "2020 reduction target") in consideration of the level recommended by the IPCC at the time, but in reality, it did not reduce greenhouse gas emissions at all. In 2015, Korean government aet the goal of "reducing 37% of the emission forecast by 2030" (hereinafter referred to as "the 2030 reduction target"), which is far behind the 2020 reduction target, and which have effectively abolished the 2020 reduction target.

As a result, the current target for greenhouse gas reduction in Korea is evaluated to be able to

increase the average atmosphere temperature by 3~4℃ and does not reach the minimum level of constitutional protection required for the rights of Petitioners. Moreover, especially in light of the responsibility and equitable burden of Korean government in responding to the climate change within the international community, the efforts of Korean government is hardly justifiable.

Below, we will look at the contents of Korea's 2020 reduction target and 2030 reduction target in turn, and evaluate the current GHG reduction target of Korean government.

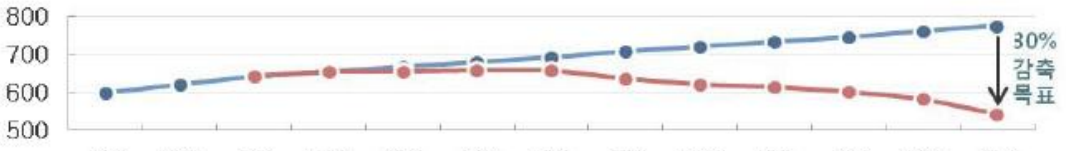
A. 2020 reduction targets

The government of the Republic of Korea, which was requested to submit GHG reduction targets ahead of the Conference of the Parties to the United Nations Framework Convention on Climate Change held in 2009 in Copenhagen, set and announced the national GHG reduction target for 2020 as “30% less than the 2020 estimated emission (BAU) 30%” through the Cabinet Council meeting (Exhibit 25, Ministry of Knowledge Economy 2009 press reference (2020 reduction target)). Here, BAU (Business As Usual) was defined as “the forecast of the future expected to be emitted if no special measures are taken”.

Soon after, the Framework Act on Low Carbon Green Growth was enacted on January 13, 2010, and the Enforcement Decree of the Framework Act on Low Carbon Green Growth was enacted in accordance with Article 42 of the same Act. The goal was set out in Article 25, Paragraph 1 of the Enforcement Decree of the Framework Act on Low Carbon Green Growth.

The detailed goal of greenhouse gas reduction by sector, industry, and year was established through the "Roadmap for Achieving National Greenhouse Gas Reduction Goals" (hereinafter referred to as the "Greenhouse Gas Roadmap") to achieve the national greenhouse gas reduction goals stipulated in Article 25 of the Enforcement Decree of the Framework Act on Low Carbon, Green Growth. The greenhouse gas roadmap was finalized at the Cabinet meeting after the related ministries, including the Ministry of Environment, the Ministry of Knowledge Economy, the Ministry of Land, Transport and Maritime Affairs, and the Ministry of Agriculture, Forestry and Fisheries jointly established emission forecasts

and reduction targets for each sector, and collected opinions from the public and the three-judgement of the Green Growth Committee. The Government of the Republic of Korea has issued a roadmap for greenhouse gas reduction for 2020 in 2011, and finalized it by revising it in 2014 (Exhibit 26).



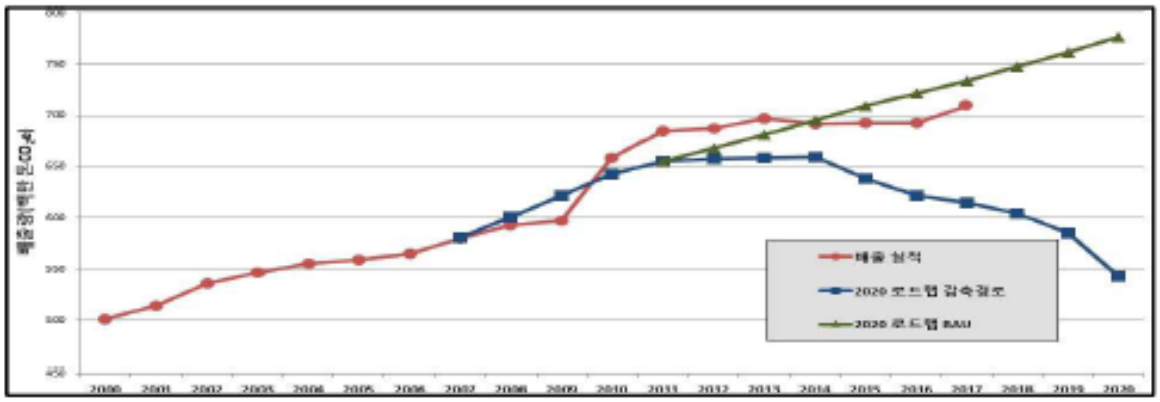
전 체	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20
배출전망치[BAU] (백만톤CO_2e)	-	-	694.5	709.0	720.8	733.4	747.1	761.4	776.1				
목표배출량 (백만톤CO_2e)	-	-	659.1	637.8	621.2	614.3	604.4	585.4	543.0				
국가 감축률	1.6%	3.3%	5.1%	10.0%	13.8%	16.2%	19.1%	23.1%	30.0%				

Figure 16. GHG reduction path according to the 2020 reduction target (Exhibit 26, page 25)

According to Korean Government's 2014 roadmap for greenhouse gas reduction, the emission forecast (BAU) for 2020 is 776.1 million tons (776 $MtCO_2eq$), and the reduction target is to reduce it to 543 million tons (543 $MtCO_2eq$) by 2020.

However, the Korean government has completely failed to achieve its 2020 reduction target. The 2020 reduction target has never been met since it was set in 2009. Unlike the government's plan to reach a record high in 2014 and achieve continuous reductions, since 2009, greenhouse gas emissions have increased almost continuously, especially between 2010 and 2013 – right after the 2020 reduction target was announced. Over the years the gap between planned emission and actual emissions is widening. This default has been explicitly acknowledged by Korean government.

< 2020 국가 온실가스 목표 대비 실적 >



□ 2020 로드맵* 상 감축경로를 상회하는 온실가스 배출

* '09년, 국가 온실가스 감축목표를 2020년 배출전망치(776.1백만톤) 대비 30%로 결정 (목표배출량 543백만톤), 이를 이행하기 위한 2020 로드맵('14.1) 수립

○ 2010년부터 연도별로 목표배출량 대비 2.3~15.4% 초과 배출하였으며, 초과정도(초과배출률) 계속 증가

※ 초과배출률 : 2.3%('10) → 4.5%('12) → 4.9%('14) → 11.5%('16) → 15.4%('17)

○ '10~'13년 간 배출실적은 감축경로를 넘어 배출전망보다도 높게 나타남

Figure 17. Second Basic Plan for Climate Change Response, page 22 (Exhibit 2).

B. 2030 Reduction Target

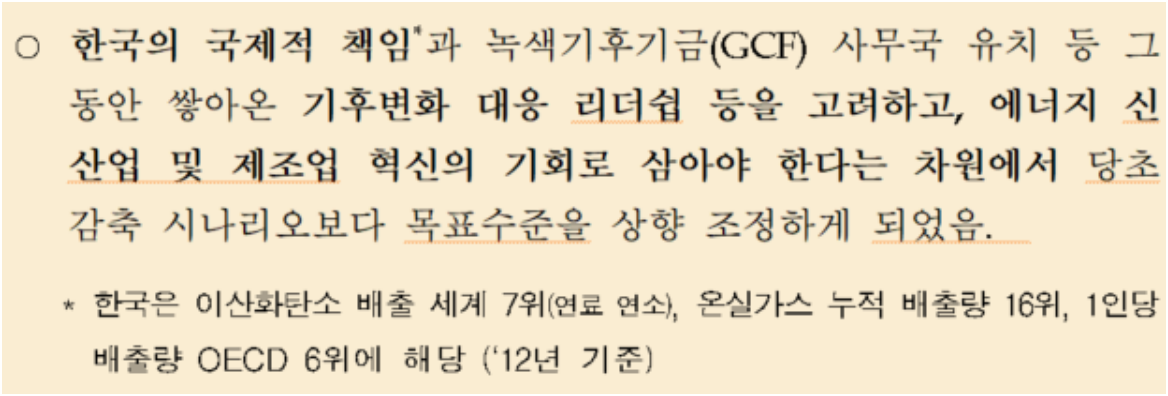
Amid the widening gap between the 2020 reduction target and the actual greenhouse gas emissions, the option chosen by the Korean government was to irresponsibly abolish the 2020 reduction target and set a much more lax 2030 greenhouse gas reduction target.

In 2015, the Secretariat of the UN Framework Convention on Climate Change requested the parties to submit an Intended Nationally Determined Contribution on Greenhouse Gas Reduction ahead of the 21st Conference of Parties to be held in Paris. The Government of Republic of Korea has submitted to the United Nations a national reduction contribution of

37 per cent from the emission forecast for 2030 (Exhibit 27-1,2, Korean NDC and press release (2015)).

Subsequently, Article 25 of the Enforcement Decree of the Framework Act on Low Carbon, Green Growth was amended to abolish the 2020 reduction target, which was defined as a 30 per cent reduction from the 2020 emission forecast, and a 37 per cent reduction from the 2030 emission forecast was set as a new national greenhouse gas reduction goal (hereinafter referred to as "the 2030 reduction target").

The 2030 reduction targer is calculated by estimating the emissions for 2030 as 850 million tons (850.6 $MtCO_2eq$) and reducing that amount by 37 percent to 536 million tons (536Mt CO_2eq).



○ 한국의 국제적 책임*과 녹색기후기금(GCF) 사무국 유치 등 그동안 쌓아온 기후변화 대응 리더쉽 등을 고려하고, 에너지 신산업 및 제조업 혁신의 기회로 삼아야 한다는 차원에서 당초 감축 시나리오보다 목표수준을 상향 조정하게 되었음.

* 한국은 이산화탄소 배출 세계 7위(연료 연소), 온실가스 누적 배출량 16위, 1인당 배출량 OECD 6위에 해당 ('12년 기준)

Figure 18. The press release of June 29, 2015 on the Government's 2030 Reduction Goals (Exhibit 27)

The South Korean government claimed that the 2030 reduction target, which set emissions at 536 million tons (536Mt CO_2eq) in 2030, is an "improvement" because the 2020 reduction target is 543 million tons (543MtCO2eq), but this is completely different from the fact. The difference between the 2020 reduction target and 2030 reduction target is only 1.3% (7 million tons, 7 Mt CO_2eq), so the 2030 target is simply a 10 year delay of almost the same goal.

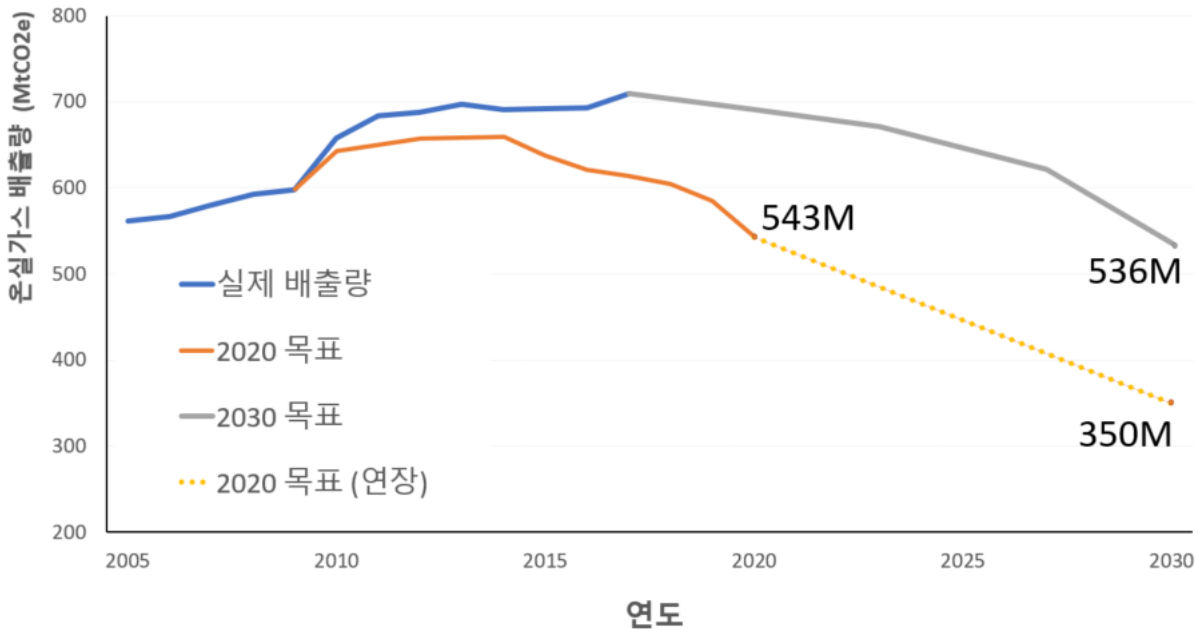


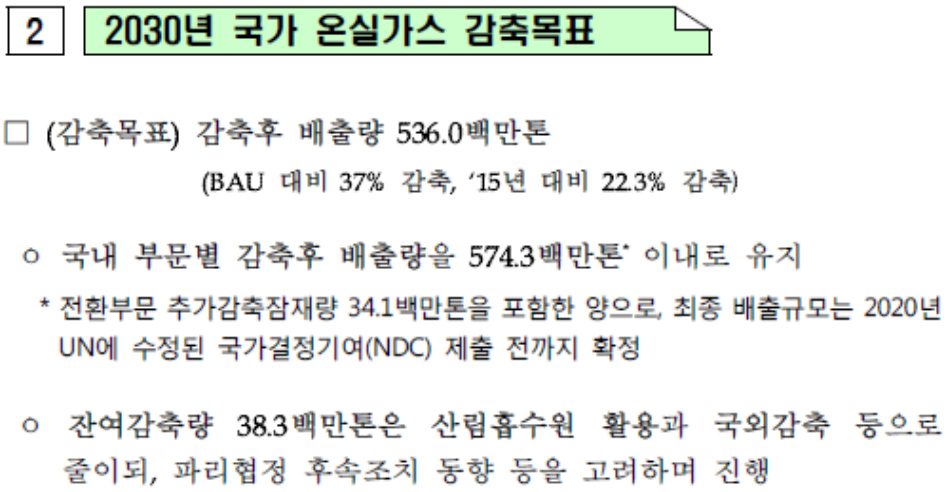
Figure 19. Korea's greenhouse gas reduction goals and actual emissions.

This is all the more clear when we predict how much emissions would have been in 2030 if Korean government maintained the reduction path based on the 2020 reduction target. As the 2020 reduction target calls for the nation's greenhouse gas emissions to peak in 2014 and then continuously decline, as shown in the figure above, if the Korean government had consistently implemented and maintained the reduction trend in the 2020 reduction target, the 2030 target should have been around 350 million tons (350Mt CO_2eq), not 536 million tons (536Mt CO_2eq). If the Korean government had not failed to comply with the 2020 reduction target and had not scrapped it irresponsibly, it should have been around 60 percent reduction, not a 37 percent reduction, based on the 2030 BAU. Therefore, the 2030 reduction target is not an extension of the reduction trend in accordance with the 2020 reduction target, but a long retreat in the reduction of greenhouse gases.

Korean government has recognized that the 2020 reduction target is the amount required to limit the

temperature rise to 2°C, as set by the recommendation of the IPCC Fourth Report. However, Korean government allowed much higher levels of greenhouse gas emissions when it set its 2030 reduction target. Therefore, even with the government's own explanation, the 2030 reduction target is not at a level that limits climate change to below 2°C. Korean government's failure to achieve greenhouse gas reductions even after setting the 2020 target and replacing it with a much weaker 2030 target five years later has greatly increased Korea's cumulative greenhouse gas emissions, depriving its Petitioners of opportunities to cope with the climate change and forcing them to spend more effort and money to reduce greenhouse gas emissions. This is the reason why Petitioners contend that the Korean government's abolition of the 2020 reduction target is an independent violation of Petitioners' constitutional rights.

Furthermore, the South Korean government has failed to come up with a clear plan on how to achieve the 2030 reduction target.



2 2030년 국가 온실가스 감축목표

□ (감축목표) 감축후 배출량 536.0백만톤
(BAU 대비 37% 감축, '15년 대비 22.3% 감축)

○ 국내 부문별 감축후 배출량을 574.3백만톤* 이내로 유지

* 전환부문 추가감축잠재량 34.1백만톤을 포함한 양으로, 최종 배출규모는 2020년 UN에 수정된 국가결정기여(NDC) 제출 전까지 확정

○ 잔여감축량 38.3백만톤은 산림흡수원 활용과 국외감축 등으로 줄이되, 파리협정 후속조치 동향 등을 고려하며 진행

Figure 20. 2018 Greenhouse Gas Reduction Roadmap Page 5 (Exhibit 29)

According to the 2018 Greenhouse Gas Reduction Roadmap, which sets out detailed implementation plans for the 2030 reduction targets, domestic emissions will be reduced to 574.3 million tons (574.3 Mt CO_2eq) by 2030. In order to achieve the goal of 536 million tons (536 MtCO2eq), the government plans to utilize "forest carbon sinks and foreign reductions" to account for an additional 38.3 million tons (38.3 MtCO2eq) of greenhouse

gases. However, as the government acknowledges, it is not clear whether forest absorption can be recognized as a reduction, and specific criteria have yet to be established to qualify for reductions from purchases made abroad.

C. Evaluation of Korea's Greenhouse Gas Reduction Target

Korea's current greenhouse gas reduction target will fail to achieve even the minimum temperature increase limit of the Paris Agreement, "well below 2℃". By the end of the 21st century, the temperature is estimated to increase by 3°C to 4°C compared to pre-industrialization era. As mentioned earlier in this brief, this level of climate change falls short of the minimum level required to protect Petitioners' basic rights because it could pose a serious threat to Petitioners' lives and safety.

In setting the greenhouse gas reduction target, the Korean government did not provide any specific explanation for the temperature limit target and the trend of climate change according to the target. It is the government of the Republic of Korea who has the responsibility to gather and review technical and scientific information while formulating policies to establish that Korea's GHG reduction targets meet the minimum level necessary to protect Petitioners from the threat of the climate change. However, the official reporting documents from organizations such as the United Nations Environment Program, and other objective information, such as the level of reduction in other countries, clearly confirm that Korea's GHG reduction target is significantly insufficient to protect the Petitioners' basic rights. Below, we would like to introduce: ① Evaluation based on the overall level of Nationally Determined Contributions (NDC) submitted by each country under the Paris Agreement ("UNEP Gap Report") ② Evaluation according to the distribution of "Carbon Budget" ③ Evaluation by international research groups ④ Evaluation in comparison with reduction targets and trends of other countries.

1. UN Environmental Planning Emissions Gap Report

The United Nations Environment Program collects Nationally Determined Contributions (NDCs) submitted by countries in accordance with the Paris Agreement to examine whether

the reduction targets set by each country meet the Paris Agreement's temperature limit targets and assess the extent of excess emissions. The results are published as the “Emissions Gap Report”.

According to UNEP 2019 emission gap report, if all the Nationally Determined Contributions (NDCs) currently submitted by each country are complied with, the total greenhouse gas emission in 2030 is expected to be 56 billion tons (56 $GtCO_2eq$). This is 32 billion tons (32 $GtCO_22eq$, 57%) more than the 25 billion tons (25 $GtCO_2eq$) limit required to meet 1.5℃ goal, and more than 15 billion tons (15 $GtCO_2eq$, 27%) above the limit to meet the 2℃ goal (Exhibit 9, page XVIII). As a result, even if all countries would achieve all of the Nationally Determined Contributions currently planned, it was predicted that by the end of 21st century the temperature would rise by 3.2℃ compared to pre-industrialization era (Exhibit 9, page XIX).

	2030 Emission ($GtCO_2eq$)	**Emission gap ($GtCO_2eq$)**	**Additional reduction**	**Republic of Korea 2030 reduction targets**
Now NDC	560 (56)			5.36 billion tons
1.5℃ 대응	250 (25)	320 (32)	▼57%	2.30 billion tons
2℃ 대응	410 (41)	150 (15)	▼27%	3.91 billion tons

Unit: billion tCO_2eq

Table 4. Korea's reduction targets according to the evaluation of the UN environmental plan emissions gap report

In other words, in order to achieve the temperature limit target under the Paris Agreement, it is necessary to increase the current reduction target by 27% to 57% on average worldwide. Assuming that the burden is distributed evenly, the 2030 GHG reduction target of Korea (currently 536 MtCO2eq) should fall below the level of 391 million tons (391 $MtCO_2eq$), a level that can achieve a temperature limit of at least 2°C. This means that it has to decrease at

least 230 million more tons (230 $MtCO_2eq$).

It is clear, that, considering Korea's greenhouse gas emission responsibility and its ability to reduce, Korea is in a position to bear the more than the average level of responsibility for the global GHG reduction. According to the Basic Plan for Climate Change Response released by the Korean government, Korea has recorded the world's 11th largest greenhouse gas emission in 2016 and the 7th largest greenhouse gas emission in the world based on carbon dioxide, which means that now Korea is one of the countries with the greatest responsibility to prevent climate change (Exhibit 2, page 11).

It is true that South Korea started industrialization later than the U.S. or European countries, but it is also true that South Korea has already ranked 16th in the world in terms of accumulated greenhouse gas emissions since industrialization (1850 to 2011) (Exhibit 30, page 11). In particular, nowadays Korea's carbon dioxide emissions per capita are 2.7 times higher than the global average. In terms of responsibility and actions that have caused the climate change, these facts mean that South Korea has no excuse to avoid bearing at least a fair share of responsibility for the greenhouse gas reduction obligations.

Furthermore, South Korea's economy ranks 12th in the world in terms of gross domestic product (GDP), and its per capita gross national income (GNI), an indicator of living standards, is also in the top 30 in the world, so it has to bear high responsibility in terms of its ability to reduce its economy.

The United Nations Environment Program stressed the importance of implementing emissions reductions in the G20 countries, which account for 78 percent of global greenhouse gas emissions, and pointed out that the Republic of Korea is not anticipated to meet the 2020 reduction target submitted to the United Nations Framework Convention on Climate Change in 2010 and that it is predicted to produce levels of greenhouse gases exceeding the 2030 reduction target by 15 percent (Exhibit 9, page 10). In sum, not only in terms of the responsibility, but also in terms of the level of goals set and policies implemented, Republic of Korea has a higher duty of care than other countries.

2. Appraisal according to Carbon Budget Distribution

IPCC 1.5℃ special report calculates the residual carbon dioxide that can be globally discharged according to the 1.5℃ and 2℃ temperature rise scenarios, that is, the "carbon budget" (Exhibit 31, IPCC 1.5℃ Special Report Chapter 2, page 108).

Additional Warming since 2006–2015 [°C]*(1)	Approximate Warming since 1850–1900 [°C]*(1)	Remaining Carbon Budget (Excluding Additional Earth System Feedbacks*(5)) [$GtCO_2$ from 1.1.2018]*(2)		
		Percentiles of TCRE *(3)		
		33rd	*50th*	*67th*
0.3		290	160	80
0.4		530	350	230
0.5		770	530	380
0.53	**~1.5°C**	**840**	**580**	**420**
0.6		1010	710	530
0.63		1080	770	570
0.7		1240	900	680
0.78		1440	1040	800
0.8		1480	1080	830
0.9		1720	1260	980
1		1960	1450	1130
1.03	**~2°C**	2030	1500	1170
1.1		2200	1630	1280
1.13		2270	1690	1320
1.2		2440	1820	1430

Figure 21. Carbon budget of IPCC 1.5℃ report (Exhibit 31, page 108)

According to this report, as of 2018, the carbon budget that can limit the temperature rise to 1.5℃ with a probability of 66% is 420 billion tons (420 $GtCO_2$), and the carbon budget that can limit the temperature increase to 2℃ with a probability of 66% is 1,170 billion tons (1,170 $GtCO_2$).

The carbon budget is a greenhouse gas reduction obligation and a right to greenhouse gas emissions. From this perspective, it can be assumed that the allocation of carbon budgets to all people is equally based on the allocation criteria, and in this case, it is possible to calculate

the national carbon budget according to the population of each country. According to UN statistics, the share of the Korean population in the world's population is about 0.66%, and Korea's carbon budget according to the share of the population is about 2.727 million tons (2,772 $MtCO_2$) at 1.5℃ and about 7.722 million tons (7,722 $MtCO_2$) at 2℃. Since the carbon budget is calculated based only on the amount of carbon dioxide, considering that the share of carbon dioxide in Korea's total greenhouse gas emissions is about 91%, when the carbon budget is converted into the total greenhouse gas budget, it is about 3.34 billion tons at 1.5℃ (3,046 Mt CO_2eq), and at 2℃, it is about 8.84 billion tons (8,486 $MtCO_2$eq).

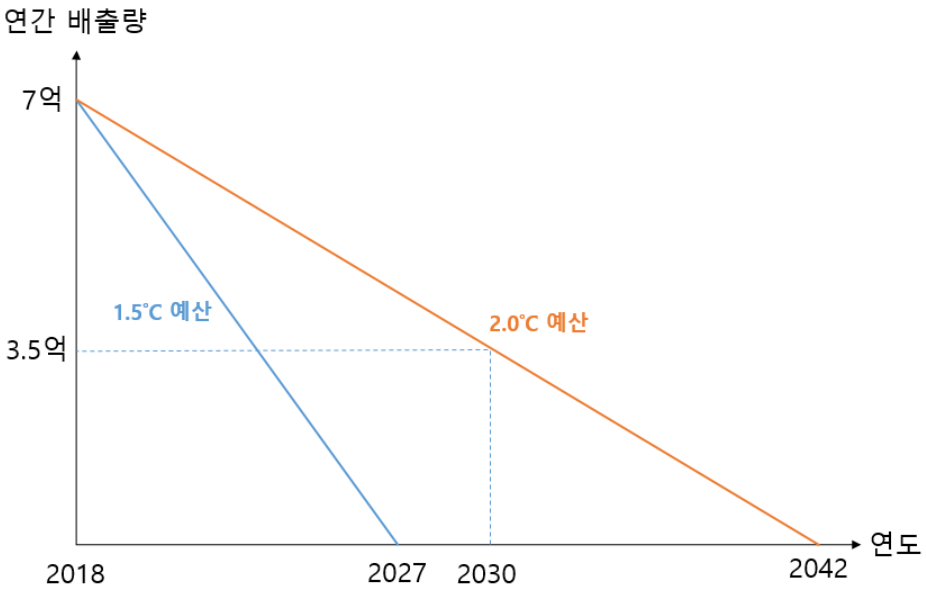


Figure 22. Reduction path according to the Korean carbon budget

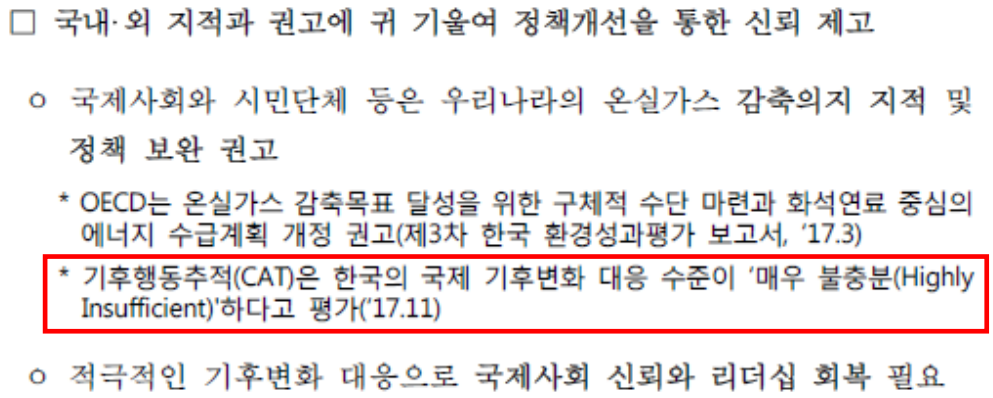
It is possible to calculate the approximate route of the greenhouse gas emission reduction route, assuming that the greenhouse gas emissions of Korea will be reduced at a constant rate from 2018, starting with 700 million tons (700 $MtCO_2$eq), which is the approximate amount of greenhouse gas emissions in 2017. According to this, the 1.5℃ carbon budget will be exhausted in 2027, which is 9 years later, so it appears that Korea's 2030 greenhouse gas reduction target should be "net emission 0". The 2℃ carbon budget will be exhausted in 2042, 24 years later, and it has been shown that Korea's 2030 greenhouse gas reduction target

should be 350 million tons (350 $MtCO_2eq$).

Considering the “Principle of Shared But Differential Responsibility”, it is clear that advanced countries, including Korea, which have made high levels of emissions, should further reduce emissions in order to reduce the per capita emissions gap with developing countries. In this regard, the carbon budget distributed as a share of the population is an effective standard for estimating the size of the responsibilities that the Republic of Korea should bear. In this case, as we have seen above, it is clear that Korea's current greenhouse gas reduction target is inadequately to meet the carbon budget for the 2℃ temperature limit as well as that of 1.5℃.

3. Evaluation by international research organizations

Independent international research organizations have conducted the scientific analysis that is necessary to determine greenhouse gas reduction targets in light of the responsibilities, capacities and equity of each country. Currently, the most widely cited data on the adequacy of GHG reduction targets is “Climate Action Tracker” (http://climateactiontracker.org, established by two organizations, Climate Analytics and New Climate Institute, hereinafter “CAT”). German climatologist Niklas Höhne, who led the establishment of CAT, is one of the most authoritative authors of IPCC report. CAT is widely recognized for its reliability, as CAT's method of analysis is based on IPCC's methodology and data. Korean government also considers CAT to be a representative analytical institution in the field of climate change, as the government cited CAT analysis results when it summarized the international evaluation of existing climate change response policy in its 2018 Greenhouse Gas Roadmap.



□ 국내·외 지적과 권고에 귀 기울여 정책개선을 통한 신뢰 제고

○ 국제사회와 시민단체 등은 우리나라의 온실가스 감축의지 지적 및 정책 보완 권고

* OECD는 온실가스 감축목표 달성을 위한 구체적 수단 마련과 화석연료 중심의 에너지 수급계획 개정 권고(제3차 한국 환경성과평가 보고서, '17.3)

* 기후행동추적(CAT)은 한국의 국제 기후변화 대응 수준이 '매우 불충분(Highly Insufficient)'하다고 평가('17.11)

○ 적극적인 기후변화 대응으로 국제사회 신뢰와 리더십 회복 필요

Figure 23. 2018 Roadmap for Greenhouse Gas Reduction (Exhibit 29)

CAT estimates each country's GHG reduction targets based on how much temperature rise will occur if it assumes that all other countries will adopt the same reduction levels.

Figure 24. CAT Korea's Greenhouse Gas Reduction Target Assessment [23]

CAT evaluated that Korea's 2030 reduction target is at a level that causes a temperature rise of 3–4℃, which is the second lowest level, "highly insufficient". Furthermore, apart from the adequacy of the goal itself, it was evaluated that the level of climate change policy currently being implemented by the Korean government to achieve the goal is "critically insufficient", which can lead to an increase in temperature above 4℃. In other words, it is an evaluation that the GHG reduction target of South Korea is insufficient, and the plans and policies established to achieve the goal by the government of South Korea are more insufficient, so even the current policy will be difficult to achieve.

As such, Korea's GHG reduction targets are far from reaching the 2°C goal, much less 1.5°C. Even if the 2030 reduction targets are achieved, it has been objectively proven that the resulting climate change is expected to reach extremely dangerous levels of 3℃ to 4℃.

4. Comparison with other countries' climate change response

Moreover, the government's GHG reduction targets are far behind those of other countries, so

[23] https://climateactiontracker.org/countries/south-korea/2018-04-30/ 에서 인용.

it is clear that the government's 2030 GHG reduction targets are not sufficient and effective to protect the rights of the Korean citizens including Petitioners. The table below calculates the ratio of 2030 emissions compared to 2010 emissions to compare the Nationally Determined Contributions (NDC) submitted by OECD countries under the UN Framework Convention on Climate Change. In terms of this standard, Korea's GHG reduction target is equivalent to a reduction of 18% by 2030 compared to 2010 emissions.

Total greenhouse gas emissions (MtCO_2eq)	**2010 Emissions**	**2030 NDC Goal**	**Total reduction rate [%]**
Republic of Korea	657.4	536	18%
USA	6938.6	4,770	31%
European Union (EU, 28 countries)	4783.6	3,389	29%
England	614.4	343.1	44%
Japan	1302.7	1028.6	21%
Australia	537.2	386.1	28%
Canada	692.6	511	26%
Iceland	4.8	2.16	55%
New Zealand	78.7	58.2	26%
Norway	55.5	24.9	55%
Swiss	54.1	26.6	51%
Mexico	669	729.7	-9%

Turkey	398.7	928.2	-133%

Table 5. Comparison of NDCs in OECD countries

As you can see above, among 36 OECD member countries, Korea's GHG reduction target rate ranks 34th. The only countries with lower GHG reduction targets than Korea are Mexico and Turkey, developing countries whose per capita GDP is less than a third of Korea's (US$31,362). Even Turkey is one of the 195 countries that have not ratified the Paris Agreement.

The United States, which had the most uncooperative attitude in the process of climate change negotiations, also aims to reduce 2030 emission rates by 31% compared to 2010. Even Japan, which replaced nuclear power with coal and gas after the Fukushima nuclear power plant accident, submitted a 21% reduction rate target – a reduction that is higher than that of Korea.

The same is true not only of future plans, but also of greenhouse gas reduction and emission trends to date. The results of the analysis of the greenhouse gas emissions of OECD member countries over the period 1990-2016 are as follows (Exhibit 28, OECD country greenhouse gas emission trends).

Name of Country	GHG emissions by country
Republic of Korea	Continuous increase trend
USA	Declining trend since 2007
European Union (EU, 28 countries)	Declining trend since 1990
England	Decline since 1991

Japan	Declining trend since 2013
Australia	Declining trend since 2001
Canada	Declining trend since 2003
Iceland	Declining trend since 2006
New Zealand	Declining trend since 2005
Norway	Declining trend since 1999
Swiss	Declining trend since 2005
Mexico	Continuous increase trend
Turkey	Continuous increase trend

Table 6. Trends in greenhouse gas emissions by OECD countries

As shown in the table above, European countries peaked in the mid-2000s and most other OECD countries, including the United States, began to peak in the mid-2000s and returned to a downward trend. Korea, Mexico and Turkey are the only countries where greenhouse gas emissions continue to rise.

The objective assessment is that Korea refuses to act in accord with its capabilities and responsibilities as a member of the international community in responding to climate change. It was no coincidence that South Korea was included in CAT's “Four Greatest Climate Villain

States" in 2016,[24] and ranked 58th out of 61 countries in the 2019 Climate Change Response Index (CCPI) jointly published by international organizations.[25]

5. Evaluation / Sub-conclusion

Considering that there is little time left to respond to climate change, it is a scientific fact that the current situation is an "emergency". On November 5, 2019, 11,000 scientists from 153 countries around the world proclaimed the "Climate Emergency" and announced that "unless the entire world takes serious action, the climate crisis will lead to unprecedented suffering".[26]

Countries around the world are taking the current situation very seriously and are moving urgently. As of March 2020, 1,480 local governments in 28 countries around the world have declared "climate emergencies" and are urgently reducing greenhouse gas emissions.[27] The fact that climate change will continue to increase in severity if greenhouse gas emissions are not reduced to zero somehow has become a fundamental premise of climate policy. Currently, 120 countries around the world have formed a global coalition (Climate Ambition Alliance: Net Zero 2050) that aims to achieve greenhouse gas "net zero" by 2050.[28] Eighteen countries, including the United Kingdom, France, Sweden, New Zealand, Portugal, and Denmark, have already adopted the goal of reducing greenhouse gas emissions to zero by 2050 as the official national greenhouse gas reduction target.

However, Korea is not treating the risk of climate change as an urgent matter. It is objectively clear in all respects that Korea's goal to reduce greenhouse gas emissions is far behind that of other countries in the world. Korea's greenhouse gas emissions account for about 1.5% of global emissions, and Korea's efforts alone cannot prevent global climate change. To think or claim that Korea, as the world's 11th largest GHG-emissions country, does not need to act effectively and responsibly to reduce GHG emissions because it can shift responsibility to the

[24] http://www.hani.co.kr/arti/society/environment/768994.html
[25] https://www.climate-change-performance-index.org/country/korea
[26] 조선일보 2019. 11. 6.자 "153개국 과학자 1만 1000명 "전지구적 기후 비상사태" 선포" https://news.chosun.com/site/data/html_dir/2019/11/06/2019110601506.html
[27] https://climateemergencydeclaration.org/climate-emergency-declarations-cover-15-million-citizens/
[28] https://climateaction.unfccc.int/views/cooperative-initiative-details.html?id=94

failure of other countries is irresponsible. It is an irresponsible attitude contrary to Korea's Constitutional guarantees, and such logic is fundamentally against the "Principle of the Prohibition of Under-protection". When judging whether a country is sufficiently protecting its people from the dangers of climate change, the standard of review is to judge on the basis of whether the government is making reasonable and effective efforts in light of its responsibilities and obligations.

In the case of "Urgenda vs. The Netherlands", which argued the inadequacy of greenhouse gas reduction against the Dutch government, there was also a dispute over this issue. The Dutch government pleaded that the Dutch government alone cannot solve the problem, as the greenhouse gas emissions in the Netherlands are only marginal compared to the rest of the world. In this regard, the Dutch Supreme Court ruled that "Each country is responsible for its share and is obliged to reduce the amount of greenhouse gas emissions from its territory in proportion to its share." "On this global scale, we can't circumvent our responsibility to take action by claiming that the impact is minimal."

This is the same legal principle that should be applied in determining whether the requested Republic of Korea has taken the minimum necessary measures to protect the Petitioners' basic rights from the risk of climate change. If we do not judge on the basis of the "obligation to act on each country's share" of the risks arising from worldwide actions such as greenhouse gas emissions, we will eventually be unable to hold anyone accountable.

As mentioned earlier, Korea's current greenhouse gas reduction target does not meet any criteria for calculating "Korea's fair share," and it is clear that the respondents are not taking the minimum necessary measures required to protect Petitioners' fundamental rights from the risks of climate change.

6. Conclusion

Climate change is a man-made disaster. There is no question that climate change is caused by artificial greenhouse gas emissions and that the climate is changing at an unprecedented rate. If climate change continues, it will deal a serious blow to the natural environment and the ecosystem as

a whole, and it is expected to pose a huge threat to human life, health, social stability and economic activity.

At the same time, it's also a scientific fact that it's possible to prevent this kind of climate crisis. The international community has agreed to reduce greenhouse gas emissions quickly to minimize climate change and is taking action in recognition of a "climate emergency."

Although the Korean government recognized all these scientific facts and joined the international community's agreement to prevent climate change, it has set a passive goal of reducing greenhouse gas emissions, which is bound to lead to a climate crisis. As a result, the Republic of Korea has been criticized as one of the most "climate-vicious" countries that contribute the most to worsening climate change in the world.

These damages must go to Petitioners who are Korean citizens. Climate change is expected on the Korean Peninsula to be greater than the global average. The Korean government's current greenhouse gas reduction target, which is causing the climate crisis, falls short of the minimum level required to protect the basic rights of Petitioners. Climate change caused by emitted greenhouse gases is irreversible. The slower the response to climate change, the greater the infringement of the Petitioners' basic rights.

Therefore, considering the above circumstances, the subjects of judgment in this case, including Article 25 paragraph 1 of the Framework Act on Low Carbon, Green Growth, as stated in the petition, cannot avoid the judgment that it violates the Constitution by violating the basic rights of the petitioners and the people.

Reference

1. Exhibit No. 3 호증 IPCC 2014 Fifth Assessment Report

1.	Exhibit No. 4 호증		IPCC Fifth Assessment Report 2013 Working Group1 Technical Summary Report
1.	Exhibit No. 5 호증 의	1	IPCC 2014 Fifth Assessment Report Working Group 2 Report Chapter 11 (English)
		2	IPCC 2014 Fifth Assessment Report Working Group 2 Report Chapter 11 (Excerpts)
1.	Exhibit No. 6 호증 의	1	IPCC 5th Assessment Report 2014 Working Group 2 Report Chapter 3 (English)
		2	IPCC 5th Assessment Report 2014 Working Group 2 Report Chapter 3 (Excerpt translation)
1.	Exhibit No. 7 호증		IPCC 2018 Global Warming 1.5°C Special Report Summary Report
1.	Exhibit No. 8 호증 의	1	IPCC 2018 Special Report on Global Warming 1.5°C (English)
		2	IPCC 2018 Special Report on Global Warming 1.5°C (Excerpt translation)
1.	Exhibit No. 9 호증 의	1	UN Environment Plan 2019 Emission Gap Report (English)
		2	UN Environment Program 2019 Emission Gap Report (Excerpts)
1.	Exhibit No. 10 호증 의	1	European Commission Green New Deal Announcement Material (English)

	2	Announcement of the Green New Deal of the European Commission (Excerpts)
1. Exhibit No. 11 호증		Korea Centers for Disease Control and Prevention Research Short Message (Analysis of World Trends for Future Infectious Diseases)
1. Exhibit No. 12 호증		IPCC 2019 Special Report on Ocean and Cryosphere Summary
1. Exhibit No. 13 호증 의	1	IPCC 2019 Special Report on Oceans and Ice Cards (English)
	2	IPCC 2019 Special Report on Marine and Ice Rights Chapter 5 (Excerpts)
1. Exhibit No. 14 호증		IPCC 2019 Climate Change and Land Special Report Summary Report
1. Exhibit No. 15 호증 의	1	Fourth United States Flag Postal Evaluation Report (English)
	2	Fourth United States Flag Postal Evaluation Report (Excerpts)
1. Exhibit No. 16 호증		2018 Korean Peninsula Climate Change Forecast Report
1. Exhibit No. 17 호증		2012 Korean Peninsula Climate Change Forecast Report
1. Exhibit No. 18 호증		2019 Abnormal Climate Report

1. Exhibit No. 19 호증		First National Climate Change Adaptation Measures in 2010
1. Exhibit No. 20 호증		World Bank 2010 Report
1. Exhibit No. 21 호증		Report of the Korea Environmental Policy and Evaluation Institute (RCP Climate Scenario-based Coastal Impact Assessment and Adaptation Strategy Development Study)
1. Exhibit No. 22 호증 의	1	Map of 100-year coastal flooding area of Busan Metropolitan City_Present
	2	Busan Metropolitan City 100 Years of Coastal Flood Area Map_100 Years of Frequency
1. Exhibit No. 23 호증		2012 Abnormal Climate Report
1. Exhibit No. 24 호증		(The ministry, and release the results desertification, coastal waters donghae) press release, the Ministry of Maritime Affairs and Fisheries.
1. Exhibit No. 25 호증		2009 Report by the Ministry of Knowledge Economy (Goals for Reduction in 2020)
1. Exhibit No. 26 호증		Roadmap to Achieve National Greenhouse Gas Reduction Goals in 2014
1. Exhibit No. 27 호증 의	1	Press Release 2015 INDC (Korean Literature)
	2	Republic of Korea 2015 INDC

1. Exhibit No. 28 호증		Trends in greenhouse gas emissions by OECD countries
1. Exhibit No. 29 호증		2018 Greenhouse Gas Reduction Roadmap Amendment
1. Exhibit No. 30 호증		2016 First Climate Change Response Basic Plan
1. Exhibit No. 31 호증 의	1	IPCC 2018 Global Warming 1.5℃ Special Report Chapter 2 (English)
	2	IPCC 2018 Global Warming 1.5℃ Special Report (2 excerpts)

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To the Constitutional Court