

Research Material
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Water Disaster Management in Response to Climate Change, Glacier Loss, and Onset of the Climate Crisis

The loss of glaciers due to global warming is intensifying the climate crisis on all fronts, causing a dramatic increase in natural disasters. There are even forecasts that 80% of the Alpine glaciers, which are reportedly vanishing at an unprecedented rate, could be gone by the year 2100 if current trends continue.

Glacier loss has a serious impact on climate change. When glaciers melt, the ice that used to reflect sunlight is replaced by dark water or soil, which absorbs more solar heat, causing a positive feedback loop that further raises the Earth's surface temperature and accelerates global warming. According to measurements by the National Aeronautics and Space Administration (NASA) and the National Oceanic and Atmospheric Administration (NOAA), solar heat absorbed by the Earth's surface doubled in just 14 years from 2005 to 2019, and as the Earth warms, glaciers in polar and high-altitude regions are rapidly shrinking. Arctic sea ice has decreased by 3.75 million square kilometers over the past 40 years, which is an area close in size to South Korea. Glaciers in Antarctica, Alaska, the Himalayas, and the Andes are also shrinking by 151 billion to 400 billion tons each year.

Glacier loss leads to rising sea levels. Since 1993, global sea levels have risen by an average of 3.4 mm per year, with a total increase of 10.3 cm over the past three decades. Rising sea levels trigger changes in the climate system, leading to extreme weather patterns, ecological changes, coastal erosion, floods, and landslides, and can have significant impacts on low-lying areas and island nations. The increase in water vapor and changes in ocean density caused by rising ocean temperatures alter the direction and strength of ocean currents, which in turn affect precipitation. This interacts with the monsoon front and typhoons, significantly increasing precipitation and triggering extreme weather events such as floods and landslides. The World Meteorological Organization (WMO) has emphasized that issuing warnings 24 hours in advance can reduce damage by 30%. According to WMO data, the number of natural disasters worldwide increased fivefold from 711 in the 1970s to 3,536 in the 2000s. However, with the introduction and implementation of early warning systems, the number of deaths in the 2010s dropped significantly to one-third of the levels recorded in the 1970s and 1980s.

The key to disaster response lies in predictive and management capabilities. Efforts to minimize casualties through non-structural methods, such as early warning systems, are critical. Korea has established a policy framework for natural disasters in the wake of Typhoon Sarah and greatly improved the accuracy of its flood prediction system through flood control centers. In addition, the accuracy of natural disaster predictions is expected to improve and warnings will be issued more quickly through big data analysis and

development of AI models that utilize weather data, satellite images, sensor data.

In 2021, Korea enacted the Framework Act on Carbon Neutrality and Green Growth for Coping with Climate Crisis, establishing a new legal framework to facilitate the transition to a carbon-neutral society and promote green growth. This law defines the climate crisis as “a situation that poses irreversible risks to human civilization, including extreme weather, water shortages, food shortages, ocean acidification, sea-level rise, and ecosystem collapse,” and mandates immediate adaptation measures.

As the international community implements various climate change response projects and measures in response to water disasters, KOICA, Korea’s official development assistance agency, needs to expand its water-related disaster response and management projects in consideration of the inadequate disaster response infrastructure in its partner countries. In particular, there is an increasing demand for disaster response in countries with mountainous terrain, such as Bangladesh, Nepal, and Central Asia.

Going forward, KOICA should actively identify water-sector projects related to disaster risk management across a wide range of partner countries, and establish programs that support infrastructure development for disaster prevention and strengthen community resilience and adaptive capacity as a top priority within its water-sector projects.