

CURRENT RESEARCH TRENDS ON FLOODING IN SOUTH KOREA

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The effects of climate change to our environment is so noticeable that almost all people in the world are aware of what it is and what it does. But what is climate change? NASA defined climate change as a change in the usual weather in a location. It may be a change in the precipitation pattern, amount, and or intensity. It can also be a change in the monthly or seasonal temperature. According to NASA, climate change is also a change in the Earth's climate. It can be a change in the Earth's usual temperature or it could be a change in where rain and snow usually fall on Earth. Climate change takes more than a hundred or millions years before it happens.

But how does climate change directly affect us? To put it simply, higher climate temperatures evaporates more surface water on Earth, which eventually returns to us as rain or snow. Warmer air can hold more water vapor in the atmosphere and thus causes intense rainstorms, torrential rainfall, and typhoons. These sudden and concentrated rainfall are the most common cause of water-related disasters in coastal and urban areas.

Why does it flood and what is flooding? Flooding occurs when water overflows to its surrounding land. Flooding usually occurs when there is too much rainfall, bodies of water overflows to its surrounding area, rapid snow melting, or when dam, levees, or any other water retaining structures break. Flooding are most common in highly urbanized area, where there poor urban planning, inefficient structure and drainage

systems. Climate change and rapid urbanization are just some of the most common factors that increases the likelihood of experiencing disasters, and the Asia Pacific is particularly susceptible to water-related disasters.

The United Nations' Global Humanitarian Overview 2019 report states that from 2014 to 2017, more than 870 million people from 160 nations, were directly affected by natural disasters. And 90% of the global disasters are in the form of flooding, severe typhoons, droughts and other climate-related events that completely affects us both directly and indirectly. And according to the World Economic Forum, Asia-Pacific countries are more vulnerable from natural disasters as compared to other nations in different regions. From year 2014 to 2017, 217 typhoon events, and 236 cases of flooding were recorded to have affected 650 million people and caused 33,000 casualties.

In South Korea, the climate and topographic conditions of our country are both disadvantageous when it comes to flooding. Sixty-five percent of the countries' topography are composed of mountainous areas with steep slopes, which means that at the event of rainfall, rapid runoff is directly directed to low-lying areas. While in terms of our climate, two-thirds of the total annual precipitation is concentrated only during rainy season, which is from June to September. And based from past data, Korea is affected by severe flooding and drought for every five to seven years. But due to climate

change, regional droughts usually happens every two to three years. After year 2000, severe floods are always associated with typhoon events, and these two water-related disasters are the key issues in our Country. Fortunately, South Korea has always been prepared to reduce life and property casualties. Dam construction, gate and weir constructions, and river improvement projects are some of the structural solutions in our Country. While, dam operations, accurate calculation of design flood in all streams, dam and weir joint operation rules, and dam sedimentation maintenance rules are just some of non-structural approach implemented in South Korea.

An example of a structural method implemented in Korea is the 'Four major rivers restoration project' which had five key objectives: 1) to secure abundant water resources to prevent water scarcity in the nation; 2) to implement comprehensive flood control measures; 3) to improve the water quality in streams and to restore the natural ecosystem of rivers; 4) to create multi-purpose spaces for local residents, which includes recreational areas accessible by everyone; and 5) to boost regional development centered on rivers.

An example of non-structural measure for flood control is to implement comprehensive flood control steps: 1) Through a precipitation forecast system, a numerical analysis is performed to forecast a 5-days

rainfall prediction, which is computed four times a day to ensure accuracy of forecast data. 2) Perform a flood analysis using Flood Analysis System and to perform reservoir simulation. 3) Perform an impact analysis in downstream areas by dam operations, which aims to determine damage predictions by calculating the inundated area, and to yield to a decision on how much dam discharge is allowable, which is beneficial for decision making. And lastly, 4) Disseminating warning information to all related institutions and nearby residents through SMS to inform possible outcomes. After information dissemination, the water gates are opened to release some water.

Even though the government has tried to mitigate the damages from various types of flooding, South Korea has still experienced life and properties losses almost every year. Therefore, the South Korean government have invested a lot to the R&D budget, to hopefully reduce possible damages from future natural disasters, especially in flooding. Several of our countries' R&D are outlined and will be presented shortly.

Such methods are necessary to reduce future life and property damages due to flooding. We, humans, are responsible for climate change, and the only means to address its aggravating effects, is to be prepared for any possible outcomes, and to be resilient to reduce further losses.