

Impacts of Global Warming and Adaptation Strategies in Japan - Civil Engineers Perspective

According to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), which was issued in 2007, global warming and the associated changes in climate are the result of past human activities. The adverse impacts are of such importance that it is necessary to implement both mitigation measures to halt or slow the progression of global warming as well as adaptation measures to reduce the negative effects and exploit the relatively few benefits of climate change. Adaptation is required in locations and sectors where impacts are already occurring or are anticipated to emerge in the future.

Climate change affects water resources such as surface and groundwater, coastal zones, and disasters such as flooding and inundation during high tides. Its impacts also extend to various other areas, including natural ecosystems, food production, human health and lifestyles, energy supplies, and industry.

The effects of climate change are worldwide and cannot be avoided, even by Japan and other developed nations. In many developing countries in Asia, the Pacific, Africa and other regions, the effects of climate change are high.

From the standpoint of civil engineering, the effects of climate change include the following: (1) reductions in the safety and performance of civil engineering structures, (2) effects on the implementation of civil engineering projects, including planning, design, procurement, construction, maintenance and management, (3) decreased functionality of infrastructure facilities, and (4) adverse effects on safety and security, convenience, and environmental protection in the national and community levels. In addition to being strongly influenced by climate change, civil engineering can also play a major role in countermeasures to combat the adverse effects of climate change.

The effects of climate change, as well as the countermeasures, are characterized by complex interactions. For example, changes in the frequency of river flooding due to rising sea levels and changes in earthquake-related ground liquefaction risks due to higher groundwater levels are cases in which the level of damage from natural disasters could be increased as a result of climate change. In addition, the need to conserve water resources and aquatic ecosystems is closely interrelated not only with climate change itself, but also with changes in population and land use.

Because of the complexity of these effects, the countermeasures also need to be multipurpose in nature. Some countermeasures will likely have co-benefits as well as multi-layered effects, while those designed to address individual effects of climate change may involve tradeoffs. The most desirable countermeasures will produce diverse and comprehensive benefits by addressing multiple consequences of climate change, and thereby serve a dual purpose.

