

Influence of Storm Surge Damage Due to Climate Change in Coastal Areas

ASAI Tadashi, Head

Coastal Disaster Prevention Division, Coastal, Marine and Disaster Prevention Department

(Key words) Coastal Area, Climate Change, Global Warming, Sea Level Rise, Storm Surge Damage, Adaptation Measures

1. Influence of climate change on coastal areas

According to the Synthesis Report of the IPCC's Fifth Assessment Report (AR5), published in November 2014, there is no room for doubt concerning warming of the global climatic system; the atmosphere and oceans are warming, and sea levels are rising. Since around 1950, many changes in climate phenomena and related extreme events have been observed. These changes would include an increase in occurrence of extremely high tide levels. It is necessary to establish response measures for climate change in coastal areas. Therefore, it is important to assess the future risk of storm surge with consideration to sea level rise and the enlargement of typhoon scale.

2. Evaluation of future risk of storm surge damage

In order to enhance the knowledge of the response to storm surge damage in giant typhoons, we summarized the damage of ports ¹⁾ and evacuation attitudes of residents ²⁾ based on a joint field survey in the damaged area of Typhoon 1330 (Haiyan) with the Port and Airport Research Institute (PARI) (Photo-1). In November 2013, Category 5 super typhoon 1330 (max. central pressure: 895hpa) passed over the islands of the southern Philippines, causing storm surge damage along the coast of the islands in its path. We also carried out a field survey of storm surge damage in and around the Port of Nemuro (Nemuro City, Hokkaido, Japan) due to low atmospheric pressure on December 17, 2014.

Future changes in the risk of damage by inundation due to storm surge were estimated, considering the effect of global warming³⁾ (Fig.-1). It was shown that the risk of damage increased in Japan's three major bays (Tokyo,

Osaka, Ise), the Seto Inland Sea and the Ariake and Yatsushiro coasts. For the three major bays, storm surge inundation was calculated to assess the future changes in the risk of inundation damage in the areas outside seawalls (Fig-2).



Photo-1 Damage of port in Philippines caused by Typhoon 1330 (Haiyan) (Port of Estacia)^{1),2)}

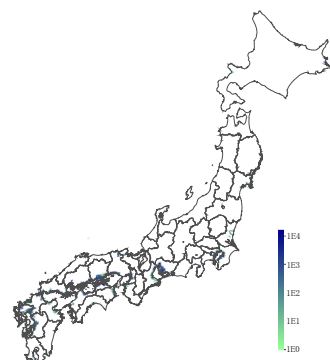


Fig.-1 Geographic distribution of inundated population³⁾



Fig.-2 Example of storm surge inundation calculation

3. Investigation of policies for climate change adaptation measures

To assess future the risk of climate change, including storm surge damage, and to investigate policies for its adaptation measures, the governmental agencies with

responsibility for coastal protection established a Study Committee on Future Risk of Climate Change in Coastal Areas and Policies for Its Adaptation Measures (Chair: Prof. Masahiko ISOBE, Vice President, Kochi University of Technology) ⁴⁾. As a member of the committee secretariat, the Coastal Disaster Prevention Division is supporting the development of policies for adaptation measures.

4. Toward the safety of coastal areas against storm surge damage

It is necessary to secure the safety of coastal areas against future changes in the risk of storm surge damage. Therefore, to evaluate the safety of coastal protection facilities, we are promoting researches on advanced observation technologies for sea level and waves, and on methods for assessing the risk of disaster in port and harbor areas.

【References】

- 1) Journal of Coastal Zone Studies, Vol. 27, No. 3, pp. 63-74, 2014.
- 2) Journal of the Japan Society of Civil Engineers B2, Vol. 70, pp. I_1436-I_1440, 2014.
- 3) Journal of the Japan Society of Civil Engineers B2, Vol. 70, pp. I_1441-I_1445, 2014.
- 4) Website of Ministry of Land, Infrastructure, Transport and Tourism. Committee for Study of the Effects of Climate Change in Coastal Areas (Coasts) and Directions for Adaptation Measures.
http://www.mlit.go.jp/kowan/kowan_fr7_000022.html