

Coastal Engineering for Taking Action to Climate Change

River Department

For taking action to sea level rise, stronger storm surges and waves, and more severe coastal erosion caused by climate change, the River Department is conducting research on coastal erosion prediction techniques and countermeasures considering future external forces, and seawalls with resilience against storm surge and high waves.

Social background and issues

- Disasters caused by storm surge and high waves, for example, during Typhoon No. 21 (Typhoon Jebi) in 2018, have occurred with increasing frequency in recent years.
- Rises in the mean sea level due to the effects of climate change have already been observed, and the effects of further increases in the mean sea level, larger and more powerful typhoons, etc. in the future are feared.
- Japan's Basic Policy for Coastal Protection was revised in 2020 and requires concrete implementation of measures for coastal protection in order to pass on "beautiful, safe, and flourishing coastal areas" to the next generation, which is the basic philosophy of the policy.

Study contents

Techniques for coastal protection considering the effects of climate change

If the mean sea level rises due to climate change, the cross-sectional shape of beaches will change toward a new equilibrium state corresponding to the rise in sea level. Therefore, the shoreline will retreat to the landward side to more than the distance submerged by the rise in the sea level. Since the wave runup height on seawalls will also increase due to the combined effects of shoreline retreat and the increased size of storm surges and waves, new countermeasures will become necessary.

The Coast Division of the River Department is studying practical techniques for predicting the amount of future shoreline retreat due to sea level rise, etc. and coastal protection measures based on the results of that research.

As shown at the right, countermeasures for sea level rise and larger storm surge and waves are not limited to raising the height of seawalls, but also include planar protection by increasing the wave dissipating function of sandy beaches by beach construction and raising the height of offshore wave-dissipating facilities.

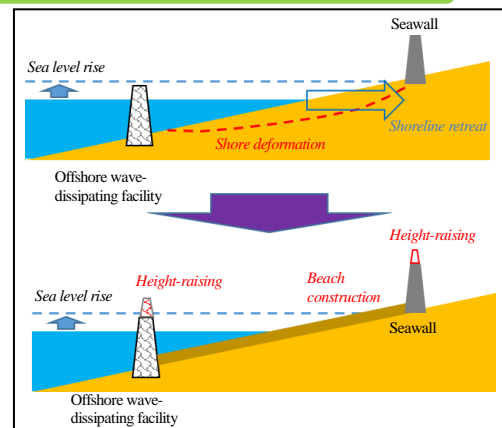
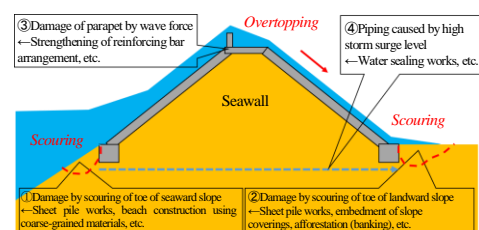


Image of measures for sea level rise

Seawalls with resilience against storm surge and high waves exceeding design target

As storm surges and waves become larger and more powerful due to climate change, wave overtopping of seawalls will also increase, and seawalls be damaged more easily by wave overtopping and scouring. Therefore, it is necessary to review the design external forces of seawalls considering climate change, and promote the construction of seawalls with resilience against storm surges and high waves that exceed the design targets. The Coast Division is engaged in research on seawall structures which can resiliently demonstrate an inundation prevention function.

Based on the results of hydraulic model experiments conducted to date, the Coastal Division has proposed countermeasures for four assumed seawall damage modes under storm surge and high wave conditions that exceed the design scale, as shown at the right, and is studying the scale of those countermeasures.



Assumed damage modes and their countermeasures

Coastal protection considering the effects of climate change
To leave "beautiful, safe, and flourishing coastal areas" to the next generation.

☞ Related article is here (Introduction of related article by Coast Division)

- Preparing for Future Beach Erosion Caused by Climate Change Focusing on Beaches with Experience of Sea Level Rise (P.49)