A short history of countermeasure against storm surges and tsunamis in Japan

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After the 1896 Meiji Great Sanriku Tsunami, the maximum run-up height of which was 38 m, several villages were relocated to high ground at private expenses of individual person or village leaders. Most of people returned to the original villages after about ten years, due to shortage of domestic water and so on.

Restoration from the 1933 Showa Great Sanriku Tsunami, the maximum run-up height of which was 28 m, was led by local and central governments. Among 10 countermeasures proposed by the Council on Earthquake Disaster Prevention, the most recommended was relocation of dwelling houses to high ground. Coastal dikes or sea walls were constructed at four sites.

In 1934, the Muroto Typhoon hit the Hanshin area. The survey report by JSCE did not recommend construction of sea walls because they were financially impractical.

In 1941, a tsunami warning organization was founded for the Sanriku coast. A tsunami forecasting chart was drafted empirically. By the Meteorological Business Act enacted in 1952, the forecasting system was made to cover the whole coast of Japan. The JMA introduced tsunami numerical forecasting in 1999.

In 1959, the Ise Bay typhoon generated a storm surge with the amplitude of 3.5 m at Nagoya port. Coastal embankments made of soil with solid covers only on the seaside surface were completely washed away by overflowing sea water. After this experience, the design standard was revised. Three surfaces (seaward slope, landward slope and crown) of soil embankment should be armored by concrete.

In 1960, the Chilean Tsunami, a typical far-field tsunami, hit the Pacific coast of Japan. The tsunami height, 3 to 6 m, was not so high in comparison of such near-field tsunami as the Meiji and Showa Tsunamis. The countermeasures are three-surface-armored coastal dikes, sea walls and the tsunami breakwaters, the first one in the world, at the mouth of the Ofunato Bay.

In 1968 when all urgent Chilean Tsunami defense countermeasures were completed, the Tokachi-Oki Earthquake Tsunami struck Hokkaido and Sanriku Region. Fortunately, its tsunami height was not higher than the crown height of just completed structures, and there were no damages. But unfortunately, many person including coastal residents became to believe that there would be no threat of tsunami in the future, forgetting such huge tsunamis as the Meiji and Showa events.

The 1993 Hokkaido Nansei-Oki Earthquake Tsunami hit. The tsunami 11 m high devastated Okusiri Island, after overflowing the seawalls 4.5 m high. This fact called for serious reflection to the conventional method after 1960 that relied mainly on structures.
In 1997, “A Guidance on Reinforcement of Tsunami Disaster Prevention Countermeasures in Local Disaster Prevention Planning” was agreed by National Land Agency and other six government offices concerned tsunami disaster prevention planning. The guidance recommends the combination of three components: defense structure, tsunami-resistant town development and defense system.