For the lessons to be learned from the Past Disasters ～Based on the Study Tours to the Sanriku Area affected by the Great East Japan Earthquakes of 3.11～

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INTRODUCTION

The joint teams of Tokyo City University Aoyama Laboratory and Environmental Research Institute Inc. have surveyed the affected areas (Sanriku Areas) of the 3.11 Earthquake and Tsunami by visiting there several times from April to November 2011. It was noticed that we could not apply what we have learned from the past disasters repeatedly attacked the same coastal zones of Tohoku District where thousands of people and houses became victims. Following are the past Tsunami Disasters of the Sanriku Areas (the coastal zone of Tohoku Areas).

- 26 May 869 : Jyogan Sanriku Tsunami
- 28 December 1611: Keicho Sanriku Tsunami
- 15 June 1896: Meiji Sanriku Tsunami
- 3 March 1933: Showa Sanriku Tsunami
- 11 March 2011: The Great East Japan Earthquake

Table.1. Estimated Number of Victim of Tsunamis

Prefecture	Municipality	The Great East Japan Earthquake 2011	Meiji Sanriku Tsunami 1896
Iwate prefecture	Kuji city	4	669
	Noda village	38	258
	Fudai village	1	1,010
	Tanohata village	33	98
	Iwaizumi town	7	367
	Miyako city	544	1,739
	Yamada town	853	2,790
	Otsuchi town	1,450	900
	Kamaishi city	1,180	8,181
	Ofunato city	449	3,143
	Rikuzentakata city	2,098	845
Miyagi prefecture	Kesennuma city	1,411	1,467
	Minamisanriku town	987	1,013
	Ishinomaki city	4,003	193
	Onagawa city	953	1
Total		14,011	22,674

Rererence: Aoyama, Ikeda 1st, 2nd Study tour to Sanriku coast tsunami stricken area,
Source: Ministry of Home Affairs

Fig.1. Sanriku coastal-line (Iwate Pref.) Sanriku coastal-line (Miyagi Pref.)

Lessons from the History and Proposal of the Polliciies

(1) The Attacks of Earthquake and Tsunami has happened by the frequency of the once per 100 years, not once per 1000 years in the Sanriku area.

Comparing the data of Meiji Sanriku Tsunami and the Great East Japan Earthquake of 3.11 shown in the above Table, the numbers of victims of the both Tsunami disasters are almost the same scale except the data of Kamaishi City at Meiji Sanriku Tsunami. What is important here is that the scale of the damage caused by Tsunami will occur in the frequency of not once per 1000 years, but once per 100 years. This means we cannot identify the scale of Tsunami as “Unprecedented one”.

(2) Lessons to relocate the houses to the higher ground was not learned from the past Tsunami disasters！

After the study tour of the affected areas for more than 30 municipalities, we noticed that the most important lesson is to move or relocate the houses (residential areas) to the higher ground. The villages where the houses and the communal facilities moved into the higher ground areas were saved from the Tsunami even in the Sanriku coastal areas. Those ferroconcrete buildings constructed facing the shorelines, the buildings were totally affected by the Tsunami even they were not collapsed or fell down to the ground. We understand that the

houses of the fishermen and the related facilities have to be constructed in the coastal and the port areas, but it is quite necessary that the residential zone should be developed at the higher ground areas separated from the fishery industry facilities. Further, many school buildings were also severely affected by Tsunami this time in the communities of river side and coastal zone areas. Following is our proposal of land use images for the Sanriku Areas. These are the images, but it is necessary to be considered based on the actual landscape, geography and other related physical and social conditions of the target Municipality.

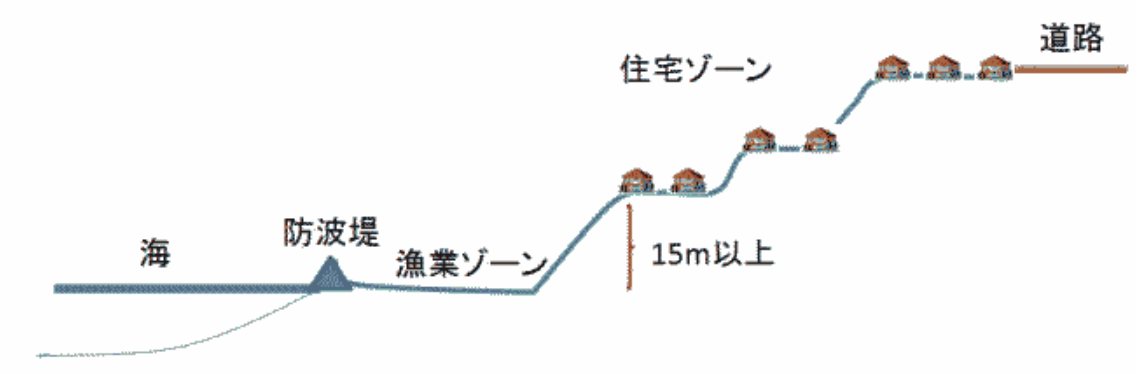

Fig.2. Image of relocation to high ground (1)

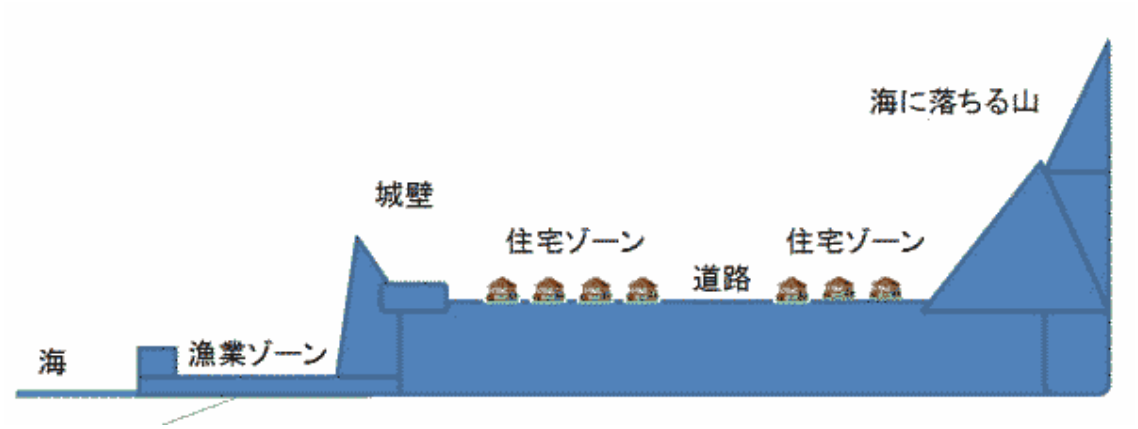

Fig.3. Image of relocation to high ground (2)

(3) Management of Radioactive waste

Fukushima Prefecture where Fukushima Nuclear Power Plant was caused the serious accident is now facing the difficult problems how to treat the huge amount of radioactive polluted wastes especially in the coastal zone. To solve this problem, we are proposing following ideas for not to disseminate the pollution nationwide. The waste contains not only radioactive substances, but also other pollutants such as dioxins, asbestos, heavy metals, hazardous chemicals like pesticides and various oils spilled from the oil and gas tanks of the affected areas. It is absolutely important to treat the waste in the affected areas under centralized management with responsibility-taking systems.

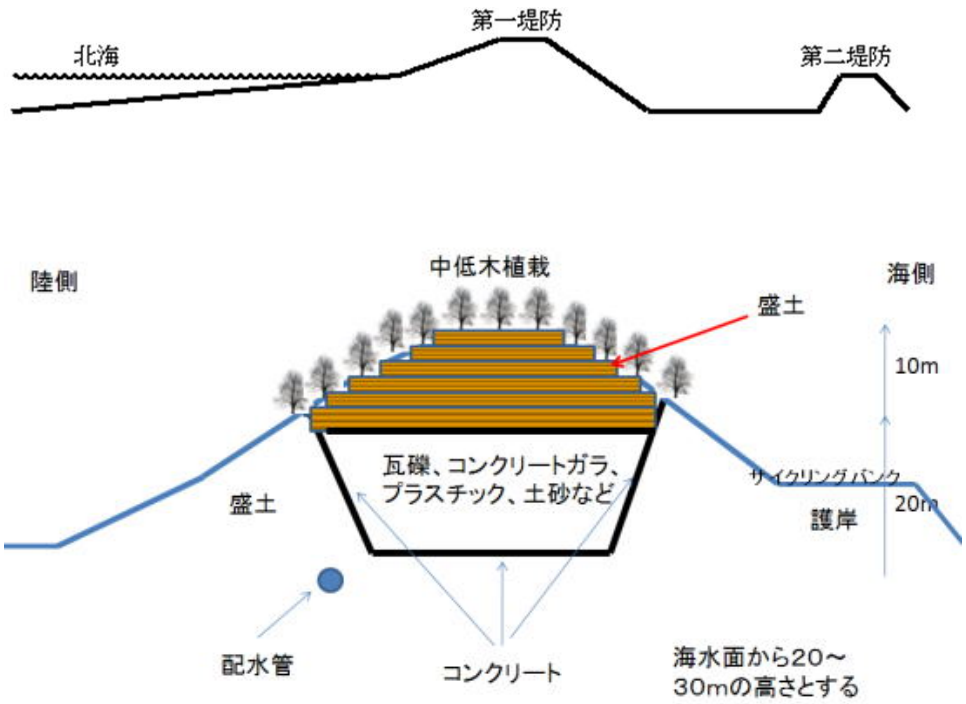

Fig.4. Image of radioactive waste management site

(4) Land Use Plan, Land Use Regulation and Architectural Requirements should be reviewed！

The 4th proposal is the urgent requirement for national and local Governments to review the present land use related legal systems and the Plans. It is not effective to escape from the Tsunami by indicating the dangerous zones on the hazard maps of the municipalities. What is important is the strict legal restriction of land use and permit control of development for the vulnerable or dangerous areas such as coastal zone and slide areas of the hill side. Once the citizens lose their house by Tsunami, it will be the biggest disaster for them by losing all of their properties.

(5) Existence of breakwaters and tide embankments made of steel and concrete weakened the awareness of citizens for tsunami disasters

The fifth lessons from our inspection of the suffering sites is that large scale breakwaters and tide embankments made of steel and concrete could not prevent damage caused by the tsunami. Although some of them may have weaken the damage or delay the tsunami attack arrival, according to the interviews to the victims we conducted in person, in many cases the existence of large breakwaters and tide embankments made them feel safe and turned out to have delayed their evacuation.

The lesson from the “3.11” disaster is that even huge and costly breakwaters and tide embankments cannot prevent tsunami damages. Land-use control and community planning which urges the residential area move from low-level ground near coast-line to high ground area is more essentially important measure than fighting natural disasters with steel and concrete.

Fig.5. The breakwater at the entrance of Kamaishi bay destroyed by the tsunami (Construction cost: 120 billion yen)

Fig.6. The tide embankment at Kojirahama fishing port in Touni Town, Kamaishi city, destroyed by the tsunami

(6) Keeping awareness of disaster and conducting regular evacuation drills are necessary

The sixth lesson is having drills to their evacuation sites, on to higher ground, held regularly by each community, as well as making the evacuation place commonly known to including small children. According to our field study, in Okawa elementary school case, in which over 70 students were kill by tsunami, if they had run up a hill near the school they would have been safe. The causes of the tragedy were unguarded mind and assumption that tsunami would not have reached to their place, and lack of reaches as a measure of precaution. Unlike nuclear reactors' accidents, the evacuation places or direction from tsunami disasters have been already clear. They say well prepared means no worries.

(7) Bring out the best in strengths of Sanriku Saw tooth Coast-line.

There is beautiful and precious environmental resource in Sanriku coast-line, such as a national park, historic sites and scenic places known as beautiful tourist spots. However, unlike

Sorrento Peninsula and Costiera Amalfitana in Italy, the administrative plans for natural resource preservation in Japan are usually not considered the harmonization with community life style and activities with those beautiful precious environmental resources and historical and cultural resources in Snariku area.

In Italy scenic places are harmonized with people's life and work. They have long historical and cultural backgrounds and are full of energy together with local citizens. On the other hand, in Japan scenic places are registered as nature conservation area, national park or semi-national park and nature is more prioritized than people's life.

Fig.7. Residential area on elevated grounds in Sorrento Peninsula, Italy

(8) To move forward (Measures for Livelihood Rehabilitation)

It has been around nine month since the earthquake occurred. About 72,000 evacuees have moved to temporary housing and are taking a step forward to rebuild. On the other hand there is a fact that the number of tragic suicide by evacuees is increasing. Even when the physical damage is the same, the traumas they are suffering are different, so they have to be carefully taken care of.

In the stricken areas destroyed seawalls and roads have been being repaired quickly, while energy, human resource and budget which are required to support people seem to be far low enough. The survivors must be the most important resource of their community. The life in the coastal area is always with the ocean.

Hasty restoration construction project by sectionalism government should be avoided. Taking care of evacuees and their mind must be prioritized. Not by providing one way or inducing construction restoration project, but by listening to the evacuees' opinion carefully and make their rebuilding community together is required.

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