

## Vulnerability Assessment Based on the Disaster Risk Reduction Plan for Typhoon Disasters in Taiwan, Japan, and United States

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According to a concept discussed in a previous study, vulnerability consists both of the so-called inner factor and the outer factor. Inner factor pertains to the community conditions in a hazardous area, while the outer factors are those outside of the community that affect the loss. How inner factors in a community can change the probability that the loss occurs is clarified in these past studies. On the other hand, it is apparent that outer factors in communities are also the main reason that cause loss, especially those associated to the Disaster Risk Reduction Plan (DRRP) designed and executed. The main purposes of the study are to interpret the differences of the DRRP between Taiwan, Japan, and the United States and to clarify how DRRP cause an effect to the areas exposed to a specific natural hazard.

DRRP is the plan which is designed for mitigating any kinds of natural and technologic disasters and is cooperated by government associations, organizations, and enterprises. We considered the differences from the comprehensive disaster management, including recovery, preparedness, mitigation, and response, which was mentioned by Federal Emergency Management Agency (FEMA). Therefore, the results are shown as following (Fig.1),

a) The DRRPs,

The DRRP framework, governmental associations, and the legislation were list in this part. Here we found that the main concept of Taiwan DRRP is based on the one of US, but the association in the emergency and normal times is based on the one in Japan.

b) Before Disaster Occurs (mitigation resource),

Different members of ministry deal with strategies for mitigation and preparedness in Japan and Taiwan. On the other hand, Department of Homeland Security is a professional association to deal with the disaster matters in the US.

c) During Disaster Occurs (emergency responses),

The emergency associations during the disaster are mainly focused on. The member of ministry, researchers, and the public organizations are well-coordinated in Japan. National Incident Management System (NIMS) and National Response Plan (NRP) are two important associations to connect the Federal associations in the US.

d) After Disaster Occurs (recovery).

Resources used for recovery come from the central government in Japan and Taiwan. On the other hand, the local government (ex. states) has the responsibility to manage the resources in US.

Factors	Taiwan	Japan	US	
The whole plans	The mitigation department in central government in the normal time	None	The disaster prevention agency	
The whole plans	The original act of the mitigation and emergency program	Disaster Prevention and Response Act	Basic plan for disaster prevention	
The whole plans	Association when the emergency occurred	3 levels, Country or City/ Municipality directly under the jurisdiction of the Central Government or Country/ Country	3 levels, Village/ City/ Country	
The whole plans	The content of disaster plans	Disaster Prevention and Response Act includes most of the steps. The other departments of central government do not need to make the detail. But the local government have to make the manual according to the local characteristic	Basic plan for disaster prevention only includes the summary direction of the mitigation program. The departments of the government have to make the detail of the mitigation program individually.	US Federal Response Plan includes every steps, plans and detail of the mitigation program. There is not necessary to make the detail program.
Before the disaster occurs- Mitigation Resources	Strategies support the resident	None	Some Acts instituted for limiting the landuse and development	
Before the disaster occurs- Mitigation Resources	Insurance support	None	The insurance for flood, earthquake, and fire disasters.	
During the disaster occurs- Emergency Response	The scale and the association	The prime minister is the head of the mitigation program. When there is emergency, the prime minister make the decision.	The head of the mitigation department make the comment, and the prime minister make the decision.	
During the disaster occurs- Emergency Response	The levels to manage the disasters	The response associations held by central and local governments. The central government have to manage the disasters.	The response associations held by central and local governments. The central government have to manage the disasters.	
During the disaster occurs- Emergency Response	Associations support the disaster management	Some of the local organizations support the disaster management. However, there is no act or regulations for the local organizations.	Many local organizations support the disaster management, which is clearly list in the Acts.	
After the disaster occurs- Recovery	Mitigation Funding	There is funding for mitigation program. But there is no funding for emergency, when the disaster occurs, the second disaster is easy to occur.	Each department manages the own funding for mitigation, individually.	
After the disaster occurs- Recovery	Resources	The resources come from central government.	The resources come from central government.	

Fig 1 The differences on DRRP of Taiwan, Japan, and the United States

In the future study, the strategies for flood disaster are considered. We find out the insufficient from the law, legislation, and the strategies for protecting and managing water resources in Japan and Taiwan.