



Establishment and Practical Application of Flood Warning Stage in Taiwan's River

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In the face of extreme flood events or the possible impact of climate change, non-engineering disaster prevention and early warning work is particularly important. Taiwan is an island topography with more than 3,900 meters of high mountains. The length of the river is less than 100 kilometers. Most of the watershed catchment time is less than 24 hours, which belongs to the river with steep slope and rapid flood. Every year in summer and autumn, several typhoon events invade Taiwan. Typhoons often result in rainfall events in excess of 100 mm/hr or 250 mm/3hr. In the face of Taiwan's terrain and extreme rainfall events, flooding is difficult to avoid. Therefore, most of the river has embankment protection, so that people do not have to face every year flooding caused by economic and life and property losses. However, the river embankment protection is limited. With the increase of the hydrological data, the design criteria for the embankment protection standards in the past was 100 year of flood return period and is now gradually reduced to 25 or 50 year of flood return period. The river authorities are not easy to rise the existing embankment height. The safety of the river embankment in Taiwan is determined by the establishment of the flood warning stage to cope with the possible increase in annual floods and the impact of extreme hydrological events.

The flood warning stage is equal to the flood control elevation minus the flood rise rate multiply by the flood early warning time. The control elevation can be the top of the embankment, the design flood level of the river, the embankment gap of the river section, the height of the bridge beam bottom, etc. The flood rise rate is consider the factors such as hydrological stochastic and uncertain rainfall and the effect of flood discharge operation on the flood in the watershed catchment area. The maximum value of the water level difference between the two hours or five hours before the peak value of the analysis result is decided by this rate. The flood early warning time is divided into two levels, the first level is 2 hours, evacuation time for the public, the second level is 5 hours for the implementation of unit preparation time. Finally, The flood warning stages are practical application in 20 water level stations have been incorporated into the flood early warning system of the Danshuei river basin in Taiwan.