The Research of Typhoon Flood Investigation

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Abstract. In recent years, the extreme rainfall occurs quite often due to the global climate change, resulting the more serious typhoon disasters. In particular, the loss of flood is the most relevant information that should be analyzed right after the typhoon. In other words, it can be represented by both the information of estimating and compensating the loss of flooding. The information of such types of flood investigation in a typhoon can be used to do all kinds of projects related to reduce or even prevent flood hazard. The study area of research is located in the city of eastern Taiwan in which flood is the most serious natural disaster. We have collected these investigation information of typhoon flood within three years to analyze and show the overall result, that could be used as a reference of improving flood resilience.

1. Introduction

Yilan country lies in northeastern Taiwan and belongs to the subtropical monsoon climate. As its eastern side faces the sea, and the northeast monsoon winds are prevalent during autumn and winter, this has created continuous rainfall. In addition, this region frequently comes under the onslaught of typhoons during the summer, and the spring rainy season often last for several continuous months. Due to the effects of the weather, flooding frequently occurs in Yilan. Floods not only have impacts on the environment and property, but can also cause numerous disasters. An example was Typhoon Megi in 2016, when strong winds and heavy rains resulted in disasters in multiple sites in Yilan. The rainfall on Taiping Mountain of Yilan even reached 1010 mm. Agricultural crops in parts of Yilan also rot due to the effects of flooding, resulting in severe economic losses [1]. Therefore, earlier notification of typhoon information could be used for pre-disaster and post-disaster preparation in the future, which could reduce the damage brought about by typhoons. When flooding occurs, it can easily cause significant loss of life and property. However in the past, rescue personnel relied on notification of the flooding situation by the public or relevant personnel. This resulted in missing the critical time for rescue operations and inability to be promptly informed of the changing flood conditions, such as the depth and areas affected by flooding. Therefore, real-time information and assessment of the flooding situation, providing information on rapid flooding, reducing errors in judgment due to information gap, and establishing the flooding relationships of each area based on hydrological data, are generally the more important areas aspects

The aim of this study is to collect flooding data of the flooded areas in Yilan, enhance water level monitoring facilities and data maintenance, upgrade real-time flooding information systems, provide real-time flooding information, in order to develop disaster response measures and to control the timing for issuing early warning and enhance the effectiveness of disaster relief.

2. Study Method

Field investigations of depth of flooding and flooded areas during a typhoon. Telephone interviews will be conducted and data from the various water level stations will be collected in

real-time (Fig.1). The study areas in the range of flooding mainly include low-lying areas such as Dezikou Creek, Meifu Drainage Canal, and Dongshan River [4].

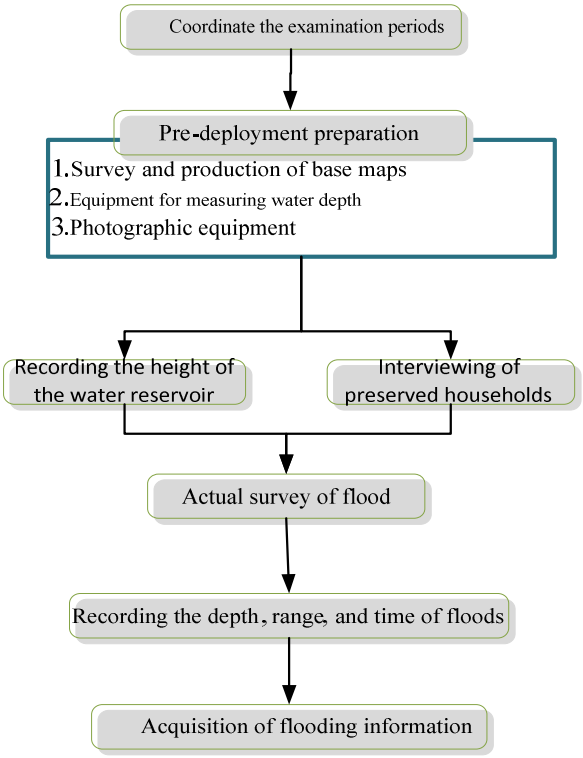

Fig.1,Study process

3. Analysis of Case Studies

The 2016 Typhoon Megi was used as an example. The typhoon was formed at the seas near Guam and gradually moved in a WNW direction. The Taiwan Central Weather Bureau determined Typhoon Megi to be a Category 7 wind whose highest wind speed at the center reached Category 13. The radius of the storm was 250 km and the center of the storm reached the seas of southeastern Hualian on September 27, 5 am. The center of the storm made landfall in Hualian City on September 27, 2 pm (Fig.2) [3].

Fig.2 Path of the Megi typhoon(Profile table of typhoon Megi ,2016.)

Using the Meifu Drainage canal as an example, water-level meters were set up in 5 easily flooded areas before the arrival of the storm (Table 1) [1]. On the arrival of the typhoon and resultant flooding, the information would be transmitted back to the system in real-time. Subsequent arrangements for the routes for follow-up flood investigation were also mainly in low-lying areas or frequently flooded areas, and the ranges of these were near the Meifu Drainage Canal (Fig 3) [2].

Table 1,The Information of The Water Stations
(Monitoring report of first river management Office ,2016)

Fixed value for floods / Name	(drain) [Unit: M]	(Embankment) [Unit: M]	(Road surface) [Unit: M]
Jung Nan Shing Wu Hau bridge	2.33	2.65	2.99
Shin Nan bridge	0.63	0.63	0.94
Sz Jie Tian Tz Tzai bridge	0.61	0.91	2.47
Mei Fu Fang Chausluice	0.48	0.78	1.141
Sz Jie Tian Tz Tzai bridge 2	0.91	1.16	1.561

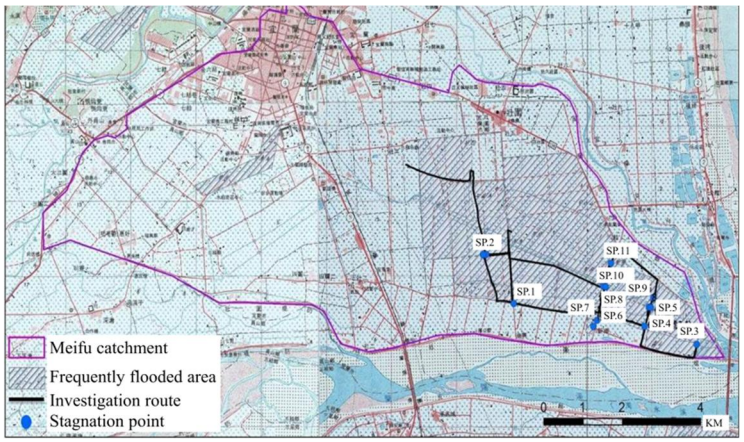

Fig.3 Routes of Investigation Zones(Preliminary investigation and report of Typhoon Megi (flood) ,2016)

The flood-prone towns in this region are Guting and Xinnan villages in Zhuangwei Township, Yilan County. From actual flood investigation and data monitoring, we found floods actually occurred in these areas, and the locations were Shia Juang Wu road and Mau Li Wu An bridge. The depth of the flood was 0.05-0.25 m (Fig 4) [4].

Fig 4 Ttyphoon Situation in Guting and Xinnan Villages(Flooding situation report of Typhoon Megi in Yilan County,2016.)

4. Conclusion and Recommendation

Investigations of typhoons and floods not only can provide rapid and real-time flooding information, it can also provide better understanding of the flood situation from the actual scene. This facilitates subsequent integration of information in order to provide more accurate information about the flood. The floods that occurred in Meifu Drainage Canal this time were mainly due to its low-lying terrain and flood discharge capacity being affected by rising water levels of the Yilan River. This resulted in insufficient capacity of agricultural fields in draining and collecting water, resulting in flooding due to inability to promptly drain water.

As some flood-prone areas in Yilan are prone to sporadic flooding in low-lying roads, it is recommended that the height of the roads be raised to improve this situation [4]. In addition, besides rectification of drainage, the drainage system response should be further evaluated and integrated water control measures (such as improving flood reservoirs, rainwater storage, etc.) should be implemented to increase flood protection capacity.

References

[1] First River Management Office, "Monitoring report of first river management Office ",2016.

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