Article

Case Study on Floods in Vietnam

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Abstract: Flood disasters rank the highest among natural disasters affecting Vietnam. The number of heavy floods recorded on the main river is rapidly increasing and occurring more irregularly and unpredictably, causing widespread damage, fatalities and high economic losses to the country. This calls for more effective actions from the Government to address further risks from these hazards.

Keywords: Flood hazards, flood risks, disasters, Vietnam.

INTRODUCTION

Vietnam is prone to many kinds of natural disasters, of which storms, floods and drought rank as the worst and most frequent, inflicting substantial human suffering, massive environmental, social and economic damages, and agricultural production losses. The country has around 331,000 km^2 of natural land, located in monsoon humid tropics, and is affected by both oceanic and continental climates. There are 2,360 rivers and streams that have lengths longer than 10 km. The coastal plains are not large but densely populated (60% of population) with many important and rather developed political, socio-economic centers. Total flow of rivers in Vietnam reaches 650 km^3 annually, equivalent to a flow depth of 960 mm. Ratio of flood and low flow varies from 1.5 to 30. Vietnam is at risk of flooding and storms every year. Flood disasters rank highest among natural disasters affecting Vietnam. Over 70% of the population of Vietnam is at risk, many severe flood cases were recorded from year 1945 to 2017.

STORMS AND FLOODS

The ENSO phenomenon is becoming more intense in Vietnam, making weather complicated and unpredictable. The number of heavy floods recorded on the main river is rapidly increasing. Floods have occurred irregularly and unpredictably over the past 12 years, with heavy floods happening more frequently (Figure 1). Examples include the main basin of Da River to Hoa Binh and Son La lakes during the periods of 10/2006, 10/2007, 11/2008, 10/2010,1/2013, 12/2013,1/2015, 12/2015 and 8/2017. Severe events such as the huge flash flood in May 2013 occurred upstream of Cau River and Bac Giang River. Recorded amplitudes were from 3-5 m, up to 7 m, which was the highest for that year.

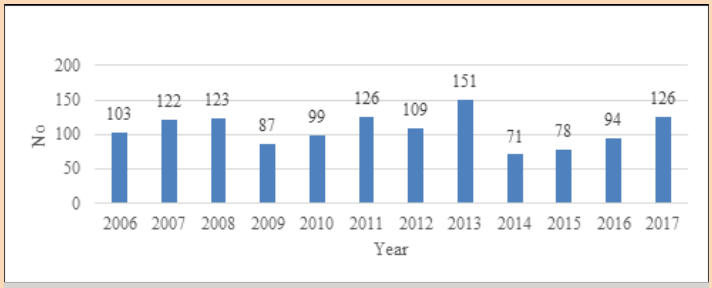

Figure 1: Number of flood events in major rivers.

In addition to flash floods, pluvial and fluvial floods also occur in many provinces of Vietnam. An example is the intense rain that occurred in July 2015.

This caused severe landslides that isolated many populated areas in Quang Ninh, Hai Phong, Bac Giang, Dien Bien, Thai Binh, Nam Dinh, Hai Duong, Thanh Hoa Provinces (Figures 2 and 3). The total loss caused by flash floods is more serious over the past 10 years (Figures 5 and 6). Many provinces are frequently damaged by flash floods. These inlcude Ha Giang, Lao Cai, Son La, Tuyen Quang, Cao Bang, Bac Can, and some other areas in Central Vietnam (Figure 6).

Figure 2: Number of flash floods nationwide from 2006 to 2017.

Figure 3: Peak Flood Value on the main basin from 2006 to 2017.

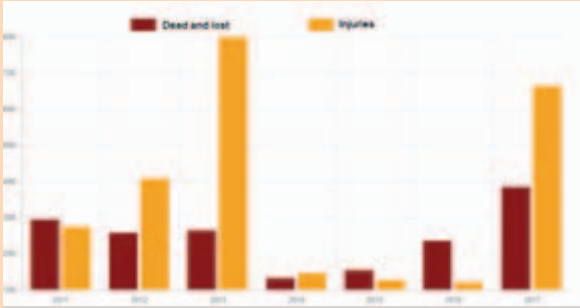

Figure 4: Deaths and injuries due to floods from 2011 to 2017.

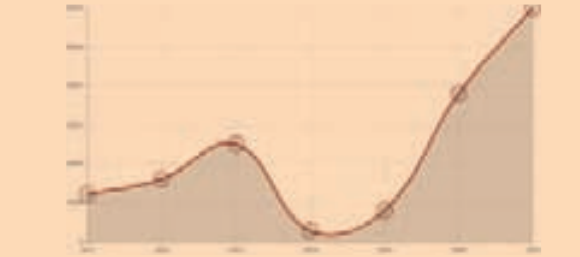

Figure 5: Economic losses due to disasters from 2011 to 2017 (Billions VND)

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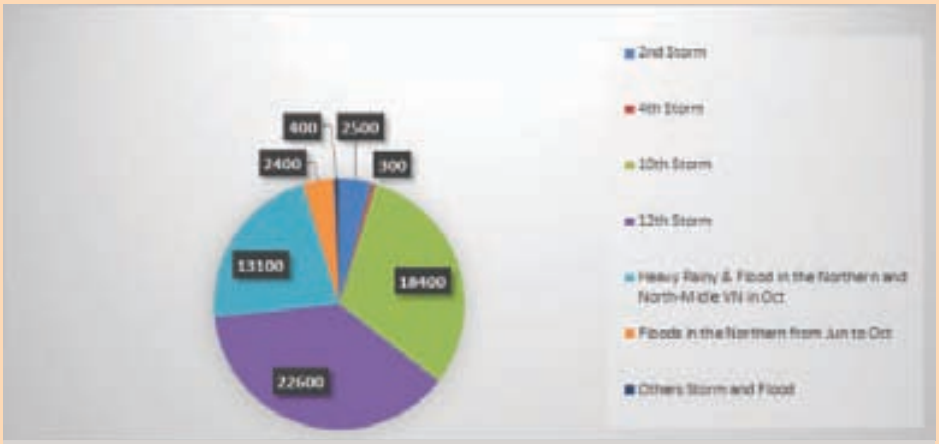

Figure 6: Economic Losses due to Storms and Floods, 2017. (Billions VND)

SOLUTIONS TO PREVENT AND REDUCE THE EFFECT OF DISASTERS

In dealing with disasters, Vietnam has applied many solutions that are implemented nationwide to prevent and reduce the impact of disasters. These include the following measures:

• *Legislative improvements.* The Law on Natural Disaster Prevention and Control 2013 included elements of disaster risk analysis and monitoring; Rule of Meteorological & Hydrological Administration in 2015 requires matching of disaster risk analysis with weather monitoring to strengthen the strategy of other ministries, cities and provinces in order to sustainably develop economy and society.

• *Education programs for society including information on type and risk of floods.* This helped societal engagement where people proactively participated in the disaster prevention strategy of the Government. Information on the four local actions was disseminated to all provinces and cities to quickly respond to disasters. They were on local force, local administration, local logistics and local supplies.

• *Adequate Infrastructure.* Plan and build hydrological infrastructure to provide water for society and economy as well as regulate water flow during floods and rainy seasons; refine river and sea dams to protect against annual floods and salinization; building of water-pumping stations and stream dividers.

• *Protect and plan more forests.*

• *Establish the combination force during disaster,* including military, local volunteers and civilians to join in the emergency; prepare boat and related rescue tools.

• *Improve capacity for flood forecasting*. Establish flood and flash flood warning and forecasting system on the big river system, where floods and flash floods frequently occur; improve the hydrological station network (automatic stations), rainfall estimation using conventional methods, satellite and radar; and more efficient use of hydrological and hydraulic models (e.g. DEM based distributed models).

• *Enhance Research.* Improve flood and flash flood mapping; set up Flood Warning Towers; and enhance capacity in forecasting techniques.

• *Request support from the Asian region countries and international partners.* Develop capacity on data acquisition, information extraction for flood analyses and risk reduction; use high resolution satellite data for flood prevention; continuously invest and build technology infrastructure, weather forecast system using AI and big data.

• *Continuously invest in weather monitoring, forecast and disaster warning systems.* Increase the number of rain measurement stations – target to the density of 40-120 km^2 per measurement point for the long term and 80 km^2 per measurement point for short term; set priority for consistent operation of weather radar systems; enhance ocean storm measurements with floating measurement stations; and for the long term, consider automated storm monitoring.

CONCLUSION

The threat of disasters in Vietnam is expected to rise continuously for many years to come. The Vietnam Government understands the risk of disasters to society and the economy, especially from floods and related phenomena. Thus, monitoring and prediction as well as methods to improve disaster response will be pursued. In addition to internal solutions, cooperation and experience from neighbouring countries such as Thailand will be sought. Collaborative research with international organizations will also be enhanced to support effective disaster risk reduction.

SOURCE

Unpublished flood statistics from Vietnam Meteorological and Hydrological Administration (http://www.nchmf.gov.vn)