# WATER-RELATED DISASTERS IN THAILAND FROM THE PERSPECTIVE OF THE WATER SECURITY INDEX.

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## ABSTRACT

Globally, disasters, i.e. droughts, floods, storm surges, earthquakes, and tsunamis, are a concern because they create enormous damages to countries. Again globally, the issues of disaster risks have been surveyed by many organizations. For example, the Asian Development Bank (ADB) launched the Water Security Index (WSI), University Bochum, the Institute for International Law of Peace and Armed Conflict (IFHV) presented the WorldRiskIndex 2019, and Germanwatch developed the Global Climate Risk Index (CRI). This paper discussed the Water-Related Disasters Index (KD 5) of Thailand, which is one of the Water Security Indexes of the ADB. The KD 5 is composed of (1) floods and windstorms, (2) droughts, and (3) storm surges and coastal floods. The objectives of the present paper were to analyse the water-related disasters in Thailand from the perspective of the Water Security Index. Thailand's the water-related disasters score of is 10.6 out of 20. Although the disaster risk in Thailand is not at the critical level compared to other countries worldwide, overall it can be seen that Thailand has moderate capability to manage risks. The Thai government has a large amount of data and information for protecting the disasters, but related institutions are lack of good management. This results in high economic losses from disasters and leads to decreases in the growth rate of the Thai economy.

**Keywords:** Water-Related Disasters Index, Water Security Index

## INTRODUCTION

Presently, damages of natural disasters, i.e. droughts, floods, storm surges, earthquakes, and tsunamis, are increasingly frequent and intensified, creating huge losses for countries. In addition, climate change stimulates high levels of such. Based on the study of the Centre for Research on the Epidemiology of Disasters (CRED) and the UN Office for Disaster Risk Reduction (UNISDR) from 1995-2015, the study presents that ninety percent of major disasters were weather related disaster: floods, storms, heat waves, droughts, and other weather-related events. Floods and storms cause severe damages to lower-income countries, whereas heat waves and extreme cold cause severe damages to high-income countries [1]. In addition, the development of countries are obstructed by the disaster. Base on the study of UNISDR, the economic losses from the disaster are estimated between $250 billion and $300 billion annually [1].

Globally, the issues of disaster risk have been surveyed by many organizations. For example, the Asian Development Bank (ADB) launched the Water Security Index (WSI), the Institute for International Law of Peace and Armed Conflict (IFHV) at Ruhr University in Bochum in Germany presented the WorldRiskIndex 2019, and Germanwatch developed the Global Climate Risk Index (CRI). Based on the WSI, it has presented that more than fifty percent of the Thai people access safe drinking water, safe sanitation, water service, but water

quality need to improved [2]. The IFHV has claimed that Thailand has capability to manage risks at a moderate level, therefore Thailand is at the moderate rank of 91 among 198 countries in the world [3]. Moreover, the CRI claims that Thailand is among the top 10 most affected countries by climate change [4].

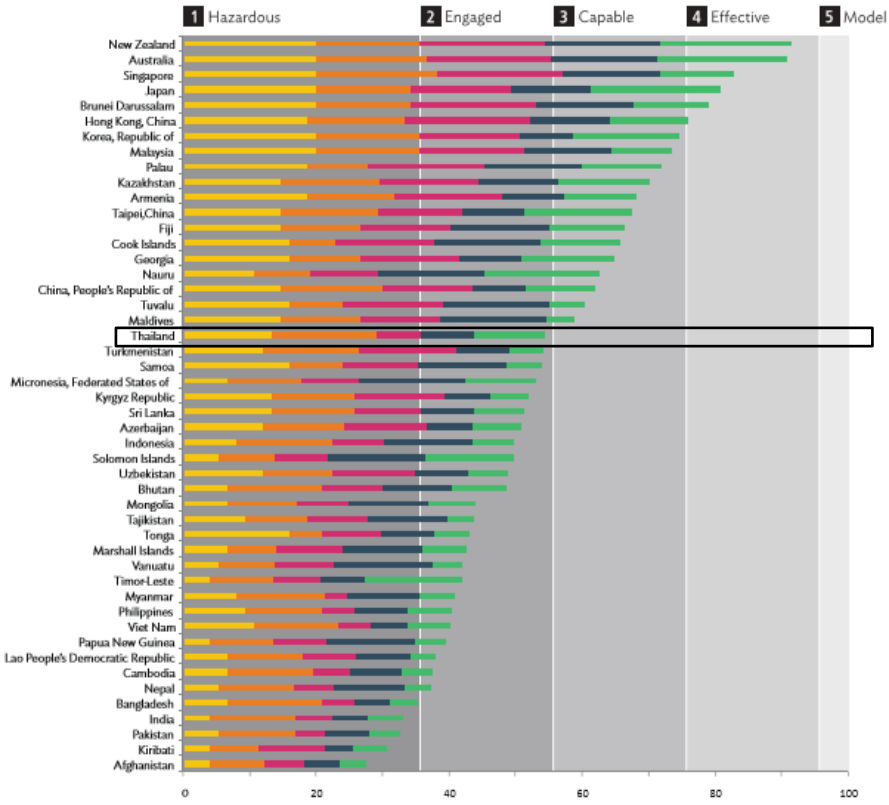


Fig. 1 National Water Security Index Score 2019,
Source: AWDO, 2016

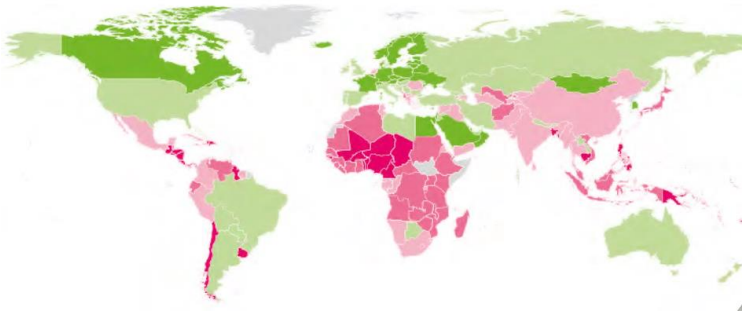

Fig. 2 WorldRiskIndex, 2019
Source: WorldRiskIndex, 2019

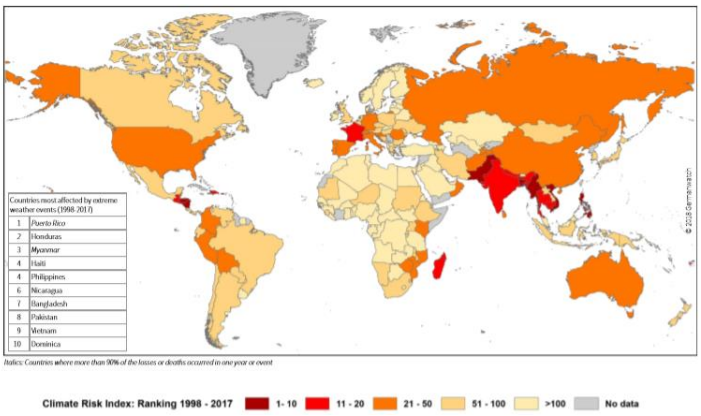


Fig. 3 World Map of the Global Climate Risk Index 1998–2017
Source: Germanwatch 2017

Although the disaster risk in Thailand is not at a critical level compared to other countries worldwide, overall it can be seen that Thailand has moderate capability to manage risks resulting in high economic losses from disasters. This has caused a decrease in the rate of Thailand's economic growth.

## OVERVIEW OF WATER RESOURCES AND DISASTERS IN THAILAND

Thailand is located in South East Asia in a tropical area. The country's climate is divided into three seasons: rainy (May to October), cold (November to February), and dry (March to April). Floods occur in the wet season and droughts in the dry season. The total renewable water resources per capita (cubic meters per year) is 6,353. This is lower than the world average of 22,167 mm3 [5]. Therefore, the amount of fresh water is sufficient for the normal season, but the dry season will encounter water shortages. At present, approximately 2 billion people encounter water stress based on UN regulations that require a minimum of 1,700 cubic meters per year, which means that the water available in the country drops below 1,700 m3/year [6]. The average water availability per person in Thailand is approximately 2,868 mm3 per year, and this means that the Thai people have available water use to meet their demand. In Thailand, the total water demand is 147,747 million m3 separated into 77% for agricultural use, 3% for domestic use, 1% for industrial use, and 18% for the ecological system [7]. It can be seen that the agriculture sector consumes the largest amount of the water but generates only 8.3 percent of the GDP, while the proportion of water usage in the industrial sector is only 1 percent but generates 33.6 percent of the GDP—the second largest income for the country [8]. Based on World Bank data, which separated the country into 4 groups of income—low income (< $1,025), lower-middle income ($1,026 - 3,995), upper-middle income ($3,996 - 12,375), and High income (>$12,375), Thailand is classified in the upper middle income group with US$ 6,610 per capita per year [9]. General information on the economy, climate and hydrology in Thailand can be seen in the following table.

**Table 1.** General information on the economy, climate, and hydrology in Thailand

| Item | Details |
|---|---|
| Population, persons (2018) | 69,428,524 |
| Area, sq. km. | 510,890 |
| GDP, billion current US$ (2018) | 505.0 |
| GDP per capita, US$ (2018) | 7,274 |
| Rainy season | May to October |
| Dry season | March-April |
| Precipitation share per capita, mm. per year | 1155 mm |
| Annual rainfall, mm. | 1,629.5 |
| Water demand, million m3 | 147,747 |
| Agriculture, million m3 | 113,961 (77%) |
| Industry, million m3 | 1,913 (1%) |
| Service, million m3 | 4,783 (3%) |
| Ecological system, million m3 | 27,090 (18%) |

The causes of disasters in Thailand are both natural and manmade disasters. Among 8 types of disasters (tropical cyclones, earthquakes, thunderstorms, landslides, storm surges, forest fires, and floods and droughts) in Thailand, floods and droughts, which are water-related disasters, are the most frequent and cause the greatest economic loss for the country. From 1995-2015, the extreme event that created the most damage was the flood crisis in 2011, with the cost of 23,839 million baht; and the greatest damage from drought was 2,915 million baht in 2013 [10]. In addition, in 2017, the south of Thailand faced heavy floods from extreme rainfall that created great harm for the people and large areas: villages, farmland, roads, and schools. The cost of the damage can be seen in Fig. 4.

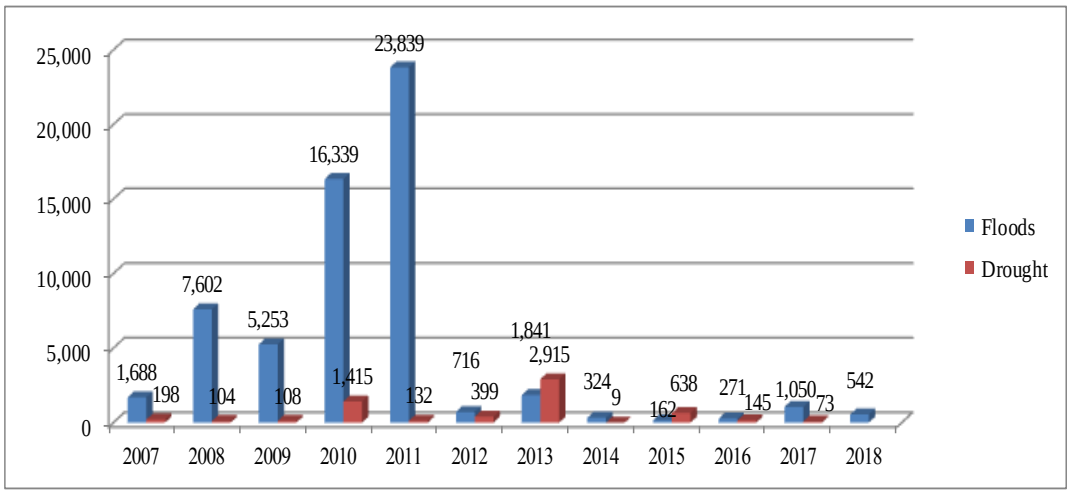


Fig.4. Floods and Droughts in Thailand, Year 198
Source: NESDB, 2018

## WATER -RELATED DISASTERS INDEX

Water can be claimed as a basic need for human being and important to economic development, therefore water security is a vital considering. Base on UN definition of water security, people deserved to have enough safe water for using in their daily life in terms of quantity and quality. They should be protected from water pollution, water-related disasters, and having good governance related to water issues. [11]. Fig. 5 shows the 5 key dimensions of the Water Security Index, i.e., Key Dimension 1—Household Water Security; Key Dimension 2—Economic Water Security; Key Dimension 3 —Urban Water Security; Key Dimension 4—Environmental Water Security; and Key Dimension 5—Resilience to Water-Related Disasters. There are 5 stages of national water security: 1= Hazardous, 2= Engaged, 3= Capable, 4= Effective, and 5= Model. The scores are scaled from 1 to 20.

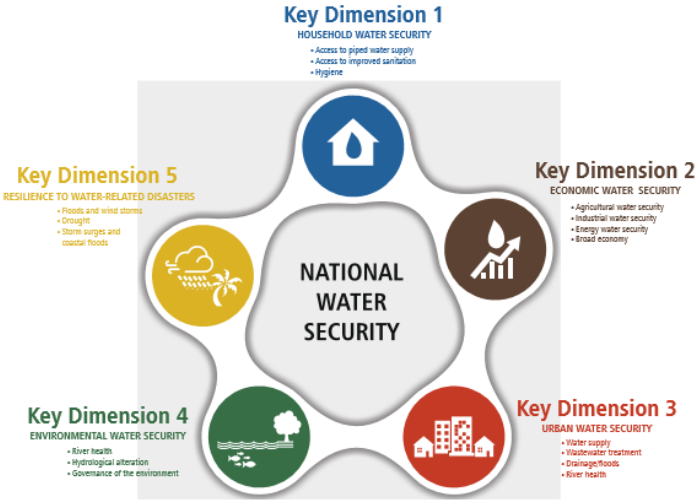


Fig.5. Water Security Framework of Five Interdependent Key Dimensions
Source: AWDO2016

Focusing on the water-related disasters index, (KD5), it presents the performance of a country in managing with the disasters. The index consists of three sub-indicators that analyses the country's tolerance on (i) floods and windstorms, (ii) drought, and (iii) storm surges and coastal floods, as seen in Table 2.

**Table 2.** Indicators and Sub-indicators for Key Dimension5

| KD | Index | Indicator | Sub-indicator |
|---|---|---|---|
| KD5 | Resilience to water-related disasters | • Floods and windstorms | -Deforestation rate<br>-Reservoir capacity per area |
| | | Droughts | -Agricultural part of GDP<br>-Reservoir capacity per area |
| | | Storm surges and coastal floods | -Population proportion living in area below 5 meters<br>-Infrastructure (paved road density) |

Source: AWDO 2016

At present, increasing on resilience of water-related disasters is a big concerns, in 2015 the Sendai Framework for Disaster Risk Reduction 2015–2030 is adopted with the objective to decreasing the risks and building the resilience in various areas ie., policies, people, process [12].

## RESULTS AND DISCUSSION

Thailand had a water-related disasters index's score of 10.6 out of 20 and at the level 2 of engaged [1]. It means the country needs to arrange good management to solve water related risks [1]. From the three sub-indicators; storm surge /coastal flooding, flood and windstorms, and drought, the scores are 3.3, 2.5, and 2.1, respectively. It can be interpreted that the storm surge has good management. Drought is the lowest handle, as be seen in Table 3.

Table 3. Thailand's Water Security Index

**Table 1.** General information on the economy, climate, and hydrology in Thailand

| List | Scale | Thailand |
|---|---|---|
| Floods and windstorms | 0–5 | 2.5 |
| Drought | 0-5 | 2.1 |
| Storm surges/coastal flooding | 0-5 | 3.3 |
| KD5 Total | Max 15 | 7.9 |
| KD5 Score | Max 20 | 10.6 |
| KD5 Index | 1-5 | 2 |

Source: AWDO2016

## CONCLUSION

Thailand has many kinds of disaster, but the major water related disaster that creates loss to the country's economy is flooding. The Thai government has sufficient data and warning system, but good management of related agencies are lacking. Therefore, Thailand need to improving ability in managing the risk in various aspects as country's policy, nation budget, and human resource. In addition, investing in water related disaster infrastructure is a factor that increasing growth for the country [13].

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