

2011 Thailand Flood Execute Summary

In 2011, Thailand witnessed its worst flooding in half a century, leaving severe impairments to the country's economy, industrial sector, and society. Factors that contributed to flood crisis range from natural to manmade. Consequently, floodwaters inundated 90 billion square kilometers of land, more than two-thirds of the country, ranking the natural disaster as the world's fourth costliest disaster as of 2011. (*Geo-Informatics and Space Technology Development Agency*)

Diagram of Flooded Areas

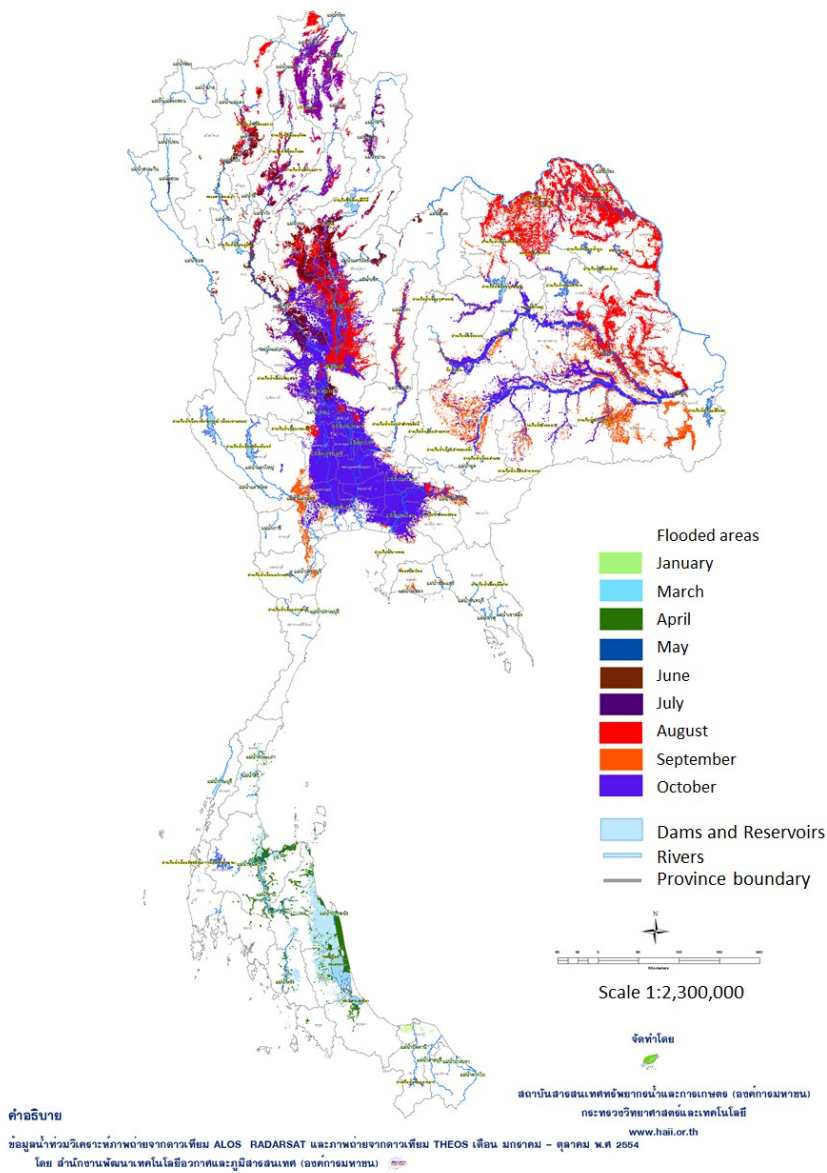


Table of 2011 Monthly Flooded Areas

Month	Area (Square kilometer)	Area (Rai)
January	189,607,196.54	118,504.50
February	-	-
March	1,963,221,266.48	1,227,013.29
April	22,925,700,697.00	14,328,562.94
May	122,616,438.84	76,635.27
June	739,073,358.93	461,920.85
July	1,415,716,433.11	884,822.77
August	9,100,495,393.35	5,687,809.62
September	24,604,894,396.54	15,378,059.00
October	29,591,106,876.98	18,494,441.77
Total	90,652,432,057.77	56,657,770.01

I. CAUSE

Thailand's tropical savanna climate leaves Thailand vulnerable to flooding during its monsoon season—this year in particular. The accumulated precipitation from January to October 2011 was 35% higher than average in consequence of La Niña—a phenomenon that, as a result of lower surface ocean temperatures, usually brings increased and, in this case, earlier than expected precipitation—, five key tropical storms, and monsoon troughs. Heavy rainfall raises the level of water in waterways, producing overflowing and flooding to adjoining areas. Another consequence of the heavy rainfall is the exceeding amount of water entering particularly Bhumibol and Sirikit dams that reached an overloading capacity. High tides and storm surge in the Gulf of Thailand during the months of October and November also raised the water level and hindered the draining system into the gulf. Lastly, obstacles like aquatic plants create a natural blockage in the sewer system.

Table 1.1 Cumulative rainfall in 2011

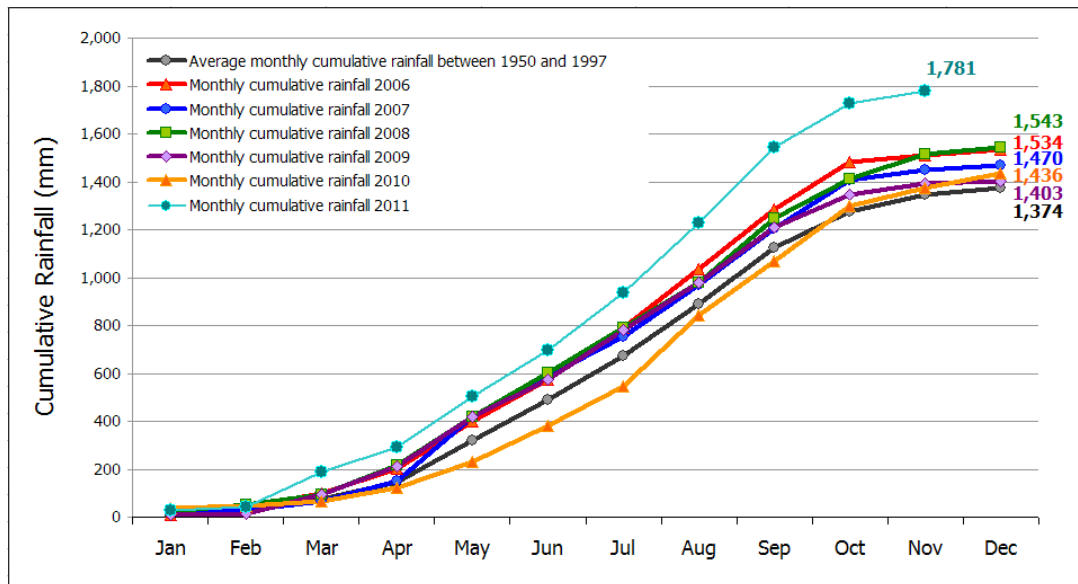


Table 1.2 Average Annual Cumulative Rainfall Comparison (mL per year)

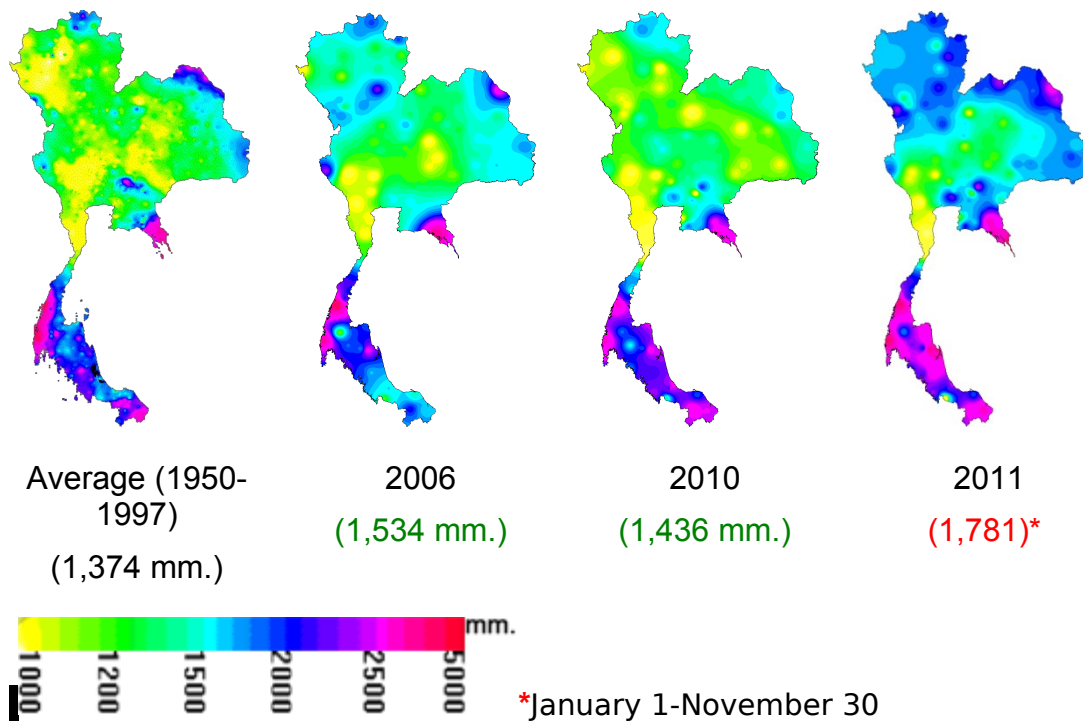


Table 1.3 Bhumibol Dam Graph
Bhumibol dam 2011

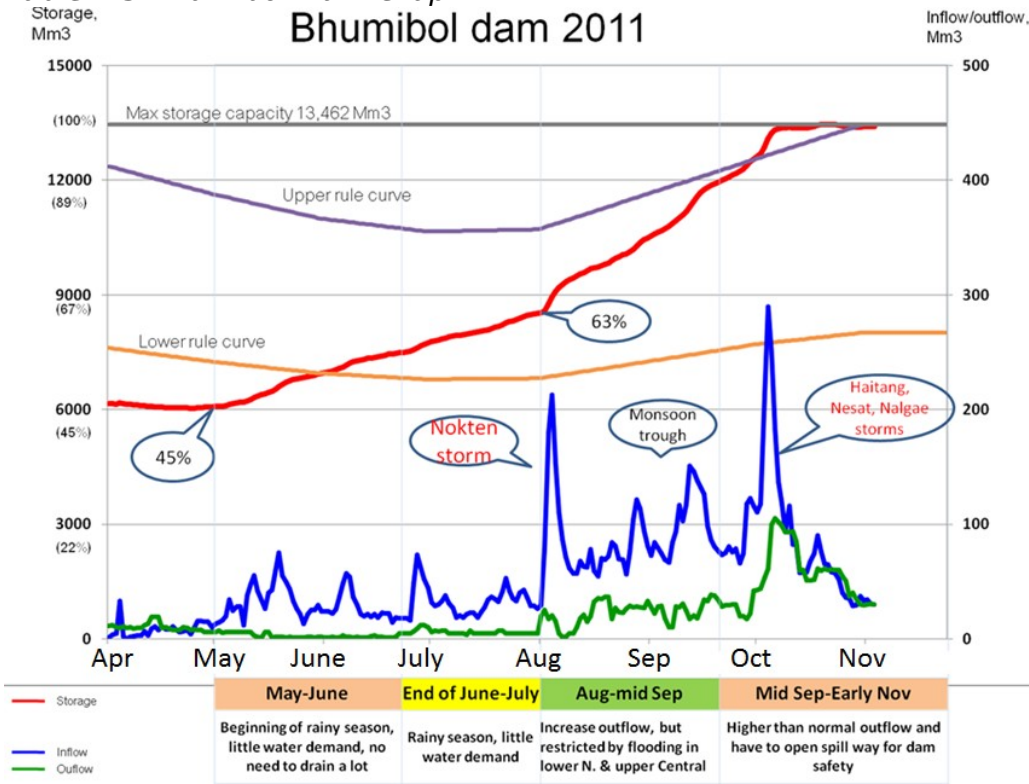
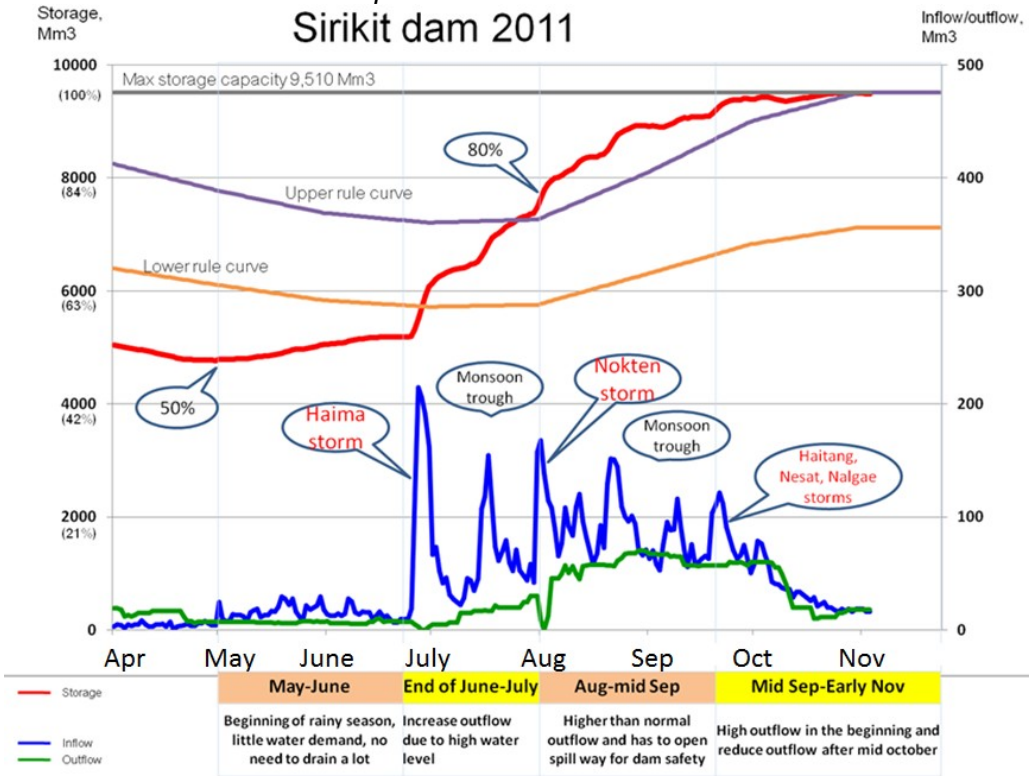


Table 1.4 Sirikit Dam Graph
Sirikit dam 2011



Human factors that factored in the flooding crisis stem largely from deforestation. Deforestation erodes soil, which settles at the bottom of waterways, rising the level of water and consequently causing flood. Forests also acts as a natural regularator of discharge; forest can alleviate flooding by controlling downstream flow by natural flow resistance like dead woods, twigs, and tree trunks.

Table 1.6 Deforestation

Year	Forest Land area in square kilometers	Deforestation area in square kilometers	%
1961	273629		
1973	221707	4327	0.84
1976	198417	7763	1.51
1978	175224	11597	2.26
1982	156600	4656	0.91
1985	150866	1911	0.37
1988	143803	2354	0.46
1989	143417	386	0.08
1991	136698	3359	0.65
1993	133554	1477	0.31
1995	131485	1018	0.2
1998	129722	588	0.11
2000	170111	-16	-3.94
2004	167591	630	0.12
2005	161001	6590	1.28
2006	158653	2349	0.46

II. IMPACT

The flood crisis impacted a total of 4,039,459 households and 13,425,869 people; 2,329 houses were completely destroyed, while 96,833 houses were partially damaged; death toll reached to 657 people and 3 were reported missing. As of December 2011, World Bank estimated damages to have reached THB 1,440 billion. Because of the major affects on the industrial sector, unemployment has stemmed due to the closure of multiple factories. The economy continues to be in a delicate position as the flood impact has reduced investors' and insurance companies' confidence, which will ultimately lead to an increase in unemployment and poor economy. Tourism, another substantial revenue in the economy, suffered a loss of THB 3.71 billion and a fall of 3.2 million tourists according to the Tourism Ministry. Although domestic tourism will recover prompter than international tourism, international tourism revenue contributes twice that of domestic tourism. Urgent measures have been instigated, but the journey in recovery and enhancement is years ahead

2.1 Damage report from the Department of Disaster Prevention and Mitigation. Ministry of Interior

Month	Provinces		Casualties	Rainfall (mm)	Average rainfall 2005-2010
June	4 Chiang Rai, Nan, Phayao, Tak	4 provinces in the North	2	North - 217.81 mm	North - 170.12 mm
July	10 Phrae, Nan, Chiang Rai, Mae Hong Son, Uttaradit, Phichit, Nakhon Phanom, Udon Thani, Nong Khai and Bungkan	6 provinces in the North and 4 provinces in Northeast	-	North - 252.85 mm, Northeast - 278.29 mm	North - 181.04 mm, Northeast - 196.70 mm
August	36 Chiang Mai, Nan, Phrae, Lampang, Lamphun, Mae Hong Son, Uttaradit, Tak, Kumpangpetch, Phetchabun, Loei, Nong Khai, Nakhon Phanom, Mukdahan, Udon Thani, Bungkan, Sakon Nakhon, Roiet, Kalasin, Prachuap Khiri Khan, Nakhon Nayok, Prachinburi, Sukhothai, Phichit, Phitsanulok, Nakhon Sawan, Ang Thong, Phra Nakhon Si Ayutthaya, Chai Nat, Ubon Ratchathani, Chiang Rai, Rayong, Phangnga, Phuket, Ranong, and Surat Thani	14 provinces in the North, 10 provinces in the Northeast, 4 provinces in the Central, 3 provinces in the East, 3 provinces in the Southwest and 2 provinces in the Southeast.	55	North - 292.99 mm, Northeast - 333.38 mm, Central - 194.42 mm, East - 326.53 mm, Southwest - 366.69 mm, Southeast - 221.56 mm	North - 228.29 mm, Northeast - 252.08 mm, Central - 164.29 mm, East - 224.98 mm, Southwest - 243.60 mm, Southeast - 162.75 mm
September	23 Sukhothai, Phichit, Phitsanulok, Nakhon Sawan, Uthai Thani, Chai Nat, Sing Buri, Ang Thong, Phra Nakhon Si Ayutthaya, Lopburi, Sara Buri, Suphan Buri, Nakhon Pathom, Pathumthani, Nonthaburi, Ubon Ratchathani, Khon Kaen, Srisaket, Surin, Chacheongsao, Nakhon Nayok, Prachinburi and Chiangmai	4 provinces in the North, 4 provinces in the Northeast, 12 provinces in the Central, and 3 provinces in the East.	205	North - 325.30 mm, Northeast - 351.60 mm, Central - 237.07 mm, East - 442.64 mm	North - 245.40 mm, Northeast - 253.42 mm, Central - 242.95 mm, East - 327 mm
October	26 Phichit, Phitsanulok, Nakhon Sawan, Uthai Thani, Chai Nat, Sing Buri, Ang Thong, Phra Nakhon Si Ayutthaya, Lopburi, Sara Buri, Suphan Buri, Nakhon Pathom, Pathumthani, Nonthaburi, Samutsakhon, Bangkok, Ubon Ratchathani, Khon Kaen, Srisaket, Surin, Roiet, Maharakam, Kalasin, Chacheongsao, Nakhon Nayok, and Prachinburi.	2 provinces in the North, 7 provinces in the Northeast, 14 provinces in the Central, and 3 provinces in the East.	427	North - 137.37 mm, Northeast - 178.82 mm, Central - 200.76 mm, East - 250.88 mm	North - 156 mm, Northeast - 145.46 mm, Central - 198.93 mm, East - 216.74 mm

III. SOLUTION

The following proposed strategic actions implemented tactically in urban settings, rural areas, industrial estate, and agricultural land will relieve future inundation and prevent a reoccurrence of the flood crisis:

- 1) A well-organized city planning system, or the control of the use of land and design of urban environment, must be implemented with emphasis on the development of the drainage system in order to control flood levels; the government must issue clear regulation for usage of land, especially in flooding areas.
- 2) The use of Light Detection and Ranging technology to interpret the ground level and other useful data will supplement this procedure. Reinforcing the riverbanks will reduce the risk of water overflowing into the adjacent regions. The information technology system must be renovated in order to obtain significant data in a real-time manner or, at least, updated frequently (recommended monthly). The IT system should monitor water levels in order to determine and maintain an equilibrated water level. The data garnered from the IT system should be educated and shared to the public community to raise awareness of the water situation.
- 3) Additional waterway canals and existing waterways must be further developed. Utilizing the “monkey cheek” design—large water-holding areas—in key provincial locations, the concept of dredging to deepen water ways), and enhancement of water gates, floodways, and dams will improve control of the inflow and outflow of water and balance the water-resource management. The residents who reside in the areas near the “monkey cheek” will be compensated.
- 4) Pollution and deforestation laws must continue to be reinforced in order to upkeep the functionality of the drainage and sewer systems, especially in industrial estates, and control the downstream of water flow, respectively.
- 5) The government must centralize authority to help coordinate with various government agencies to improve communication and cooperation among the water management private sectors to draw optimal synergy from all relevant parties.

There is no doubt over the need for enduring water management, in which safety, nature, and economic prosperity are taken into account.