

## **SITUATION ANALYSIS OF FLOOD DISASTER IN SOUTH AND SOUTHEAST ASIA – A NEED OF INTEGRATED APPROACH**

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**ABSTRACT:** Floods are known to cause enormous damage and large-scale loss of human life. South Asia being the most populated region in the world lends itself to high vulnerability to the caused damages than any other part of the world. The aim of this paper is to provide overview of flood disaster trends in the Asia region and countries during past 50 years (1960-2009) and recommended integrated flood management wheel concept and ‘no-regret’ adaptation strategies to reduce impact of such extreme events on society and ecosystem. Based on available datasets, it was observed that the South Asia is more vulnerable to flood in the region. The number of flood events across various parts of Asia increased by three folds and six folds between 2000-2009, when compared to period 1980s and 1970s, respectively. The analysis also revealed that India is more vulnerable to flood events with about 68% of the total socio-economic damages caused compared to other countries in the region, followed by Bangladesh.

**Key words:** Floods, South Asia, Adaptation strategies, Flood management

### **1. SITUATION ANALYSIS OF FLOOD DISASTER IN ASIA**

South and South Asia regions are the most populated region in the world and partly as a consequence, it is facing many environmental, and social challenges. It is exposed to various kinds of natural hazards, including earthquakes, cyclones, floods, tsunamis, droughts and other devastating events and in result posed a serious and growing challenge to regional development. There is evidence of prominent increases in the intensity and frequency of many extreme weather events such as heat waves, tropical cyclones, prolonged dry spells, intense rainfall, tornadoes, snow avalanches, thunderstorms, and severe dust storms in the region [1]. Few recent evidences of natural disasters show that this part of the world is facing serious challenges against natural hazards [2]. Vulnerability due to natural hazards (floods) is defined as the extent to which a system is susceptible to floods due to exposure, a perturbation, in conjunction with its ability (or inability) to cope, recover, or basically adapt [3]. A study conducted on flood vulnerability index (FVI) indicates that the FVI is highest for the South Asian and African regions [4]. The study also indicates high FVI for river basins of India and Bangladesh.

Table 1 presents an overview of the number of events, number of deaths and estimated damage cost caused as a result of flood disaster in the sub-regions of Asian continent. It reveals that South Asian region experienced the maximum flood events (i.e. 40% of the total events that occurred during 1960-2009), thus, becoming highly vulnerable to the consequent damages. About 66% of the deaths due to flood events were reported from the South Asian region. However, the estimated costs (US\$ '000) of damages were reported to be the highest in the Eastern Asia (70% of the total estimated costs).

Table 1: Overview of situation caused due to flood in Asia (1960-2009)

Damage	Eastern Asia	South-East Asia	South Asia	West Asia
Events	305	440	563	110
Deaths	46247	18861	133803	2893
Estimated cost (US\$' 000)	171977706	12147992	56468900	6454776

Figure 1 shows the increasing trend in flood frequency in all the sub-regions of Asia based on 50 years datasets (1960-2009). It is observed that the flood disaster events for Asia region has increased by three folds for the period 2000-2009 when compared with period 1980-1989, and has increased almost six folds when compared with period 1970-1979. There was not much difference in flood events for Asia as whole for the period 1960-1969 and 1970-1979. The region witnessed a drastic increase between 1970-1979 and 2000-2009.

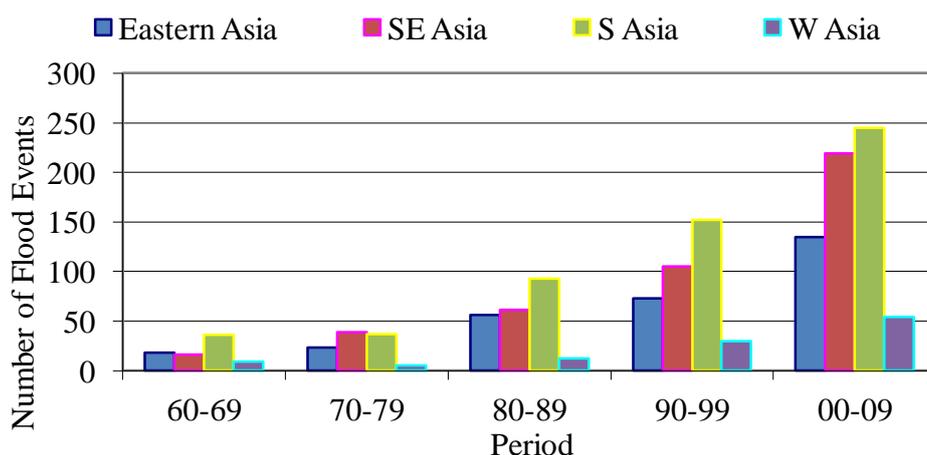


Figure 1: Flood disaster trend in Asian region in the last 50 years (1960-2009)

Increasing flood events across South and Southeast Asia is indicative of its high vulnerability to flood events and subsequent estimated damage cost when compared with other sub-regions of the Asia (Figure 2). There is 1.5 to 2 times increase in flood

events during 2000- 2009 when compared with period 1990-99. South Asia is observed to highly vulnerable to flood events considering number of events, number of deaths and estimated damage cost (Table 2).

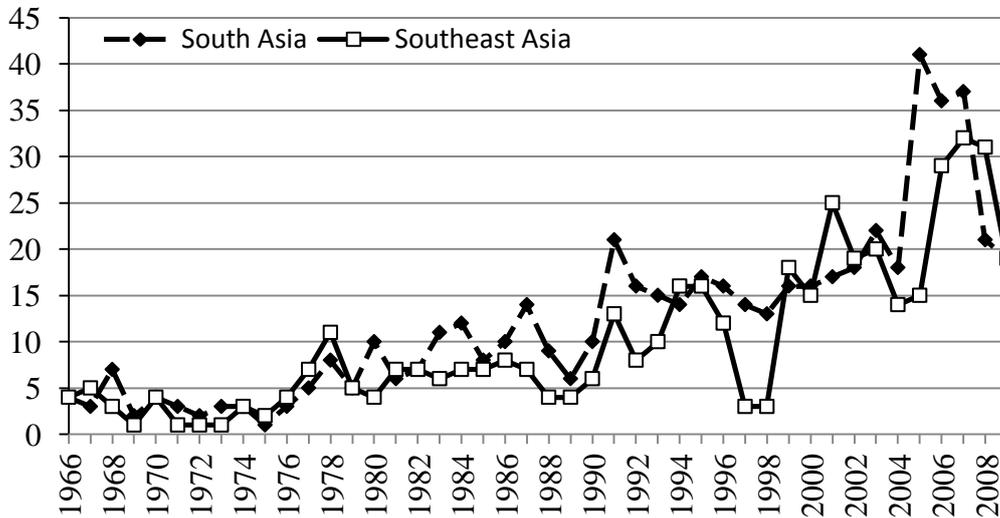


Figure 2: Trend in annual flood events for South and Southeast Asia (1960-2009)

Table 2: Flood events, deaths, estimated damage cost in South and Southeast Asia

	South Asia			Southeast Asia		
	Events	Deaths	Estimated Damage (USD ,000)	Events	Deaths	Estimated Damage (USD ,000)
1960-69	36	21604	321600	16	1206	95011
1970-79	37	40635	3434672	39	2191	734142
1980-89	93	23462	10166234	61	3173	773672
1990-99	152	26275	21890422	105	5337	5104482
2000-09	245	21827	20655972	219	6954	5440685

Table 3 presents the situation analysis of past flood events and their socio-economic impacts on South. It is revealed that India is more vulnerable to disasters due to flood events, compared to its neighbouring countries. The number of total affected is found to be highest for India followed by Bangladesh. India faced about 68% (794762132) of the total affected in South Asia, followed by Bangladesh with 27% (i.e. 308951042). India was also observed to have faced maximum number of deaths (45 percent) followed by Bangladesh (41%). Number of people declared homeless was also the highest for India i.e. 58%. The estimated costs of damages due to flood events

(US\$ '000) for India have been reported to be approx. 86% (i.e. 31996188) of the total estimated damage cost in the South Asia.

Table 3: Number of floods, and their socio-economic impacts in South Asia

Damage	Events	Deaths	Total Affected	Estimated cost (US\$ ,000)	Homeless	Injured
India	212	58274	794762132	31996188	15610000	1569
Bangladesh	80	52077	310086682	396000	4255362	102392
Pakistan	61	9062	42889283	2968178	4234415	2073
Nepal	33	5869	3571489	1037242	84925	1137
Afghanistan	59	3593	1134031	396000	48550	707
Sri Lanka	48	1070	11103635	374364	2806601	1002

Table 4: Number of floods, and their socio-economic impacts in Southeast Asia

Damage	Events	Deaths	Total Affected	Estimated cost (US\$ ,000)	Homeless	Injured
Cambodia	13	1127	9533614	328100	275805	53
Indonesia	131	5758	8718254	2418047	172800	251748
Lao PDR	18	434	3448340	39608	17600	150
Malaysia	35	311	1232058	1076100	64000	0
Myanmar	18	398	2427378	134955	304156	110
Philippines	99	2986	14367768	1230249	556091	626
Thailand	61	2699	32473621	4152408	161483	3691
Vietnam	60	5143	26344504	2768525	336650	1314

Similarly, Table 4 presents the situation analysis of past flood events and their socio-economic impacts on Southeast Asia. The number of total affected is found to be highest for Thailand followed by Vietnam and Philippines. Thailand faced about 33% of the total affected in South Asia, followed by Vietnam with 27%. Maximum number of death was observed for Vietnam (27%) whereas Philippines and Thailand was almost at same stage with 15% deaths when compared with Southeast Asia situation. Number of people declared homeless was also the highest for Philippines (58%). The estimated damage cost (US\$ '000) for Thailand have been reported to be approximately 34% (i.e. 4152408) followed by Vietnam in the Southeast Asia.

## 2. INTEGRATED FLOOD MANAGEMENT

Developing countries with limited economic resources, lack of infrastructure; insufficient levels of technology, information and skills; coupled with inequitable empowerment, and access to resources has inadequate capacity to adapt and is highly

vulnerable to flood disasters. Enhancement of adaptive capacity is a necessary for reducing vulnerability to such disasters and their impacts. For a comprehensive, integrated and futuristic policy framework on adaptation with respect to flood events, the following recommendations and ‘no-regret’ adaptation strategies based on the proposed ‘integrated flood management wheel’ concept (Figure 3) need to be seriously considered.

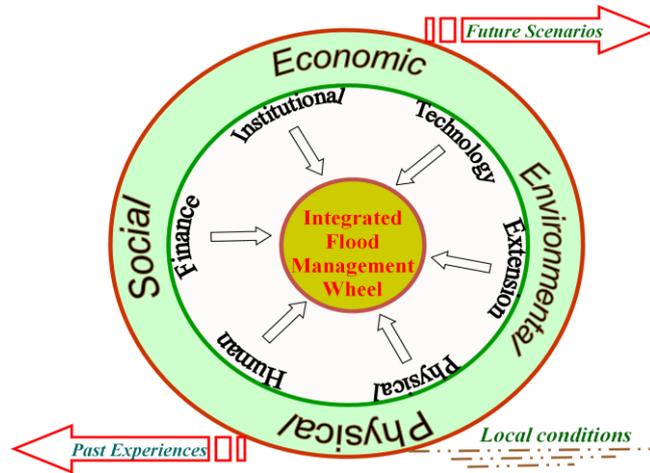


Figure 3: Integrated Flood Management Wheel

This integrated flood/water management wheel concept takes physical, social, economical, and environmental factors into consideration. Availability of and access to the desired resources is the key to the overall development of a region, and reduction of damages caused. Thus, planning and strategies development must consider the past flood events, experience gain through those events, and future scenarios (climatic, socio-economic development). It is also worth to focus on local conditions (topography, weather, population, area, land-use, institutional set-ups, etc.) at the time of planning and implementation of flood protection measures. It may include improvement of the infrastructural facilities, widening of the knowledge base to promote national and regional initiatives and institutes that foster research, extension of knowledge base for better technology development.

Keeping the above three facts in mind, the following recommendations have been made:

- 1) The traditional flood control and flood management methods already in place in the country need to be streamlined, modernized and made effective to take care of more frequent, intense and potentially unprecedented floods.

- 2) Integrated farming systems with suitable blend of aquaculture and agriculture can provide better livelihood means for the vulnerable communities, and, if appropriately designed, it can be more resilient to extreme events.
- 3) Existing flood forecasting methodology may be refined by using computer based comprehensive catchments forecasting models using real time, remotely sensed data and GIS.
- 4) The water level forecast needs to be converted into potential area inundation forecast so that relief and rehabilitation response is better targeted.
- 5) Updating and digitization of flood plain zoning maps and better enforcement of flood plain zoning regulations shall considerably mitigate the flood impacts.
- 6) Encourage community participation in flood management, as they will have better knowledge of local needs and potential and building quick resilience. This shall require setting up of a community oriented and empowered institutional framework backed by strong capacity building measures.
- 7) Need a cross-sectoral integration between engineers, planners, economist, ecologist and policy makers
- 8) Engineering systems should be developed further to reduce the effects of floods according to the demands of socio-economic development
- 9) Climate models output need to become locally useable through downscaling and bias correction methods
- 10) Development of Knowledge storage and sharing platform with proper updating facilities

### **3. CONCLUSION**

South and Southeast Asia are highly vulnerable to flood events that not only devastate lives and livelihoods, but also undermine economic growth and development of the region as a whole. Climatic changes are likely to exacerbate the damages caused by extreme events. In order to combat the extent of damages caused, an integrated flood management wheel has been proposed. Certain recommendations and no-regret adaptation strategies have also been suggested. Streamlining of the existing traditional flood control methods, increased reliance on non-structural measures, integrated farming systems, refinement of models based on remote-sensing and GIS along with flood plain zoning regulation, and strengthening community participation have been

highlighted. Further work on updating the mechanism for data sharing and enhancing the knowledge base, along with downscaling climatic models with refined prediction systems and higher resolution data could prove to be useful.

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