An Assessment of Multidimensional Aspects of River Flood in India: A Theoretical Review

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Abstract

Flood is a bulk of water which upsurges to overflows an area which is not normally submerged. In hydrological sense a flood may be any relatively high water level or discharge above an arbitrary selected flood level or flood discharge. Thus inundation is explicit and damage is implied due to flood. Flood result from a number of basic causes of which the most frequent are hydro-meteorological in nature. Excessively heavy and prolonged rainfall is the most common universal cause of flood. Flood may also occur due to other causes. However it is evident that climatological cause is the most dominant. While the frequency, duration and magnitude of monsoon floods are determined by numerous factors. There are so many geomorphological characteristics of flood that primarily determine the channel size and shape, the nature and type of erosion and deposition, as well as the nature of aquatic life and riparian vegetation. Large floods of India are primary force responsible sculpturing of the landscape, and for the formation of valleys, flood plains and deltas. The socio –economic importance of flood is very much considerable in case of agricultural production during the post flood in India. Except it, erratic monsoonal rainfall caused flood of moderate to very heavy magnitude and brings immense miseries and loss of lives and properties of the flood plain dwellers of different river basin of India.

Keywords: Flood, River, Hydro-meteorological, Geomorohological, Socio-economic, loss

Introduction

According to Chaw (1956), flood is relatively high flow which overtakes the natural channel provide for the runoff. The principal generic flood types (Ward, 1978) occurring in the subcontinent are rainfall floods and rainstorm floods. These types of floods are the most frequent in the annual flood series for most rivers of the subcontinent. Rainfall floods result from heavy to very heavy rainfall due to active to vigorous monsoon conditions for a number of days (e.g. 1954 mega flood on Kosi, 1962 mega flood on Brahmaputra and 1978 mega flood on Damodar). Rainstorm floods are associated with low pressure system such as low depressions and cyclonic storms.

Meteorological Aspects of Flood

Floods have been occurring almost regularly every year in different parts of country during monsoon season (or summer season), which stretches for four months from June to September. Flood phenomena can be described in various way by the flood workers.

Geomorphological Aspects of Flood

A flood plain is normally dry land area adjacent to a stream channel, which is likely to be flooded in rainy season. The erosive power of river curves a channel large enough to carry most frequent flow and the flood plain receives stream flow in excess of channel capacity. The areal extent of inundation is related to the magnitude of flood discharge and the physical characteristics of river valley. In humid climate flood may occur in every two to three years and high magnitude floods occur at an interval of decades on a very large number of Indian rivers. Channel formation, erosion of the bed and bank material and transfer and storage of sediment are dependent to a large extent on floods.

Spatio-Temporal pattern of Flood

Although large floods occur on almost all the rivers, the areas with great risk to human life and property are (i) Ganga plain (ii) Brahamputra Valley (iii) Coastal plain etc. In those areas not only is the area liable to floods high, but frequency at which the frequency at which the floods occur is also high. In general human life in the Ganga plain is significantly affected by the flood hazard more often than Peninsular India. Where the areal extent of the flood prone land is limited and the recurrent interval of big flood is greater. From perspective of areal distribution of monsoon floods some river basins are more frequently affected and the extent and intensity of damage is high. Long and well documented historical flood records for the sub-continental rivers are not available. There are however several references to large floods in India. But the flood magnitudes of historic floods are difficult to estimate and hence the historical information cannot be used to understand the floods response to long term climatic variability.

Seasonal Flood

These are floods, which occur during different seasons. As summer monsoon season brings large amount of rainwater and causes floods, since major storm activity occurs during this season. As for example, the southern half of the Indian peninsula experiences floods during the winter season.

Generally, floods are caused directly by heavy rainfall over a drainage basin. However, floods can also occur due to usually high water level of lakes in which that river fall. This type of floods occurs in the Jhelum river when the water of lake is higher than the river (Dhar and Nandargi, 1989).

Flash Flood

This is frequently associated with violent, conventional storms of a short duration. It causes huge loss of life and property. Orissa and Andhra Pradesh is favourable place of origin of this type of flood.

Single Event Flood

This common type of flood occur by widespread heavy rain of a longer duration of 2 to 3 days over a drainage basin. Such heavy rain associated with cyclonic disturbances such as storms, slow moving depressions are the important features during summer monsoon season. Then the moisture content of air is very high. In India, most of the floods are of this category.

Multiple Event Flood

Sometimes heavy rainfall occurs when successive weather disturbances follow each other closely. Here floods are caused by the passage of a series of upper air circulation, low pressure areas and depressions, for example, floods in Indo-Gangetic plains and Central Indian region. In 1970, two upper air cyclonic circulations and a deep depression created active monsoon conditions over the Narmorda basin resulting highest ever- recorded flood at Gurdeswar site on September 06, 1970.

Flood Characteristics

Flood constitute an integral and inseparable element of the natural cycle of the flow of seasonal and monsoonal rivers, that primarily determine the channel size and shape, the nature and type of erosion and deposition , as well as the nature of aquatic life and riparian vegetation. Large floods are primary force responsible sculpturing of the landscape, and for the formation of valleys, flood plains and deltas. Clearing of the debris delivered by the tributaries, scouring of the channel bed and banks, deposition of the fine sediments and nutrients on the flood plains and the recharge of soil moisture are some of the important and essential tasks performed annually by floods (Ward 1978, Collier et al 1996). Without periodic floods, river channels would chock with sediments and over grown life but would be potentially more dangerous for people occupying the river banks, flood plain and deltaic regions. Realizing the importance of floods for the benefit of the environment in and around the regulated and heavily engineered Colorado river, a control flood was staged in 1996 (Collier et al 1997). The experimental flooding proved that rivers significantly benefit from periodic floods.

In India, several programme to control floods were initiated after the launching of the National Flood Control Programme in 1954 and after the constitution of the Rastriya Barh Ayog (RBA) or National Flood Commission in 1976 (CWC 1991). The programmes primarily included engineering structural measures (CBIP2013). Before independence only about 5280 km. of embankments existed along different rivers of the country. However by March 1993 aboutv16200 km. of embankments, 32000 km. of drainage channels, 906 town/ village protection works and raising of 4700 villages above the high flood level had been completed (CWC 2011). As a result of the flood control programmes in India which is implemented in the last three decades about 14.4 million hectares of land has benefitted.

Effect of Flood

Flood Losses

Flood losses may be defined as the destruction or impairment, partial or complete, of the value of goods or services or of health, resulting from the action of floodwaters and the silt and debris they carry. The flood losses are as diverse as the action of floodwaters and the silt and debris they carry. The flood losses are as diverse as the economic interest of modern society. Again it is easy to define, that flood losses are difficult diverse as the economic interest of modern society. Again it is easy to define, that flood losses are difficult to set down in monetary terms. Flood losses are categorize into two according to the action

(a) direct losses and

(b) indirect losses. According to nature of the losses will be (a) tangible and (b) intangible.

The direct damage consists of losses of physical property or even destruction of intangible matter. The following damages are to be considered as direct damage.

Urban Property: Damage to manufacturing industries, equipment's, stock, stores and residences are the immediate consequences of flood.

Agricultural Property Losses :

Crop loss or agricultural loss is main aspect of direct flood loss. Damage to crops and pasture, farm buildings, livestock, fences farm, equipment, growing crops , and crops in storage and damage to the land itself through scour or sedimentation – are the main parameter of agricultural losses.

Losses of Communication:

Flood directly disrupts highways and railways network. Damage to roadbeds, bridges, railways, equip stores create very much problem transit from one place to other.

Public and Semi-public losses:

Damage to bridge, airports, schools, community halls and similar structures are fallen in this category.

Utilities:

Damage to telephone, telegraph, radio, gas, electricity or power lines, water lines, sewerage facilities and street cars and bus transportation are included into the flood losses.

Indirect damage due to flood is a major source of trouble. It is chiefly the losses of business and services and include many intangibles. Real enough to the individual or to the community, it may be offset by gains to others. The indirect losses chiefly involve loss of business, pay or profits.

Conclusion

In the beginning human being tried to adjust with the prevailing natural hazard which for the time being dislocate their economic activity. As a solution to flood drainage the concept of multipurpose river valley project came into being in the 20th century. The Government of India initiated different project to reduce the flood effect of River in different parts of India. Only structural measures not yield sufficient result to mitigate flood. So, the idea of non-structural measures has become the most important aspect of flood hazard mitigation.

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