ISSN: 2249-894XIMPACT FACTOR : 5.2331(UIF) VOLUME - 6 | ISSUE - 12 | SEPTEMBER - 2017

REVIEW OF RESEARCH

FLOOD HAZARD IN MITHILA PLAIN: CAUSES AND CONSEQUENCES

Rakesh Bihari
Research Scholar ,
P.G. Department of Geography, L. N. Mithila University,
Darbhanga, India.

ABSTRACT

In this research article, an attempt has been made to trace out the causes and consequences of the flood hazard in Mithila Plain and to determine flood prone areas. Mithila Plain is consisting the flood plains of rivers descending from the Nepal Himalayas to the Ganga in the south. Mithila Plain has been classified as the play ground of rivers. Its low elevation above sea level, moderate to heavy rainfall concentrated within the monsoon months, huge catchments in the Himalayas combine to make the region vulnerable to severe floods annually causing huge loss to mankind, settlement and infrastructural facilities. The present study grew out of the suffering faced by the people in general on account of this perpetual problem of Mithila Plain.

KEYWORDS :*Flood Hazard, Mithila Plain, Nepal Himalayas, Playground of rivers, Disaster Management.*

INTRODUCTION

Floods are complex phenomena. They are the result of the interaction between man and environment. Therefore, the definition of flood is not as simple as it appears to be, because it is viewed differently by different people. However, floods can be defined as "a relatively inundation in the lowland which may result there form." (Rashtriya Barh Ayog,1980). It is generally a level of water in a stream which is associated with the spilling of excess water beyond the bank-full capacity of a river and is also the beginning of damage to the physical and cultural landscape. It has been the concern of man since his advent on the earth. The whole sequence of human civilization right from the beginning contains records of man's constant endeavour to escape the fury of floods. At the same time it also tells us the story of his failure to evade the destructiveness of the floods. Nature is generally blamed for it but the failing are man-made. The fertile valleys have always lured him towards their great potentialities only to drive him back or to inflict distress upon him for trespassing into their domain during the floods. The benefits accruing from the flood-plains have far out-weighed the damages inflicted by the floods. This perennial problem of flood, however, has not been fully understood by the planners, politicians, agriculturists, engineers, and the hydrologists. The phenomenon is both physical and socio-economic a direct concern of geographers.

The present study grew out of the suffering faced by the people in general on account of this perpetual problem of Mithila Plain and also with a sense of challenge, if geographers could contribute towards a correct appraisal of the problem and suggest remedial measures to ease this problem, keeping in view the maintenance of ecological balance of the region.

HISTORY OF FLOODS AND CONSEQUENCES:

By virtue of geo climatic conditions about 60 percent of the landmass of India is prone to flood and it is the most common of all environmental hazards. Flood regularly claims over 20,000 lives per year and adversely affects around 75 million people worldwide (Smith, 1996). The reason lies in the widespread geographical and geo morphological distribution of the tracks of rivers and floodplains and low-lying coasts, together with their longstanding attractions for human settlement. Death and destruction due to flooding continue to be all too common phenomena throughout the world today, affecting millions of people annually, especially in the low lying and coastal regions. Floods cause about one third of all deaths, one third of all injuries and one third of all damage from natural disasters.

In a country like India where about half of its population lives under the constant threat of floods, Mithila Plain (that portion of Bihar state which lies north of river Ganga) is an acutely chronic flood-prone area. More than 75% of its total area of Mithila Plain is at the mercy of flood. (Rashtriya Barh Ayog,1980). Yet the region contains more than half of the total population of the state in less than one third of its area. The reason are apparent - its exceptionally high agricultural potentialities. Within a few days after the onset of the south-west monsoon, the headlines and front pages of national news-papers and other means of mass media are flooded with alarming reports of the major portion of Mithila Plain facing the devastation by floods of the Gandak, the Kosi, the Kamla-Balan, the Bagmati and the Mahananda rivers. Crops and properties worth crores of rupees are washed away annually. Hundreds of lives are lost every year by these floods. The Kosi on account of its notoriety of floods and uncertain nature of its banks earned the sad title of "Bihar's river of Sorrow." A major chunk of the annual budget of the state is spent or squandered in the name of flood relief and flood protection. Hundreds of crores of rupees have been spent of these accounts in the post-Independence period, but the problem has not shown any declining trend. It is rather getting aggravated day by day.

Mithila Plain is consisting the flood plains of rivers descending from the Nepal Himalayas to the Ganga in the south. It has been described as the play-ground of rivers. Its low elevation above sea level, moderate to heavy rainfall concentrated within the monsoon months, huge catchments in the Himalayas combine to make the region vulnerable to severe floods annually. The most important flood producing rivers are the Kosi, the Ghaghara, the Gandak, the Burhi Gandak, the Bagmati, the Kamla Balan and the Adhwara. The Ghaghara and the Gandak, make a natural barrier between the eastern U.P. and North Bihar. Though the eastern boundary does not coincide with the Mahananda, it follows it for some distance. The mighty Ganga forms the Southern boundary and the base level for the region.

The history of floods in this region is as old as the region itself but reliable and written floods records are available since the last quarter of the 18th century. From these records it is apparent that floods of normal magnitude occurred almost every year. But severe floods occurred periodically. The present century has witnessed memorable floods in 1901, 1902, 1904, 1906, 1910, 1915, 1918, 1921, 1925, 1930-32. It has to be noted after the great earthquake of January 1934, devastating floods occurred regularly between 1934 to1954. The floods in 1954 were serious in Mithila Plain. Since then floods were also unusually severe in 1956, 1960, 1962, 1965, 1967, 1972, 1975, 1978, 1984, and the floods of 1987 broke all the previous records. Flood of 2008 is devastating in nature and the course of river Koshi changes.

The river Ghaghara is responsible for the floods in Siwan and Saran districts whereas the Gandak brings flood to West Champaran, Gopalganj, Muzaffarpur, Vaishali and Saran districts. The Burhi Gandak, having a longer course through the region, brings floods to a vast area forming portions of East Champaran, Muzaffarpur, Samastipur, Begusarai and Khagaria districts. The floods of Burhi Gandak are more extensive and damaging than the floods of Gandak and the Ghaghara, The Bagmati and the Adhwara group of rivers is notorious for their severe floods. The district of Sitamarhi, Darbhanga and Samastipur become badly affected by the floods of these rivers. The river Kamla now known as Kamla-Balan is noted for its flood vagaries. The magnitude of its flood devastation is next only to the Kosi. Like the Kosi, the river is notorious for its shifting character. The main problem of the flood in this basin is heavy spilling and consent changes in its course. The principal victims of the river are the districts of Madhubani and portions of Darbhanga and

Samastipur. Since the beginning of the century the river has shifted its channel several times and has migrated eastwards to distance of 40 kms. contrary to the westward movements of the Kosi.

The mighty Kosi surpasses all other rivers of Mithila Plain in the magnitude of floods, in its migratory behavior and silt deposition by coarse, sands and flood damages. The river has therefore earned notorious epithets e.g. 'Hwangho of Bihar' (Ahmad, E. 1946-47), 'Bihar's river of Sorrow' etc. on account of its notoriety. No other river in India has shifted its course so many times and over such a vast tract. The river has shifted its course so many times and over such a vast tract. The river has shifted its course westward over a distance of 112 kms. out of which it has travelled 88 kms. within the last 100 years. The entire region between the Madhubani in the east and the Kamla-Balan on the west constituting the districts of Khagaria, North Bhagalpur and portions of Madhubani, Darbhanga and Samastipur have been completely devastated and compelled the central and State Government to initiate flood control measures in Mithila Region.

CAUSES OF FLOODS:

This problem of floods in Mithila Plain is mainly the outcome of drainage and basin characteristics of the rivers of the region. Most of the rivers of the Plain originate on the southern slopes of the Himalayan ranges but some also receive drainage of the northern slopes of the Great Himalayan range and the Tibetan plateau. All the major rivers which have their sources in the Great Himalayas are perennial. The other major Himalayan Rivers are also generally perennial because of numerous spring and considerable recharge but those streams which rise on the southern most ranges in the Siwaliks are generally seasonal. A large number of rivulets originate in the plain itself from marshes and others as spill channels of the larger streams during the floods. Thus the principal, sources of all the rivers of Mithila Plain lies outside the region in the Nepalese territory. The two largest rivers, the Gandak and the Kosi, are fed by the permanent glaciers of the Great Himalayan range. As compared to the vast catchment area in the mountains as well as in the plains, the rivers length is very short . Besides, the drop from the Himalayas to the plains of Mithila is so abrupt that the rivers have not sufficient scope for attaining grade. As a result, the enormous quantities of water and sediment collected by the rivers in the Himalayas cannot be drained by the shallow and flat channels of these rivers. Therefore, they spill most of their excess water and sediment content in the surrounding area resulting into floods and associated phenomena e.g. silting, shifting of courses, erosion etc.

(a)Natural Reasons:

A most remarkable and characteristics features of drainage of Mithila Plain is the migratory behavior of the rivers. Most of the major rivers of the region such as the kosi, the Gandak, the Burhi Gandak, the Kamla and the Ganga have been changing their courses at frequent intervals. They tend to raise and slit up their beds by the large amount of sediment carried during the rains. In course of time the rivers begin to flow in raise channels lying above the surrounding area. The pressure of large volume of water during the floods causes a breach in the banks and compelled the streams to adopt new course (Ahmad E. 1965).

The geology and structure of the catchment determine the magnitude and destructive power of floods. The structural disposition of the catchment has also great bearing on the floods in the lower basins. The extremely folded and shattered nature of rocks in the hilly catchment is the Himalayas have greatly influenced the sediment load behavior of the rivers during the floods. The section of the Himalayas lying to the north of Bihar is the highest mountain region in the world. The higher a region the more it is subjected to erosion. Accordingly huge amounts of sediments are thus eroded from the Himalayas and are carried down to the Mithila plains. During the rains the rivers of Mithila Plain increase enormously in volume and carry vast quantities of silt and mud. Thus silt is deposited over the flood plain when flood water recedes into the river channel thereby raising the river bed and the adjoining flood plain. The river beds are raised more quickly than the adjoining flood plains. As a result the beds of the river become higher than the flood plains. Consequently when the river is baneful even a small breach in the river levee cause a sever devastation to the surrounding areas as a result of floods and erosion. The excessive coarse sediment carried down by the rivers Kosi, Kamla, Gandak and Mahananda can be explained by the fact that in their catchment the

Himalaya is more compressed. The valley is narrower, the sides are steeper and there are not sufficient wider basins in the hilly region for the rivers to spill over their flood waters and deposit their coarse sediment. Besides, frequent seismic activities have further accentuated the loosening up and disintegration of already shattered rocks in the catchment.

The role of topography is the foremost for the phenomenon of floods in North Bihar. Topographically the whole of Mithila Plain except the northwestern hilly tract is almost a dead level surface. The watersheds between streams do not seem to exist because during the floods the flood waters of different river basin intermingle. The entire Mithila Plain appears as an inland sea in which rivers descending from Himalayas pour their water. However, the Invisible gradient is reflected by the alignment of the river courses which is generally northwest to southeast. But an abrupt change in gradient takes place where the rivers enter the plains. The change forms a very steep gradient in the mountain to almost zero in the plain result into spilling of flood water from the beginning of monsoon rains.

Another effect of the flat gradient is that the streams or rivers have extremely meandering courses which further reduce their capacity to hold the runoff between their banks. As a result there is a constant tendency of the streams to change their courses by cutting across the meanders during the floods.

Generally floods are caused by a combination of physical factors, among which meteorological factors are the most important. Excessively heavy and prolonged rainfall is most common cause of floods. Most of the great floods are generally caused by short spells of heavy rain in the catchment. There are three main meteorological conditions which are responsible for the incidence of heavy precipitation causing floods over this plain:-

(i) Heavy rainfall caused by the monsoon depression during their movement through this plain.
(ii) Heavy rainfall over the eastern and Nepal Himalayas during the monsoon.
(iii) Heavy rainfall caused by orographic effect during the spell of strong monsoon.

About 75% to 80% of total rainfall occurs during southwest monsoon period. The maximum rainfall occurs during July & August and December is the month of minimum rainfall. The river hydrographs closely follow the incidence of rainfall. Peak flow is generally recorded either in July or in August. It generally results after very heavy rainfall in the catchment. As such about 80% of the total run-off occurs during the five monsoon months and only 20% in rest of the seven month of the year.

Apart from these physical causes, there are other physical causes of floods also. Sometimes floods may also result from such physical causes as earth-quake, landslides, and changes in the courses of the rivers and soil erosion.

In many parts of the world as well as during the memorable earthquake of January, 1934 in Mithila Plain, floods resulted as an after effect of earthquake. Huge quantities of water and sand gushed out of the earth fissures or cracks and inundated the area affected by the earthquake. They also created changes in the bed level of river courses resulting into floods either immediately or in the following rainy season. Although a landslide does not occur in North Bihar, they do occur in the catchment of the rivers falling in the Nepalese territory. There are numerous examples of devastating floods caused by landslides. Frequent landslides in the Himalayas during the rainy season have caused disastrous floods in Mithila Plain. Landslides are also associated with earthquakes. As a result of 1934 earthquake huge landslides took place in the Himalayan catchment of Mithila Plain Rivers near Kathmandu, Udaipurgarhi and Eastern Nepal.

(b) Man Made Reasons:

Apart from the physical reason some manmade reason are also responsible for the floods in this Mithila Plain and they aggravate the situation more vulnerable. In 1954 when the length of embankments is nearly 160 km then the flood area estimated in the state is about 2.5 million hectares. After introducing the flood policy, system construct the embankments, 3465 km and the amount of flood prone land increased to 6.89 million hectares by 2004.

In 2008 a breach in the East Koshi afflux above the dam occurred and the river picked an old channel it had abandoned over 100 years previously and approximately 2.7 million people were affected as the river

broke its embankments at Kusaha in Nepal, submerging several districts of Nepal and India. 95% of the Koshi's total flowed through the new course.

Recently Kamla Balan broke the embankments in Jhanjharpur and submerged the entire villages with huge loss of lives and the infrastructure.

Deforestation in hilly area and in the catchment area has led to increase in the silt content of the river flow. Experiments confirm that during rain water can flow through deforested area as fast as through unforested area .

Development in flood prone area and making infrastructure in river basin destroy the ecological balance of the reason and the area becomes more vulnerable to floods. Dams and barrage is also the reason of flood in this plain as we seen in 2008 when Koshi changes their course.

In spite of our best efforts the floods are getting more aggravated and more destructive day by day. They also arise out of man's inadvertent handiwork. They are also due to human interference in the realm of river's activities. It has also been equally responsible for the sufferings caused by floods. Encroachments into the flood-plains and river beds have aggravated the floods. Among the human interference, deforestation, artificial levees or embankments, dams or reservoirs, roads and railways are the important causes. Dams or reservoirs are constructed across natural flow of river. This obstruction naturally sometimes causes disastrous floods. Faulty construction of roads and railway across the natural flow of water results into the raising of flood level causing breaching and overtopping of roads and railways.

FLOODS-PRONE AREAS:

Although most of Mithila Plain suffers due to floods, the intensity and frequency of flooding is not uniform. As a matter of fact the worst sufferers from the flood are not those areas which are situated along or near the river bank. On the basis of intensity and frequency of flooding Mithila Plain can be divided in to three broad zones:-

(i) Highly Flood - prone Areas.
(ii) Moderately Flood- prone Areas.
(iii) Areas Relatively Immune from floods.

The Central Mithila Plain comprising Sitamarhi, Muzaffarpur Darbhanga, Madhubani, Samastipur, and Khagaria districts are highly prone to floods of high intensity and frequency. As compared to these areas East Champaran and Vaishali are subjected to floods on moderate intensity. Some of the marginal districts of Mithila Plain Viz. West Champaran and Begusarai are least affected or relatively immune from floods of high intensity and frequency.

The magnitude of floods depends upon the hydrology or the discharge behavior of the rivers. The regime of Mithila Plain rivers are marked by monsoonal character. The following factors determine the hydrology of the rivers of this plain:-

(i) A large part of the catchment of the rivers is above the snowline.
(ii) The annual rainfall in the catchment areas within the Himalayas varies from 50 cm. near the foothill to as much as 400 cm. on the southern slopes of the central Himalayan range.
(iii) The bulk of this rain, about 75% to 80%, occurs during the southwest monsoon period.
(iv) The Himalayan catchment area is more compressed than elsewhere giving a general geographical weakness to the area accounting for the enormous sediment load of the rivers of the plain.

CONCLUSION:

The Mithila Plain is more vulnerable to flood disaster and the huge mass is affected with this. Flood disaster mitigation and management is needed for this reason. It becomes more desirable because the area is densely populated and the economy is mainly based on agricultural activities. Both structural and non structural measures are needed for the flood management in this region. Structural measures are those which involve the construction of engineering works such as dams, embankments, reservoir, drainage channel, etc. The structural measures are fail to mitigate the flood , so an increasing stress is now laid on the

non structural measures for long term planning for the flood disaster management with adopting the new technology such as Geographical Information System, Remote Sensing, Geomatics, etc. The important non structural measures are flood plain management, flood plain zonation, existing flood control vulnerability identification, analysis of river morphology and channel management, flood forecasting, flood damage assessment, rehabilitation and land reforms, flood proofing, disaster management, flood insurance, etc,
These measures must be taken in consideration while making the flood disaster management in long term. This long term planning have long lasting impact on society.

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