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Assessment of the Impact of Environmental Hazards on Livelihood : A Case Study of Madhubani District, Bihar

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1. Introduction :

In this research paper , an attempt has been made to trace out the impact of environmental hazards on livelihood pattern of Mithila Plain in general and Madhubani district in particular, and to make aware of the existing physical ecology of the region which is responsible for making the region prove to flood hazard and other natural disasters like earthquake, cyclones etc. In this paper the main research hypothesis elaborated and tested are that the strategies of preparedness for disaster management has the higher possibility of protecting the gains of regional development from recurring flood -hazard -induced disaster and disaster risk reduction strategies have the merit that affects regional habitat , economy, livelihood, society and sustained vulnerability situation reduced and regional development strengthened .

2. Research Problem :

The main research problem relates to natural environmental hazards and disasters are natural and hence these are also termed as *NATURAL PROCESS*. It may be pointed out that the concept and perception of environmental hazards and disasters are closely related to their impacts on the organisms in general and mankind in particular. In other words, the natural sudden physical processes and events become hazards and disasters when live close to a potential danger. For example, if an earthquake of more than 10 on Richter scale occurs in totally uninhabited area it is not a disaster at all but an earthquake even of lower intensity, say below 7 on Richter scale, occurs in heavily populated area, it becomes a severe hazard and disaster. It may be further pointed out that it is not the frequency which makes any extreme event and disastrous, rather it is the intensity, magnitude and dimension and the quantum of damage done by any event which makes it hazardous and disastrous. It is also important to note that environmental hazards are not always destructive and disastrous themselves rather it is the effects of these events on other natural processes which become disastrous. For example, the

Tajik area of the former southern U.S.S.R. 'is seismically a highly active region, shaken by upwards of 3000 tremors a year but these cause few direct causalities'. But 'the Tajik earthquake in the south of the former U.S.S.R. on 21 January, 1989, for example, was only of magnitude 5.5, but its timing unfortunately coincided with highly unstable slope conditions caused by high pore-water pressures resulting from snow-melt' (C. Embleton, 1989) and thus it became disastrous.

Environmental hazards and disasters are normally divided into two broad categories on the basis of main causative factors viz. 1. NATURAL HAZARDS AND DISASTERS and 2. MAN-INDUCED HAZARDS AND DISASTERS. Natural hazards are further sub-divided into two categories e.g. (i) planetary hazards and (ii) extra-terrestrial or extra-planetary hazards and disasters. Planetary hazards and disasters again fall in two subtypes viz. (a) terrestrial of endogenous hazards and (b) atmospheric or exogenous hazards. Man- induced hazards and disasters may be divided into 3 sub-categories viz., (i) physical (man-induced) hazards (landslides, accelerated soil erosion), (ii) chemical and nuclear hazards and disasters (release of toxic chemical elements in the air, water and soils, sudden outburst of lethal poisonous gases from chemical factories, nuclear explosions and leakage of radioactive elements from nuclear reactor plants etc.) and (iii) biological hazards and disasters (sudden increase or decrease of population of species in a given habitat either due to increased nutrients or toxic chemical elements).

Natural environmental hazards and disasters involve comparatively rare high-intensity process and extreme events caused by both terrestrial and atmospheric processes. The study of natural hazards/disasters includes the consideration of identification of specific events, finding of their causative factors, assessment of their impacts on human and other biological communities, prediction of such events and finding their remedial measures. Natural hazards and disasters fall in two broad categories e.g. (1) planetary hazards/disasters and (2) extra planetary or extra-terrestrial natural hazards/disasters.

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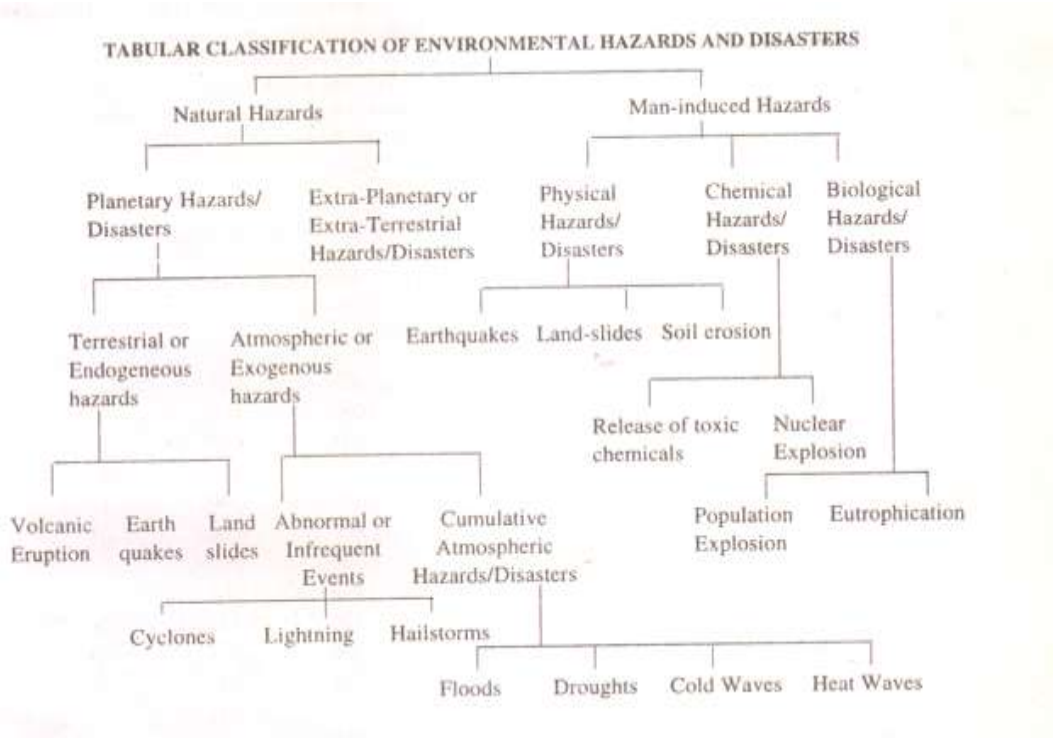
Table-1



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According to the report of the United Nations Disaster Relief Coordinator (UNDRO) about 50 per cent of all the reported natural hazards and disasters occur in the developing countries or in the Third World Countries . This observation may not be entirely true because natural disasters do not know any political or economic boundary and consideration. This observation may be because of the fact that most of the developing countries are located in the tropical and subtropical regions of the world where atmospheric process very often causes numerous natural hazards and disasters such as floods, droughts, forest fires and of course volcanic eruptions and earthquakes wherein the last two are also more prevalent in other parts of the world . Rapid rate of urbanization , industrial expansion, agricultural development, population growth and social development are continuously accelerating the frequency and magnitude of natural hazards and disasters in the developing countries . 'Developing countries more or less chronically suffer from disaster . In one sense, they live with disaster . The achievements of development programmes have often been destroyed and their future plans halted because funds had to be diverted to relief and recovery activities . It should be noted , however, that a single disaster can strike a nation's social infrastructure , damaging its feedback system to an irrecoverable extent (M. Hashizume, 1989)

Natural hazards are uncontrollable, unstoppable, inevitable natural events and features of our planet. They occur as part of the balance of nature and ecosystem, can usually recover and restore themselves and they can't be prevented. Hazard is a perceived natural event, which threatens both life and property. A disaster is a realization of hazard (Whittow, 1980). This means that disaster is consequential outcome of hazards. Hazards produce disaster consequences. A global review of disaster reduction initiative, 2004 version states "Strictly speaking, there is no such thing as a natural disaster, but there are natural hazards such as cyclone and earthquake".

Natural hazard when causes widespread destruction of property and human lives and occurs in places that are heavily inhabited with human populations are termed as "disasters". The word disaster is French derivative "**Disaster**" of 'des' + 'aster' meaning bad + star. Thus, the term refers to 'Bad or Evil star' fallen from heaven.

The term disaster has been meaningfully comprehended as a serious disruption of the functioning of the society causing widespread human, materials, environmental losses, which exceed ability of affected society to cope with its own resources. More precisely, it has, been defined as the occurrence of a sudden, a major misfortune, which disrupts the basic fabric and normal functioning of a society. It is fundamentally hazard-induced adverse consequence of an

event or a series of events, which give rise to casualty and/or damage or loss to property infrastructure, essential services or means of livelihood in scale that is beyond the normal capacity of the affected community to cope with unadded (Gupta, 2001).

To make the meaning more comprehensible the term disaster has also been used to describe a catastrophic situation in which a normal pattern of life (or required to save and preserve human lives and environments. These definitions intend to explain that disaster is not an abstract and independent rather it is relative and dependent outcome. It may be said that hazards are generally natural phenomena-centric where as disasters are more human-centric.

There exists a direct relationship between natural hazards and disasters to humanity. Both are characterised by the extent and intensity associated with them which can be gauged in terms of:

The impact, intensity and characteristics of the natural phenomena
How people's environment and infrastructure are affected by that phenomena

Disaster is, in its realization, a risk factor, which is governed by the equation of the hazard impact and the extent of vulnerability to such impact. It becomes important to explain that term vulnerability which may refer to mean the extent to which a community structure, service of geographic area is likely to be damaged and disrupted by the impact. of particular hazard of their nature, construction and proximity to hazardous terrain or a disaster-prone area. Vulnerability, in this sense, includes the measurements of what is put at risk in relation to types of hazards such as floods, earthquakes, volcanic eruptions, landslides etc. "Disaster, thus, is a product of a hazard such as earthquake, flood or drought coinciding with a vulnerable situation which might include communities, cities or villages" (Goel, 2007).

Vulnerability appears commonly in two forms: physical vulnerability and socio-economic vulnerability. The four main components hazard vulnerability living organism/property and risk, meet together or combine together to generate disaster (Fig. 3.1). Disaster signifies, thus an outcome of vulnerability and risk factors.

Disaster, precisely, results from a combination of hazards, vulnerability, and inability to reduce the potential negative consequence of risk (Goi, Ministry of Home Affairs). Hazards-induced disaster has been a potential occurrence along with the areas of human habitation including its economic and social organization and ecosystems.

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History speaks, mankind has experienced both natural and manmade disasters. However, in ancient times it was only natural disasters that caused havoc on humanity. The potential of disasters has increased with densification of region with population, urbanization and industrialization, which have disturbed the natural equilibrium through exploitation of natural resources in the name of development in a situation of low pressure of population on land, making people sectors of economy and society and infrastructure less vulnerable to hazards. The indigenous philosophies and religion were geared to the maintenance of ecological balance in nature. Man was part of nature like the rest of sentient nature- the plant and animal kingdom (Dikshit, 2006).

Disaster has grown potentially is evident from the observation that across the world, natural hazards are growing in number and destructiveness, and their human toll is escalating (WB, 2007). DFID, UK has reported that in the past 20 years alone, more than 4 billion people have been affected by natural catastrophes from flood, cyclone, tsunami, earthquake, landslide, and volcanic, eruptions. Apart from the suffering, the loss of human life, and the destructions of livelihood, the economic costs of major disasters are huge. Countries worldwide are estimated to have lost an average of 2-5 percent of their GDP from natural calamities in the recent past. Disasters are rooted in development failures. Disasters do not just happen, they result from failures of development and management.

3. Consequences of Natural Hazards:

Natural hazards are not uncommon phenomena and they associate necessary consequences, more particularly, of social and economic dimensions. The consequences of natural hazards are experienced in the form of natural perceived in their magnitude, complexity, frequency and impacts on habitats, economy and society of a region. The consequences of natural hazards are met with more apparently in areas of dense human habitations, which are naturally favourable and ecologically sensitive to attract settlements of population. The ecological conditions of different parts of the world make different regions particularly vulnerable to different kinds of hazards, making some regions prone to multiple hazards. Disasters, as inevitable consequences of natural hazards, occur mostly with unfailing regularity causing constantly inconvenient living. The regional population is certain to incur severe economic and social costs on account of losses caused by natural hazards-induced disasters.

Natural hazards produce multi-dimensional consequences and they have been known to cause environmental crisis. It has accordingly been said that the world is undergoing to several

environmental crises (Bhatt, 1997). The world is supposed to face environmental to crisis because the human community is found too small in front of the nature, which is source of major natural hazards. Natural hazards bring consequences of human concerns because humanity has limitations in preventing or containing completely the impact of hazards-induced disasters. Among all the disasters afflicting, in particular reference to India, river floods are the most frequent and often the most devastating. The unique geo-climatic conditions of the nation make various parts of it, particularly, vulnerable to natural hazard-induced disaster. Regarding floods, about 85 p c of annual average rainfall of 1200 mm is found concentrated over a short monsoon season of four months only which differ regionally in intensity. Besides, earthquakes are considered another major natural hazard, which impact the regional ecology, both physical and the most, dangerously and hazardously. Drought appears another water-related natural hazards as a perennial feature in some states in India causing condition of disaster for about 16%, of the country's total area and to approximately 50 million people annually. There are also wind-related natural hazards, mentions of which can not be disposed of the long coast line of over 8000 KM. of India, which remains vulnerably exposed to tropical cyclone of varying intensity arising in the Bay of the Bengal and Arabian Sea. Danger of tsunami associated with ocean belt earthquake has also been found threatening. The consequences of natural hazards are therefore, multi-dimensional having varied sources of origin and speed. About 75 percent of the world's population live in areas affected at least once by earthquake, tropical cyclone, flood or drought between 1980 and 2000 (UNDP report, 2005).

3.1 Earthquake:

Earthquake is one of the most feared and destructive natural hazards. They may occur without any recognizable warning (making it impossible to predict) at any time of the year, day or night, with sudden impact. They can inflict heavy losses destabilising the region's habitat, economy and society.

Reports are available that in the past decades, nearly 60 per cent of the people like by disasters died because of earthquakes (UNISDR, 2010). Earthquakes are thus, regarded to be the deadliest natural hazard of the past years and remain a serious threat for millions of people worldwide as eight out of the ten most populous cities in the world are on earthquake fault-lines.

Earthquake is defined as a series of underground shock waves and movement of the earth surface caused by natural processes underneath the earth crust (Goel, 2007). The phenomenon of occurrence of an earthquake is very common in Indian sub-continent due to the continuous

movement of the Indian plates and its striking the Eurasian plate as well as the location of the youngest mountain in the form of Himalaya'. That's why the earthquake is the regular feature of the subcontinent and many results in the several damage of lives and properties.

1934 earthquake attracts special mention on because it is related directly to the study area as a part to experience its consequences (Bilham, 2009). Dr. Sahadev Kumar in his editorial in South Asian Observer, Aug. 5, 2009 says that "the January 15, 1934, a severe earthquake rocked Bihar, unleashing extensive devastation over a vast area; some 650 kms away, in the city of Kolkata, the tower of St Paul Cathedral was destroyed. The earthquake like more than 30,000 people at a time when India was engaged in the movement for independence under Mahatma Gandhi. The natural causes for an earthquake, and when and where one might occur, were little known then and are still barely known.

Earthquake occurs whenever it changes its position. Scientific causes of earthquake have been described as a sudden movement of displacement of earth's crust in the ground produced by abrupt displacement of rock masses, of varying thickness ranging from a depth within the upper 10 Km under the sea and 65 km under the continents. Most earthquakes result from the movement of one rock masses (plates) pressed to another in response to tectonic forces which is driven by yet unconfirmed mechanism, perhaps thermal convection current. Due to slipping or rupturing, these plate boundaries when collide each other the stress arises and release accumulated energy, which exceeds the strength of the rock. The rock breaks along the plates' boundaries can be of following types:

Pulling away from each other.
Pushing against each other and
Sliding sideways relative to each other.

This placement of plates causes vibrations also known as seismic waves travel in all directions from the area of fracture. The point on the earth's surface that is directly above the focus is called as "Epicenter" of an earthquake. The theory of 'elasticity' says that the movement of the tectonic plates continuously stresses the crust. Shallow focus earthquakes with depth less than 60 Km are more common and are extremely damaging because of their proximity to the surface. Accurate and exact predictions of such sudden incidents are still not possible.

The impacts of earthquake are measured in terms of two distinctively different scales demonstrating magnitude (M) and intensity (I). Earthquake magnitude is the measure of the strength of an earthquake or the strain energy released by it. The intensity of earthquake is

expressed with reference to Ritcher scale. The Modified Mercalli Scale, expresses the intensity of earthquake effect on people, structure and the earth's surface in values from I to XII. With an intensity of VI and below most of the people can feel the shake and there are cracks on the walls. The impact of earthquake can be directly felt in terms of losses of life and damages caused to essential fabrics constituting the habitat, economy and society including structures, infrastructure human and cattle's life, properties, building etc. In this case earthquakes are hazards that strike without warning and cause wide-spread damages to various man made structure and systems. It becomes relevant to understand that hazards caused by earthquakes can neither be prevented nor predicted in terms of their magnitude when they take place. The impact of earthquake hazards can be explained and assessed in relative terms only. It has, naturally, been stated that earthquakes do not kill people, buildings do.

Earthquake-induced hazards and consequential disasters have formed the basis of mapping earthquake hazards zones over the earth surface. India constitutes a significant part of the world which is prominently prone to earthquake hazards. Accordingly, the earthquake hazards zone map of India **(Fig.1)** provides the bases of earthquake zoning. The earthquake risk to a structure or system has been considered to be made up of four components:

Seismic Risk = Hazard × Exposure × Vulnerability × Locations,

Where hazard means the occurrence of terrifying earthquake of sufficient magnitude, exposure indicates the objects and structures made as ingredients of human habitation and vulnerability explains that damageability of the exposure under the action of hazard and location signifies how far exposure is situated from the location of the hazard, the nearer ones in greater danger than those far away.

3.2 Flood:

Flood is major water-related natural hazard. Flood, generally, refers to the natural condition of large volume of water from heavy rainfall and/or river spill making the normal channels unable to drain off quickly. Floodsare seen as natural phenomena caused by rain. Naturally, since early floods have been a major aspect of man's interaction with his environment (Ward, 1978).Floods are of various nature and dimensions. It is, therefore, not possible to find an all accepted definition of flood to make the recognition of flood authentic. Somewhat, Rastriya Badh Ayog, 1980, has defined floods as a relatively high flow stage in river mark by higher than usual, also the inundation in the low land, which may result there from. This may also be understood as an unusually high stage of a river and may be better described as that stage at

which the stream channel can not contain the water flows over the bank and spread over the adjoining areas (Choudhary, 1992).

Floods are the function of river of fluvial ecology. They influence the regional habitat economy, and society unfailingly. The regional fluvial ecology is internally connected with drainage systems. Floods are normally caused by temporary inundation of large region as the result of an increase in reservoir, or of rivers flooding, their banks because of heavy rains. high winds, cyclones storm surges along coast, tsunami, melting snow or dam bursts. Besides, there are flash floods which are said to occur within six hours of beginning of heavy rainfall is usually associated with cloud bursts, storms and cyclones. Flooding in rivers and its causes may be summarised as:

Inadequate capacity within the bank of the river to contain high flows,

River bank erosion and silting of river belts,

Landslide leading to obstruction of flood and change in the river course,

Poor synchronisations in the main and tributaries of river,

Flows of retardation/ alteration due to tidal and back water effects,

Poor natural drainage.

Cyclone and heavy rainfall during the period of flooding,

Almost all the heavy rainfall during the period of water flows and the flood hazard is compounded by the problem of sediment deposition, drainage formation and synchronisation of river flood with sea tides in the coastal plains (Gupta et. al, 2001). Regions in larger prospective, face flood problem with reference to their various river basins. The magnitude of flooding is mostly greater in lower sections of river basin, which are mostly represented by the existence of flood plains. Naturally, the plains of a country or of the world are found more prone to flood hazards-induced disasters. Flood hazard associates significant regional dimension, as every year some parts or the other of geographical region are affected by floods of varying magnitude. Some regions of India for, example are subjected to floods of high magnitude recurrently. The regions falling within the region of Brahmaputra river basin and Ganga river basin are inevitably prone to flood hazard associated with the flood supporting ecology. A major portion of the alluvial plains of Bihar lies in north of Ganga, which is prone to chronic and

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recurrent floods affecting the regional habitat, economy and society. Flood hazard map of India shows the territorial extent of flooding, in which areas liable to flood have been depicted **(Fig. 1)**.

4. The Impact of Environmental Hazards on Livelihood in State

Context & Madhubani District:

The state of Bihar manifests apparent case of hazards-prone region. The state may be said to have its significant share of natural hazards-induced disaster, when viewed with reference of India. The geographical ecology of Bihar makes it susceptible to occurrence of major natural hazards including earthquake, flood, drought, fires, clod and hot wave, epidemics etc. The state geographical segment lying north of Ganga are more prone to such hazards as compared with its counter parts lying to south of the Ganga.

A look at the earthquakes hazards zones map (Fig 3.6) clearly shows that a significant part of north central peripheral land falls within the high damage risk zone MSK-VIII; south of which the entire north Bihar plain and a substantial portion of south Bihar comes under moderate damage risk zone MSK-VII. This shows that the dense population of the region is vulnerable to earthquake hazards and risking its habitat, economy and society. The occurrence of earthquake hazard is certainly not regular phenomena but Bihar has faced the wrath of earthquakes in the past and the recent times. The 1934 earthquake and 1988 earthquake have entered into the permanent memories of inhabitants of the region. It becomes important in this context, to note that the historical earthquake of 1934 along with 1905 Kangra earthquake were considered to form the basis of ROSSI-FOREL(RF) intensity scale, which was used for drawing the isoseismal. The occurrence of August 21, 1988 earthquake having location of North Bihar-Nepal border measured the magnitude of above M>6 and 8.3 at Richter Scale. The 1934 Bihar earthquake was dubiously considered as one of the worst earthquake of India's history, in which district of Munger and Muzaffarpur were almost completely destroyed, culminating in widespread damage in the northern Bihar. The extensive impact of this natural hazard may be assessed by the knowledge of areas where the most damage to life and properly occurred. Extending from Purnia in the east to a distance of nearly 320 Km towards west and from Kathmandu in the north to Munger in the south to a distance of nearly 130 Kms, the 1934 earthquake left the impression that its impact was reported to be felt in Lhasa to Mumbai and from Assam to Punjab. It was so severe that in Kolkata (Around 650 KM from epicenter) many buildings were damaged and the towers of Saint Paul Catherdral collapsed. The impact of the

earthquake yielded one noteworthy phenomenon: that sand and water vents appeared throughout the central vents of earthquake areas, associating that the ground around these sand fissures subsided resulting in huge damage. Extensive liquefaction of the ground to place over a length of 300 Km (called slump belt) appeared during 1934 Bihar-Nepal earthquake in which many structures went a float. Mention of specific places may be made in Muzaffarpur where sand fissures erupted at several places in town, the wells were chocked with sand while water level in tank became shallow due to sand deposited in the beds. Most of the buildings were damaged and all the Kachha buildings collapsed while other buildings suffered damage due to shrinking of ground. The buildings of Darbhanga Raj including the famous Naulakha was severely damaged at Rajnagar near Madhubani. Building was damaged where Nargauna Places stands today at Darbhanga, all the Kachha buildings collapsed in Sitamarhi and not a single house was left standing. The 1988 earthquake also deserves its mention. The extent of the impact of it was felt, mostly in area covering Darbhanga, Madhubani, Saharsa, Purnia and Munger.

The flood hazardis, however, the most recurrent which has become synonym with the state. The fluvial ecology of the region sustains occurrence of flood regularly and naturally of the natural hazards. It is flood, which leaves the impression of causing enormous damage to the life and economy. The habitat, economy and society of Bihar is constantly put to high proneness to flood hazards. The extent of the flood hazard may be realised by the fact that on an average 16.5 p c of the total flood affected areas of India lies in Bihar. The prelim associated with the flood hazard has been compounded due to an unfortunate truth that the flood-prone areas in Bihar have increased. This is despite the fact that the length of embankments over the rivers have risen from 160 Km in 1954 to 3465 Km in 1999 (Mishra, 2000½.

Geographically, North Bihar stands the most affected flood hazard region, where the Kosi, the Kamla, the Baghmati, the Mahananda river basins inflict severe loss to life and property, particularly to the eastern half. Besides this, the western half is affected by floods, associated with the river flows of the Ghaghra, the Ganga and the Budhi Gandak. It can summarily be said that in Bihar the flood hazards are largely confined to the rivers of North Bihar and are more or less an annual feature. The number of districts experiencing the severe impacts of flood hazard in Bihar count for 28 including Supaul, Saharsa, Purnia, Katihar, Madhepura, Kishanganj, Araria, Khagaria, Darbhanga,Madhubani, Samstipur, Begusarai, Muzzaffarpur, East Champaran, Sltamarhi, Sheohar, Gopalganj and Vaishali etc. The intensity of flood hazards is enhanced in the wake of torrential rain in the upper catchments of Bihar and bordering country Nepal and the release of water from Nepal responsible for raising the water level of the major rivers like the Bagmati, the Budhi Gandak, the Adhwara group, the Kamla etc.

Among recent floods those which deserve mention includes 1987, 2002, 2004, 2007, 2008 in which the worst affected district appeared Darbhanga,Madhubani, Sitamarhi, East Champaran, Samastipur and Muzaffarpur.

Apart from earthquake and flood hazards, the state of Bihar remains prone to many other natural hazards though not inflicting widespread impacts, Drought and famines occasionally visit the state more frequently in the district lying south of Ganga. The eastern part of North Bihar is prone to wind-related natural hazards not necessarily related to cyclones. It may be referred that the devastation in north eastern part of Bihar was caused by a twister, and not by a cyclonic storm. Purnia, Araria, Katihar, Kishanganj and adjoining areas were hit by a Tornado not a cycolonic storm (Laskar, 2010). Tornados are considered as sudden developments and unpredictable but as the most violent form of storm. They are like dark funnel-shaped clouds made out of violently rotating speeds which can attain the speed of about 500 Km/hour. Their origin takes place where warm moist air and the surface in the earth moves up and mixed hotter dry air. It has been observed that upper air cyclonic circulation hovering over Bihar gets active due to heavy moisture incursion.

The Bihar state region represents prone to multiple hazards like flood, drought, earthquake, storm along with fires and consequent upon the conditions related to poverty, disease, health hazards. Floods have been however, proving to be the most hazardous. Of all the floods occurring, it is supposed that 22 p c of them are subnormal, 55 p c are abnormal and rest 2 p c of the, are extremely abnormal. The flood-prone area has constantly increased in Bihar and it has nearly tripled from 2.5 Lac hectares n 1952 to more than 6.8 lac hectares in 1996. In addition to this about 3.7 lac hectares of so called floods protected land was flooded in 2008 breach of the Kosi river. The flood-prone area in the state actually comes to some 7.2 lac hectare (Mishra, 2000).

Madhubani district has been selected as the study Area :

The present research work makes a critical appraisal of impact of natural disasters on livelihood pattern of Madhhubani district, a part of Middle Ganga Plain (7c) of Middle Ganga Plain under the regional scheme of classification by Prof. R. L. Singh and others (1971) in their famous edited book: "India : A Regional Geography." Hemmed in between latitudes $25^{o}55'$ N to 26^{o} 30' N and longitudes $85^{o}45'$ E to $86^{o}40'$ E on an area 3501Km^2, Madhhubani District has a total population of 35,70,651 persons having, 18,37,361 males and 17,33,290 females registering 26.80% decadal growth (1991-2001) as per 2001 census.

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As per administrative division, Madhubani district having its headquarters at Madhubani has five subdivisions, i.e., Madhubani, Jhanjharpur, Benipatti, Jainagar and Phulparas and 21 Development Blocks viz. Madhwapur (113,459); Harlakhi (151,708); Benipatti (135,132); Jainagar (151,893); Ladania (137,397); Khutauna (167,469); Laukahi (162,483); Phulparas (130,036); Babubarhi (173,692); Khajauli (110,958); Kaluahi (96,793); Benipatti (286,091); Bisfi (261,762); Madhubani (258,895); Pandaul (218,702); Raj Nagar (199,343); Andhratharhi (147,091); Jhanjharpur (138,631); Ghoghardiha (157,224); Lakhnaur (134,121) and Madhepur (217,289).

Table-2

Madhubani District: Demographic Characteristics, 2011

Block	Area (km)	Total Population	Density of Pop Per Sq. (km)	Male Pop	E.P.	Sex Ratio	Sc. P.
Rajnagar	177.73	246933	1389	127851	19082	931	42935
Kaluahi	94.20	117282	1245	60713	56569	932	18333
Khajauli	111.72	143583	1285	75209	68374	909	24012
Jainagar	123.54	193700	1568	102403	91297	892	23838
Laukahi	260.25	208317	800	107031	101286	946	22849
Babubarhi	184.59	217331	1177	111970	105361	941	27346
Basopatti	139.31	173499	1245	90774	82725	911	24232
Benipatti	271.07	361400	1333	188764	172636	915	43239
Bisfi	180.78	320704	1774	167767	152937	912	31420
Harlakhi	144.20	196251	1361	101522	94729	933	22164
Ghoghardiha	168.46	193088	1146	99142	93946	948	17985

Jhanjharpur	152.24	205520	1350	106180	99340	936	28394
Pandual	175.23	270642	1544	140092	130550	932	36312
Phulparas	162.32	166012	1023	86249	79769	925	15999
Ladania	184.46	175561	952	90896	84665	931	26668
Madhwapur	107.58	134704	1252	68909	65795	955	21046
Laukaha	216.42	212127	980	108413	103714	957	26366
Lakhnaur	118.47	167841	1417	86959	80882	930	25926
Madhubani	149.21	323592	2169	169094	154498	914	42869
Madhepur	233.88	267606	1144	139319	128287	921	43006
Andhrathadhi	145.32	191680	1319	100056	91624	916	25892

Madhubani, the heart of Mithilanchal has been very famous for the production of Pan, Maanchh and Makhana i.e. betel, fish and Eurale Ferox Salisbury. Madhubani district is bounded by the international boundary with Nepal in the north, Supaul district in east, Darbhanga district in south and Sitamarhi district in the west.

Thus, the Madhubani district region has complete rural character having 94.5% rural population and very low rate of literacy and hence the key to the regional development of Madhubani district lies in rural industrialization, because the overdependence on agricultural sector has led to the poverty of the area. Hence, Madhubani district region has been selected as the study area for research from the view point of Geography.

5. Objectives of Research :

The following are the main objectives of the present research project :

(i) To assess the magnitude of natural disasters in terms of variations at sub regional scales in North Bihar in general and Madhubani district in particular.

(ii) To measure and map the areas prone to flood hazards and other natural disasters;

(iii) To analyse flood - hazard related problems being faced by the regional habitat, economy and society

(iv) To trace out the impact of natural disasters on the livelihood pattern of the people of Madhubani District.

(v) To make aware of the existing physical ecology of the region, which is responsible for making the region prone to flood hazard and other natural disasters;

(vi) To work out strategic measures and to formulate plans and its execution, with the help of Remote Sensing and G.I.S. as part of remedies to the problems to make natural disasters management strategies .

6. Research Hypothesis :

The following points are the main findings of research which have been tested by research hypothesis :

(i)The adequate comprehension of the regional ecology of the region has the potential of making disaster management strategy beneficial.

(ii) The strategies of preparedness for disaster management has the higher possibility of protecting the gains of regional development from recurring flood hazard-induced disaster.

(iii) Disaster risk reduction strategies will have the merit that affects regionalhabit, economy, society and sustained vulnerability situation reduced and regional development strengthened.

(iv) It is not the formulation of disaster management strategy but their effective implementation, which alone guarantees the regional sustainability.

7. Conclusion :

From the above discussion, it is clear that Madhubani district is prone to environmental hazards mainly flood, earthquakes, droughts and cyclones and flood hazard is perhaps the most concern and extensive case of disaster, particularly for regions, which are most suited to human habitation based on the use of surface water and flood plains for social and economic development. Floods have the major impact on the livelihood pattern of especially the rural areas of Madhubani district. The March 2012 issue of Yojana which is focussed at disaster management may be helpful in solving the problems of flood affected people of Madhubani district and improving their livelihood status . The major contributions like 'Managing Disaster in India' (Kumar, M. 2012). 'Challengesin Disaster Management' (Menon 2012), Post Disaster Impact Assessments and Funding Mechanism' (Kumar, 2012). Disaster Risk Reduction Techniques for Effective Poverty Eradication (Management, 2012) and 'Hazard Profit in India (Padmanabhan, 2012) may provide vent into disaster management perspective, reconstruction and analysis . This study may also be helpful for Bihar State Disaster Management Authorities . Thus, if the recommendations are implemented in full, the livelihood pattern of the people of Madhubani may be enhanced with a new horizon of progress and prosperity and the dreams of the researcher may come true.

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