Relief and Human Intervention Are Major Reason for Flood and Drought: A Case Study of Birbhum

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Abstract

Flood may be defined as overflows of water where it is not wanted. The covering of normally dry land by water that has escaped or been released from the normal confines of: any lake, or any river, creek or other natural watercourse, whether or not altered or modified; or any reservoir, canal, or dam. Floods are a natural river process in response to changes in drainage basin inputs. They are an essential characteristic of the landscape and are fundamental to the development of floodplains, wetlands and many river features. Floods are therefore overwhelmingly caused by the physical environment. The interaction between atmospheric condition, drainage basin size, shape, geology and vegetation as well as the geometry of the channel varies over time and space. As a result, floods vary in magnitude and frequency. Humans' interaction, interference and management of the drainage basin and river channel have an influencing role as well. Large scale dams can control discharge and prevent floods. With increased population and pressure on natural resources humans are having an increasingly important impact on the drainage basin. In many cases human impact is adding to or exacerbating both the frequency and magnitude of floods.

KEYWORDS: Flood, Drought, Sedimentation, Accelerating factor of flood

Introduction: Drought prevents the growth of plants it leaves the soil bare and soil erosion is likely to occur during the next rain storm. In turn, soil erosion removes part of the fertile topsoil layer, which further limits plant growth. So it is necessary to identify a complex of related land degradation processes to properly design corrective activities. Common land problem of Birbhum are land degradation (1281 km^2). It also helps to increase degradation of water resources, degradation of plant resources, and degradation of animal resources which may define as environmental degradation. Other important problems are flood and drought. It is also related with land degradation.

The most important cause of floods concerns the interaction between precipitation and drainage basin response. In Birbhum soils become saturated and the water table rises to the surface during monsoon season then water cannot infiltrate and surface run-off occurs. As a result, extreme rainfall leads to pooling on the surface and surface run-off. The nature of the drainage basin and its storage capacity is also an essential factor. Steep sided relief and/or impermeable rock and thin dense soils all accelerate surface run-off, which in turns leads to higher discharge and shorter lag times. Vegetation cover has an important role to play. Dense forest vegetation intercepts and transpires over 40% of precipitation inputs. Root networks further absorb water. The forest canopy intercepts rainfall slows inputs as through fall. As a result surface run-off is minimized and deep infiltration encouraged. Densely vegetated drainage basins therefore drastically reduce the magnitude and frequency of floods.

Human causes of flooding are a result of growing population pressure. Humans impact the interaction between precipitation and the drainage basin response

through deforestation, as a result of agricultural development, floodplain drainage, urbanization and channel management. Deforestation reduces the interception and transpiration feedback resulting in increased quantities and rates of surface-run off. As a result more water reaches the river faster. In addition, deforestation exposes the soil to greater rates of erosion and nutrient leaching, which in turn increases the likelihood of further soil erosion and gullying. Soil erosion leads to sedimentation of the channel, which in turn reduces the capacity and hydraulic efficiency of the river, increasing the likelihood of floods. All these factors of flood are representing in a diagram below (Fig.-1).

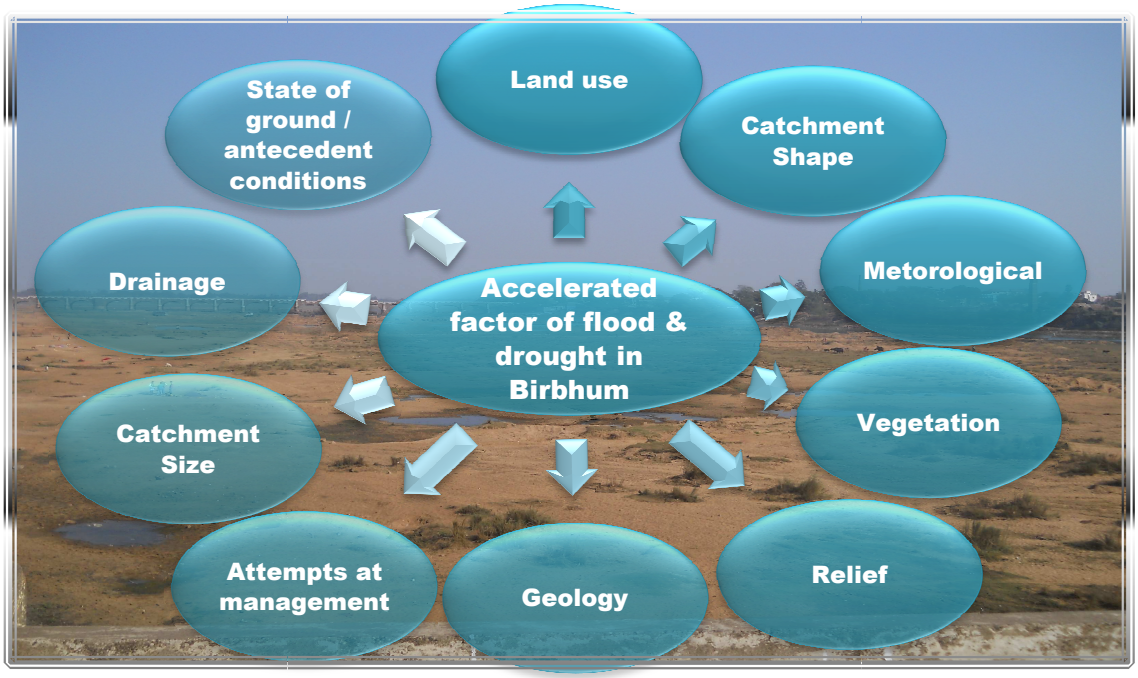

Fig.-1: Accelerated factor of flood & drought in Birbhum

Objectives: In the context of above point of views, the present study aims at the detail. Objectives are:

- To understand the physiographic characteristic of Birbhum district which is responsible for flood and drought;
- To assess the ecogeomorphological characteristic this study can help to understanding the morphology and morphometric characteristic of geomorphic features in hydrogeomorphic units of this area;
- It is very much important tool to calculation or identification of land degradation as well as environmental degradation of the study area;
- To help morphometric analysis of all patches (exposed at the surface) and the entire region to be determine degradation severity;
- It's also helped to take decision about geomorphic prioritization with preparation of integrated management.

Study Area: Birbhum (23° 32' 30" and 24° 35' 0"N and 88° 1' 40" and 87° 5' 25" E) extends over 4545 Km^2. Birbhum is bounded on the north and west by the Santal Parganas of Jharkhand state and the district of Murshidadbad; on the east by the districts of Murshidabad and Burdwan; and on the south by Burdwan, from which it is separated by the Ajoy river. Administratively, it comprises of three Sub-divisions

(Suri, Bolpur and Rampurhat), 19 Community Development blocks and 2,467 villages.

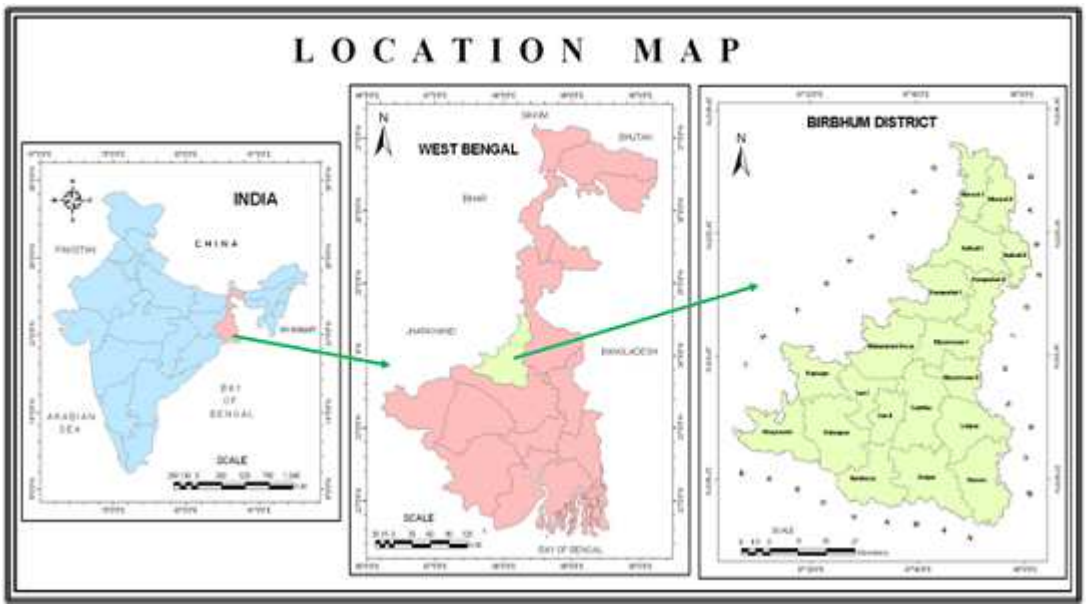

Fig.-2: Location of the Study Area

The study area belongs to the moderate morphogenetic region with prevalence of week mechanical weathering, strong chemical weathering, least wind erosion, moderate mass wasting, maximum fluvial erosion.

Methodology (Sources of Data): This paper is based on Topographical Sheet survey of India, Satellite Image LISS-III (Geo-coded IRS P6), and District statistical Hand Book etc. The methodology adopted for carrying out this analysis could be categorized into 6 steps as follows and after collecting the essential information required for this study, the digital analysis of these data was carried out through following technique (Fig.-3).

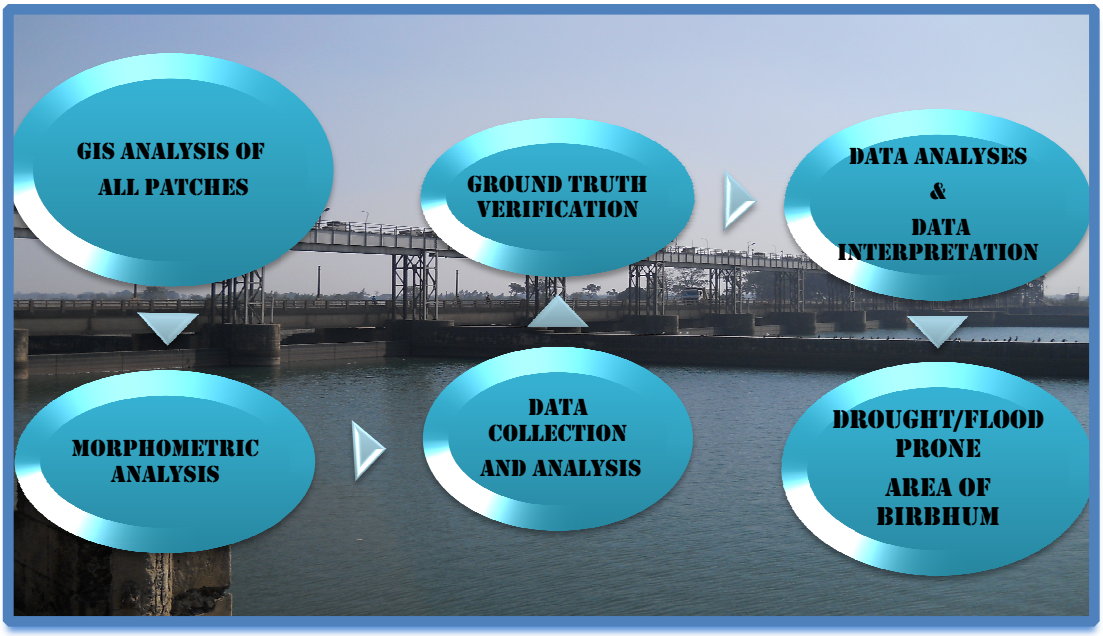

Fig.-3: Methodology

Result and Discussion: Satellite imagery and Topographical Map of Birbhum district provided the Morphometric statistical result through GIS software which is needed for the study. The utility of remotely sensed data in extracting the information is of great value to landscape mapping as the starting point of most landscape ecological studies is focused on different patches. All morphometric attributes are help to understanding the major cause of flood and drought of this district.

From Fig.-4, it is evident that Birbhum is well drained by a number of rivers and rivulets running in nearly every case from west to east with a slight southerly inclination. Among them, most of the rills, gullies and tributaries located western part of the district and major rivers runaway through the district which is the tributaries of Bhagirathi. As a result flood frequently occurred in the distract along with the river coarse in eastern part of this district. The map shows the vulnerable and less vulnerable flood prone areas of this district. According to Schumm's (1977) River basin zones, here most of the rivers are belongs to depositional basins zones. As a result sediment particles deposited during periods of low velocity and discharge, are stored in river bed. This is lead to reduce the river depth of this district. Rivers are adjusted to the nature and amount of water and sediment discharged through it. Thus rivers experience floods. In this district two types Reverine flood take place i.e. - rainfall floods and dam/barrage (natural or manmade) failure floods.

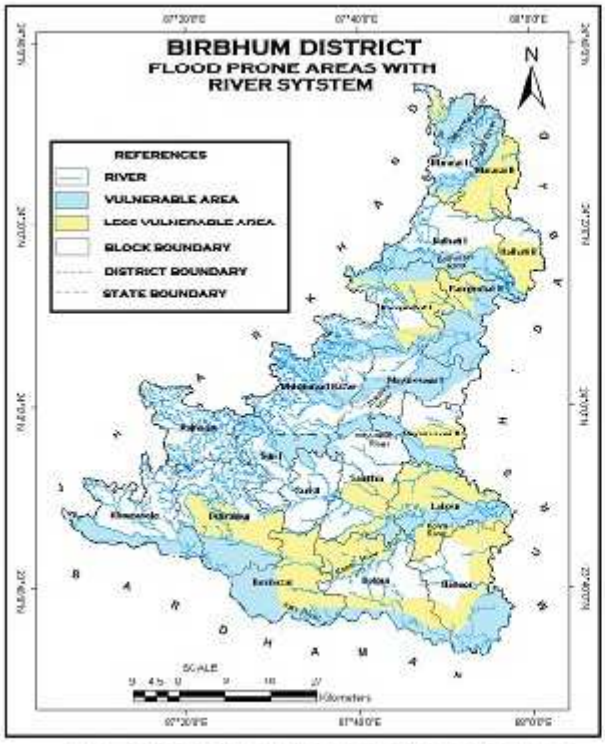

FIG.- 4: FLOOD PRONE AREAS WITH RIVER MAP

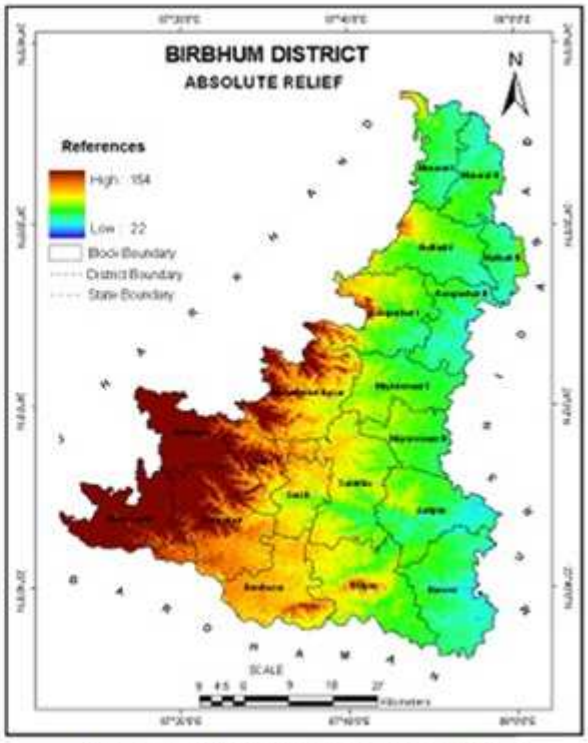

FIG.– 5: ABSOLUTE RELIEF MAP

Fig.-5 shows that the south western part is higher from sea level than the other part of the district. Because of lateritic lithological characteristic and semi arid region of western part of this district, rain drop impact, rainsplash erosion, rill wash, sheet erosion and stream deposition are responsible for flood and drought. The important forests of Birbhum district are Ballavpur, Chowpahari, Gonpur, Amlakuri, Rajnagar-Guralgachi, Bakreswar, Khairasole, Tumboni, Khairasole etc. These forests also exist in western part of this district. Now deforestation has taken place here due to

increasing population and agricultural land conversation from forest land. So sedimentation procedure is accelerating by deforestation.

It has made a steady progress in agriculture during the post-independence era through the gradual development of irrigation facilities, introduction of high yielding varieties and adoption of improved technology by the cultivators. Now the district has attained surplus production in case of paddy, potato and vegetables. The agriculture extension wing of the state Government has played the key role in achieving this success. But one question is arise with practice more cultivation i.e. amount of total ground water reduce which accelerated drought and sediment.

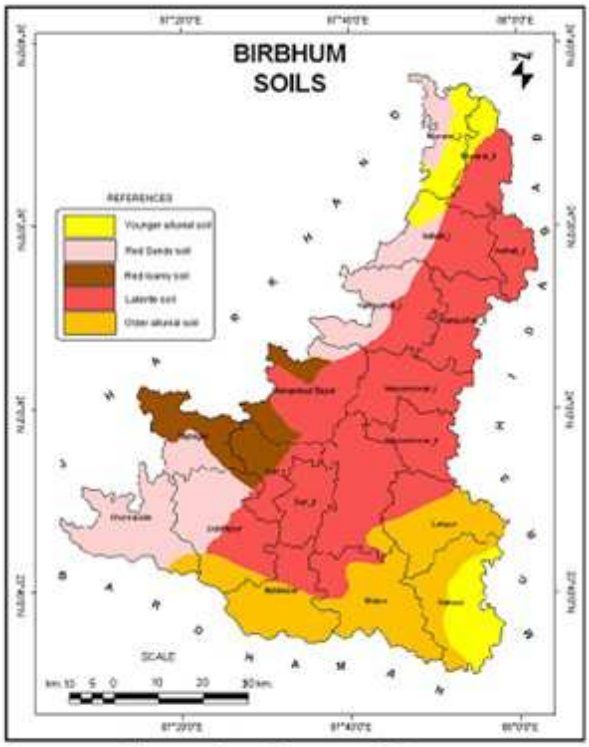

FIG.-6 : SOILS MAP

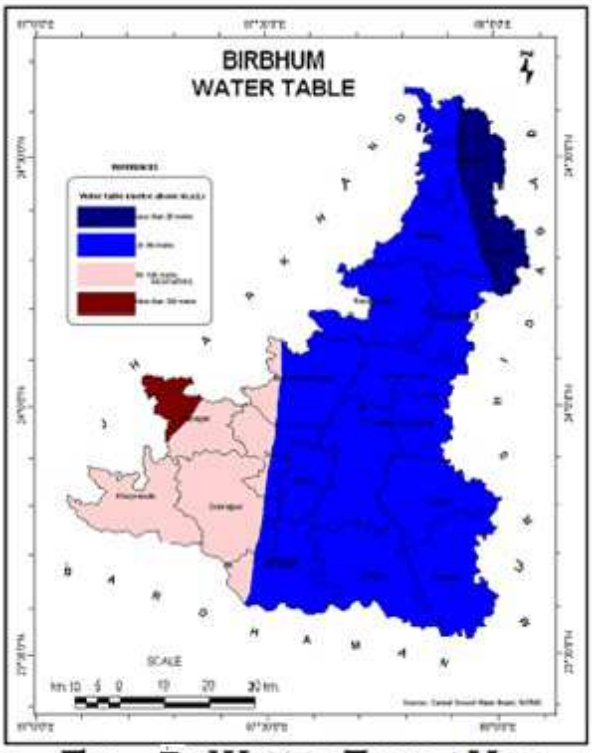

FIG.- 7 : WATER TABLE MAP

Geomorphologically western part of this district is buried pediment (lateritic coverage) while eastern portion is flood plain and geographically/Geologically western part is the continuous part of Chottonagpur Plateau while eastern part is continuous Gangatic flood plain. Most of the area (Fig.-6) is covered by lateritic, red sandy and red loamy soil which is also accelerated drought due to unscientific land use practice. Needless to say western part is steeper than eastern part of this district. The average slope (Fig.-8) of this district lies between 1 to 3 %.

Fig.- 9, shows the drought prone C.D. blocks of this district. It also reveals that western part is more critical from eastern Birbhum. Among 19 C.D. blocks, 8 C.D. blocks i.e. Rajnagar, Dubrajpur, Khairasole, Suri-I, Nalhati-I, Mhammad Bazar, Rampurhat-I Murarai-I are critical, 4 C.D. blocks i.e. Rampurhat-II, Murarai-II, Mayureswar-I, Nalhati-II are semi critical and 7 C.D. blocks i.e. Ilambazar, Bolpur, Labpur, Mayureswar-II, Nanoor, Sainthia, Suri-II are safe drought prone areas. Ground water table map (Fig.-7) is also shows that eastern portion of this district's ground water table is more nearer form surface while western parts are suffering for

ground water during summer season. More cultivation practice accelerated the drought of this district

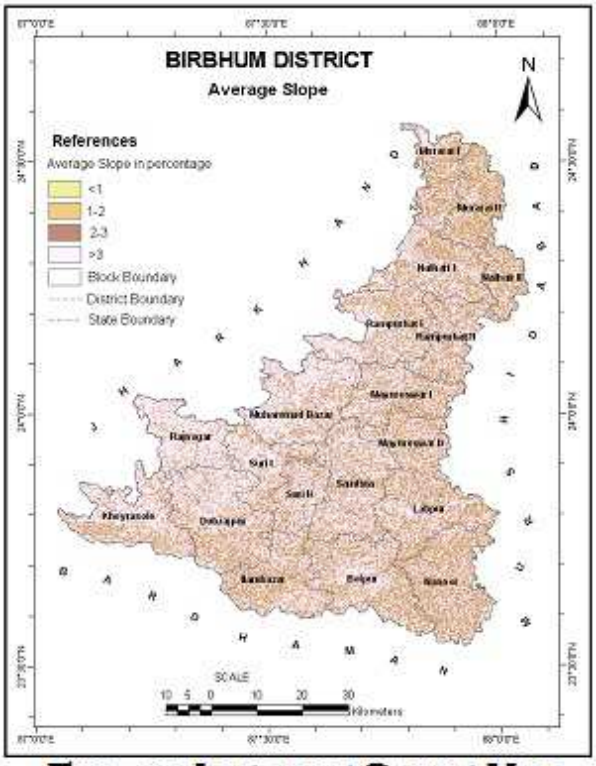

FIG.- 8 : AVERAGE SLOPE MAP

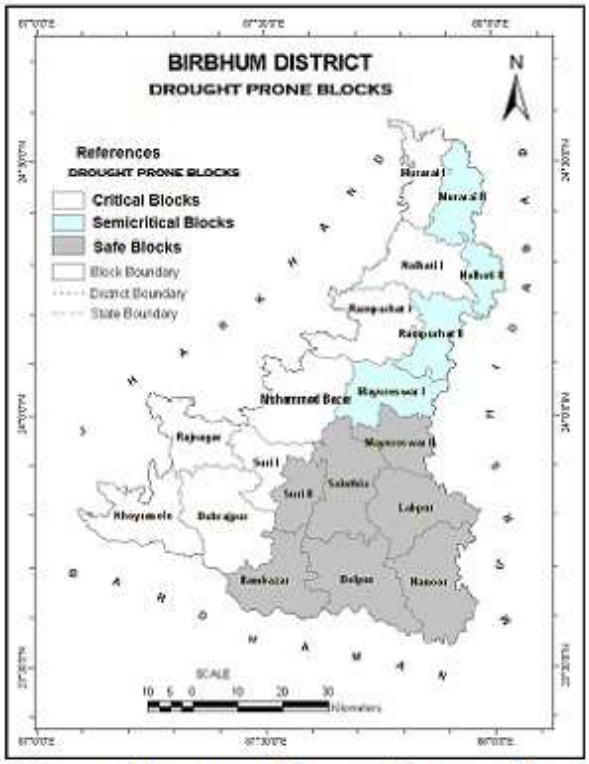

FIG.- 9: DROUGHT PRONE BLOCKS MAP

Both sediment and water discharges are primarily determined by the nature and characteristic of the basin area. The water and sediment discharges generally increase in the downstream direction of this district. This implies a decrease in the competence increase flow downstream which is accelerated the flood.

Table-1: River Carrying Capacity and Irrigation facility:

Name of the River	Gauge Station	Zero Level (in Mts.)	Danger Level (in Mts.)	Extreme Danger Level (In Mtr.)	Availability of Irrigation Facility (Area in Hect.)
Ajoy	Gheropara	34.54	39.416	40.416	
Hinglow	Hinglow Dam	94.49	98.755	NA	12656.25
Mayurakshi	a)Massanjore Dam b)Tilpara Barrage		a) 121.310 b) 62.79		61590.00
KUIYA	Angarpur		19.05	20.05	
BABLA	BazarShow		15.02	15.63	
Brahmani		5	15		

Source: MULTI .HAZARD DISTRICT DISASTER MANAGEMENT PLAN, BIRBHUM 2011-2012

To prevent flood and drought dam/barrage play important role here. It's also help irrigation for agriculture (Table-1). It is another cause of flood due to miss mange or unscientific use. Is being carried out by the Irrigation Department through building of

embankments to prevent flood prone areas of Birbhum to prevent flood waters from damaging agriculture areas such as in Mor, Hingolo, Pagla, Dwarka etc rivers and renvation and remodeling of embankments along the Mayurakshi-Hingolo system. It excavates new drainage channels and enhances the drainage capacities existing channels of various river systems. The Department also regularly undertakes anti river erosion. The Sustainability Land Management can access rights to resources, community organization, self-governance, and benefit sharing between the local communities and the government which reduce flood and drought intensity. These social changes are considered indispensable for long-term successful forest rehabilitation. To allow these changes to happen, significant investments in terms of financial resources, advisory services and assistance to local communities are required and should be considered as an integral component of Sustainable Land Management.

Concluding Remarks: In Birbhum have built vast structures to control and regulate the flow of rivers. However, major multi-purpose dam projects are developed here. These are now almost entirely part of the development strategies of Birbhum. In India large scale river management schemes have had mixed success and in many cases river management projects are reverting back to softer approaches in the realization that the natural river system and catchment has much to offer. River management can attempt to reduce or regulate discharge in the river. Here practice two type of engineering e.g. - Hard engineering, which is expensive, and tends to have a large impact on the river and the natural ecology and hydrology. Softer approaches tend to be more ecologically sensitive. However, with the main purpose of flood management aimed to increase capacity and move discharge as quickly and efficiently as possible past a settlement.

In Birbhum, waterways prone to floods are often carefully managed by defenses such as detention basins, levees, bunds, reservoirs, and weirs are used to prevent waterways from overflowing their banks. In conclusion, I have stress the need to continue to develop the biogeomorphic approach and for geomorphologists to consider pioneer riparian vegetation as a fundamental dynamic control on physical morphogenesis and for hydroecologists to consider more explicitly the control of flood and drought by pioneer vegetation in river corridors as a key ecosystem function.

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