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Experiences of Sufferings from Flood Hazard in Lower Damodar Basin, Eastern India – A Theorical Review

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Abstract:
Floods are recurrent phenomena in India from time immemorial. More than 520 million people are affected by flood per year in the world. Flood is the most frequent natural disaster that caused, and continues to cause, serious economic and environmental losses. Modern landscape ecology, with its emphasis on the interplay between spatial heterogeneity and ecological process, considers humans as one of the many important agents affecting landscapes, and emphasizes natural, semi-natural, and built landscapes. The degradation of the river basin ecosystems and its repercussions on human societies have emerged as major issues for India in this century. This region has a great number of river systems. Human interference in the form of dam building and other construction activities have affected river basin ecosystems, the flow dynamics of the rivers and the lives of the communities who dwell by the side of the rivers and, thus, can be seen as a component in river basin ecosystems. This study is based on a case study of the lower Damodar Basin in West Bengal, India. The River Damodar is known as 'sorrow of Bengal' for its frequent floods and related flood ravages. The hydro-meteorological condition of Lower Damodar Basin is dominated by monsoon confined to four months in a year. It explores issues such as the relationship between the river and the bank dwellers, how the bank dwellers perceive the man-made changes in the river regime, and to what extent they are involved in these changes. The main finding of the study is that, as the river has shifted its course, floods have changed physical and social landscape. This study addresses the risk from flood by examining the factors influencing local communities to adopt both structural and non-structural flood mitigation strategies in lower Damodar Basin, in Eastern India. This paper briefly describes the flood problems of lower Damodar basin, the magnitude of flood damages and outlines of important flood management practices.

Keywords: Chronic floods, Lower Damodar basin, landscape change, alternative cropping arrangements.

Introduction:

A flood is a usually high stage in a river- normally the level at which the river overflows its banks and inundates the adjoining areas. In the late 20th century, awareness of natural hazard has been a greater theoretical perspective sharpened by a new generation of text books (White 1974, Bryant 1991, Alexander 1993, Cutter 1993, Blaikie *et al* 1994, Smith 1998). This article is about the social aspects of the flood and landscape changes taking place in lower Damodar River basin in India. All individual

perceptions are regarded equally valid evaluation of hazard, and for any given threat, an individual chooses his or her own response (Hewapathirane, 1978, Sarkar, 2005). Meaningful involvement and participation of the community for risk reduction and human adjustment to hazard empowers people to take right decision (White, 1974; Murshed, 2003; Shaw and Krishnamurty 2009). This article is about the social aspects of the landscape changes taken place in lower Damodar River basin in India. This study addresses the social dimensions of flooding and how people's perceptions of flooding change with experience. The hydrological regime of the river Damodar brings flood hazard every year in its lower course. During last 100 years, the lower Damodar area of West Bengal experiences more than 20 serious devastating floods. The flood and related landscape change have been bringing miseries in life not only because of the casualties and but also due to the associated disease and livelihood disruption (Mitra and Mukhopadhyay, 2005). The aim of present endeavor is to analyze the flood hazard and related landscape change, perception and risk reduction through capacity building of the community combined with managerial adjustment in Lower Damodar Basin.

Research Problem:

Among all the hazards that occur in the country, river floods are most frequent and often the most devastating. The causes for flood are chiefly hydro-meteorological. Except it, anthropogenic activities like different control structures changes to stream channels during urban growth (hardening stream channels, building in floodplains, breaching of the embankments) can limit their capacity to convey floodwaters. Structures that encroach on the floodplain, such as bridges, can increase upstream flooding by narrowing the width of the channel and increasing the channel's resistance to flow. The present study relates to the flood risk and consequent landscape change of Lower Damodar basin, which is characterized by the predominance of agricultural activities. The hydrological regime of the river Damodar brings flood every year in its lower course. During last 100 years the Lower Damodar area of West Bengal experiences more than 20 serious devastating floods. With the rapid socio-economic changes in the study area, flood sometimes bring in heavy loss of life, damage to property and disruption in public utility services.

Aims and Objectives:

The main objectives of the study are:

- To assess the flood prone zone in lower Damodar basin.
- To identify human role in flood hazard and resultant landscape change.
- To find out the vulnerability, loss, community participation, risk reduction and adjustment to flood.

Materials and Methods:

Hydrological and meteorological information is generated from the meteorological center, and from the Block Seed Farms in the districts, Durgapur Barrage, Panchet and Maithon reservoirs, different gauging stations particularly in the lower reaches of the river. An in-depth interview was conducted to determine the extent of vulnerability, loss, perception and community participation in the study area.

Study Area:

The river Damodar, a rainfed river, has its origin in Chotanagpur plateau. It has a wide catchment area of 37000 sq. km. of which 63.6% contributes upper catchment and only 36.4% contributes lower catchment

in West Bengal. The Present study area Lower Damodar Basin which lies in the Southern part of West Bengal of Eastern India is bounded by latitude $22^o15'N$ to $23^o00'N$ and longitude $87^o55'E$ to $88^o05'E$. This region starts from Begua where the river bifurcates into two branches Mundeswari and Damodar. Its southern extension ends at a point where the river Damodar meets Hooghly River at Shyampur near Falta. The total geographical area of the region is about 2365 sq km.

Results and Discussion:

Flood behavior of river Damodar

Flood behavior of river Damodar and resultant landscape change is influenced by a range of factors that vary significantly with location. The region experiences flood by heavy monsoonal rainfall in the catchment area and the release of excess water from the upstream
reservoir during the monsoon months adds severity to flood situation in lower Damodar basin. Catchment size, shape, slope development and vegetation all significantly influence the hydrological processes, in particular the conversion of rainfall into runoff. The speed of conversion from rainfall to runoff, the volume and peak runoff and the speed of rise of water, all influence flood behaviour and the length of time a flood will last. Though floods are a historic presence in this river basin, especially in the downstream areas, there has been much debate about whether the recent devastating floods were used by anthropogenic activities that directly or indirectly affect the river regime. Both in 1978 and 2000, 2008, 2015, 2021 the floods coincided with an extraordinarily vigorous monsoon, though the effect of an upstream dam has also been described as crucial (Sarkar 2005)..The concept that man-made changes have drastically altered the river morphology and its hydrology has been discussed by Mitra and Mukhopadhyay (2005). They mention bridge building and dam construction on the river and one of its tributaries as major examples of anthropogenic changes.

The intense rainfall during monsoon and discharge from upland reservoir leads to severe flooding in various parts of the area in varying magnitude almost every year. 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 economic interest of modern society. Again, it is easy to define, that flood losses are difficult diverse as the economic interest of modern society. It is easy to define, that flood losses are difficult to set down in monetary terms. Flood losses are categorized into two according to the action i.e. direct losses and indirect losses. According to nature of the losses will be tangible and 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.

Vulnerability and Loss:

The flood prone zone of lower Damodar Basin is an assessment of land relative to its susceptibility of flooding. Vulnerability to flood is defined as the extent to which a community, structure service of any area likely to be damaged by the impact of flood hazard. Vulnerable cultural elements such as settlements, agricultural lands, roads and railways are the viable components and effective indicators of a dynamic geomorphic landscape.

The study area is mostly inhabited by the villagers. The economically weaker people i.e. the marginal farmer, daily wage earner and artisans are the most vulnerable sector of a society. Elderly people, disabled children, pregnant women, sick and ailing people, widows, families living near to the river etc.

are vulnerable population and cattle livestock, livelihood assets, standing crops, drinking water sources, communication system etc. are considered as **t**he damage from natural hazard can be minimized by the way of comprehensive preparedness plan.

Different types of flood loss were considered:

Agricultural property loss: 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.

Loss of 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 however is a major source of difficulty. 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. The costs of alleviating hardships and safeguarding health during a flood, the money spent to reduce flood losses by the erection of temporary barriers or removal of goods, social dislocations and distress, airports temporarily out of service and added costs of rerouting rail and highway on longer detours are other form of indirect loss.

Findings:

- Rainfall, river discharge from upland reservoir and human induced anthropogenic activities are the main occurring agents of recurrent flood and resultant landscape change in lower Damodar basin.
- Human interference in the form of dam building and other construction activities have affected river basin ecosystems, the flow dynamics of the rivers and the lives of the communities who dwell by the side of the rivers and, thus, can be seen as a component in river basin ecosystems.
- With the passage of time it has been observed that the DVC is unable to alleviate the flood problem.
- Food security with alternative cropping arrangements, flood forecasting, flood risk reduction through capacity building is evident in lower Damodar basin.
- As a severe flood prone zone, lower Damodar Basin requires mitigation of the adverse impacts of flooding and consequent landscape change by local decision makers. The adopted structural measures in this area have not yielded sufficient results to mitigate the chronic flood problems and resultant landscape change.
- Therefore, some non-structural measures like flood forecasting, alternative cropping arrangements and capacity building through self-help group or community based organizations are taken into considerations to reduce the problem pertaining to landscape change.
- As a severe flood prone zone, lower Damodar Basin requires mitigation of the adverse impacts of flooding and consequent landscape change by local decision makers.

Conclusion:

Flood in various magnitude is a recurrent phenomenon in the study area. This region is crisscrossed by branches of river Damodar. The geomorphological feature is also one of the factors for causing flood in the study area. Except rainfall, river discharge from upland reservoir and human induced anthropogenic activities are the main occurring agents of flood. The inhabitants of the study area have been experiencing flood since time immemorial. Before commissioning of the DVC, the area was subjected to severe flood causing immense loss of property and life. The DVC was visualized to alleviate the flood problem in lower Damodar basin. With the passage of time, it has been observed that the DVC is unable to alleviate the flood problem. Normally flood events disturb the existing cropping system of any particular area. Food security with alternative cropping arrangements play a vital role to reduce risk of the vulnerable people of the study area. The perception study undertaken among the flood victims revealed that more emphasis is put by the people in self-organizing themselves rather than depending on government authority. A culture of coping with flood and risk reduction through Community Based Organization, and alternative cropping arrangement is evident in lower Damodar basin.

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