HYDRO-GEOMORPHOLOGICAL HAZARDS, THEIR IMPACT ON REGIONAL ENVIRONMENT

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Abstract
Today man is the most important geomorphological agent. Wherever man uses land, he has to accommodate its relief, materials and water resources to his purposes. The role of man such way creates a number of hazards on the earth because; he does not always understand the consequences of his manipulations. To meet with the situations and to overcome the problems geomorphologists is likely to develop contacts with a variety of environmental managers and technicians, especially engineers, farmers, foresters, planners and politicians etc. Many problems relate to the interaction between man, land and water. The concept of land management is taking place with as informed awareness of the nature of geomorphological systems, an attempt has been made to put an integrated management plan for sustainable development of the inter-stream region of Denwa-Dudhi and Narmada rivers.

Keywords: *Environmental Hazards, Geo-environmental Factors, Rill, Gully, Ravine,*

Introduction

The Study of the 'Inter-Stream Region of Denwa - Dudhi and Narmada Rivers'is related hydro-geomorphology of 'NarmadaTrough' Region. Being a part of 'Peninsular Foreland'. According to the region, Hdro-geomorphological hazards, heir impact on regional environmen and the geo-environmenal factos which are responsible for the geneating the hazards and problems in the way of the develpment of he region. The main aim of the study is to arrest the hydrological, ecological and geo-environmental crisis of the inter-stream region which is heading towards the chronic situation through the flood hazard, deep soil eosion through ravination, slope, failure in hilly and alluvial terrains and depletion of forest resources through deforestation and overgrazing etc.

Study Area

'Inter – stream Region of Denwa – Dudhi and Narmada Rivers' as the term is used in the thesis, is a part of 'Peninsular Foreland' having contrasting terrain of never depositional surfaces as well as older residual surfaces. The region taken for the study within the geographical ambit of 22^{o} 30' 59" N to 22^{o} 58' 50" N latitudinal and 78^{o} 2' 42" E to 78^{o} 44' 55" E Longitudinal extent forms a compact quadrangle shape having the longest dimension in east – west direction with a length of 71.5 kms, whereas its width in north – south direction increased from west to east which is only 24 kms in the former side and 44.5 kms in the later side. Country, stretching along the left bank of Narmada valley between the Vindhyan mountains and the Satpura hills, and including part of the latter range within its borders, white the Chhindwara district may be described as consisting of three steps or sections of different elevations ascending from the south (Gazetteer of India, Hoshangabad and Chhindwara Districts, M.P., 1997). Structurally, the region is an integral part of the super continent of Gondwanaland and represents the old rigid mass

and preserves the history of the land – surface of large segment of the earth for such a vast measure of time.

The northern and central parts of the plain country have more settlements than the south-western southern and south-eastern parts of the study region. Sohagpur, Piparia, semri, Shobhapur, Rampur, Rajola, Dorikhera and Matkuli etc. are the main service centers which fulfill the needs of the occupants.

Hydro-Geomorphology And Generated Environmental Hazards And Problems

'Hydro-geomorphology' normally deals 'with the study of landforms caused by the action of water' (Scheidegger, 1973). It also deals with the changes in geological and hydrological aspects of water bodies in response to flow variations and to natural and human caused events such as heavy rainfall, floods, channel straightening and heavy soil erosion etc. . 'Hazard' perceived events hit the ecological system of the physical environment, the area comes to gradual lowering and the process of environmental degradation starts. In geomorphology, the study of geo-environmental hazards and problems and related environmental degradation, in fact, provides the required foundation of management (Kumar and Pandey, 1989) of the region where geomorphic processes have imposed contain limitations and man has induced rather accelerated the process of charge. the nature has endowed the inter-stream region of Denwa-Dudhi and Narmada rivers with varied and rich geomaterials , flora and fauna, water resources and associated landforms etc. which altogether have provided safe harborage to the physical environment of the region but their improper treatment for the development of the region by man not only accelerated the natural processes but have introduced some new hazards to the area like flood hazard, rill, gully and ravine erosion, rockslides, landslides and landslips, depletion of forest resources and conversion of natural forests into timber mines etc.

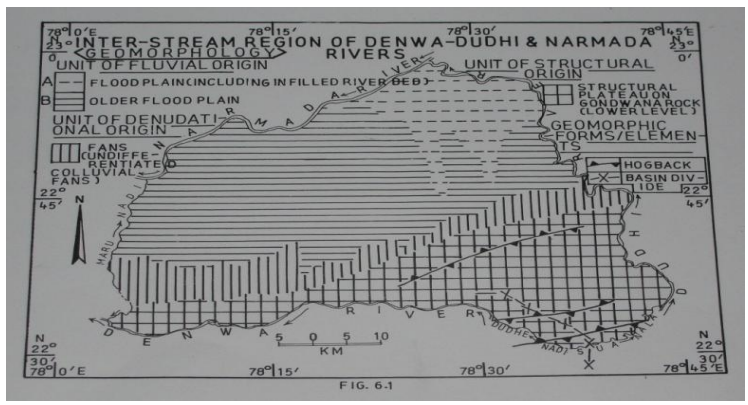

Figure 1.Inter Stream Region.

Rill, Gully And Ravine Erosion

If we look to the region we find that there are many locations in the inter-stream region of Denwa-Dudhi and Narmada rivers where magnitude of soil erosion is serious enough to be considered as the foremost hazard prevailing. At present, these different types of soil of the Denwa and Narmada-Dudhi catchments especially of riparian tracts are running under hazardous situation due to heavy soil erosion in the form of mass wasting, slump, splash

erosion, sheet flow and sheet wash and rill, gully and ravine erosion (plates-1) due to which the entire body of the soil plant nutrients, humus, beneficial microscopic organisms and all other inhabitants and constituents of the soils of the hazardous region are being removed from the soils slowly and slowly and they are achieving at the barren stage. Besides, the process of soil erosion has also resulted into local thinning of the soil layers and in the field the fact is recognized by the appearance of bare spots, accumulation of coarse lateritic and lime kankars and siltation in drainage ways.

According to the report of the 'Techno-Economic survey of Madhya Pradesh' conducted by the 'National Council of applied Economic research, New Delhi' the most serious type of soil erosion in Denwa, Dudhi and Narmada catchments is rill, gully and ravine erosion.

The Nature Of Rills, Gullies An Ravines

It is noticed that the 'process of rilling and gullying' begins at the stage of erosion when the top soil is removed down to or near the subsoil. For achieving such stage of 'rilling' and 'gullying' the surface run-off becomes concentrated through loose and unconsolidated geomaterials into shallow channels (rills) which then combine to form deep gullies which ultimately dissect the surface and create 'ravines' and 'bad lands'. A number of abroad and Indian geoscientists have studied the nature of rills, gullies and ravines in various ravined parts of the earth surface viz. Bryan (1941), Antev (1952), Bennett (1955), Schumm (1956), Brice (1966), Kumar and Pandey (1989), Uddin (1992), Agnihotri (1993), Singh, C.K. (1993), Singh S.R. (1994), The area is seriously affected by the process of gullying and ravination mainly in the alluvial plain of Narmada-Dudhi rivers and Denwa riverine zone in the southern part of the study region.

Geo-environmental Factors Responsible For Floods

The floodway zones of ravinated terrain and outfall zone of Dudhi, Ol, Anjan and Korni Rivers, in fact, are those areas where a number of geomorphic features create considerable obstruction to drain water quickly during heavy rains resulting into silting and flattening of the bed slope in the channel. In monsoon months especially during cyclones and associated heavy rain storms and cloud bursts when these rivers Dudhi, Ol, Anjan, Korni and Narmada simultaneously overflow the extra flowing water of Dudhi, Ol, Anjan and Korni does not get free outfall due to back watering from the river Narmada. This situation especially occurs in the outfall zone of the rivers Dudhi, Ol, Anjan and Korni resulting heavy floods in the area. Inadequate capacity within the banks of the rivers to contain high flows within the rivers, river bank, erosion and silting of river beds, land slips and slides leading to obstruction of flow, synchronization of floods in the main and tributary rivers, poor natural drainage in the flood prone area, unmindful encroachment of flood plain and lack of control on proper landuse, deforestation and lack of soil conservation and management of watersheds are some other but important contributory causes to flash floods in floodway zone of ravinated terrain and outfall zone of Dudhi, Ol, Anjan and Korni river basins.

Geo-environmental Factors Responsible for Soil Erosion Through Rills, Gullies And Ravines

Top soil layer of the surface of the earth is the principal feeding zone of the vegetal cover that provides food for human being, livestock consumption, fiber for clothing and timber for shelter etc. Soil also constitutes the physical basis of our agrarian culture. Thus, it is as necessary to human life as water and winds. It is estimated that formation of 2.5 cm of top

soil takes about 1000 to 2500 years. the study of the nature of the soils of the inter-stream region of Denwa-Dudhi and Narmada rivers that soils of the region have been influenced by parent material, climate and relief, in addition to physical, chemical and biological agents (microorganisms) that are active over the region. . It has also become apparent from the spatial distribution of rill, gully and ravine erosion in different parts of the study region that nature of soil erosion in the form of rills, gullies and ravines is largely controlled and affected by a number of variables which relate to geological structure, topography, climate, soil characteristics, vegetation, character of streams and land use practices etc. the role of geo-environmental factors becomes more destructive than constructive it creates physical hazards like increasing the stoniness of the surface, clogging of stream channels with sediments, reducing their capacity to transmit water and making them more subjective to floods.

Effects of Grass And Forest Cover, On Rill, Gully And Ravine Erosion

Perhaps, the land covered with vegetation, whether grass, shrubs or trees, is an ideal condition for resistance to erosion. Actually, the vegetation cover absorbs the rainfall; decreases the velocity of run-off; reduces the amount of water available for discharge by consuming it and by improving infiltration capacity. In the region under study the natural vegetation is only of dry deciduous type but of fair quality on flat lands of loamy to clayey soils of fair depth. In sheltered valleys on analogous sites, the evergreen element preponderates in the retention in the soil is the minimum; the deciduous crop opens up with plentiful grass and the proportion of low quality, thorny and slow growing shallow-rooted species increases. The real situation is that the rapid human growth and unscientific development of agriculture over the extensive alluvial country of the Dudhi-Narmada basin and Denwa basin have led to destruction of original habitat of the plants which no longer find their ecological and geo-environmental niche in the changed environment.

Preservation of Natural Vegetation

For checking further encroachment of gullies into the forest and culturable lands, it is felt necessary to preserve the existing forest growth in all eroded, gullied and ravined areas of the study region. For improvement operations it is also felt necessary to remove all dead trees from the forest lands, cutting back of all live high stumps, cutting back of bushy, branchy and advance growth of coppicing species, cutting of all climbers except along nalas which are seriously gullied and ravined and cleaning of all bamboo clumps etc.

Prospects for Development Of The Region

The inter-stream region of Denwa Dudhi and Narmada rivers is an attractive plain, plateau and hilly country with great altitudinal variations having beautiful hills and valleys with waterfalls and springs, sunrise and sunset points, caves and pools, cliffs and gorges, wildlives and national park etc.

Viewing its potential for development, the region was declared protected under 'Wild Life Protection Act in 1977'. In fact, any protected area like 'Satpura National Park' if does not have the sympathy of the people around it, can't survive long. we find that there are prospects for the development of the region and its dwellers in and around it but for the purpose some objectives for the development are necessary but these objectives should be based on the principles laid down in the National and State policies.

In this regard, when we view the inter-stream region of Denwa-Dudhi and Narmada rivers, we find that the region needs conservation and management practices at a large extent with

a solid management plan. To afford protection to the friable soils and to check erosion and landslides and slips, and to create an environment best suited for development of the region as a whole. To preserve and improve wild life as a part of ecological balance. To provide aximum grazing facilities for cattle compatible with the regeneration and preservation of forests and to improve the pastures. To work the forests systematically to improve the condition of the crop. To maintain the 'Satpura National Park' as an international park land and to preserve and improve its amenities as a sanitarium.

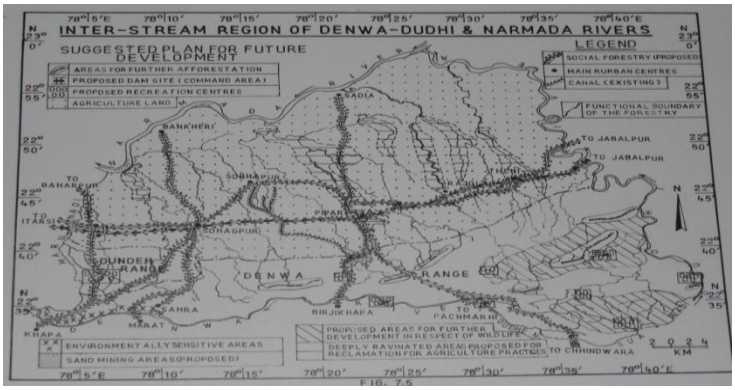

Figure 2. Inter- Stream Region of Denwa- Dudhi & Narmada rivers.

Keeping in view the above objectives and the aforesaid affecting factors, an idea integrated management plan for the development of the Satpura region and the Narmada Dudhi plains, has been worked out. all these things, a management plan has been suggested for the future development of the study region the suggested plan is associated with the land development, irrigation, drinking water, approach roads, energy plantation, grass planting green fodder forms, pasture land development improved breed cattle's, fruit bearing plants, habitat improvement, soil, forest and water conservation etc. if this suggested management plan is materialized, with the march of time, the economic condition of the people of the area will be strengthened and their dependence on the forests will be minimized.

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