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**GRT** A REVIEW STUDY OF ECO-GEOMORPHOLOGY  
(AN INTERDISCIPLINARY APPROACH TO RIVER SCIENCE)

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**Abstract:**-Eco-geomorphology is an interdisciplinary approach to the study of river System that integrates hydrology, fluvial geomorphology and ecology. Ecogeomorphology is an important new branch of geomorphology which deals with the study of interactions between organisms and the development of landforms. Ecogeomorphology is commonly used to describe studies that focus more on the amplification of erosion and deposition processes. It is fundamentally concerned with bidirectional influences of biota and landscape on each other. In this context of above point of views, the present study aims at determining analyze ecogeomorphology as new branch of geomorphology. Due to the heterogeneity features of land, it's very much important to study the ecogeomorphology for landform and human beings.

**Keywords:**Ecogeomorphology, Landscape ecology, Relation between Hydro-Geomorphic-Environmental studies, Land degradation.

**INTRODUCTION:**

Birbhum district is very much enlightened for his physical and cultural properties. In this district, lateritic soil made different topography which is known as "khoai region". Not only topographical/ landscape heterogeneity taken place here, but also ecologically heterogeneity found here. Two things are very much associated between them and both are concerns with river system which is known as ecogeomorphology. Plants and animals affect morphological evolution in many environments. The term "ecogeomorphology" describes studies that address such effects. During this research work I investigate not only the effects of organisms on physical processes and morphology but also how the biological processes depend on morphology and physical forcing. The two-way coupling precipitates feedbacks, leading to interesting modes of behavior, much like the coupling between flow/sediment transport and morphology leads to rich morphodynamic behaviors. The dynamic interactions between vegetation and flow/ sediment transport that can determine river channel patterns and the multifaceted ecogeomorphic feedbacks shaping "Khoai region", "Basaltic topography", "Flood plain" and channel networks. It suggests that the effects of morphology and physical processes on biology tend to operate over the timescale of the evolution of the morphological pattern. The ecogeomorphic research work driven by societal need and a confluence of complex systems-inspired modeling approaches in ecology and geomorphology. To make fundamental progress in understanding the dynamics of many landscapes, our community needs to increasingly learn to look for two-way, ecogeomorphic feedbacks and to collect new types of data to support the modeling of such emergent interactions.

Eco-geomorphology is an interdisciplinary approach to the study of river System that integrates hydrology, fluvial geomorphology and ecology. Ecogeomorphology is an important new branch of geomorphology which deals with the study of interactions between organisms and the development of landforms. Examples of this studies is to explicitly integrating ecology and geomorphology date back to at least the late 1800s (e.g. Cowles, 1889)<sup>(3)</sup>, with more examples appearing in the 1950s (e.g. Olson, 1958)<sup>(24)</sup>, and 1960s (e.g. Hack and Goodlet, 1960)<sup>(9)</sup>. The terms eco-geomorphology is become popular in the 1990s (Osterkamp and Hupp, 2010)<sup>(11,12)</sup>. The British geomorphology Research group annual Meeting (Thornes, 1990)<sup>(31)</sup> and the 1995 Binghamton symposium on bio-geomorphology (Hupp et al., 1995b)<sup>(12)</sup> were two of first symposiums to emphasize the theme of bio-geomorphology. Ecogeomorphology and biogeomorphology are generally considered synonyms (Hupp et al., 1995)<sup>(11,12)</sup>. Ecogeomorphology is commonly used to describe studies that focus more on the amplification of erosion and

deposition processes. It is fundamentally concerned with bidirectional influences of biota and landscape on each other.

The Geomorphology (Elsevier journal 126, 2011) 265–268 special issue focused specifically on ecogeomorphology, about definition to include other related approaches. Earlier two of the same Elsevier journal's special issues on biogeomorphology, edited by Hupp et al. (1995b)<sup>(11)</sup> and Viles & Naylor (2002)<sup>(21)</sup>, were also published in Geomorphology. Plants and animals affect morphological evolution in many environments. The term "ecogeomorphology" describes studies that address such effects (MURRAY, et al. 2008<sup>(28)</sup> & V. C. Jha 2009<sup>(13)</sup>). A considerable body of work concerns how physical processes and morphology in river channels determines the suitability of these environments as habitats (Buffington et al., 2004<sup>(2)</sup>; Kondolf and Wollman, 1993<sup>(16)</sup>; Merz et al., 2006<sup>(19)</sup>; Pasternack et al., 2004<sup>(26)</sup>; Suttle et al., 2004<sup>(30)</sup>). Vegetation increases the erosion resistance of banks both directly, through the sediment strengthening and flow diverting effects of plant roots, and indirectly, by trapping fine-grained sediment that adds cohesion (Knighton, 1984<sup>(15)</sup>; Smith, 1976<sup>(28)</sup>). Studies of systems in which biological morphological coupling and feedback is important, which we term "biomorphodynamic", are beginning to blossom, and in our opinion this trend should accelerate. The terms "ecomorphodynamic", "biogeomorphology", and ecogeomorphology have also been used (Fagherazzi et al., 2004<sup>(5)</sup>; Hupp et al., 1995<sup>(11,12)</sup>; Naylor et al., 2002<sup>(20)</sup>; Stallins, 2006<sup>(28)</sup>; Viles, 1988<sup>(36)</sup>, 1990<sup>(37)</sup>), and the latter two might be applied more broadly than the restricted sense of two-way coupling we suggest for biomorphodynamics. Ecologists and some geomorphologists, on the other hand, study how topography and geomorphic processes affect biology (Bendix, 1997<sup>(1)</sup>; Parker and Bendix, 1996<sup>(25)</sup>; Stallins, 2006<sup>(29)</sup>). Animals and plants on hillsides and in drainage basins affect the rate that sediment enters a river (Liebault and Piegay, 2002<sup>(18)</sup>; Piegay et al., 2004<sup>(27)</sup>; Yoo et al., 2005<sup>(39)</sup>), therefore affecting river morphology.

Finally, as past literature has shown, attempts to clarify nomenclature are unlikely to really change the inconsistent use of these terms (similar to the 'restoration definition' debate). Nonetheless, the above history provides some context for what is clearly a growing area of interest (National Research Council, 2010).

Wainwright et al. (2011) use an improved distinction between structural and functional connectivity to lay out a conceptual framework that aids in more clearly elucidating feedbacks between ecologic, geomorphic and hydrologic systems. Thus, this work helps conceptualize and link together some of the empirical evidence of feedbacks detailed in previous works in the research work.

#### **AIMS AND OBJECTIVES:**

In this context the present study attempts

To know what is ecogeomorphology?

To know why it is important part of geography as well as human beings?

What is the relation between other branch of geography and ecogeomorphology?

It may be particularly useful for proportion of master plans, in planning nature reserves and in general as a guide to many types of land management.

Based on ecogeomorphological characteristic of any area/ land, geographer or planer would like to produce some integrated management for development of land use.

#### **DATABASE USED:**

Ecogeomorphology have been carried out by conventional methods and by using data obtained from topographical sheets, satellite imagery and space borne platforms. To study the "Ecogeomorphology", ecological patches are efficient accurate and cost effective information system which is required. One of the important tools for determining variation in time and space is repeated mapping. The change detection studies with particular reference to deforestation using remote sensing have been done at global local level (Hecht, 1982)<sup>(10)</sup>. Ecogeomorphology is focusing on land & water degradation status as well as environmental degradation. So, Ecogeomorphological study of any area will be based on the following techniques and database i.e. Digital analysis and Morphometric analysis. The methodology of Digital analysis adopted for carrying out this analysis could be categorized into 6 steps as follows in the Fig.1. After collecting the essential information required for this study, the Morphometric analysis of these data was carried out through following technique. To prepare this article, I have flow the following methods which is shown in flowing figure-2.

Figure-1  
Methodology Used for Ecogeomorphological Study

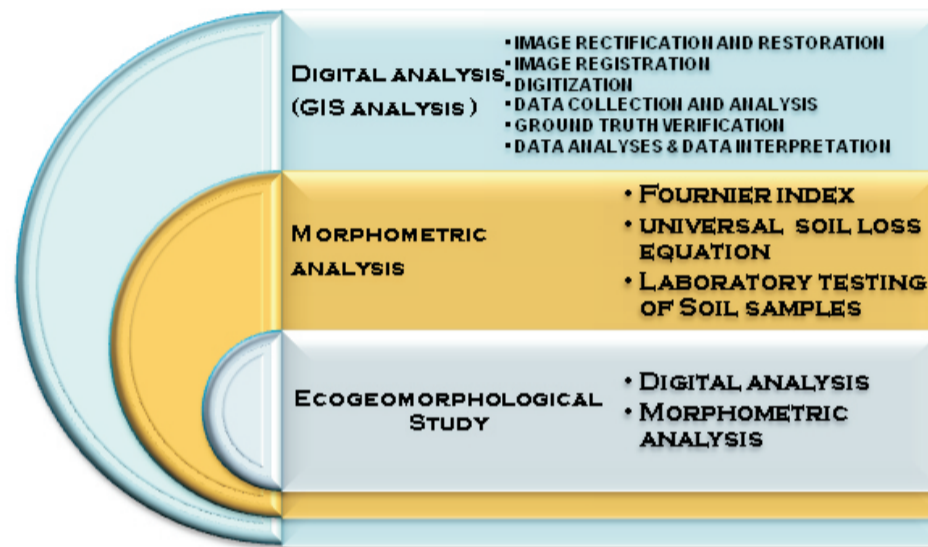


Figure-2  
Methodology of this article



**RESULT AND DISCUSSION:**

The term 'eco unit' in ecogeomorphology has been developed to refer to a landform component lying in a particular land systems, ecosystems, bioclimatic zone and ecological district. Eco units provide the means by which these other dimensions are spatially integrated for analysis and management. In ecogeomorphology, landform, ecosystem, geomorphic processes is very much important things. Here analyses their relationship - "how they are co-related each other?" It is the major finding of ecogeomorphology. How the geomorphic processes affect by the ecology and also how the ecology affect by

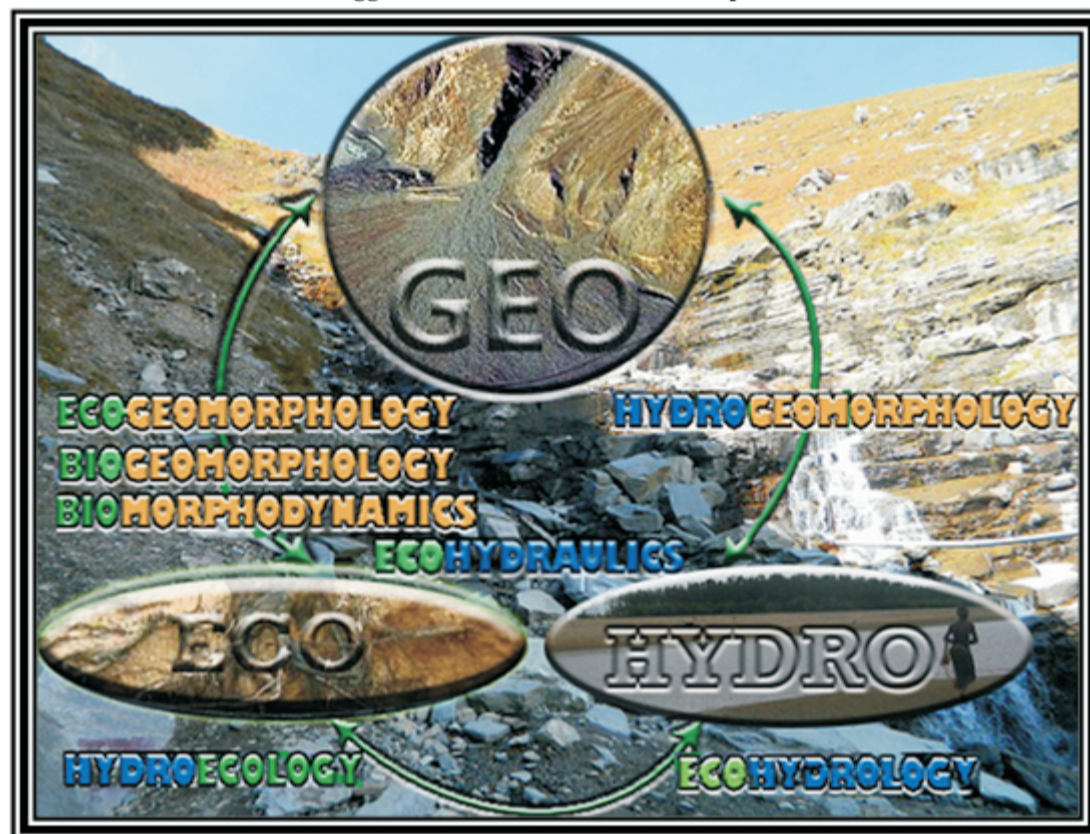
landform/ geomorphic processes is the main theme of ecogeomorphology.

In this context 'landscapes ecology' is very much applicable to assess the landscapes which 'dealt with in their totality as physical, ecological and geographical entities, integrating all natural and human ('caused') patterns and processes.....'(Naveh1987) <sup>(21)</sup>. The German geographer and scholar Alexander Von Humboldt, 200 years ago, regarded the landscape as 'the total character of a region', but the term landscape ecology was coined by the German bio-geographer Carl Troll at the end of the 1930s. Landscape ecology was born as a human- related science (Naveh and Liberman 1984) <sup>(23)</sup> but it is recently been accepted that the landscape is very promising for ecological studies (Forman and Godron 1986 <sup>(7)</sup>, Turner 1989 <sup>(35)</sup>, Farina 1998 <sup>(6)</sup>, Forman 1995 <sup>(8)</sup>). The landscape perspective is full of promise for the realization of the integration of different sciences i.e. - ecology, geography, botany, zoology, animal behaviour and landscape architecture. There are problems with the way in which these various disciplines will interact, but space is recognized as a new frontier of ecology and the landscape is one of the main components of this space.

Landscape ecology cannot explain geomorphic processes which developed the landform but it can help us to understand the complexity, i.e. the interrelationships between geomorphic processes and ecology.

Figure-3

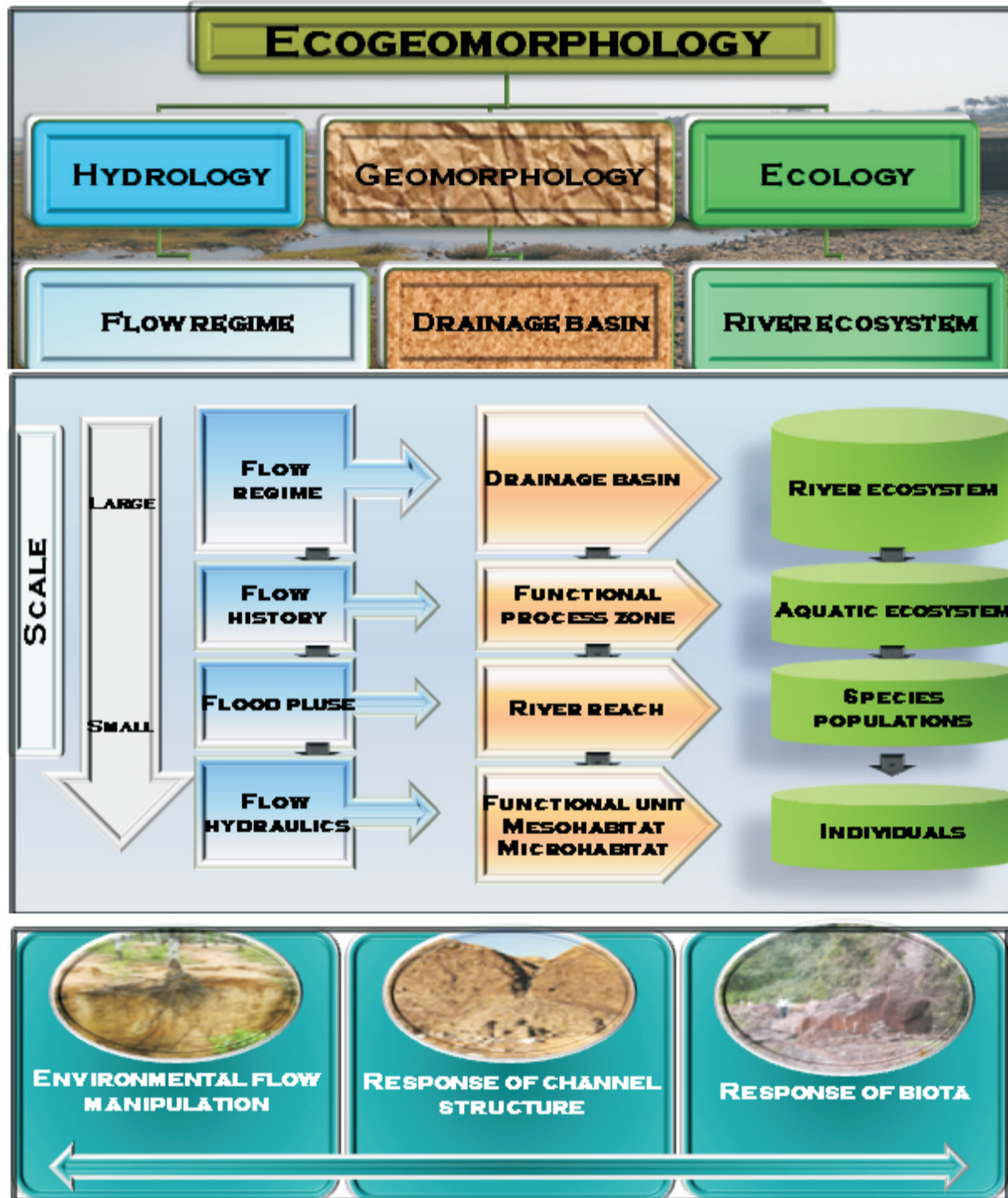
The 'Eco-Geo-Hydro Mess'. Interdisciplinary scientists at the interface of physical and biological sciences have struggled with what to call their disciplines.



These seven combinations of geo-, hydro-, and eco-roots represent invented terms scattered throughout the literature, which represent different sub-disciplines. In this study, I focus on relation between ecological and geomorphic processes during my Ph.D. work and adopt the 'ecogeomorphology' as a new discipline of geomorphology. This discipline is very important for land degradation. We can easily analysis environmental degradation of an area through the ecogeomorphic assessment. As human beings, some knowledge about land degradation as well as environmental degradation is necessary to acquire. It can be possible with the help of this discipline.

Using an interdisciplinary framework, environmental water allocations can be placed within a spatial and temporal context that considers key hierarchical links between hydrology, fluvial geomorphology and ecology. This framework changes the issue of water allocation from one of discipline-specific effects to one that must consider complex multi scale interactions among biota, physical structure and hydrological processes (Fig. 4).

Figure- 4  
Multi scale relationships between hydrology, fluvial geomorphology and ecology



At a micro scale, flow hydraulics influences the character of the river-bed substratum (Lancaster & Belyea, 1997)<sup>(17)</sup> and the corresponding level of biological organization is that of an individual organism. At a larger scale, the flow history partly determines the morphology of river zones and the corresponding level of biological organization is that of the community (Fig. 4). Environmental water allocations rely on the manipulation of the hydrological component of river systems. It is important to know at what scale these hydrological manipulations are based, in order to predict physical and biological responses. Environmental flow strategies need to monitor geomorphological and ecological responses to hydrological

manipulation at the appropriate scale and need to conduct hydrological manipulations at the appropriate scale to produce a geomorphological or ecological benefit.

#### INFERENCE:

The purpose of this article is to introduce modern geomorphology to the university students and researcher. I have explained the state-of-the-art concepts and methodology, using, so far as possible, case studies of Birbhum (4). This article is an essential reading tool for all students and researcher of geography, geology and environmental science, with special interest in the field of land degradation. Day by day population increase, as a result human interference over land is also increased and environmental degradation has occurred. Then bio-diversity became threatened, afforestation taken place, ground water decreases, several health problem arises, socio-economic status changed etc.

To prevent land/water/environmental degradation, ecogeomorphological study is very needful. Based on ecogeomorphological characteristic of any area/ land, geographer or planner would like to produce some suitable integrated management for development of land use.

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