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Appraisal and Management of Wetland of Champaran Plain with Special Reference of Gandak Basin: A Geographical Analysis

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Abstract – The Burhi Gandak river basin is bounded by the Himalayas in the north, Ganga River in the south, the Kosi River in the east, and the Great Gandak in the west. It originates from the Chautarwa Chaur Terai region near Bishambharpur, Bihar district of West Champaran. It is known in its upper reaches as Sikrana. Harha, which emerged near Someshwar Hill, collects water from several mountainous rivers and is known as Masan in the plain and is Sikrana's primary source of water. A second mountainous flow, Singha, is divided into two, one joins Harha and Masan near Churharwa and one identified as Ramrekha joins Sikrana. Rivers Masan and Ramrekha join Lauria Nandangarh in creating Sikrana, which greatly contributes to its discharge. Dhanauti, a highly sinuous nearly deserted river, meets Sikrana near Pakridayal village, Motihari and after this confluence is renamed Burhi Gandak, the Sikrana.

Keywords: Wetlands, Gandak Basin, Chaur, Meander, Budhi Gandak

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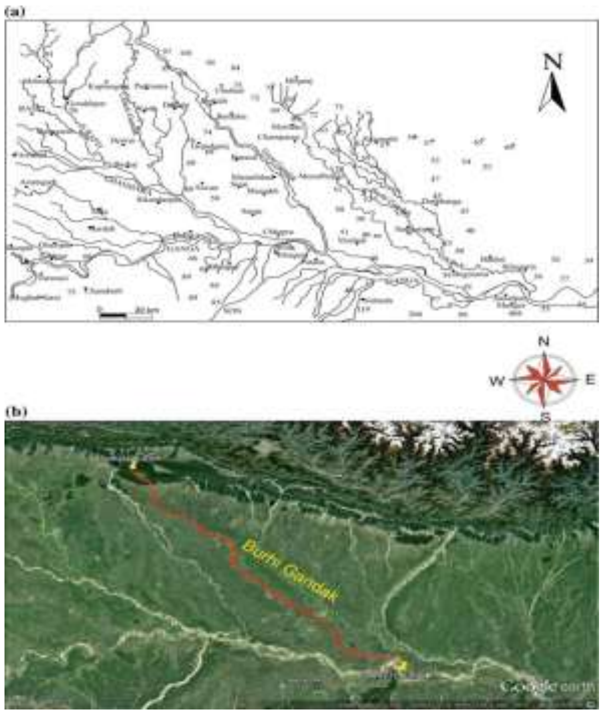
INTRODUCATION

Burhi Gandak is a left bank tributary of the Ganga River. It is meandering in nature and flows in the southeast direction**.** The right main channel of Bagmati meets Burhi Gandak near Rosera and affects its discharge during monsoon season. Traversing a distance of about 400 km in the alluvial plain, Burhi Gandak joins Ganga near Gogri Jamalpur, Khagaria district of Bihar. The Gandak Bay stretches across the western districts of Champaran, East Champaran, Muzaffarpur, Samastipur, Begusarai and Khagaria. There are roughly 32 streams leading to the Burhi Gandak. Some foothill rivers also follow it in the district of Champaran.

8,60 cm / km, per one. And the total sediment scale is 2.03, 2.44, and. The depth of the valley ranges from 20 to 800 metres, in the next section minimal and in the distal section limit. The canal ranges between 10 and 350 m, in the proximum section minimal and in the distal section limit. In the proximal portion the overall height is 230, 124 and 90 m and in the digital part the minimum height is 43, 38, 31 m. The measurement of Burhi Gandak River channel width, valley width and sinuosity is seen in, and the graph between the three is given in.

The sinuosity is between 1.1 and 5.9 with the addition of a place where 13.9 The sinuousness is poor in the close and strong in the centre and poor again. in the distal section.



Natural Hazards

Bihar is the most influenced state in India. Nepal / Tibet is the main region with catchments with snow-fed rivers draining Bihar. In the Bihar Plain the strong water flow and the broad sediment load transported by rivers are dropped, growing the water power of the channel. Burhi Gandak is a well-known river for its regular floods. The Burhi Gandak bank was destroyed in several locations during the floods of 1998, 2001 and 2004, causing loss of life and property. In 2007 and 2012, severe rainfall destruction triggered catastrophic floods in the basin. The flood waters hit the railway track at West Champaran. A reservoir was constructed by the river to shield the city of Khagaria from the floods.

To consider its water carrying capacity, the lodging area of a river should be estimated. In order to create a partnership between precipitation and water keeping power of the channel. A storm and storm duration

It is the way of life for citizens from about five Bihar districts. The important cities and towns located at its left bank are Madhubani, Siwaipatti, Kishanpur, Rosera, Majhaul, Khagaria, Gogri, and Jamalpur, and right bank cities are Lauria Nandangarh, Motihari, Pipra, Mehsi, Motipur, Kanti, Muzaffarpur, Samastipur, and Narhan.

The locals treat it as Ganga. It also triggers loss of life and property due to inadequate preparation and control during flooding. It supplies sand as the raw material for the building and manufacturing sectors. It also provides lime (CaCo3) to rural people for local use via the bivalve and gastropod shells and to prepare lime on a local scale for tobacco. There are several routines at the bank.

Numerous alluvial fans initially flooded the Indo-Gangetic forest basin (Parker, 2000). Fluvial mechanisms within numerous tectonic and atmosphere regimes carve the existing environment. Deformation of the order of few mm (2–3 mm)/year can produce anomalous features in a river basin, hence the landforms and subsurface characteristics. Dynamics of a fluvial system subjects to geometry and nature of channel pattern, and river deposits. These essential elements provide important information about the dynamics of the fluvial system. The channel adjusts to significant changes in the water discharge, and nature of sediment supplied to the channel. When the quantity of water and sediment over a period of years remains relatively constant, the channel geometry and pattern vary about a mean of quasi-equilibrium conditions. Understanding the processes of river channel adjustment in response to a change in the water discharge, sediment size, and sediment load supplied to the channel is vital for the successful river basin management.

The adjustment within a river basin that significantly influence the sediment size distribution, occurrence of bars, and channel width describe the hydraulic processes controlling these characteristics as well as the rate at which they function. Therefore the physical characteristics of the channel, describe the dynamics of the river at the time of their evolution. The discharge of Chhoti Gandak is mainly controlled by rain which is very high during monsoon and low during summer. It has been observed that whenever precipitation is high in the catchments area, there is flood in the downstream part of Chhoti Gandak River Basin. The nature of drainage pattern and drainage density reflects the hydrogeological condition of the area. The wide valley occupied by narrow channel indicates that river was carrying high discharge in the past when this wide valley was carved. High discharge is attributed to large drainage area and enhanced precipitation. Narrow channel is the result of decrease in discharge due to change in climate. Most of the rivers in the Ganga Plain (Ganga, Yamuna, Ghaghara, Great Gandak, Kosi etc.) are characterized by narrow channel confined within wide valley (Singh, 2007, Singh et al., 2010). The reduced discharge in the peninsular river such as Narmada River Basin is also attributed to the change in climate (Kale and Rajaguru, 1988). The pond has a gentle slope, a medium relief surface, low surface run-off, a high degree of runoff and a low water storage potential suggesting a mature stage of topographic growth and erosion. This groundwater fed alluvial river originating in the terai region has natural drainage system. The water spreads within the basin and concentration of peak discharge takes place in the distal part. The morphometric parameters have hydrological significance.

The analysis provides informationthat recharging of the groundwater is a natural process in this basin therefore planning for water resource management and recharging ponds should be made to retain it and caution should be taken during prolonged heavy precipitation for flood mitigation. Granulometric parameters of old and new point bars indicate that the transporting capacity of the river which is controlled by discharge is continuously decreasing. The decrease in discharge is attributed to the loss of upstream catchment areas by river piracy or by low precipitation due to climate change. Gandak Chhoti is a fifth-order river dominated by lower order streams and the basin is stretched in SE direction. The dominance of first order streams indicates uniform lithology and gentle slope gradient where the major fraction of precipitation flows as surface run-off. Variation in the size and order of streams are in direct response to the physiography and climate. However, lithology is alluvium and infiltration rate is high which is against the dominance of first-order streams. Hence, prolonged precipitation during monsoon in the catchment area reduces the rate of infiltration and increases the surface runoff and number of first-order streams. Gentle slope gradient and low basin relief indicate low surface run-off, low sediment transport and high infiltration rate. Low drainage density and gentle slope characteristics evaluate low run-off and high percolation potential. Gentle slopes are favorable for building up the hydraulic gradient and are most suitable for groundwater recharge (Shankar and Mohan, 2005). It is controlled by climate processes in the area underlying uniform lithology (Sreedevi, et al., 2004). All streams originate in the alluvium and their drainage network shows a linear relationship with a small deviation when logarithmic stream number is plotted against the stream order. The mean Bifurcation ratio indicates that the streams are natural and not influenced by geological structures (Strahler, 1964).

The study of climate and tectonics control also indicates that the river valley is not tectonic in origin (Singh et al., 2009). However, it is believed that in the Ganga Plain, rivers are flowing through tectonic lineaments (Mohindra and Parkash, 1994; Singh and Singh, 2005). Hence, it is concluded that the groundwater-fed rivers originating in the terai region have natural drainage system (Singh et al., 2009; Awasthi and Singh, 2011). The stream-length ratio and number of first-order streams reflect mature stage of topographic development and erosion. Hypsometric integral (value = 0.52) for this basin also indicate mature stage of landscape evolution (Singh et al., 2009, Awasthi, 2012). The RHO coefficient and gentle slope gradient indicate spreading of water within the basin due to its low water storage capacity, which causes flooding. The basin has low water storage capacity due to which water spreads within the basin. The channels are far away from each other, as a result, during prolonged precipitation water accumulates in the basin which creates flood due to water logging. The length of overland flow (Lg) indicate longer path for the concentration of flow and so the peak discharge takes place in the downstream part of the river. The rainfall data indicate that whenever rain is high in the catchment area there is flood (1974, 1978, 1980, 1984, 1998, 2000, 2008) in the downstream part of the basin (based on the rain fall data and information of local people) (Singh and Awasthi, 2011a, Awasthi, 2012). Therefore, caution should be taken and planning should be made during prolonged precipitation for water resource management and flood mitigation. The shape parameter indicates that basin is elongated and skewed in SE direction and has smaller flood peaks but longer periods of flooding. Dendritic drainage network is the definite response of basin to complex physical processes such as climate and hydrology (Garde, 2006; Rao et al., 2010). The drainage network of the basin is effective to provide a sufficient superficial drainage with dominance of low order streams that flow directly in the principal collector or in upper order streams.

The Hypsometric Integral (HI) demonstrates the mature stage of the Chhoti Gandak River Basin landscape creation and is also confirmed by the extension and meanders of the canal's valley. The stream longitudinal gradient (SL) index defines that soft content for erosion and transport in upper reaches is usable while the greater value suggests that the content in the lower reaches is comparatively resistant. Granulometric study, the occurrence of sand in the upper reaches and clay in the lower reaches, are also verified. The asymmetry component of a drainage basin (AF) and the topographic symmetry component transversal (T) mean that the basin tilts because of the inclination to drift in the gorge. The similitude of rocks, coalesce point bars, discharge variations, anatomy of the channel and the breadth of valleys and river terraces suggest different energy levels of the river which in the past had clear climatic influence over the river during the humid clima. Owing to climate change and decreased discharge the channel has become very short. The decrease in the scale of the point bars suggests shifts in the sediment load and water release of this river as a consequence of the climate shift from rainy to arid. The palaeo and point bar complex are climate-controlled and demonstrate that the mousson was stronger in the past. Tectonics regulate the migration of the stream and tilting of the basin. The river terraces are under climate and tectonic influence. Climate change produces fundamental changes in channel geometry and depositional style. Cold and arid stages are characterized by the presence of channel facies whereas warm and humid stages contain channel as well as interchannel facies.

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