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Depositional Fluvial Landforms of Sai River, Uttar Pradesh

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Abstract: *The rivers deposit sediments in different parts of their courses and thus form three major types of landforms such as point bars, channel bar and natural levees etc. The depositional action of a river is influenced by flow velocity and loading capicity. The decrease in stream velocity reduces the transporting power of the river which are forced to leave some load to settle down. Increase in river load is effected through accelerated rate of erosion in the source catchment areas consequent upon deforestation. Individual lithofacies of the channel bar, point bar and natural levee were identified and described based on their physical appearance and sedimentary structures. The lithofacies are further grouped into lithofacies associations or assemblages characterizing a particular depositional environment. Most deposits of braided river could be described following Miall (1978) classification with the inclusion of a number of additional minor but significant lithofacies types, which subsequently became a standard field methodology for the examination of fluvial deposits.*

Key Words: *Point Bar, Channel Bar, Natural Levee, Sai River, Uttar Pradesh.*

1. INTRODUCTION:

The Sai River, also known as the Adi Ganga, is a tributary of the Gomti River in Uttar Pradesh. Sai River originates from a pond in village Para near Pihani in district Hardoi and travel about 755 km finally joins the Gomati River at Rajepur in Jaunpur district. The Sai River forms the district boundary of Lucknow and Unnao. The Sai River flows through the Uttar Pradesh districts of Hardoi, Unnao, Raebareli, Pratapgarh, and Jaunpur (Kumari and Chaurasia, 2015). The study area is a part of the Indo-Gangetic Plains, which lies between the Ddoab region of the Ghaghara – Ganga interfluve (Fig. 1). The total area of the basin is 11952 sq. km and perimeter is 1952 km. The river is essentially alluvial derived and receives water from streams namely Loni, Bakulahi, Bhainsta and Sakarni (Kumari and Chaurasia, 2015; Arya, et al., 2020; Gautam et al., 2020).

All rivers may deposit material anywhere along their course, but they mainly deposit material in valley bottoms where gradients are low, at places where gradients change suddenly, or where channelled flow diverges, with a reduction in depth and velocity. The important fluvial deposits are recognized such as channel deposits, channel margin deposits, overbank floodplain deposits, and valley margin deposits etc.

2. METHODOLOGY:

The detailed filed surveying of the Sai River has been done. The different depositional land forms and other significant charateristics of the river have been studied in details. The facies asssociation of the different landforms (pont bar, channel bar and natural levee) have been charaterised at minimal scale.

3. RESULT AND DISCUSSION:

Every river has its own morphology, channel characteristics and depositional, erosional features depending upon the sediment supply, hydrodynamics and other geological, geophysical factors. The detailed observation of the different depositional features and structures of the Sai River have been done during field surveying. The river meandering, pont bar, channel bar and natural levee development and beautiful cliff embankment section have been noticed in various places.

Channels form in sediment that has been, and is being, transported by flowing water. They may change form substantially as discharge, sediment supply, and other factors change because alluvium is unable to resist erosion to any

great extent. In general Channel bars are characteristic features of any braided river having steep slope and course bed material. However, river with fine-grained material may also show braiding. There is no well-defined difference in the sequence of channel bar and point bar deposits especially for the river with very fine grain sediments (Singh, 1977). The channel bar sequence is characterized by the lamination with the alternating layers of sand and clay (Fig. 1 a).

The natural levee is an important landform associated with floodplains. It is low, linear and parallel ridges of coarse deposits along the banks of rivers on both sides due to deposition action of the stream, appearing as natural embankments. The levee sediments are made up of somewhat finer material than the corresponding point bar sediments. According to Kumar and Singh (1978), in a natural levee sequence sand layers usually show small ripple cross bedding and sometime horizontal bedding; and finely laminated mud at the top of the sequence (Fig. 2 b).

The point bar sequences result from lateral migration of a meandering river during flood (Fig.2 a). Point-bars vary morphologically depending on the curvature of the meander, and are restricted in their size to by the size of the channel in which they are being deposited. The major bedding type is cross bedding of current ripple origin. The point bar section displays five types of subfacies from bottom to top are Planner Cross Bedded Very Fine Sand followed by Laminated Sand Bed, Planner Cross Bedded Very Fine Sand, Laminated Sand Bed and Convolute laminated Very fine sand (Fig. 2 c). The Planner Cross Bedded Very Fine Sand lithofacies forms due to the migration of 2-D dunes. Sand is transported up by the flank of the bed forms by traction and intermittent suspension and deposited at the crest, where bed- shear stress drops at the point of flow separation (Miall, 1996). This sub – lithofacies further subdivided into subfacies, based on inclination of foreset laminae: with foreset inclination less than 15^0 and subfacies, with foreset inclination greater than 15^0.

Floodplains are also a major landform of river deposition. The floodplain sections have categorized into four broad sedimentary facies using Flemming (2000) classification, namely very silty sandy mud, very silty sand, slightly silty sand and very silty slightly sandy mud along with calcrete horizon imbedded in the very silt sand mud facies. Among the all the very silty sandy mud is the most dominated facies observed, followed by very silty sand facies and others likely slightly silty sand and very silty slightly sandy mud facies.

Mature paleosols, such as calcretes are effectively developed in floodplains areas. The calcretes band is massive also having waste lateral extension without any variation in their organization. The calcretes are primarily made up of micritic carbonate crystals and contain fungal borings at places.

4. CONCLUSIONS:

The ripple cross laminated lithofacies is characterised by a variety of asymmetrical ripple marks. The ripple-cross laminated subfacies, variously situated on laminated horizontal-bedded sand bodies. These lithofacies occur under two quite different conditions. Importantly, it is represented by the upper plane bed, which shows transition from sub-critical to super-critical flow condition. However, these are met with at still lower velocities at shallower depths. It is distinguished by flat, parallel bedding or laminations with parting lineation occurring on bedding plane (Reineck and Singh, 1973). Here planer cross bedded fine sand with foreset inclination greater than 15^0 subfacies is observed. These facies have been quite common in all point bar, channel bar and natural levee deposits.

Laminated sand bed lithofacies is distinguished by flat, parallel bedding or laminations with parting lineation occurring on bedding plane. It is also characterised by distinct colour banding imparted by the concentration of the mica flakes and heavy minerals.

Convolute laminations are observed in over bank deposits (silt and clay); however, these facies are also developed in the upper part of channel bars (fine sand). Internally it appears as folded layers, usually with broad synclines and narrow anticlines. The degree of deformation gradually decreases downward to an undeformed state. The folds are either symmetrical or weakly to moderately asymmetrical with overturned limbs. The convolute laminations are associated with parallel laminations or small-scale climbing ripple cross laminations. Convolute laminations are the result of pore fluid expulsion generated during loading of overlying sediments.

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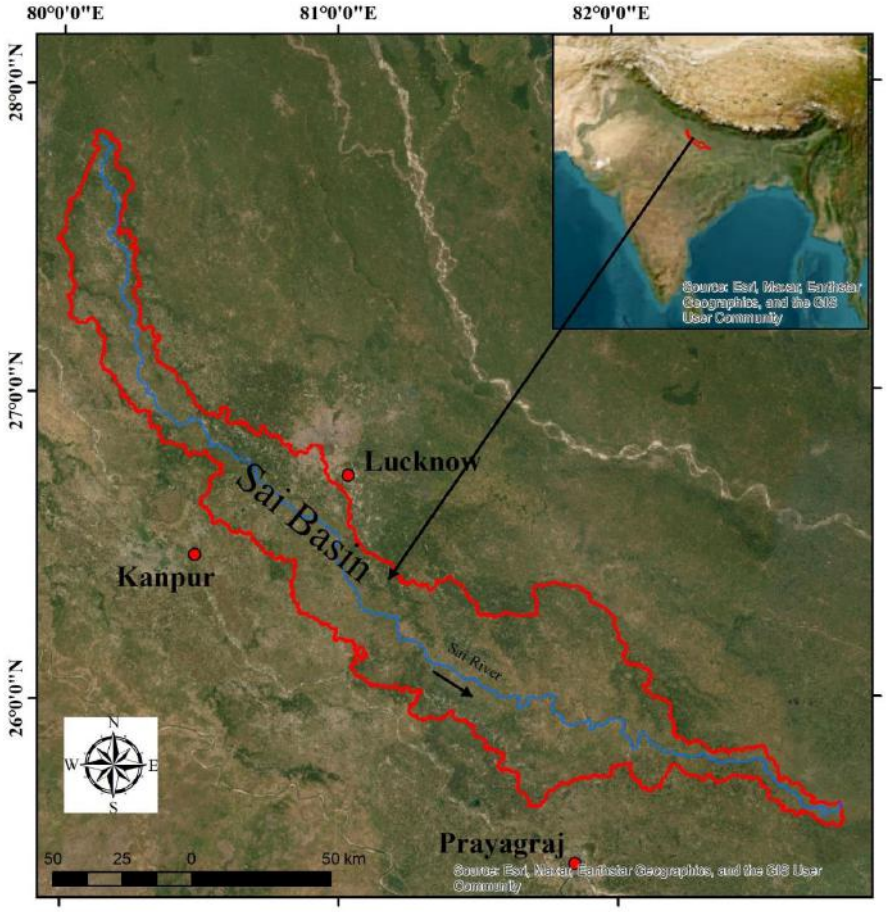

Fig. 1 Location map of the Sai River, Uttar Pradesh. Basin area is demarcated with red line.

Fig. 2 Field photographs showing (a) channel bar, (b) natural levee and (c) point bar facies assemblage of the Sai River.

REFERENCES:

1. Arya, A. K., Singh, A. P., and Agarwal, K. K., (2020). A Multi Criteria Approach for Morpho-tectonic Evaluation of Sai River Basin in Uttar Pradesh. Journal Geological Society of India, 96, 171-179.
2. Flemming, B.W., (2000). A Revised Textural Classification of Gravel-Free Muddy Sediments on the Basis of Ternary Diagrams. Continental Shelf Research, 20, 1125-1137. https://doi.org/10.1016/S0278-4343(00)00015-7.
3. Gautam, P. K., Singh, D. S., Kumar, D., and Singh, A.K., (2020). A GIS-based Approach in Drainage Morphometric Analysis of Sai River Basin, Uttar Pradesh, India. Journal of the Geological Society of India, 95, 366–376, https://doi.org/10.1007/s12594-020-1445-9
4. Kumari, V., and Chaurasia, G. L., (2015). Study of Water Quality Status of Sai River in Uttar-Pradesh with Reference to Water Quality Index Assessment. International Journal of Innovative Research in Science Engineering and Technology, 4(1), 18614-18623.
5. Miall, A. D., (1978) Lithofacies types and vertical profile models in braided river deposits: a summary. In: AD Miall (Ed.), Fluvial Sedimentology. Canadian Society of Petroleum Geology Mirror 5,597-604.
6. Nanson, G. C., (1980) Point bar and flood plain formation of the meandering Beatton River, north eastern British Columbia, Canada. Sedimentology 27, 3-29.
7. Reineck, H. E., and Singh, I. B., (1980) Depositional Sedimentary Environments, 2nd edition, Springer-Verlag-Berlin, Heidelberg, New York., pp.543.
8. Singh, I.B., (1977) Bedding structures in a channel sandbar of the Ganga River near Allahabad, U.P. Journal of Sedimentary Petrology 47,747-752.