

THE STUDY OF ABANDONED CHANNELS AND THEIR SOCIO-ECONOMIC IMPORTANCE OF THE SANKOSH RIVER BASIN IN INDIA

Abstract

An abandoned channel is an inactive channel, defined as a former stream channel through which water no longer flows. They are recognized as depression in the landscape and located at the position of a formerly active channel, though typically of considerably reduced width and depth. All these abandoned channels are naturally formed and provides different morphological characteristics along the Sankosh River of the study area. The abandoned channels are identified with the study of the mechanism of meander cut-off, channel avulsion and braid formation. In this regard, morphometric analysis has been done for the basin area of Sankosh River and various morphometric data have been calculated by using of topographical maps published by the Survey of India and Remote Sensing and GIS platforms. These abandoned channels are not only represented as various geomorphological features such as ox-bow Lake, meander scar, meander cut-off etc. over the flood plain of the concern river but also constitute an important source of natural resources which yields high economic and livelihood values to local people inhabited surroundings of the abandoned channels of the study area. But, abandoned channels are facing different kind of problems due to huge population pressure, land use change, climatic change and environmental change day by day. Therefore, the attempts has been made to bring out some unexplored facts about the restoration, conservation and management of abandoned channels which are supposed to be more useful to socio-economic development as well as risk reduction for human habitation and sustainable use of lands of the surrounding channels areas.

Sankosh River is one of the major rivers of North Bengal and Assam in India. This river system has covered up its mountainous parts of Bhutan, flowing through undulating plains of North Bengal and Assam and finally entered into Bangladesh to find its confluence in Brahmaputra River. In Bhutan, it is called as the Puna Tsang Chhu, Sankosh in India and Gangadhar in Bangladesh. The northern limit of the study area started at 26⁰44'24" North latitude where it creates boundary between India and Bhutan, and the Southern limit ends with the boundary shared between Bangladesh and India at 25⁰58'48" North latitude. The longitudinal extension ranges from 89⁰43'48" East to 89⁰55'12" East. The study area covers an area of 1012

sq.km (Map 1.1). The portion of this river basin falling within West Bengal and Assam is constituted of lower alluvial courses having significant dynamic fluvial characteristics for which frequent changes and abandonment of courses are manifested in the channel system which counts for adequate academic importance. Such changes of the river system have also sufficient social importance from the socio-economic point of view.

The present study has been conducted to identify the different types of abandoned channels resulted from various fluvial processes associated with them and to study the occurrences of sedimentary features associated with the abandoned channel fills. The researcher also investigated to identify the problems of human practices surrounding the abandoned channel areas and suggested some important recommendation to manage the problems and bring out the socio-economic importance of abandoned channel areas.

To fulfil the objectives of the research work, the methodology adopted, has been divided into three parts. In the pre-field study, secondary data has been collected from library, books, journals, various district and state offices, toposheet maps of Survey of India (SOI) etc. The field survey i.e. second part of the methodology, has been conducted to collect primary data from the field to analyse various morphometric parameters related to the research work and at the same time household survey has also been conducted to investigate various socio-economic data of the local people inhabited surroundings of the abandoned channels. In the post-field study, geo-referencing of the topographical maps to integrate or incorporated a whole or partial with the satellite images have been made and at the same time enhancement and the digital processing of satellite images for various applications have also been done with the help of different licensed and open source of GIS packages. Global positioning system (GPS) has been used for locational studies as a technique of data input and enhancement method of data interpretation wherever applicable and needful. In addition to this, some important statistical techniques have also been applied for the interpretation of primary as well as secondary data collected from the field and other sources.

The entire research work is divided into Seven chapters to fulfil all objectives of the present work. The chapter I includes a brief introduction of the research work with hypothesis, objectives and methodology along with the review of literatures. Physical and cultural set up of the study area has been discussed in the chapter II whereas the chapter III contains a brief morphometric

analysis of the Sankosh river in the study area and also discussed about the identification of the abandoned channels. A thorough discussion about the mechanism of the formation of the abandoned channels has been analysed with the help of Remote sensing and GIS platform in chapter IV. In chapter V, various resulted landforms of the abandoned channels have been identified and explained with maps. Socio-economic importance of the abandoned channel has been investigated through field survey with the help of questionnaire in chapter VI and finally in chapter VII, various methods has been suggested for sustainable management of abandoned channels in the study area and enlisted major findings of the research work.

The adopted systematic approach has helped in achieving the basic objectives and research questions to complete this research work. The courses of Sankosh River have been analyzed with the remote sensing and GIS platforms and formation of abandoned channels were quantified from the point of view of fluvial processes. Identification, types and the mechanism of abandoned channel formations have been realized and documented by field investigations. Laboratory analysis and sampling tests of different variables helped to find out the mechanism of abandoned channels formation and their resultant landforms formation in different reaches of the study area. Different morphometric parameters have been calculated and analyzed to know the nature of the River Sankosh. Meander cut-offs, ie both the neck cut-offs and chute cut-offs have been analyzed in relation to the sinuosity index which is considered the fundamental mechanism of abandoned channel formation. The mechanism of channel avulsion has been investigated on the basis of overbank flow during the high flood which is also explained as another important mechanics of the formation of abandoned channels in the study reach. Meander cut-offs, channel avulsion, influences of braid formation have been observed and identified as the main mechanisms of the formation of abandoned channels in the study area.

Different erosional and depositional landforms development with the channel abandonment has been counted and analyzed to fulfill the concern objective of the research work. Abandoned channels are important elements of alluvial river system and these channels provide huge resources for the people inhabited surrounds the abandoned channel. In this regard, the socio-economic importance of these abandoned channels has been analysed for the benefit of the local people. On the other hand, human habitation on the abandoned channel area has been made different kinds of problem are also investigated in the study reach. For this reason, restoration

processes, suggested guideline and a conceptual framework, has been prepared for the proper management of abandoned channels.

Abandoned channels are generally highly productive ecosystems, providing various key benefits to the environment. Records relating to the existing ecological values of the identified abandoned channels along the River Sankosh (main stream) is inadequate in the present era. This necessitates an urgent need to make a record on the types of abandoned channels, its formation and mechanisms, morphometric, hydrological and ecological records, surrounding land use and land cover, hydrogeology of the main stream basin, surface water quality, and socio-economic dependence, and highlight the pressure these systems are subjected to in the present context. Monitoring of water quality can be done by involving local NGOs and the regulating department of surface water, groundwater and ecology. Such programs and practices help in providing technical support and addressing hydrologic concerns, and consequently, this helps in boosting better consideration of these systems and formulating comprehensive measures regarding their management by restoration and conservation.

In the long run, it is expected that the outcome of this Ph.D. research work has fulfilled all the basic objectives of this research as well as contributed to the field of geomorphology in general and to fluvial geomorphology in particular. The research work has also demonstrated the application of geospatial technology in fluvial geomorphologic investigation.