PREFACE

Channel planform can be defined as the planimetric geometry of an alluvial river as display in the maps or satellite images. Channel planform dynamics has been studied for its geomorphological and engineering importance using empirical and theoretical models for better river management activities. It is one of the major problems of alluvial streams around the globe, which causes natural hazards like horizontal channel shifting, bank erosion and flooding which damage the hydraulic structures, transport network, agricultural land and settlement along the river.

The Ramganga river is a first major tributary of the Ganga river. It shows dynamic nature in lower reach due to frequent floods and flat topography of the region. Numerous engineering structures, e.g. the bridge, roads, gas pipelines, and settlement along the river bank, are damaged due to the meandering nature of Ramganga. It is published in the Hindustan Newspaper that seven bridges have become useless due to shifting of river Ramganga and near about Rs 1000 Crore of government money is wasted due to unpredictable behaviour of Ramganga river.

Therefore, the present work can be used to identify the most stable reach for the construction of infrastructure facilities, e.g. bridge, school, settlement, roads etc. The present study provides recent and reliable information's on the channel planform dynamics that will help as a decision support tool for designing and implementation of drainage development works in the study area. Over the past decade, Geoinformatics based modelling of the fluvial environment has substantially increased. However, morphological models provide the controlled environment in which channel planform dynamics can be modelled for future analysis

Therefore, a strong necessity is now being realized to model the channel planform dynamics in present hydrological conditions. So that this work is focused on the Geoinformatics based modelling of channel planform dynamics for river Ramganga. The motivation for conducting this research comes by observing the hazardous impact on surrounding settlement in the floodplains. The entire thesis has been divided into eight chapters, and their brief explanation are specified as follows:

The first chapter describes the introduction and objectives of the study, followed by the morphological characteristics of channel planform dynamics. The second chapter describes the literature review on Geoinformatics based predictive modelling of channel planform dynamics. This chapter explains also explain about the available morphological models which simulate the channel planform for predictive modelling. In the present study, the RVR Menander found suitable and has been used for predictive modelling in a GIS environment. The third chapter explains the geographical background of the Ramganga river in the details. It describes the variable which controls the channel planform dynamics of Ramganga river land use/ land cover, climate, geomorphology, geology, the soil of the river, hydrology basin and its impact on the channel morphology. In chapter four, the Landsat archive and historical topographic maps are used in a GIS platform to understand the channel planform dynamics of Ramganga river over ~237 years. Chapter five discussed the impact of monsoonal discharge on the morphology of the Ramganga river using SAR data. Monsoon is the leading cause of flood in the Ramganga river, which is the main controlling factor of channel planform dynamics. Chapter six focused on the evolution of the Ramganga river using remote sensing data and the hydrological data. The results showed that the study reach of the Ramganga river has significantly changed in the

past~46 years in different hydrological conditions. The objective of the seventh chapter is to develop a physically-based predictive model for modelling of channel planform dynamics in a GIS environment for the next 100 years. In this chapter, the Ramganga river morphology has been studied through RVR Meander model. The last chapter deals with the results and discussion, followed by the limitation and scope for future research.

The present study provides recent and reliable information on the channel planform dynamics, and it will be helpful as decision support tools for designing and implementation of drainage development works in the Ramganga basin. This work will also be useful for providing information for future river management activities like construction of bridges, roads, embankments and other infrastructure development activities.

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