

***Dedicated to***

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**CERTIFICATE**

This is to certify that Mr. Baidurya Biswas, a Research Scholar of the Department of Geography & Applied Geography, University of North Bengal has carried out his Ph.D. thesis entitled '**EFFECTS OF TERRAIN CHARACTERISTICS ON LAND USE LAND COVER IN SANKA RIVER BASIN (WEST BENGAL & JHARKHAND)**' under my supervision which is being submitted to the University of North Bengal for the award of Doctor of Philosophy in Geography & Applied Geography under the Faculty of Science.

To the best of my knowledge and belief it is his original research work based on extensive field survey and secondary sources of information done by the researcher.

This thesis as a whole or any part of it has not been submitted to any other University/ Institution for any other degree.

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# Preface

The studies of a river basin have a long tradition in geography especially in field of geomorphology and are well acknowledged. The condition of terrain in terms of basin area and the suitable land use and land cover is main theme of the thesis in terms of the effect of terrain. This thesis is representing the use of old and new datasets with various modern techniques.

In chapter I, the overall introduction of the thesis has explained by elaborating the problems of the study area, aims, objective and related methodology for the execution of the research work. The hypothesis has framed and tested it afterwards chapters. The execution of research requires data, the sources of data mentioned and detailed literature review has done.

In chapter II, the detailed description of the various physical and socio- cultural facets of the Sanka River Basin has executed. Various physical facets like the description of the Sanka River's course and its principal tributaries, climatic conditions, the basin physiography and geology has elaborated. Various socio- cultural facets like various demographic attributes of the basin area with proper data and methodologies has explained.

Chapter III deals with the description of geomorphological and terrain attributes of the region. This chapter focuses on Sanka River and its tributaries and generation of various laws of drainage and grouping the sub-basins. The formulae used to extract the different stream and basin parameters are described in detail along with the software techniques used to evaluate them Morphometric analysis of Sanka Basin has done with required formulae. The combination of different morphometric parameters has produced the morphometric regions using factor analysis method. Longitudinal profile of Sanka River and its tributaries has drawn to identify the best fitting curve. Surface profile and hypsometric analysis has executed for major sub-basins and the Sanka Basin as a whole to understand the relief aspects of the basin area. The analysis of terrain and classification has done on the basis of morphometric regions and surface lithology. The basin has divided in a number of separate terrain units which helps for study according to each terrain unit wise.

In chapter IV, the detailed description of surface soil has mentioned. The soil order and local soil series of the Sanka Basin has documented from proper sources. The chemical and physical properties of soil of the region have elaborated on the basis of analysis of collected soil samples in the laboratory. The detailed analysis of physical and chemical properties

provides a vivid knowledge about soil characteristics according to each terrain class. Sediment production rate in terms of soil erosion also calculated using some empirical methods and prioritisation of sub-basins has done to identify the higher priority sub-basin for considering preventive measures.

Chapter V deals with the Land Use Land Cover of the basin area. The basis of the land use land cover map has prepared from the SOI topographical maps. Satellite images with temporal variation have considered to understand the changing pattern of land use and land cover. Field verification with photographic evidences has consulted with seasonal variation. The village wise land use land cover map has also prepared using census data. Finally a detailed description have executed by analysing land use land cover according to each terrain class.

In chapter VI the status of water of the basin has elaborated. The status of ground water and surface water, their methods of extraction and storage has documented and identified potential surface water storage areas. The depth of ground water from ground and its fluctuation according to seasonal variability has documented and its status for twenty years also elaborated. The minute description of the depth of ground water from ground and its fluctuation has executed by selecting a number of wells within the basin area and monitoring according to seasonal variability. The village wise distribution of tanks, wells and identified the potential location of surface water storage area. The potential water storage areas have been identified throughout the basin considering terrain and LULC properties of the basin.

Chapter VII aims to understand and analysis the effect of various terrain attributes on land use land cover of the basin areas. The identified different terrain classes and according to each class different lithological, morphometric parameter, soil properties and ground as well as surface water scenario combined to analyse and to understand the effect on land use land cover. Suitable statistical analysis executed to quantify the effect of terrain characteristics on LULC. The proposed remedial measures have enlisted for future scope of development.

In Chapter VIII brief summary of the basin attributes evaluated and drawn conclusions has been presented.

Date: 02/09/2021

Place: Raja Rammohunpur

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## Statutory Declaration

All the materials including literatures, maps, diagrams, plates, and any information embodied in this thesis “*Effects of Terrain Characteristics on Land Use Land Cover in Sanka River Basin (West Bengal & Jharkhand)*” being submitted by myself (Baidurya Biswas) under the supervision of Dr. Snehasish Saha, Assistant Professor, Department of Geography & Applied Geography, University of North Bengal to the Dept. of Geography & Applied Geography, University of North Bengal, Raja Rammohunpur, P.O. NBU, District: - Darjeeling, Pin-734013, West Bengal. This thesis is in all aspects original and has not been submitted in part or full for any other diploma or degree fellowship or any other similar title or recognition except few parts for peer reviewed journals to partially fulfil the need of pre Ph.D. publication. The work of other authors or any other organizations/agencies wherever made use of, in this study have been duly acknowledged at relevant places with appropriate and possible recognition. The published works either in the form of direct or indirect utilization have also been used with proper courtesy. Any mistake in doing so is purely unwanted and subject to the proper acknowledgement to the concerned author(s), organization or agency etc., though there is hardly little chance of that. In every part of the work the attitude is to establish individuality and uniqueness with the help of establishment of fact through secondary data sources, published literary works, field work, group discussions, interviews etc.

Date: 02/09/2021

Place: Raja Rammohunpur

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# ACRONYMS

AOI	- Area of Interest
BGC	- Banded Gnesissic Complex
Conc.	- Concentrated
Deg	- Degree
DEM	- Digital Elevation Model
DN	- Digital Number
DPMS	- District Planning Map Series
GEC	- Ground Water Estimation Committee
GIS	- Geographical Information System
GoWB	- Government of West Bengal
GPS	- Global Positioning System
GSI	- Geological Survey of India
GWL	- Ground Water Level
Ha m	- Hectare Metre
HCL	- Hydrochloric acid
ICAR	- Indian Council of Agricultural Research
IDW	- Inverse Distance Weighting
IMD	- India Meteorological Department
LISS	- Linear Imaging Self Scanning
lps	- litres per second
LRM	- Logistic Regression Model
LULC	- Land Use Land Cover
mbgl	- metre below ground level
MLC	- Maximum Likelihood Classifier
MNREGA	- Mahatma Gandhi Rural Employment Guarantee Act

<i>N</i>	- Normal
NATMO	- National Atlas and Thematic Mapping Organisation
NBSS&LUP	- National Bureau of Soil Survey & Land Use Planning
NLRD	- National Register of Large Dams
NRSA	- National Remote Sensing Agency
OLI	- Operational Land Imager
ppm	- parts per million
ROC	- Relative Operating Characteristic
SOI	- Survey of India
SPR	- Sediment Production Rate
SRB	- Sanka River Basin
SWID	- State Water Investigation Department
TM	- Thematic Mapper
WRIS	- Water Resources Information System

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