

# CONTENTS

<b>CHAPTER I</b>	<b>PAGES</b>
<b>INTRODUCTION</b>	<b>1-24</b>
1.1 Introduction	1
1.2 Scope and significance of the study	6
1.3 Literature Survey	7
<b>CHAPTER II</b>	
<b>OBJECTIVES, DATABASE AND METHODOLOGY</b>	<b>25-30</b>
2.1 Objectives of the study	25
2.2 Hypotheses	25
2.3 General Methodology and Database	26
2.4 Data bases and sources	28
<b>CHAPTER III</b>	
<b>GEOENVIRONMENTAL SETTING OF THE STUDY AREA</b>	<b>31-60</b>
3.1 Introduction	31
3.2 Physiography of the Himalaya	33
3.3 Physiography of the Subansiri basin	36
3.4 Physiography of the Alaknanda basin	37
3.5 Climate and weather in the Subansiri basin	42
3.6 Climate and weather in the Alaknanda basin	44
3.7 Glacier and snow cover of the Subansiri and the Alaknanda basins	46
3.8 Geology and tectonics of the Subansiri and the Alaknanda basins	47
3.9 Soil Type	50
3.10 Sediment characteristics of the Subansiri and the Alaknanda basins	53
3.11 Forest and Ecology of the Subansiri basin	56
3.12 Forest and Ecology of the Alaknanda basin	58
3.13 Wetlands of the Subansiri basin	60

## CHAPTER IV

### ANALYSIS AND INTERPRETATION 61-135

4.1 Introduction	61
4.2 Material and methods	62
4.3 Analysis of hydrometeorological parameters of the Subansiri and the Alaknanda Basins	62
4.4 Analysis of selected environmental parameters of water quality	74
4.4.1 Significance and methodology of the parameters tested	75
4.4.2 Analysis of water quality results	82
4.5 Morphometric Study	92
4.5.1 Introduction	92
4.5.2 Case Study 1	93
4.5.2.1 Database and Methodology	95
4.5.2.2 Relief of the Subansiri and the Alaknanda basins	95
4.5.2.3. Slope (or Gradient)	98
4.5.2.4 Aspect	100
4.5.2.5 Discussion	102
4.5.3 Case Study 2	102
4.5.3.1 Introduction	102
4.5.3.2 Study Area	102
4.5.3.3 Database and Methodology	103
4.5.4 Analysis of morphometric parameters	105
4.5.4.1 Stream order	109
4.5.4.2 Stream number	110
4.5.4.3 Stream Length	110
4.5.4.4 Bifurcation ratio (Rb)	110
4.5.4.5 Drainage Density (Dd)	111
4.5.4.6 Basin Length (Lb)	112
4.5.4.7 Stream Frequency (Fs)	112
4.5.4.8 Drainage Texture (T)	112
4.5.4.9 Form Factor (Ff)	113
4.5.4.10 Circularity ratio (Rc)	113
4.5.4.11 Elongation ratio (Re)	114

4.5.4.12 Relief ratio (Rh)	114
4.5.4.13 Relief	115
4.5.4.14 Slope (or gradient)	115
4.5.4.15 Aspect	119
4.5.4.16 Results and Discussion	119
4.5.5 Land use, Land Cover (LULC) change detection of the Subansiri and the Alaknanda basins	120
4.5.5.1 Introduction	120
4.5.5.2 Methodology	121
4.5.5.3 Land Use /Land Cover Analysis of the Subansiri basin	122
4.5.5.4 Land Use /Land Cover Analysis of the Alaknanda basin	126
4.5.6 The Normalized Difference Vegetation Index (NDVI) of the Subansiri and the Alaknanda basins	131
4.5.6.1 Introduction	131
4.5.6.2 Results and discussion	134

## **CHAPTER V**

### **DEMOGRAPHIC PATTERN AND SOCIO-ECONOMIC STATUS OF THE SUBANSIRI AND ALAKNANDA BASINS 136-162**

5.1 Introduction	136
5.2 Analysis of Socio-economic status of the Subansiri and the Alaknanda basins	136
5.3 Dams in the Subansiri and the Alaknanda basins	155
5.4 Tourism Potential in the Subansiri and the Alaknanda basins	159
5.5 Results and discussion	162

## **CHAPTER VI**

### **HAZARD SCENARIO AND IMPACT OF NATURAL AND ANTHROPOGENIC FACTORS ESPECIALLY IN REGARD TO CLIMATE CHANGE IN THE SUBANSIRI AND THE ALAKNANDA BASINS**

**163-186**

6.1 Introduction	163
6.2 Hazard scenario of the Subansiri basin	166
6.2.1 Flood hazard of the Subansiri basin	166
6.2.2 The 1897 Shillong earthquake	167
6.2.3 Assam Earthquake, 1950	167
6.3 Hazards scenario of the Alaknanda basin	169
6.3.1 Harmony Landslide in Garhwal Himalaya, 1986	171
6.3.2 Uttarakhand Disaster 2013	171
6.3.3 Glacial lake outburst flood (GLOF)	176
6.4 Discussion	186

## **CHAPTER VII**

### **SUMMARY AND CONCLUSION**

**187-192**

### **REFERENCES**

**193-216**

### **LIST OF PUBLICATIONS BY THE AUTHOR**

**217**

### **APPENDICES**

**218-259**

Appendix 1	218-220
Appendix 2	221-243
Appendix 3	244-259