

## CHAPTER 21

### GEOGRAPHY

#### Doctoral Theses

01. AGGARWAL(Suruchi)  
**Hydrodynamic Modelling of 'Golf' Hazard and Impact on Hydropower Projects in Tista basin, Sikkim Himalaya.**  
Supervisor: Prof. Suresh C. Rai and Praveen K. Thakur  
Th 23378

*Abstract*  
(Not Verified)

Study provides a new inventory of glacial and high-altitude lakes for Sikkim, Eastern Himalaya, and evaluates the susceptibility of lakes to Glacial Lake Outburst Flood (GLOF). By using satellite data of high spatial resolution (5 m), we obtain 1104 glacial and high-altitude lakes with total area 30,498 km<sup>2</sup>, of which 472 have an area >0.01 km<sup>2</sup>. Applying pre-defined GLOF susceptibility criteria on these 472 lakes yields 21 lakes susceptible to GLOF, which all increased in area from 1972–2015. Using Analytic Hierarchy Processes (AHP), the pairwise comparison matrix further reveals that 5 of these glacial lakes have low, 14 have medium and 2 have high GLOF susceptibility. The erosion-based and time dependent hydrodynamic modelling (MIKE 11) has been performed for 16 potentially dangerous glacial lakes. The model was calibrated and validated with observed discharge data. Results for the most dangerous South Lhonak Lake show a 31m breach width with a peak flood of about 23716 m<sup>3</sup>/s at 01:41 h, which arrives with 21354 m<sup>3</sup>/s at the first settlement (Lachen village, 73 km from the lake) after 2:25 h, and with 15301 m<sup>3</sup>/s at the outlet of Tista River (184 km from the lake) after 3:39 h. Downstream areas, especially Lachen village and the Chungtham hydropower plants, and other downstream settlements and infrastructure would be seriously affected. The identified socio-economic vulnerability zones and settlements (3 majorly affected) using multi-criteria analysis may contribute to initiating an early warning system for potential future GLOF events by the local authorities and risk analysis of planned future hydropower plants and other infrastructure in Sikkim. Keywords: Climate change; Sikkim; Glacial Lake Outburst Flood (GLOF); AHP; Glacier hydrology; Socio-economic Vulnerability

*Contents*

1. Introduction 2. Geographical profile of study area 3. Glacial lake inventory and their outburst susceptibility 4. GLOF Simulation and modelling 5. Flood inundation mapping and impact assessment 6. Suggestive measures 8. Summary. References. Appendices.

02. BANDYOPADHYAY (Nairwita)  
**Drought Impact Assessment and Analysis of Drought Policy in Gujarat.**  
Supervisor: Dr. Ashish Kumar Saha and Dr. Chandrashekhar Bhuiyan  
Th 23376

*Abstract*  
(Not Verified)

Droughts are initiated due to abrupt changes in the precipitation pattern and monsoon dynamics, and significant reduction in the precipitation amount, resulting in sudden and acute deficiency in soil moisture, as well as surface-water and groundwater resources. In general, the perception of drought is built and equated with images of severe water scarcity owing to insufficient precipitation, high evapo-transpiration and over-exploitation of water resources. Large parts of northwestern India fall under hyper-arid, arid and semi-arid climatic zone. The state of Gujarat is highly drought-prone, different parts of which witness droughts frequently. Gujarat was hit by 15 major droughts in the period from 1981 to 2010. The specific objectives of the study are: a) identification of drought prone areas with the help of drought indices b) investigation of short-term and long-term impacts of drought on water resources, agriculture, economy and societal development c) assessment of existing strategies for drought-adaptation and drought-mitigation through local knowledge, experience and expertise d) evaluation of the strengths and weaknesses of drought preventive and mitigation policy in the State of Gujarat e) formulation of strategies and alternative policy to combat drought in the State of Gujarat. Both ground station data as well as remotely sensed multi-sensor satellite data are included in the study. Short-term and long-term impacts in these regions were observed and analysed to understand the vulnerability of the people to drought and their adaptive capacity. The existing strategies for drought adaptation and mitigation highlighted the present situation for countering drought with local expertise, and with or without government intervention. Up-gradation of strategies and policies have been proposed along with the formulation of a new proactive drought policy to enhance resilience of people in drought prone areas.

*Contents*

1. Introduction. 2. The study area 3. Drought analysis: Monitoring and assessment 4. Drought dynamics and environmental impact of drought 5. Drought risk perception, impact and response of drought 6. Drought policies of Gujarat – appraisal and new proposal. 7. Summary and conclusion. References. Questionnaire. Appendices. List papers published from this thesis.

03. GROVER (Aakriti)

**Urban Health and Wellbeing in Changing Urban Environment: A Comparative Study of Delhi and Mumbai.**

Supervisor: Prof. R. B. Singh

Th 23755

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1. Introduction. 2. Geographical profile of study area: Delhi and Mumbai 3. Changing urban environment in megacities: Delhi and Mumbai 4. Urban micro climates: Delhi and Mumbai 5. Urban health risk analysis: Delhi and Mumbai 6. Strategic plan for urban health and wellbeing for the Indian Megacities 7. Summary and conclusions. Selected Bibliography. Appendices. List of publications by the researcher.

04. PRASAD (Abhay Shankar)

**Impact of Natural Hazards on Livelihood security in Alaknanda River Basin, Uttarakhand**

Supervisor: Dr. Bindhywasini Pandey

Th 23204

*Abstract  
(Not Verified)*

The Alaknanda river basin with an area of 10882 Km. covers the Garhwal Himalaya and extends between 30.0° N to 31.0° N and 78.45° E to 80.0° E. Hydrological hazards are sudden calamities, which involve loss of lives, properties and livelihoods. Flash flood, cloudburst, Glacial Lake Outburst Flood (GLOF), debris-flow, mass movements, soil erosion and landslides are major disasters in the Alaknanda river basin. Anthropogenic activities are continuously disturbing the natural system of the Garhwal Himalaya and its impacts are devastating. Human interference, unscientific developmental activities, agriculture extension, tourism activity and road construction are enhancing the gravity of hydrological hazards. The study analyzes the land use/cover change detection for four time periods (1976, 1990, 2009, and 2015) and suggests the future planning for the sustainable development and livelihood security at local level. The study evaluates the Livelihood Vulnerability Assessment and its adaptation for sustainable development in the near district headquarter (NDH) & away district headquarter (ADH) determined mainly by a weighted matrix index. This paper has identified the NDH and ADH village's household's vulnerability level, which may be helpful in formulating the policy for sustainable development. The natural hazards have been divided into three units, namely, geomorphic hazards, hydrological hazards, and hazards caused by anthropogenic activities in mainly Rudrapur, Chamoli and Pauri Garhwal district. Spatial distribution, critically and mechanisms of hazards have been examined with suitable techniques. To control the hazards, different types of suitable techniques applicable in the Alaknanda river basin have been elaborated. The study suggests that the community-based vulnerability and adaptations assessment awareness programmes, can deal at grassroots levels by helping farming communities adapt within a system near its thresholds, and it also indicates what those communities can do to recover from future flood events under climate change conditions.

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1. Introduction. 2. Geographical profile of the Alaknanda river basin, Uttarakhand 3. Extreme events, vulnerability and hydrological hazards of Alaknanda river basin, Uttarakhand 4. Sustainable mountain development: Challenges and opportunities in Alaknanda river basin, Uttarakhand 5. Livelihood security: The future of sustainable mountain development 6. Mountain development: Suggestion, policy and programmes 7. Conclusion and suggestions. References. Appendix.

05. SIKKA (Gaurav)

**Socio-Economic Impacts Spatial Displacement: A Gendered Assessment of Sardar Sarovar Project resettlements in Vadodra district, Gujarat**

Supervisor: Dr. Vinita Mathur

Th 23379

*Abstract  
( Verified)*

In the simplest sense, development should be raising the ability of all to realise their truest potential without any fear or obstacle. However, the development strategy adopted in post independent India has made the development projects in India synonymous with land acquisition leading to displacement of a large number of people and their involuntary

resettlement. Many studies are being done to analyse the impacts of displacement and associated resettlement and rehabilitation (R&R). But the differential experiences and impacts of displacement and associated resettlement in a new space on men and women should also be the focus of academic research. The broader aim of this research is to incorporate a gender aware approach to resettlement planning of Sardar Sarovar Project. This project is one of the largest multi-purpose hydro projects in the world, located in Gujarat. The project has displaced more than 45,000 families from 192 villages of Madhya Pradesh, 33 of Maharashtra, and 19 of Gujarat. These resettled people have been taken as the subject of this study. To resettle the affected people, around 200 resettlement sites were developed by Sardar Sarovar Punarvasvat Agency (SSPA) in Gujarat. This study utilises both quantitative and qualitative methods. The research reveals that there is a partial improvement in the status of living conditions for the settlers. Economic conditions declined for some while improved for others, the affected communities have undergone socio-cultural transformations, and a gender bias has been observed in the resettlement & rehabilitation (R&R) policy. The study has provided suggestions to mitigate the adverse effects of R&R and for acquiring a gender-aware perspective for planning agencies.

#### *Contents*

1. Introduction. 2. Study area 3. Sardarsarovar project-evolution, displacement and r&r policy. 4. Assessing the outcome of Gujarat's policy: findings from the selected resettlement 5. Gender dynamics of displacement and relettlement: Disseminating the findings from a gender checklist 6. R& r policy implementation- impact on gender relations and identifying the gender bias in the policy 7. Key findings and suggestions. Bibliography. Annexures.

06. SINGH (Pritam)

#### **Identification of Settlement Morphology and Scope of Future Development: A Case Study of the Bundelkhand Region of Uttar Pradesh.**

Supervisor: Dr. P. K. Parihar

Th 23377

#### *Abstract (Not Verified)*

Settlement is living and functional space of humans since prehistoric times. As the point of origin and primary residence of human society, it is the linking thread and life blood of all the geographical studies. Settlements reflect not only man's response to his environment, but also religious and social customs of his society. Assume buildings in a town or village are always reserved for public use, (such as a town or village hall, temple, mosque, church, panchayat house, schools or palace of a local ruler, similarly in settlements), different groups of people are thrown together, though the towns and villages may be divided into separate quarters, religious styles or social groups. Settlements represent a natural growth. To generalise, in terms of physical aspects, the farms and the houses are huddled together without any conspicuous planning. Morphology of the settlement is related to the physical character of dwelling site, surface water, nature of the soil, cultivation and layout of the plots and other elements of the cultural landscape. The significance of the rural habitation lies in the fact that, it is the chief tool of the village community, which has been developed in relation to its work and adapted to the existing type of rural economy. The rural settlements denote more or less the simple grouping of the buildings at favourable and convenient sites. Relying on the primary as well as the secondary data, the study focuses on the development of rural settlements of Bundelkhand region and the impact of various

#### *Contents*

1. Introduction, objective and research methodology 2. Bundelkhand region of Uttar Pradesh: An overview 3. Hierarchy of the rural settlements and their distribution pattern 4. Analysis of development and village morphology: A spatio-temporal analysis 5. People and development: A socio-economic analysis 6. People and development

programmes: A Behavioural analysis 7. Summary and conclusion. Bibliography.  
Annexure I Annexure II.