

# **Biological Impacts and Local Perceptions of Tinau River Dam, Nepal**

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May 2003

A Thesis Submitted in Partial Fulfilment of the Requirement for  
the Degree of Master of Science  
(Management of Natural Resources and Sustainable Agriculture)

Submitted to:  
Agricultural University of Norway  
Centre for International Environment and Development Studies  
(NORAGRIC)

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## DECLARATION

I, Chhatra Mani Sharma, declare to the senate of the Agricultural University of Norway (NLH) that this thesis is my original work and all other sources of materials used are duly acknowledged. This work has not been submitted to any other universities for any academic award.

.....  
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## DEDICATION

**This work is dedicated to my beloved parents  
Dilli Raman Sharma and Bijaya Laxmi Sharma  
for their care, love and inspiration until this  
stage of my life.**

## ACKNOWLEDGEMENTS

I would like to give my heartily thanks to my main supervisor Prof. Dr. Ian Bryceson, the Centre for International Environment and Development Studies (NORAGRIC), Agricultural University of Norway, for his inspiration and help to make this thesis what it worth. It would not be easier for me to write this thesis in an interdisciplinary way without his help. Equal thanks goes to my co-supervisor Prof. Reidar Borgstrom, Department of Biology and Nature Conservation, Agricultural University of Norway, for his endless help during the lab work as well as write up time.

I am extremely thankful to my local supervisor Dr. Subodh Sharma, Associate Professor, Department of Biological and Environmental Sciences, Kathmandu University, for guiding me in the field with full of encouragement and enthusiasm. I really appreciate his support in my favour in each and every part during my field-works in my home country. I would like to give my thanks to the whole member of our research team: Ph D candidate- Bibhuti Ranjan Jha; and bachelor students- Anil Shrestha, Bibhuti Bista, and Shekhar Koirala, Kathmandu University, Dhulikhel, Nepal, for their painstaking help and assistance during collection of the samples in the field and sorting them in the laboratory.

It is my pleasure to give sincere thanks for having valuable comments and suggestion on my thesis manuscript from Dr. Jeppe Kolding, Associate Professor, Department of Fisheries and Marine Biology, University of Bergen. I also thank Odd T Sandlund, Norwegian Institute for Nature Research, Norway for his constructive criticism and suggestion on my thesis. The Kathmandu University deserves my sincere thanks for providing me with laboratory and accommodation facilities during my stay there. In the same way, I am indebted to the Department of Biology and Nature Conservation, Agricultural University of Norway, for providing me all the necessary laboratory facilities and available literatures. I never forget the help of our librarians, Liv and Ingeborg, for searching and providing valuable literatures during my studies here in Norway. I must acknowledge the help and kind cooperation of faculty members, Department of Biological and Environmental Sciences, Kathmandu University, Nepal.

I am grateful to the local people of my study area who provided all the necessary information and help in conducting the survey for this study. Special thanks goes to Bishnu and Narayan for their assistance during the fieldwork.

The final and very special thanks (though not necessary to express it here) goes to my wife Kabita Sharma and daughter Kusum Sharma for their encouragement, support, patience and love provided since their affiliation with me. The new guest of ours who is arriving soon to share his/her life with us also deserves thanks for not giving much troubles during the process of write up.

## ABSTRACT

Water resources can be utilized effectively with the help of dams, for various purposes such as hydroelectricity, water supply to human settlements, irrigation, flood-control etc. However, they may also create problems such as changes in water quality, alteration of the aquatic ecosystems, disruption of production systems and displacement of people. Therefore, dams are often perceived differently by different people and may become the subject of hot debates.

This thesis explores biological, social and political aspects of dams in three different chapters or papers. Paper III deals with the political ecology aspect of the dam and is attached herewith as an annex.

Paper I deals with the biological aspect of Tinau dam in Nepal. Macroinvertebrate taxonomic composition, eco-morphological habitat descriptions and substrate composition were assessed above and below a small dam in order to relate biotic conditions to dam impact. Four sites, one above, one within the reservoir and two below the dam were selected for the sampling of macroinvertebrates. The Nepalese Biotic Score (NEPBIOS) method was used for the biological water quality assessment. Attempts were made to test other bioassessment methods. Both qualitative and quantitative samplings of macroinvertebrates were done in all four sites. Macroinvertebrates were identified to the family level for bioassessment of river water. Considerable variability in macroinvertebrate assemblages was found among the different sites. The most abundant group of macroinvertebrates among the total collection were of the family Chironomidae (~49.0%) followed by Baetidae (~14.0%) and Leptophlebiidae (~11.5%) (N= 2120). Some of the groups of macroinvertebrates showed significant relationship with the microhabitat, e.g., Baetidae and Heptageniidae have shown significant variability with the substrate composition.

The main aim of Paper II is to provide information about the Tinau river resources and the impact of the dam on their utilization. The methods adopted to gather this information included questionnaire survey, interviews with key informants, group discussions, direct observations and secondary data collection. The main river resources, as perceived by the local people, are sand/stone extraction and fishing which are of value for them from an economic point of view. Other uses of the river resources are drinking water supply, irrigation, swimming, washing and bathing etc. According to the surveyed people, there are negligible negative impacts of the existing dam on the utilization of these resources. In their opinion, some of the fishing methods like poisoning, electro-fishing and dynamiting are destructive to the quality of river water. Local people are managing resources like sand, stones and fish through the local government body.

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### **Annex Paper**

Local Perception and the Political Ecology of Dams, Nepal.

# **Synopsis: A Synthesis of Biology, Sociology and Political Ecology Papers**

Dams are one of the essential infrastructures for many nations for their prosperity in many aspects. But there are often hot debates behind the construction of these dams by considering the negative impacts they impart. Dam construction has both pros and cons in relation to the environment as well as the society.

This thesis, therefore, attempts to cover both of these aspects in an interdisciplinary approach based upon an empirical field study conducted in the Tinau River, Nepal in October 2002. The interdisciplinary approach has many self-contained benefits that helps to bridge the fragmented disciplines, has greater flexibility in the research, fills the gaps in the modern academics (Nissani, 1997). Some of the problems need the help of interdisciplinary approach to be solved it in a meaningful way.

Biological criteria have been used in the management of water resources in many parts of the world. These criteria can use variety of biological indicators to measure water resource conditions for different purposes, e.g., biological restoration goals, establishing baseline for natural resource damage assessment (NRDA) etc (Simon, 2000). The criteria set in the form of environmental awareness, thus health condition, are highly related with the socio-economic condition and educational level of the people (Preston et al., 2000). In this way, the two topics of this thesis are interrelated such that they can be carried out in a parallel way.

The thesis contains two papers in the main body and another paper as an annex. The first part basically describes biological conditions of the study area and the second part deals with social aspects. The third paper in the annex addresses the political ecology of dams. All of the papers revolve around subject area, i.e., the impacts of dams. It is difficult to merge every aspect of biology and sociology in the same paper, but it is possible to link them in an interdisciplinary or a multidisciplinary way, which is the main target of this thesis.

The first paper has attempted to reveal the biological conditions of the river by using benthic macroinvertebrates as the basis of the study. Such kind of bioassessment of surface water has been started more than a century ago (Rosenberg and Resh, 1993; Sharma and Moog, 1996). Bioassessment approach of study has been widely used and gained acceptance in Australia, North America and Europe, while it is in an infancy stage in the context of Asia (Dudgeon, 1999; Rosenberg and Resh, 1993; Whiles et al, 2000).

The second paper supplements the first paper from the sociological aspect that deal with the river resources and their management. It mainly focuses on the participation of local people in management of these resources through the local government.

The third paper (as an annex) has explained local perception of the small dam based on the empirical studies. There has been an attempt to compare the small dam (Tinau dam) and a large dam (Arun III) in Nepal from a political ecology angle.

### **Problem Statement**

There is always a crucial need for water for different purposes from household to the industrial level. Surface water is one of the great potentials for all these needs, and therefore, it is vital to know the quality of the water before using it. In most parts of the world, water from rivers and lakes have been utilised by urban as well as rural people. Tinau River is also one of these rivers from which water is supplied to human settlements for drinking and other household purposes. And if water is supplied for the drinking purpose, it must be tested regarding its quality before supplying to the people. This thesis is an attempt to fulfil the same purpose.

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