

Research overview

Climate change triggered flood are causing significant human and economic loss and such devastation will further accelerate in future as the average temperature in Nepal is increasing. The changing pattern of precipitation would likely cause droughts during winter and irregular high flood, debris flow and causing inundation of settlements and agricultural land in the rainy season. The main objective of this study is the economic analysis of all possible Ecosystem based Adaptation options and Engineering Options to control flooding. The cost of EbAs, EOs, cost of inaction and avoided damage due to implementation of adaptation options and ecosystem service value will be estimated through primary and secondary data to find out cost effective adaptation options. This will be an economic insight for policy makers with community perceptions bringing science and policy interface together to plan, design and implement cost effective adaptation options as per NAPA (2011)/LAPA (2012) within the framework of Nepal Climate Change Policy 2011. This study as it serves as decision making tool for planning efficient and sustainable adaptation options.

Churia Flood, EbAs and EOs

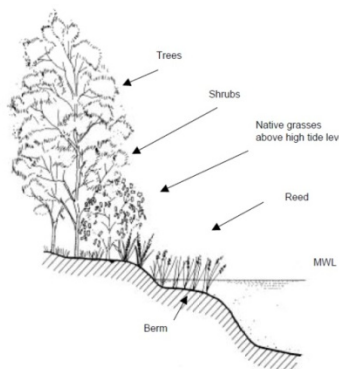
The landslide and floods that originate in *Churia* range has taken many lives, damaged properties and crops in *Churia* region and in the plains of Terai. This has worsened the situation of the poor farmers by turning more people landless, helpless and vulnerable, leaving them with limited livelihood options. This has led to increase dependency on the *Churia* resources, viz. for, fire wood, timber, forest encroachment for farming and settlements. This eventually creates a vicious circle of downward spiraling of

increased flooding causing more displacement and increasing the pressure on *Churia*.



(Flooding in Udayapur district)

Ecosystem-based Adaptation (EbA) integrates the use of biodiversity and ecosystem services into an overall strategy to help people adapt to the adverse impacts of flood due to climate change. It includes the sustainable management, conservation and restoration of ecosystems to provide services that help people adapt to both current climate variability, and climate change. Ecosystem-based Adaptation involves a wide range of ecosystem management activities to increase resilience and reduce the vulnerability of people and the environment to climate change.



(EbA method along river bed)

Flood related adaptive engineering options are controlled disruption of natural process by using man-made structures. These options are high cost and high technology solution.



(EO – cutting meander)

Study site

In Udayapur district, there are many rivers flowing from *Churia* range with high load of sedimentation.



(Map of Nepal with Udayapur district)

On the basis of vulnerability to flood, size of settlement area, source of river and implemented engineering measures to reduce flood impacts,

Research team selected Ajgada village (Ksedi River Watershed) for the research purpose.



(Ksedi River Watershed with Ajgada village)

Research Methodology

The research methodology is divided into four sections: (i) Desk Study (ii) Information collection from field (iii) Economic Analysis (iv) Result Dissemination. Different relevant literature will be collected and analyzed. Primary data are collected by FGD, KIS and district level stakeholder consultation workshops. The cost of possible EbAs will be estimated by Watershed management expert and cost of EOs will be estimated by Civil engineer/Overseer. Different economic analysis methods namely costing of EbAs and EOs, Least Cost Analysis, Cost of Inaction, Avoided damage due to implementation of EbAs and EOs, Cost Benefit Ratio will be assessed and estimated to recommend/select appropriate and cost effective EbAs and EOs. The outcome of

the study will be presented in district level workshop and suggestions are incorporated to produce final report for publication.

Time frame

The time period of this research is 6 months. The first months of this research is for literature review followed by exploratory field visit. All the relevant data (Primary and secondary data) will be collected within 3 months of period. The last three months is for the data analysis, present out come to district level for their suggestions and finally produce project report for publication.

Research Team

- *Dr. Dinesh Chandra Devkota, is Visiting Professor- CDES, TU and Policy Advisor-IDS Nepal*
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- *Dr. Bhaskar Singh Karky, Resource Economist – ICIMOD*
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- *Mr. Sujit Karmacharya, Research Coordinator – IDS Nepal*
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The district level governmental office and other supportive local organizations and community people will be incorporated for this research.

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Economic Analysis of flood related possible Ecosystem based Adaptations (EbAs) and Engineering Options (EOs) for Climate Change Adaptation in Udayapur District, Nepal



Integrated Development Society Nepal (IDS Nepal)

in collaboration with

International Center for Integrated Mountain Development (ICIMOD)