RESEARCH GRANT

Government of Nepal
Ministry of Science, Technology and Environment
Pilot Program for Climate Resilience

Mainstreaming Climate Change Risk Management in Development

ADB TA 7984: Main Project

Nepal Academy of Science and Technology

CLIMATE CHANGE RESEARCH

VERIFYING CLIMATE CHANGE SCIENTIFICALLY

Abbreviation

ADB	Asian Development Bank
CCRGP	Climate Change Research Grant Program
CCWG	Climate Change Working Group
LAPA	Local Adaptation Plan of Action
MCCRMD	Mainstreaming Climate Change Risk Management in Development
MOSTE	Ministry of Science, Technology and Environment
NAPA	National Adaptation Program of Action
NAST	Nepal Academy of Science and Technology
I/NGO	International/Non-government Organization
PPCR	Pilot Program for Climate Resilience

Introduction

The Climate Change Research Grant Program (CCRGP) is an activity of the project- Mainstreaming Climate Change Risk Management in Development (MCCRMD) that is part of Nepal's Pilot Program for Climate Resilience (PPCR). The MCCRMD project is assisting the Government of Nepal to safeguard its development programs and infrastructure from the impacts of climate change. The project is executed by the Ministry of Science, Technology and Environment and administered by the Asian Development Bank with financing from the Climate Investment Fund.

Nepal Academy of Science and Technology (NAST) has been managing CCRGP, as a part of PPCR and providing grants for 36 research projects of different themes including urban settlements and infrastructure, water resources and energy, forests and biodiversity, agriculture and food security, climate induced disasters and public health.

The objective of CCRGP is to contribute to Nepal's climate change policy process through intensive research in themes identified as priorities in the National Adaptation Program of Action (Forests and Biodiversity). Therefore, it has awarded the grants to those researchers who demonstrated high quality research on the climate change issues that are more critical to Nepal's development. Amongst the selected 36 grantees, 10 researches are related to Forest and Biodiversity, 8 are related to Agriculture and Food Security, 8 are related to water resources and energy, 5 related to climate induced disaster, 3 related to public health and 2 are related to urban settlement and infrastructure. These researchers cover 44 districts of Nepal.

Experienced Nepali researchers from universities, NGOs and private companies are selected for this research work through open, transparent and competitive selection process. Among the selected grantees, 10 research projects are being conducting by experts involved in NGOs, three from private sector institutions, and the remaining 23 from universities.

The researchers will produce their findings by August 2016 and will share it with government, development practitioners and other researchers ultimately contributing to advancing Nepal's knowledge base and policies on climate change. CCRGP will also encourage researchers to contribute to climate change science at the global level by publishing their findings in reputed international journals.

Approved Research Grantees

S. N.	Theme	Title of the Project	Principal Researcher	Geographical Location	Budget
1	FB	Impact of climate change on the quality of herbal drugs: a threat to plant based traditional knowledge for livelihood	Rajendra Gyawali	Mustang District	11,720
2	PH	Study and assessment of environmental burden of diseases attributable to climate change in Nepal	Sirjan Lal Shrestha	Mountain: One District Coverage; Hill: Kathmandu Valley (3 Districts Coverage); Terai: 2 Districts Coverage	11,005
3	WRE	"Habitat loss of freshwater molluscs and their consumption trends among Tharu people in Kailali District, Nepal"	Prem Bahadur Budha	Sadepani, Darakh, Khailad and Lalbojhi, and Janakinagar Village Development Committees of Kailali District, Far- Western Development Region	10,051
4	CID	Developing a methodology for assessing damage and losses of adverse effects of climate change and variability in Nepal	Deepak Paudel	6 districts (2 districts from each Ecological zone); 12 VDCs (2 VDCs from each District)	10,893
5	CID	High mountain facing severe climate influence and impact on the tourism and tourism dependent livelihood	Thakur Prasad Devkota	Western Region, Gorkha District	10,954
6	CID	Climate Change Impact and Adaptation Measures in Upper Mustang	Hari Krishna Shrestha	Dhey, Yara and Samjong Villages, Surkhang VDC, Upper Mustang	9,505
7	FB	Climate change and hydro-ecological responses of Glaciarized Mountain Basins in Nepal Himalaya	Narayan Prasad Ghimire	Glaciarized- and medium-small sized basins in the Eastern and Western parts of Nepal with distinct climatic characteristics	13,118
8	AFS	Agriculture calendar shift due to climate conditions in three ecological regions of Sagarmatha zone, Nepal	Bed Mani Dahal	Solukhumbu, Okhaldhunga and Saptari Districts	12,905
9	FB	River ecological study: assessing the climate change and building the base for adaptation	Bibhuti Ranjan Jha	Udaypur Districts- Iname, Tawashree, Barre, Risku and Triveni VDCs, Katari Municipality, Taplejung and Panchthar district- Adjacent municipalities and VDCs	13,863
10	PH	Impact of climate change on cholera outbreak in Nepal	Supriya Sharma	High risk cholera epidemic prone District	10,695
11	AFS	Study on autonomous adaptation measures of farmers to changing precipitation pattern	Beda Bahadur Rokaya	Rangapur and Dharmapur VDCs of Rautahat district	11,905

S. N.	Theme	Title of the Project	Principal Researcher	Geographical Location	Budget
12	FB	Plant water relations and altitudinal shifts of Quercus semecarpifolia in response to drought and climate change at Hill, Nepal.	Kanta Poudyal	Phulchowki Hill	13,040
13	AFS	Effect of climate change on insect pests incidence in major staple food crops	Kapil Kafle	Three Agro Climatic Regions Terai (Chitwan District), Mid hill (Lamjung District) and High hill (Manang District)	26,128
14	WRE	Budhi Gandaki Hydropower Project under climate change: An assessment of hydro-sociality	Khada Nanda Dulal	Budhi Gandaki River Basin	13,412
15	PH	Impact of climate change in the incidence of dengue virus in Aedes vectors	Reshma Tuladhar	One dengue endemic Terai district and one Hill district, in coordination with Epidemiology and Disease Control Division	8,983
16	FB	Assessment of the effects of climate change on distribution of invasive alien plant species	Mohan Siwakoti	22 districts	27,864
17	AFS	Development of design guidelines of digester for biogas generation at high altitude	Bhagwan Ratna Kansakar	Manang District, Manang VDC	11,000
18	WRE	Characterization of microorganisms isolated from hot springs of Nepal	Bhupal Govinda Shrestha	Department of Biotechnology, Kathmandu University	12,880
19	WRE	Climate change on spring water of mid hills of Nepal with special focus on drudgery on women	Prem Sagar Chapagain	Sindhupalchok District; Kiul, Helambu, Baruwa, and Bhotang VDCs	25,208
20	FB	Tree line shift in central Nepal Himalaya and climate reconstruction of past millennia	Yub Raj Dhakal	Manang, Mustang and Dolpo Regions	12,562
21	WRE	Study of the snow-melt run off for the sustainability of hydropower projects under climate change	Narendra Man Shakya	Himalayan Region of Nepal	10,685
22	CID	Marsyangdi basin water-induced disaster triggered by climate change and its prognostic projection in the middle of 21st Century	Dinesh Pathak	Marshyangdi River Basin (Tanahu, Gorkha, Lamjung and Manang Districts of Nepal)	26,800
23	USI	Fostering climate change resilient cities through augmenting the blue land use: A case of Janakpur Municipality	Ajaya Chandra Lal	Janakpur Municipality, Central Terai15km from the Indian Border in Central Development Region of Nepal	10,936
24	USI	Sustainable urban transport solutions to mitigate climate change, a case study of Kathmandu Valley, Nepal	Ashim Ratna Bajracharya	Kathmandu, Bhaktapur and Lalitpur districts	13,569
25	AFS	Vulnerability of livestock farming system to impact on climate change in the Terai region of Nepal	Shiva Chandra Dhakal	Morang, Sarlahi, Bara, Chitwan, Rupandehi and Banke Districts	10,302

S. N.	Theme	Title of the Project	Principal Researcher	Geographical Location	Budget
26	AFS	Impacts of climate change on cereal crop production and on food security: a case study of Dhading district	Surya Mani Dhungana	Dhading District	10,511
27	FB	Carbon sequestration in a fire ecosystem of pine forest	Biva Aryal	Gatlang and Haku of Rasuwa District	11,301
28	WRE	Selection of the best renewable energy resource for Nepal to mitigate the climate change: An Analytic Hierarchy Process (AHP) approach	Prabal Sapkota	"Local data for the project will be collected from four locations covering three climatic condition of Nepal. "	11,293
29	FB	In-vitro propagation of Paulownia Tomentosa Steud for commercial production and evaluate its carbon dioxide sequestration ability in a previously planted Paulownia trees.	Niranjan Parajuli	National College, Khusibu, Nayabazar, Kathmandu, Nepal	11,917
30	CID	Assessing the impacts of climate change induced displacement from gendered perspective in Darchula district, far western region	Sushila C. Nepali	Darchula District, Far Western Region	12,889
31	AFS	Understanding climate change adaptation by farmers in crop variety in Nepal.	Madhav Dhital	6 different districts Jhapa, Sindhuli, Sankhuwashawa, Rautahat , Salyan and Kalikot	11,990
32	WRE	Assessment of climate change impacts on Helambu sub-watershed	Lachana Shresthacharya	Central Development Region, Sindhupalchok district, Helambu VDC	21,965
33	WRE	An assessment of economic loss due to water-induced disaster of the Mahakali flood in 2013 in Darchula district in relation with climate change impact	Mahendra Bahadur Gurung	Darchula District, Mahakali Zone, Far-West Region, Nepal	15,700
34	AFS	Climate change impacts on livestock raising and household economy of Mustang District	Shreeram Prasad Neopane	Dhaulagiri zone of the Western Development region , Mustang (Lomathan VDC, Kagbeni VDC, Kunjo VDC)	21,417
35	FB	Regeneration and distribution modeling of Larix spp. under climate change scenarios in Nepal Himalaya	Prakash Chandra Aryal	Taplejung, Rasuwa and other areas of Larix distribution	10,295
36	FB	Effect of climate change on secondary metabolite production in Lichen of Nepal	Bishnu Prasad Neupane	Landhruk, Ghandruk, Sikles, Parche, Lumle, Taprang, Kimrung, Chhumrung	10,741

01

Topic	**Impact of climate change on the quality of herbal drugs: A threat to plant- based traditional knowledge for livelihood.**
Thematic Area	Forests and Biodiversity
Geographic Area	Mustang District, Mid Western Development Region
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Rajendra Gyawali, Ph.D. Department of Pharmacy, Kathmandu University, Dhulikhel, Kavre
Team Members	Dipesh Pyakurel, Tirtha Maiya Shrestha, Jagendra Khadka, Prem Narayan Poudel, Rudra Upreti, Nira Paudel, Prerok Regmi
Grant	USD 11,720
Contact Information	Kathmandu University, Department of Pharmacy Dhulikhel, Kavre **Tel** 011-663188 **Fax** 977-011- 661443 **Email** gyawali@ku.edu.np, ragyawali@gmail.com
Goal	To find out the impact of climate change on herbal resources used in traditional medicine, by studying the change patterns in the phytochemical profile and therapeutic efficacy of plants grown in different environments, and its impact on traditional medications and livelihood in Salyan .
Objectives	☂ ***Environmental:*** To evaluate the impact of temperature and soil on phytochemical constituents biosynthesized by medicinal plants in different climatic greenhouse conditions. ☂ ***Medicinal:*** To evaluate the impact of climate change on therapeutic quality, efficacy and pharmacological properties of medicinal plants. ☂ ***Social:*** To study the impact of climate change on traditional health practice and livelihood
Activities	☂ Utilization pattern and biodiversity Analysis: ☂ Field survey. ☂ Traditional healing centers survey. ☂ Practitioners and locals interviews. ☂ Organize 3 community meetings. ☂ Species distribution, shifting phenology, seed germination pattern, habitat encroachment/invasion etc. ☂ Literature survey and comparison. ☂ Analysis of Impact of temperature and soil on phytochemicals: ☂ Soil and plant collection. ☂ Greenhouse cultivation. ☂ Soil quality analysis. ☂ Morphology of plant monitoring. ☂ Evaluation on changes or depletion on secondary metabolites. ☂ Analysis of Impact of temperature and soil on medicinal property of plants: ☂ Changes on pharmacological activities.

Expected Result	☂ Utilization pattern of plants for healthcare based on traditional knowledge will be documented. ☂ Impact of climate change on traditional medicinal practices will be evaluated. ☂ Reasons for a threat to livelihood due to biodiversity loss will be documented. ☂ Impact of environmental factors (temperature and soil) on bioactive phytochemical production will be scientifically validated. ☂ Impact of environmental factors (temperature and soil) on the therapeutic and pharmacological property of plants will be evaluated thus assuring the quality of herbal drugs. ☂ Future strategies for research and policy development will be established. ☂ Appropriate policies will be recommended. ☂ Publications in International and National Journals.
Relevance to Climate Change	☂ Medicinal plant species of the area have high reproduction rates, and are typically resistant to temperature and soil, selecting a more resistant plant with more resilience to some of the predicted effects of climate change. ☂ Adaptation measures in traditional medication due to climate change will be discussed. ☂ Soil and temperature stress on phytochemicals will be determined for better yields, which can be useful to estimate important plant species towards adaptation. ☂ Contribute future strategies to formulate policy and development at the Government level.

02

Topic	**Study and Assessment of Environmental Burden of Diseases Attributable to Climate Change in Nepal**
Thematic Area	Public Health
Geographic Area	Kavrepalanchowk, Kathmandu, Bhaktapur, Lalitpur , Sunsari
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Srijan Lal Shrestha, PhD Central Department of Statistics , Kirtipur, Kathmandu
Team Members	Iswori Lal Shrestha, Ph.D.; Niraj Shrestha, Ph.D. and Researchers
Grant	USD 11,005
Contact Information	Sanepa, Lalitpur – 2 **Tel** 5539397 **Email** srijan_shrestha@yahoo.com
Goal	Reduction in climate affecting (deteriorating) factors through implementation of sustainable development plans, policies and adaptation strategies to cope with climate change and thus reduce vulnerability and burden of diseases related to climate change in Nepal.
Objectives	☂ Collection of daily time series climate data and climate sensitive health effect data and perform time series analysis for the period of 3-5 years. ☂ Develop suitable statistical models for different disease burdens (mortality and morbidity effects) separately for different eco-belt areas of Nepal and a final combined (or pooled) model for Nepal. ☂ Quantification of health effect coefficients related to climate related variables. ☂ Estimation and assessment of the environmental burden of diseases that can be attributed to climate change in Nepal.
Activities	☂ Literature review of relevant studies in Nepal. ☂ Development of detailed methodology, research plans and activities and tools. ☂ Collection of data from secondary sources. ☂ Data entry, management and analysis. ☂ Development of statistical models and estimation of verifiable indicators. ☂ Assessment of Environmental Burden of Diseases due to climate change. ☂ Report writing.
Expected Result	☂ Time series analysis and assessment of climate change assessed by meteorological data, frequency of natural disasters and extreme weather conditions and health data in the selected regions of Nepal for the study period. ☂ Estimation or quantification of health effect coefficients (mortality and morbidity) separately for the climate sensitive diseases for selected regions of Nepal. ☂ Estimation of environmental burden of diseases separately for the climate sensitive diseases for selected regions of Nepal. ☂ Computation of relative risks associated with climate changes. ☂ Separate assessment of climate change and health effect assessment for three ecological belts of Nepal. ☂ provide how climate-related variables and climate sensitive health effects have changed during the study period in different regions of Nepal and to what extent climate change have affected people of Nepal with respect to climate sensitive diseases.

Relevance to Climate Change	☂ The study is expected to develop models capable of linking climate change with health burdens in Nepal. The coefficients will quantify the extent of health burdens in Nepalese people that can be attributed to climate change. This will lead to quantify the number of people in the study area (and Nepal by extrapolation) suffering from considered disease burdens due to change in climatic conditions. This research will therefore estimate what proportions of climate sensitive disease burdens can be attributed to climate change in Nepal in terms of number of human casualties related to vector borne as well as water borne diseases. ☂ As a result, the study results will be very helpful for planner and policy makers in formulation of policies, climate resilient development and mitigation plans assessment of vulnerability of people and identification and development of adaptation strategies to cope with climate change. For instance, some examples are: development processes related to health facilities and infrastructure in particular; educating people and generating awareness about impacts of climate changes; and preventive measures which need to be adopted to avoid health effects. . Additionally, the determination of the extent of effects between considered regions will also be helpful in planning mitigation activities between the ecological belts of Nepal.

03

Topic	**Habitat loss of freshwater molluscs and their consumption trends among Tharu people in Kailali District, Nepal**
Thematic Area	WRE: Water Resource and Energy: Climate Change impacts on wetlands and ecological services, and; Food security under climate change scenarios and adaptation strategies.
Geographic Area	Sadepani, Darakh, Khailad and Janakinagar Village Development Committees of Kailali district, Far western Development Region
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Prem Bahadur Budha Central Department of Zoology, Tribhuvan University, Kirtipur, Kathmandu.
Team Members	Dambar Singh Pujara and Subarna Ghimire
Grant	USD 10,051
Contact Information	Central Department of Zoology, Tribhuvan University, Kirtipur, Kathmandu. **Tel** 01-4333816 **Email** prembudha@yahoo.com
Goal	To measure land use change and habitat destruction over the past 50 years for freshwater molluscs, document freshwater mollusc species and their utilization trends by Tharu community.
Objectives	☂ Prepare a comprehensive list of freshwater molluscs including the status of food value species of Tharu communities in Kailali District. ☂ Identify prime habitats of freshwater molluscs and produce species distribution maps of different studied lakes, river, streams and agricultural land. ☂ Collect climate change impact evidence (temperature, humidity, precipitation, droughts and floods) over the last 50 years on freshwater molluscs. ☂ Produce a map of the land use change and habitat destruction in the study area.
Activities	☂ Preparation and desktop study. ☂ Reconnaissance survey. ☂ GIS data collection. ☂ Field survey & data collection. ☂ VDC level meetings. ☂ Progress reports. ☂ Identification of species. ☂ Data analysis and interpretation. ☂ Writing color guide. ☂ Report writing & GIS mapping. ☂ Submission of paper, draft report and color guide.

Expected Result	☂ Complete checklist of the freshwater mollusc fauna in different lakes, and rivers of Kailali district will be produced. ☂ Produce a comprehensive color guide of freshwater molluscs with distribution maps and water quality of surveyed lakes. ☂ Maps on the land use change and freshwater habitat loss over last 50 years will be produced. ☂ Climatic variation of data over the past 50 years will be documented. ☂ Reference collection of freshwater mollusc species will be established in academic institutions so the further monitoring of freshwater molluscs will be available for the researchers. ☂ Awareness among Tharu communities will be raised for sustainable harvesting of edible mollusc species. ☂ Publication of a paper in peer review national and international journal.
Relevance to Climate Change	☂ Climate change can affect organisms both directly via physiological stress and indirectly via changing relationships among species (Harley, 2011). However, we do not fully understand how changing interspecific relationships contribute to community and ecosystem level responses to environmental forcing. Mussels are considered the most endangered animal groups in the planet and seventeen causes of declining mussel populations have been reported among which habitat alteration and destruction evidence was at the top (Dowing et al., 2010). Ecological knowledge to assess these ecosystem consequences is a prerequisite to assessing the full range of trade-offs involved in land-use decisions (DeFries et al 2004). The climate change impacts have been significantly observed in agriculture and food security, water resources, forest and biodiversity, health tourism and infrastructures (GON, 2011). Freshwater fauna are the most vulnerable group of animals in the world (Lydeard et al., 2004) but the specific data are severely lacking in Nepal.

04

Topic	**Developing a methodology for assessing loss and damage of climate change and variability in Nepal**
Thematic Area	Climate Induced Disasters
Geographic Area	Taplejung, Dailekh, Sindhuli, Lamjung, Kailali, and Mahottari.
Duration	17 months: February 15, 2015 to July 14, 2016
Lead Researcher and Organization	Deepak Paudel Nature's Conservation Pvt. Ltd
Team Members	Principal Investigator, Finance and Admin, Climate data Analyst, Community participation, Representative from NAST
Grant	USD 10,983
Contact Information	Mandikatar/Aktabasti, Mahankal 9, Kathmandu **Tel** 01 4738336 **Email** deepakndmf@gmail.com, deepakndmf@yahoo.com
Goal	Enhancing knowledge of DRR and CCA through the methods and tools for loss and damage assessment associated with the adverse effects of climate change, including impacts related to extreme weather events and slow onset events.
Objectives	☂ To review the existing practices of assessing loss and damage of adverse effects of climate change and climate variability to enhance adaptive capacity; ☂ To develop a method for assessing loss and damage associated with climate change adverse impacts particularly extreme weather events (e.g. rapid onset events such as floods and landslides) and slow onset events (e.g. droughts); ☂ To pilot the methods and tools in all three ecological regions of the country for building comprehensive climate risk management; ☂ To share the findings of the research among relevant stakeholders for assessing of and responding to loss and damage.
Activities	☂ Desk work and Literature review. ☂ Secondary Data Collection and Analysis. ☂ Consultation with National Institutions. ☂ Formulation of a demo version of methodology and tools. ☂ Piloting the methodology. ☂ Dissemination of the findings.
Expected Result	☂ Issue of loss and damage associated with climate change and variability will be explored for climate resilient development. ☂ Loss and damage assessment methodology will be developed and tested in the selected district. ☂ Improved knowledge of policy makers and implementing agencies in the integration of climate change adaptation in development program will certainly help in climate resilient development.

Relevance to Climate Change	Proper risk management and planning of climate impacts such as droughts and floods is required for long-term impacts on development, food security, displacement and livelihoods. The outcomes of the project will certainly contribute to the decision-making process for adaptation planning at the national and local levels. Incorporation of loss and damage assessment associated with extreme weather in national policies and also in the planning process at the local level is expected to make for a climate resilient development. For example, the finding of the research will be directly observed by increasing the knowledge of the local decision makers. The knowledge will be upscaled through the incorporation of the loss and damage assessment in Local Adaptation Plan of Action and Local Disaster Risk Management Plan. Since the local livelihoods (agribusinesses) and vulnerable communities are more exposed to the effects of climate change and variability, The research findings will also help in up-scaling the involvement of the private sector for their support to local livelihoods and vulnerable communities The research findings will also help in policy enhancement towards addressing and restoring for adaptation costs and increasing resilience especially by reducing exposure and addressing underlying causes of vulnerability.

05

Topic	**High Mountains Facing Severe Climatic Influence and Impact on the Tourism and Tourism Dependent Livelihood**
Thematic Area	Climate Induced Disasters
Geographic Area	Lho and Samagaun VDCS of Trans-Himalayan North region of Gorkha
Duration	12 months: February 15, 2015 to February 14, 2016
Lead Researcher and Organization	Thakur Prasad Devkota
Team Members	
Grant	USD 10,954
Contact Information	
	Tel
	Email bgs@ku.edu.np
Goal	Find out the impact of climate change induced disasters on tourism industries and tourism dependent people's livelihoods.
Objectives	☂ To study the critical climate related events and natural disasters in Manaslu region. ☂ To enhance the indigenous knowledge supplemented by contemporary practices on emerging issues and opportunities on tourism under climate change conditions. ☂ To provide a base for mainstreaming the impact of climate change induced disaster and risk in tourism with clear guidance on the formulation of the sustainable mountain tourism development policy and planning.
Activities	☂ Collection and review of literature. ☂ Interaction with experts for identification of sectors for policy intervention. ☂ Discourse and narrative analysis, ☂ Focus group discussion for identification and familiarization of climatic variables and disasters. ☂ Participatory Rural Appraisal for prioritization of the vulnerable climatic variables ☂ Key informant interviews with semi- structure questionnaire. ☂ Participant observation with local old age peoples for making a history of climatic disasters. ☂ Interaction with local peoples, entrepreneurs, and leaders regarding climatic disasters and identify the sectors of intervention. ☂ Perception and response collection and analysis ☂ PRA for identification of indigenous knowledge system used in tourism. ☂ Discussion with NGO/INGO, government officials and researchers. ☂ Interaction for need assessment of sustainable tourism development ☂ PRA for vulnerability assessment in local livelihoods ☂ Submission of the final report.
Expected Result	

Relevance to Climate Change	☂ In tourism potential country like Nepal, mainstreaming climate change and tourism should be one of the main national agenda of development because The associated risk of climate induced disaster is the major concern in Tourism development in the face of climate change. ☂ In this context, the study will prepare an inventory of the available natural, cultural and archeological resources together with the probable climatic risks of the study area. This will give valuable information to the policy makers, planners, development workers, researchers and even to local people by listing issues, opportunities, indigenous knowledge and practices using adopted knowledge from outside to coupe the situation. . The finding of this study will therefore be useful to planners to formulate "Climate Smart Tourism Development" policy. Knowledge and information gained from the study can be helpful to devise the develop plan that incorporates climate change adaptation as one of its components. Compiled information about the changing pattern of climatic variables and natural disasters as well as the indigenous knowledge and practices are useful for adaptation measures that fit the local conditions. This contributes to building a climate resilient community and reduces the risk of climate change impacts on the tourism sector and tourism dependent livelihood of the study area.

06

Topic	**Climate Change Impact and Adaptation Measures in Upper Mustang (CAMUM)**
Thematic Area	Climate Induced Disaster: Assessment of climate change and disaster vulnerable groups, their livelihood and adaptation priorities
Geographic Area	Dhey Village located in Ward No. 9 in Surkhang VDC in Mustang.
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Prof. Hari Krishna Shrestha, Ph.D. Hydro Knowledge System
Team Members	Climate change scientist, Ecologist, Agricultural Engineer and Field Researcher
Grant	USD 9,505
Contact Information	Jhamsikhel, Pulchowk, Lalitpur Sub-Municipality-3, Nepal **Tel** 01-5543755 **Email** hydroknowledgesystem@gmail.com
Goal	Contribute to the enhancement of climate change resilience of communities in dry semi-arid regions of Nepal by developing site-specific adaptation measures.
Objectives	☂ Comprehensive study of water availability for various livelihood options of the local community, considering the climate change scenario; ☂ Evaluation of the local residents' degree of vulnerability in terms of their reduced access to water caused by climate change; ☂ Documentation and evaluation of sustainability of the local residents' current coping mechanisms against reduced access to water; and ☂ Development of adaptation mechanisms against potential climate change impact at the study areas.
Activities	☂ Preparation of a working report on collection, compilation and analysis of available secondary data and literature review. ☂ Preparation of a field visit plan and questionnaire through an initial meeting with representatives of project area. ☂ Preparation of a working report of the field visit, which will be conducted for ground reality checks, collection of primary data, initial assessment of awareness levels, skill levels, coping mechanisms, climate change impacts on livelihood, water volume and discharge estimation, photographic evidence and video recording of existing livelihood practices. ☂ Preparation of water source maps. ☂ Preparation of a working report based on analysis of primary and secondary data and development of adaptation measures. ☂ Preparation of an updated project report through a meeting with local residents to update work progress and receive feedback on social viability and sustainability of adaptation measures. ☂ Final field visit to evaluate project impact. ☂ Preparation of a journal paper based on research findings. ☂ Preparation of final project report.

Expected Result	☂ Final report on: (i) climate change impact awareness level (before and after); (ii) water management skill level (before and after); (iii) existing coping mechanisms and site specific climate smart adaptation methods; and (iv) hydrological aspects of the study area: temporal water availability (monthly volume and discharge of rivers and springs), including a map of available and potential water sources, considering the climate change effect. ☂ Pamphlet on adaptation methods. ☂ Video of water management skill enhancement. ☂ Research paper in international journal. ☂ Policy Brief based on research findings.
Relevance to Climate Change	Analysis of the current climate change coping mechanism of Dhey residents will provide clues on the vulnerability level of the people and whether their traditional knowledge will be sufficient to deal with the climate change impacts. Based on the effectiveness of the adaptation measures applied in similar geo-climate conditions elsewhere in the world, and in coordination with the local residents, site-specific climate adaptation measures will be developed for Dhey, which is expected to enhance their climate resilience. The project will develop a schematic design of water conservation and management techniques that should enhance access to water even during the dry season. Based on the existing and expected climate condition of Dhey, the project will suggest appropriate crop types and cropping pattern for Dhey. The water management, for domestic, agriculture and livestock, and cropping pattern developed from this project can be promoted, with site specific modifications, to increase climate resilience of settlements in similar climatic regions in Mustang and in other parts of Nepal and Hindukush Region. The effectiveness of the adaptation measures in Dhey can be evaluated and upscaled for implementation in larger communities, using the research design of this project as a basic template.

07

Topic	**Climate Change and Hydro-ecological Responses of Glaciarized Mountain Basins in Nepal Himalaya**
Thematic Area	Water Resources and Energy
Geographic Area	Tamor and West Seti river basins in Eastern and Western bound of Nepal, respectively.
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Narayan Prasad Ghimire, Ph.D. Nepal Biological Society
Team Members	Glaciohydrologists, botanist and remote sensing/GIS expert
Grant	USD 13,118
Contact Information	Narephant, Koteshwor, Kathmandu Metropolitan City - 35, Kathmandu District **Tel** **Email** nghimire077@gmail.com
Goal	Detection of spatio-temporal hydro-ecological responses to climate change.
Objectives	☂ Detecting climatic trends and climate variability; ☂ Assessing the ecological vulnerability of the water bodies using biological indicators; ☂ Detecting temporal change of glaciers and snow cover extent; ☂ Analyzing the natural tracers and determining the water contribution potential from different hydrologic components to river flows; ☂ Developing future water availability scenarios.
Activities	☂ Secondary data collection (Hydro-meteorological and satellite data). ☂ Hydro-meteorological analysis. ☂ GIS and RS analysis. ☂ Field mission. ☂ Lab work and data analysis. ☂ Hydrological simulation. ☂ Presentation at different events. ☂ Submission of paper. ☂ Final Reporting.
Expected Result	☂ An established knowledge on the climatic trends and climate variability: temporal trends of temperature and precipitation, their seasonal and spatial behavior; ☂ Understanding of the ecological vulnerability of the water bodies contributed by the glaciers and snow melting; ☂ Quantitative knowledge on the change of glaciers and snow cover extent in the basins; ☂ Quantified data of meltwater contribution from glaciers and snowmelt on the river flow; ☂ New knowledge on the possible impacts of temperature and precipitation; ☂ Scenario of the future water availability and potential threats based on the projected climate change scenario; ☂ Submission of research finding to the peer reviewed journals for documentation and sharing of produced knowledge.

Relevance to Climate Change	The project will address the climate and water resource issues that are of crucial interest to human livelihood and ecosystem regulation. These issues have direct implications for the sustainability of earth's limited resources and socio-economic development. The melting of glaciers, changes in seasonality, snowfall and water supply can affect the agriculture production, hydropower generation, ecosystem goods and services, and cause potential increases in the climate related hazards. All these changes can threaten the sustainability of the people who live in these mountains and downstream in the plain. Climate and water information are vital to address societal needs, minimize growing economic losses from natural hazards and help country and society adapt to climate change. The proposed project will help obtain answers to key issues and improve the knowledge on the possible future of the water resources and thus it will actually have a direct impact on the climate resilient development process.

08

Topic	**Agricultural calendar shift due to climatic conditions in three ecological regions of Sagarmatha zone, Nepal**
Thematic Area	Agriculture and Food Security: Agricultural / seasonal calendar change and farmer adaptation strategies
Geographic Area	Solukhumbu, Okhaldhunga and Saptari districts of Sagarmatha Zone
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Bed Mani Dahal, Ph.D. Department of Environmental Science and Engineering, Kathmandu University
Team Members	Environmentalist (expertise in agricultural intensification and impacts on environment), Environment and Development studies expert, Statistician Environmental Chemist, Environmental Scientist with expertise in hydro-meteorological studies
Grant	USD 12,905
Contact Information	House#194, Radhemarg, Dillibazaar, Kathmandu Metropolitan City, Kathmandu District **Tel** 011-661399 (O), 01 4430982 (R) **Email** bedmani@ku.edu.np
Goal	Increased food security.
Objectives	☂ To study the climate change scenario based on the existing meteorological data in the study areas. ☂ To identify the historical agricultural calendar and recent change in agricultural cultivation time in three ecological regions. ☂ To establish the linkages of agricultural calendar change and agricultural production for major crops in the study areas. ☂ To document and assess the adaptation strategies by farming communities in climate change conditions.
Activities	☂ Scope and confirmation of meteorological stations applicable for study sites at VDC level of Solukhumbu, Okhaldhunga, and Saptari districts. ☂ Meteorological data acquisition and prepare agricultural maps of the study sites. ☂ Develop data collection formats like a questionnaire checklist for interviews, productivity status, schedules for workshop and focus group discussions. ☂ Identification of key informants from each wards of the study VDCs. ☂ Undertake field observations, workshops, group discussions and interviews. ☂ Develop a database of compiled information, analyze the meteorological and field data, and validate the information. ☂ Disseminate the study findings through presentation, analytical reports, and scientific papers.
Expected Result	☂ Climate change scenario in the study area based on the meteorological data. ☂ The meteorological data mainly on rainfall, temperature and humidity for past 30 years or more will be compiled from each study area and the trend of each parameter will be computed. ☂ Climate change impacts on agricultural calendar change for major agricultural crops in three ecological regions. ☂ The agricultural activities and calendar in the study area will be assessed. The agricultural calendar will be correlated with the trend of climatic data. ☂ Change in the level of agricultural productivity due to calendar change. ☂ The data on production of major crops over the past 30 years or more will be collected based on interviews. Then the compiled data will be correlated with the calendar shift. ☂ Identification of adoptive measures for agricultural productivity in different cultivation regions, which will be helpful to be considered in other similar agricultural regions in the country. ☂ The agricultural measures that farmers have practiced over the past 30 years will be assessed and linked to whether the measures are practiced in coping with the climate change.

Relevance to Climate Change	The proposed project studies on historical and recent change in the agricultural cultivation calendar, agricultural production and agricultural adaptation strategies under the climate change scenario. Thus the study provides linkages amongst climate change agricultural calendar shifts, food production and farmer adaptation strategies. The proposed project will contribute to the scientific knowledge and create awareness among local farmers for better understanding of the global climate change variability.

09

Topic	**River Ecological Study: Assessing the Climate Change and Building the Base for Adaptation**
Thematic Area	Important Plant Area (IPM) delineation, flora and fauna inventory and documentation of status of biodiversity/eco-systems as baselines for assessing climate change impacts
Geographic Area	Panchthar/Taplejung and Udaypur Districts
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Bibhuti Ranjan Jha, Ph.D. Department of Environmental Science and Engineering, Kathmandu University
Team Members	Zoologist/taxonomist, Environmental Scientist, Sociologist
Grant	USD 13,863
Contact Information	Manbhawan, Lalitpur Submetropolitan-5 **Tel** 01 5008100 **Email** bibhuti@ku.edu.np
Goal	Improved rural livelihoods.
Objectives	☂ To analyze and evaluate the effects of climate change on fish ecology In the selected river system. ☂ To assess the diversity and distribution of macro-invertebrates, for analyzing the quality of selected river ecology.
Activities	☂ Scope and confirm sampling sites on key tributaries of the Tamor and Kamala rivers. ☂ Prepare base maps of the sampling sites. ☂ Develop a schedule for sampling during the four key seasons. ☂ Develop data collection formats and establish an electronic database system. ☂ Establish a partnership with local community members. ☂ Undertake sampling visits to the sites. ☂ Analyze data and prepare an analytical report. ☂ Develop database.
Expected Result	☂ A complete data set after each sampling comprising fish attributes macro invertebrates assemblage, physico-chemical parameters and the river substrates.
Relevance to Climate Change	It is generally presumed that the impacts of climate change would be more severe in the country like Nepal due to its location, physiography, poverty and lack of preparedness to cope the changes. The last reason is mainly associated with knowledge, information and ability to use technologies based on science. The objective of the proposed research is to analyze and evaluate the effects of climate change by taking fish as an indicator. However, an even more important outcome of the proposed research would be to prepare a solid foundation of fish-based information, which could be used as a reference for a variety of purposes including the study of climate change. Two sets of examples, one in the tributaries of a glacial river and another in the tributary of the rain/spring fed river will be compared in terms of fish ecological attributes to see the effects of climate change. Climate change study is a long-term study and requires scientific information in space and time. In many sectors, Nepal either lacks primary information or has an unscientific documentation of available information. This research addresses this gap and at the same time builds capacity to extend research and prepare adaptations.

10

Topic	Impact of climate change on cholera occurrence/outbreak in Nepal
Thematic Area	Public Health (Impact of climate change on infectious waterborne diseases)
Geographic Area	Kathmandu, Bhaktapur, Lalitpur, Kavrepalanchowk, Saptari, Kaski, Kanchanpur, Surkhet
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Supriya Sharma Central Department of Microbiology, Tribhuvan University
Team Members	Microbiologists, Statistician , Environmental Scientist,
Grant	USD 10,695
Contact Information	Bhajangal, Kirtipur Municipality – 18 **Tel** 01-4331869 **Email** suprisharma@hotmail.com
Goal	☂ To reduce morbidity and mortality rates due to cholera by timely prediction of possible cholera outbreak and proper management
Objectives	☂ To identify the relationship between various climatic factors with the occurrence/outbreak of cholera.
Activities	☂ Communication with organizations for the execution of the project ☂ Retrospective study ☂ Longitudinal study ☂ Data analysis ☂ Awareness program
Expected Result	☂ Documentation of socio-demographic factors and changes in climatic factors affecting cholera outbreak. ☂ Development of statistical tool to assist in early warning and prevention on cholera outbreak. ☂ Public awareness on risks to health related to climate change.
Relevance to Climate Change	Climate risks cannot be eliminated, but negative impacts on people and economies can be reduced or managed. Climate-resilient development helps minimize the costs and consequences of climate impacts so they do not hinder progress toward development goals. In this context, the proposed project will identify key climatic factors that are associated with occurrence/outbreak of cholera in Nepal. Finally, a statistical tool will be developed for prediction of possible cholera outbreaks in Nepal. This can be utilized by the concerned stakeholders to establish early warning systems so that the possible negative outcomes of the outbreak can be minimized or even controlled by timely public awareness and proper management. Thus Nepal would be able make better use of the early warning information to predict the onset, intensity and duration of epidemics. Such predictions allow health professionals to pre-position medicines and other medical supports as required that can reduce the morbidity and mortality rates.

11

Topic	**Study on autonomous adaptation measures of farmers to changing precipitation patterns**
Thematic Area	Agriculture and Food Security: Agricultural / seasonal calendar change and farmer adaptation strategies
Geographic Area	Mohambatpur and Sangrampur VDCs of Rautahat district
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Beda Bahadur Rokaya Nepal Environment Protection Centre
Team Members	Research Assistant
Grant	USD 11,905
Contact Information	Koteshwor, Kathmandu, P.O. Box 404, Kathmandu, Nepal **Tel** 014465942 **Email** rkbda@yahoo.com
Goal	Support the farmers to cope with the climatic variability through identifying measures for adaptation relevant to their agro-ecological zone.
Objectives	☂ To increase food security at the local level. ☂ To help the government to identify national level adaptive measures to climate change in the agriculture sector.
Activities	☂ Baseline information collection. ☂ Sorting the possible crops to be cultivated before monsoon season. ☂ Leasing the agriculture land for the action research trial. ☂ Conducting research trial (demonstration plot). ☂ Training to local farmers on adaptation of agriculture to climate change resilience in agriculture. ☂ Purchase and distribution of inputs (seeds, fertilizers, insecticides and pesticides etc.). ☂ Field training to farmers. ☂ Technical support for changing cropping patterns and changed condition of diseases due to changed precipitation patterns. ☂ Exchange visits with farmers. ☂ Preparation of a brief concept proposal for future research. ☂ End line survey. ☂ Up-scaling of research output.
Expected Result	☂ Baseline information on cropping patterns, precipitation patterns and economic loss due to climate variability gathered. ☂ Knowledge on adaptation of climate change to agriculture imparted to farmers. ☂ Technically and economically feasible alternative crops for the two months of pre-monsoon period identified. ☂ the findings of the research disseminated ☂ Possibility of further research on alternative adaptation measures of climate change to agriculture explored.

Relevance to Climate Change	The outcomes of the project are to derive the best potential crop species and varieties to fill the gap between different seasons. It also intends to inform farmers on climate change and its negative effects both in cropping patterns and in daily life of. It is planned to establish baseline information on cropping patterns, precipitation patterns and economic loss due to climate variability; transfer knowledge on adaptation of climate change to agriculture to farmers; identify technically and economically feasible alternative crops for the two months of pre-monsoon period; Dissemination of the findings and exploration of the possibility of further research on alternative adaptation measures of climate change to agriculture. These attempts will provide a mirror of the gravity of climate change effects and test/demonstrate the possible resilience measures that may include the identification of crops that require less water and more photoperiod that can be cultivated to help paddy management. This project will impart this knowledge and technology to develop a crisis management plan to the farmers for resilience of climate change effects for better utilization of seasonal planting.

12

Topic	**Plant Water Relations and Altitudinal shifts of Quercus semecarpifolia in Response to Drought and Climate Change at Phulchowki Hill, Nepal**
Thematic Area	Forests and Biodiversity: Climate induced vegetation shift and ecosystem changes
Geographic Area	Phulchowki Hill**,** Lalitpur District
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Kanta Poudyal, Ph.D.
Team Members	Statisticians, Research Assistant, Field Assistant
Grant	USD 13,040
Contact Information	Lohsal, Basbari, Kathmandu Metropolitan-4
	Tel 01 4017076
	Email kantadidi@gmail.com
Goal	☂ To assess the degree of climatic stress by studying plant water relations parameters and phenological cycle in *Q. semecarpifolia* at Phulchowki Hill.
Objectives	☂ To monitor soil and tree water status, drought impacts and phenological activities. ☂ To study altitudinal shifts of the species from lower to higher altitude. ☂ Investigate the effects of drought and the relative importance of elastic and/or osmotic adjustments in the maintenance of turgor. ☂ To study twig conductance, wood water properties, leaf dynamics and phenology and their adaptive mechanisms. ☂ Estimation of the existing soil seed banks, seed viability, seed regeneration and germination and the effect of water availability. ☂ To perform an adaptation analysis and provide recommendations and development of management options for improved forest management under the regional climate change scenarios.
Activities	☂ Measurements of soil and plant water status and phenological cycles. ☂ Measurements of stomatal conductance during morning and afternoon. ☂ P-V Curve analysis. ☂ Measurements of different parameters of twig conductance, wood water properties and phenology. ☂ Seed bank estimation and germination of seeds. ☂ Dissemination of the final outcomes of the research work.
Expected Result	☂ Degree of water stress. ☂ Degree of Temperature stress. ☂ Mechanism of turgor maintenance. ☂ Phenological shifts. ☂ Degree of climatic stress and altitudinal shifts. ☂ Altitudinal shifts in response to Drought and Climate Change.

Relevance to Climate Change	Seasonal variations of precipitation are reflected by the species as the depletion in water availability greatly affects their water relations parameters. Plants have developed certain mechanisms to survive water deficit by tolerance, escape and avoidance of tissue and cell dehydration. Avoidance of stress includes rapid phenological shifts, increased stomatal and cuticular resistance, changes in leaf area, osmotic adjustment, hydraulic architecture etc. Maintenance of turgor, however, is another primary performance that is very important for plant growth and survival and is achieved mainly by the integrated mechanism of osmotic potential, changes in tissue elasticity (bulk modulus of elasticity) and tissue relative water content. Oaks occupy a very prominent place in the ecosystem of not only the Himalayan region but according to Gailing *et al*. (2009) Quercus spp. are a model for forest tree species, being one of the most important genera of northern hemisphere. As *Q. semecarpifolia* grow in typical seasonality of rainfall in Himalayas, it needs a special adaptational strategy to efface water stress such as lowering of osmotic potential, change in tissue elasticity, high xylem conductivity, phenological shifts etc. Thus a comprehensive study of the basic interactions of this species and its environment will help to predict responses for now and in the future to the expanding demands of growing population, global warming and climate change in natural and managed ecosystem. Hence, the proposed research will provide a baseline for the study of water relation of oaks in a proper perspective as well as a guideline for forest regeneration and management considering the evolutionary and ecological consequences in the Himalayan region.

13

Topic	**Effect of climate change on insect pest incidence in major staple food crops**
Thematic Area	Agriculture and food security
Geographic Area	Three Agro Climatic Regions Terai (Chitwan District), Mid hill (Lamjung District) and High hill (Manang District)
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Kapil Kafle Institute of Agriculture and Animal Science, Lamjung Campus (TU)
Team Members	Entomologist, Horticulturist, Agronomist/Plant breeder and economist cum data analyst
Grant	USD 26,128
Contact Information	Sundarbazar, Lamjung-4 **Tel** 066402037/38 **Email** kaflekapil@hotmail.com
Goal / Objectives	Increase production of major staple food crops by reducing yield loss caused by insect pests.
Activities	☂ Recruitment of field man for data recording and take care of fixed plot. ☂ Procurement of light trap, other traps, vials, brush, eye lens, bucket, net, forceps, insect collection box, sweep net, ethyl acetate etc. ☂ Take land on rent to conduct field plot survey. ☂ Inputs purchase (seed and fertilizer). ☂ Costing agronomical practices ☂ Questionnaire preparation and field survey ☂ Publication of results. ☂ Dissemination of results.
Expected Result	☂ Assessment of insect pest dynamics of the major stable food crops (Rice, Maize, Wheat and Potato) will be the ultimate outcome of the project. The outcome of the project will help in assessing the abundance and incidence of insect pests in major cereals and potatoes as a result of changing climatic conditions. This will facilitate the adoption of appropriate adaptation measures so that the goal of increasing production of major cereals and vegetables could be met. To achieve this outcome, the project has four outputs: ☂ Insect pests and their severity, as a result of changing climate, in rice, maize, wheat and potato crops identified across the agro climatic zone and development regions of the country. ☂ Pest incidence variation within the same crop across the different agro climatic zone assessed. ☂ Crop stage identified at which insects problem is more prominent. ☂ Insect abundance and population fluctuation with respect to climatic condition investigated.
Relevance to Climate Change	The project studies the seasonal pest population variation within the same climatic condition and pest population variation with respect to different climatic conditions in the different agro climatic zone of the country, which will ultimately be useful in pest forecasting. Similarly, pest severity of rice, maize, wheat and potato crops in different development regions and agro climatic zones will be identified which will help to develop and timely use effective and efficient pest control measures to reduce yield loss caused by insect pests and help in food security.

14

Topic	**Budhi Gandaki Hydropower Project under Climate Change Uncertainty: An Assessment of Hydro-sociality**
Thematic Area	Water Resources and Energy
Geographic Area	Budhi Gandaki River Basin, Nepal
Duration	12 months: February 15, 2015 to February 14, 2016
Lead Researcher and Organization	Khadga Nandan Dulal, Ph.D. Asian Institute of Technology and Management
Team Members	Water resources engineer, environmentalist/social scientist, hydrologist/water resources engineer, hydro-meteorologist, hydropower engineer, field enumerators
Grant	USD 13,412
Contact Information	Satdobato, Lalitpur Sub-metropolitan, Lalitpur District **Tel** 01 5545052, 5542423 **Email** kndulal@yahoo.com
Goal	Assess potential impacts of climate change on BGHP hydropower project and measures required for adaption of this major government investment.
Objectives	☂ Assess the impacts of increased uncertainty introduced by changing climate dynamics on the energy generation from the proposed Budhi Gandaki Hydropower Project (BGHP) ☂ Assess the impacts of climate change on the livelihood of the indigenous people in the BGHP area.
Activities	☂ Literature review & data collection (Spatial and temporal data). ☂ Data preparation, verification and hydro-climatic trend analysis. ☂ Temperature & rainfall analysis. ☂ Hydrological modeling ☂ Reservoir simulation. ☂ Extreme events analysis ☂ Climate change analysis (Generation of future climate data). ☂ Primary data collection. ☂ People's perception analysis. ☂ Results interpretation and discussion. ☂ Conclusion.
Expected Result	Baseline document for the mainstreaming climate resilience in BGHP project. Assessment of people's perceptions of climate change impacts on their livelihoods and documentation of adaptation strategies.
Relevance to Climate Change	The main purpose of this research is to assess the hydro-sociality condition of BGHP under CC in Nepal. Normative hydrologic studies under current climatic conditions will not be sufficient to enhance the resilience of these projects to the changing climate. Overall research output will be determined through the policy framework, which makes the project sustainable and environment friendly. Ranking of CC adaptation strategies through the people's perception will be a key contribution of this research to the climate resilient development process at local level. This research will generate a baseline document for the BGHP which will be extremely applicable to the government for further development.

15

Topic	**Impact of climate change in dengue virus infection among human and *Aedes* vectors**
Thematic Area	Public Health (Climate change and disease outbreak)
Geographic Area	Kathmandu valley and Chitwan district
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Reshma Tuladhar Central Department of Microbiology, Tribhuvan University
Team Members	Microbiologists, Statistician and Entomologist
Grant	USD 8,983
Contact Information	Thamel, Kathmandu Metropolitan City-29, Kathmandu District
	Tel 4331869 (O), 4260359 (R)
	Email resutu@gmail.com
Goal / Objectives	To determine the relationship between the number of dengue cases, vector density with climatic, socio-demographic and vector breeding preference ratio in two different ecological settings of Nepal.
Expected Result	☂ Burden of dengue expressed as: ☂ Vector density ☂ Natural rate of infection of vector ☂ Climatic factors
Relevance to Climate Change	The approach can be made by addressing the potential outbreak of disease as a consequence of climate change at different levels. The system of identifying interventions for reducing dengue fever risk, such as modifying household water storage methods in dry season by covering the storage units, proper managing of solid waste and improving early detection of outbreaks is one level. This project will contribute to the community by enhancing awareness among vulnerable people to take preventative measures and better respond to outbreaks of dengue fever. An approach can be made on the institutional level by strengthening the existing knowledge base about dengue fever and linkages to climate variability, improving access to information and services about outbreaks, and improving capacity of health systems in Nepal to prevent and respond to dengue fever.

16

Topic	**Assessment of the effects of climate change on distribution of invasive alien plant species in Nepal**
Thematic Area	Forest and Biodiversity
Geographic Area	19 districts from Chitwan-Annapurna Landscape and Rupandehi, Bara and Parsa Districts
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Prof. Mohan Prasad Siwakoti, Ph.D. Central Department of Botany, Tribhuvan University
Team Members	Invasion ecologist, Plant ecologist, GIS/RS expert and ecological modeling scientist and Resources economist
Grant	USD 27,864
Contact Information	Kapan VDC-3, Kathmandu District **Tel** 014331322 **Email** mohansiwakoti@live.com; or info@cdbtu.edu.np
Goal	Projection of potential distribution of invasive alien plant species of Nepal under future climate change scenarios.
Objectives	☂ Assessment of diversity of Invasive Alien Plant Species (IAPS) and naturalized species in 22 districts of Nepal. ☂ Mapping distribution of IAPS under current and future climate change scenarios. ☂ Economic valuation of IAPS. ☂ Prioritization of ecosystems and IAPS for management.
Activities	☂ Ecological (quadrat) sampling. ☂ Distribution survey in 22 districts and ecological modeling ☂ Socio-economic survey. ☂ Expert consultation meeting.
Expected Result	Contribute to climate resilience development process by: fulfilling the gap in scientific knowledge and data; identifying vulnerable ecosystems as well as economic and ecological risks in the context of climate change; building capacity of new generations of scientists and increase public awareness of local communities on the potential risks of biological invasion and climate change; and assisting to formulate adaptation options recommended by National Adaptation Program of Action.
Relevance to Climate Change	The National policy on Climate Change (2011) considered challenges of the lack of knowledge, scientific data and information related to the science of climate change and its impact on different sectors to make the socio-economic sectors climate-resilient. It emphasized implementing climate adaptation-related programs and building resilience capacity of local communities. This research by bridging the science-policy interface, will help engender climate-resilient ecosystems and communities through knowledge generation, capacity building, and awareness in particular by: a) Fulfilling the gap in scientific knowledge and data; a) Identifying vulnerable ecosystems as well as economic and ecological risks in the context of climate change; a) Building the capacity of new generation of scientists and increase public awareness of local communities on the potential risks of biological invasion and climate change; a) Assisting to formulate adaptation options recommended by NAPA. The proposed promotion pathways for the use of the research findings on a more national level are: a) Use of the data on the distribution and diversity of IAPS, their impacts on ecosystems and economy, and the prioritized list of IAPS and ecosystems while preparing a national strategy for the management of IAPS as envisioned by National Strategy for Biodiversity and Action Plan 2014. a) Production of public education materials. a) Inclusion of 'biological invasion' in school and college levels curricula.

17

Topic	**Development of design guidelines of a digester for biogas generation at high altitude**
Thematic Area	Agriculture and Food Security
Geographic Area	Manang VDC, Manang District
Duration	17 months: February 15, 2015 to July 14, 2016
Lead Researcher and Organization	Prof. Bhagwan Ratna Kansakar, Ph.D.
Team Members	Bio-Technologist, Biogas Expert and Research Assistants
Grant	USD 11,000
Contact Information	House No 238/51, Yagabirsingh Marga, Kathmandu Metropolitan City-18, Kathmandu District
	Tel 014259359
	Email brkansakar@gmail.com
Goal	Provide measures for adaptation towards climate change induced impacts to the indigenous people of high altitude regions of Nepal.
Objectives	1. To deliver methods for reducing the dependence on firewood as primary means of energy source - To identify and quantify methanogenesis potential of psychrophiles present in wetlands of Nepal - To establish experimental pilot setup for production of biogas using psychrophilic methanogens using organic household waste as substrate. - To identify and formulate design parameters for construction of biogas digester feasible in cold climate of high altitude using psychrophilic methanogens - To simplify the design parameters in abridged design guideline/manual/knowledge briefs/standard operating procedures useful for various end users ranging from policy making organizations, biogas making companies to community people. - To raise awareness about of the psychrophilic digesters to address the scarcity of firewood in high altitude regions in the wake of increasing impact of climate change.
Activities	- Identification of possible sites for sample collection. - Collection of permafrost sediment from appropriate sites. - Determination of the amount and composition of household waste by survey. - Isolation and characterization of psychrophiles from the collected samples. - Determination of concentration of methanogenic psychrophiles in the isolated colonies. - Preparation of prototype biogas digesters. - Detection of methane production and measurement of biogas production rates. - Design of an anaerobic digester for biogas production. - Piloting of the design in reduced scale - Verification of the design. - Simplification of the design to develop user-friendly manual/ guidelines. - Organization of a consultative workshop/seminar for dissemination. - Communication with related organizations about the research findings.
Expected Result	- Psychrophilic methanogens identified from permafrost sediments - design parameters formulated for construction of psychrophilic biogas digesters - Psychrophilic biogas digesters piloted - Knowledge briefs/simplified guidelines prepared and shared with related organizations for scaling up-scaling out.

Relevance to Climate Change	Increase in temperature and decrease in precipitation causes vegetation shift and decrease in vegetation. (ACAP, 2012) Providing an alternative to the already scarce firewood would lead to conservation of forests and in addition would reduce the expenditure in comparatively costlier forms of energy like LPG gas and fossil fuels. Furthermore, soil fertility is naturally poor in upper-hilly regions and this problem is further amplified by the decrease in precipitation as a result of climate change. The end products of biogas digestion can be utilized as a pathogen-free, nutrient-rich fertilizer that can significantly enhance soil fertility and also promote healthy sanitary practices (P. E. Wright) (C. T. Lukehurst, 2010). Methane, a potent greenhouse gas, is naturally released during the decomposition of organic matter (Wilkes, 2008). This gas will be trapped and converted to a less potent greenhouse gas carbon dioxide during its utilization as a fuel source. This research will produce guidelines using a prototype biogas plant, which can easily be promoted and implemented at the community level by different biogas installation companies. Hence, Policymakers can use the findings of this research to redesign the existing policies and implement it for the achievement of climate resilient development.

18

Topic	**Characterization of microorganisms, for production of bioethanol from agriculture wastes and using it as a biofuel**
Thematic Area	Water Resources and Energy
Geographic Area	Department of Biotechnology, Kathmandu University; Sankhuwasabha, Terhathum; Panchthar, Ilam, Manang, Mustang, Myagdi
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Bhupal Govinda Shrestha, Ph.D. Department of Biotechnology, Kathmandu University
Team Members	Genetic engineer, biotechnologist, microbiologists,
Grant	USD 12,880
Contact Information	House # 68, Bhanu Chowk, Dharan - 6, Sunsari District **Tel** 025-521247 **Email** bgs@ku.edu.np
Goal	Reduce Green House gases mainly carbon dioxide and thus mitigate the adverse changes made by climate change, through sequestering of carbon dioxide and reducing the usage of fossil fuel.
Objectives	☂ Isolation of robust microorganism that can convert the complex carbohydrates in lignocellulosic biomass (agriculture biomass) namely cellulose and hemicelluloses into their monomer units glucose and xylose respectively, optimization of pretreatment and fermentation condition, genetic engineering of yeast so that it can utilize both glucose and xylose ☂ Upscale the fermentation process to 1.5 L capacity so that Ethanol can blend with gasoline and run as neat alcohol.
Activities	☂ Sample Collection. ☂ Isolation of microorganisms ☂ Characterization. ☂ Activity testing. ☂ Pretreatment Optimization. ☂ Genetic Engineering. ☂ Distillation. ☂ Upscaling. ☂ Seminar, Report Writing.
Expected Result	☂ Utilization of endogenous microorganisms of Nepal for scarification of cellulosic biomass and then for its fermentation to bioethanol. ☂ Isolate microorganism which shows both cellulolytic and xylanolytic activity using congo red essay. ☂ Optimize the process of pretreatment for efficient conversion of complex carbohydrate to simple sugars and ultimately ferment the substrate to ethanol. ☂ Genetic engineering of yeast will de done so that it can utilize both 5 and 6 carbon sugar ☂ Upscaling upto 1-5 L fermentor.
Relevance to Climate Change	One of the main reasons of climate change are greenhouse gases, mainly carbon dioxide, that are the result of human activity, especially burning of gasoline. Carbon dioxide can be sequestered by agriculture production when growing, contributing to reducing green house gases. Also, replacing gasoline with 10% bioethanol would help in the reduction of green house gas emission, in turn helping in climate resilience development. Since, there will be enforcement of 10% bioethanol mix with gasoline, in the near future, as outlined in this year's budget, the success of this project would have positive policy implications. Moreover, the raw material for production of bioethanol in this project is agriculture wastes and not any foodstuffs, and thus will have no effect on food security.

19

Topic	**Climate Change Impact on Spring Water of Mid Hills of Nepal with Special Focus on Drudgery of Women**
Thematic Area	WRE (Water Resource and Energy)
Geographic Area	Kiul, Helambu, Baruwa, and Bhotang VDCs of Sindhupalchok District
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Prem Sagar Chapagain, PhD Central Department of Geography, Tribhuvan University, Kirtipur, Kathmandu
Team Members	Biometricians. Gender experts, GIS experts, Sociologists,
Grant	USD 25,208
Contact Information	Dhobighat, Lalitpur Sub-metropolitan City - 4 **Tel** 01 4330329 (0), 5534298 (R) **Email** ps.chapagain@gmail.com
Goal	To develop knowledge base on spring water of mid hills of Nepal for evidence-based policy making.
Objectives	☂ To develop a digital inventory (GPS location and database) of natural springs and examine the spring water potentiality (database), soil-moisture condition using Remote Sensing technology to analyze the location and distribution pattern of springs with respects to geology, altitude, land-use, settlement drainage pattern and slope. ☂ To examine the demand and supply situation of water that will also focus on discharge measurement of selected spring for future monitoring and explore the knowledge on spring conservation ☂ To examine that how climate change has affected different socioeconomic groups and particularly women because of changing situation of availability and accessibility of water.
Activities	☂ Conduct Consultation meetings/discussions. ☂ Conduct GPS survey of natural springs. ☂ Prepare Spring Inventory. ☂ Analyze Remote Sensing data to map out natural springs and soil moisture. ☂ Develop Spring water potentiality maps. ☂ Develop a Soil Moisture Index ☂ Conduct household survey/FGDs/Informal discussions. ☂ Develop GAM and CVA indicators. ☂ Integrate of all data into a Single GIS based Database ☂ Write articles for peer reviewed journals ☂ Conduct Workshop and Disseminate findings
Expected Result	The major results of the project will be the publication of at least three peer- reviewed papers in international journals. Preparation of a scientific report will be another result. Finally, preparation of a spring database that is compatible with other database systems will be another result of this project.

Relevance to Climate Change	The project is directly related to the climate resilient development process as it develops a comprehensive and integrated knowledge base including both local and scientific knowledge. The study's methods and techniques adapted in the study will further promote and invoke researches on climate change and variability stress on the spring water resources and drought conditions. The study will follow the integrated approach where it applies remote sensing and GIS technology to make an inventory and a GIS database of springs, assess spring water potential, soil drought conditions. The findings will lead to the examination of the water availability against the present and future demand conditions as a prerequisite for developing climate resilient water policy. The proposed study will cover the women, poor and disadvantaged groups for understanding their knowledge and the effect of changing water patterns on them. It further sensitizes the issue from very grass root level to the national level and beyond. The work in terms of its concept, methods and implication can be scaled up. A comprehensive digital water database, which the study intends to start, could eventually be developed using the contribution of several sectors (such as drinking water, irrigation, micro and small hydro power development, agriculture) thus aiding in the combat against climate change.

20

Topic	**Treeline Shift in Central Nepal Himalaya and Climate Reconstruction of Past Millennia**
Thematic Area	Forests and Biodiversity
Geographic Area	Manang, Mustang and Dolpa
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Yub Raj Dhakal, Tree Ring Society of Nepal
Team Members	
Grant	USD 12,562
Contact Information	Simlar Village, Simlar VDC-2, Rupandehi District **Tel** **Email** dhakalyr@gmail.com
Goal	Study impact of climate change on high altitude vegetation and past climate reconstruction.
Objectives	☂ To establish permanent research plots for determining the rate of climate change induced treeline shifting and its long term monitoring at selected treeline sites of Annapurna and its adjacent region (Manang, Mustang, and Dolpo) ☂ To assess climatic response of multiple treeline species (*Abies spectabilis*, *Betula utilis*, *Juniperus* sps, *Rhododendron* sps, etc.) and reconstruct temperature and precipitation of the region during past millennia. ☂ To study livelihood vulnerability of high-altitude marginal and pastoral communities to climate change and climate change induced biophysical changes.
Activities	☂ Establish permanent plots for the study of treeline shifting and long term monitoring. ☂ Calculate rate of treeline shifting. ☂ Assess the response of multiple tree species to climate change. ☂ Study the vulnerability of livelihood of high-altitude marginal and pastoral subsistence people. ☂ Provide information for developing Local Climate Change Adaptation Plan.
Expected Result	☂ Demarcated treeline position and calculated rate of treeline shifting. ☂ Developed at least 12 tree ring chronologies. ☂ Identified response of tree species to climate change. ☂ Reconstructed temperature and precipitation for at least the past 500 years. ☂ Listed existing livelihood dependencies on alpine resources. ☂ Published Journal Articles/Abstracts/ Posters.

Relevance to Climate Change	The analysis of treeline shifting rate and construction of past climate will reveal the severity of climate change in the study areas. The response of different treeline species to climate change will be useful to estimate the future forest and rangeland area that could support and develop a climate resilient forest and rangeland management plan. Simultaneously, all treeline building species may not be able to shift upward due to genetic, ecological or climatic factors. This means some tree species will be the winners and successively invade through a gradual upward shift whereas others will be the losers. Therefore understanding such changes in species composition is important from the perspective of forest management and ecosystem maintenance. Moreover, collection of the first hand data on different aspects of livelihood from the resource users and analysis of livelihood vulnerability to climate change will be useful to identify the areas for intervention to enhance adaptive capacity and reduce exposure and sensitivity of local communities. Concurrently, our current research framework could be easily upscaled in other treeline sites in the Nepalese Himalaya as it follows the standard scientific method for dendrochronology. Therefore, the results might be of interest to and encourage graduate students and young researchers for conducting similar studies. TRSN also provides regular training sessions on dendrochronology and sampling methods to motivate young researchers in conducting similar research.

21

Topic	**Study of the snowmelt runoff for the sustainability of hydropower projects under climate change**
Thematic Area	Water Resources and Energy
Geographic Area	Himalayan Region of Nepal
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Prof. Narendra Man Shakya, Ph.D. Engineering College, Tribhuvan University
Team Members	Hydrologists, meterologists, statisticians.
Grant	USD 10,685
Contact Information	House # 13, Jwagal, Lalitpur Sub Metropolitan City-10, Lalitpur District **Tel** 01-5520277 **Email** nms@ioe.edu.np
Goal / Objectives	The goal of this project is to develop a comprehensive understanding of the snow and glacier melt water to river discharge and analyze its regional characteristics under the influence of climate change.
Activities	☂ Collection of required hydro-smeteorological data. ☂ Simulation of snowmelt runoff using the first principle of energy balance. ☂ Validation of the snowmelt runoff by analyzing the diurnal variation in the stream-flow. ☂ Comparison of the results of the energy-balance model with the Snow Runoff Model (SRM) and optimization of the parameters of the SRM. ☂ Generation of a snowmelt runoff scenario using the optimized parameter set of the SRM for various Himalayan River basins of Nepal. ☂ Use of the AR5 climate projections to determine the effects of climate change on the snowmelt runoff and its possible subsequent impact on the hydropower generation during the lean/dry season. ☂ Assessment of Policy Implication and issues of mainstreaming CC risk management.
Expected Result	☂ Utilizing the understanding to propose various climate resilient modifications to the existing design plans of the various projects. ☂ Regionalization of the snowmelt parameters for the SRM for various geographic and physiographic regions of Nepal. ☂ Attempt to influence the project development authorities towards giving due consideration to the impacts of climate change on the energy production from hydropower plants as a result of the mutation in snow and glacier dynamics. ☂ Draft documents that can serve as guidelines for formulating climate resilient strategies. ☂ Serve as a reference to the policy makers for decision-making, to the government authorities for resource allocation and to the hydropower producers to plan the long-term sustainability of the project. ☂ Influence the wider science-policy community on water-governance issues.
Relevance to Climate Change	Various researches have shown that the water resources will largely be impacted by the impending anthropogenic changes in the climate. These impacts are predicted to be more glaring in the Hind-Kush Region due to recession of the snow line, which will bring about alterations in the seasonal hydrological patterns of the region. In this context, understanding the present mechanism and dynamics of snow and glacier melt and its contribution to the stream-flow, especially during the dry summer seasons when the monsoon precipitation has not yet arrived and the groundwater storage of the previous year has already depleted, will help us plan the hydropower projects with more confidence based upon the differences between the firm energy and secondary energy. Usually, larger hydropower projects have an operational life of about 50 years and acknowledging that this is a long duration, the analysis of the effects of the climate change on the snowmelt stream-flow contribution will help us towards planning climate resilient hydropower projects that might be able to ensure the sustainability of such projects.

22

Topic	**Marsyangdi River Basin Water Induced Disaster Triggered by Climate Change and its Prognostic Projection**
Thematic Area	CID-Climate Induced Disasters
Geographic Area	Marshyangdi River Basin in Tanahu, Gorkha, Lamjung and Manang.
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Dinesh Pathak, Ph.D. Central Department of Geology, Tribhuvan University
Team Members	Geologist, Hydrogeologist, Meteorologist/Climate Modeler, Hydrologist/ Water Resource Engineer, Research Assistants
Grant	USD 26,800
Contact Information	Sankhamul, Kathmandu Metropolitan City-34, Kathmandu District
	Tel 014333085(O), 4782758 (R)
	Email dpathaktu@gmail.com
Goal	Developing resilient community in Maryangdi River Basin.
Objectives	☂ Assess the state of community, water resources and potential water induced hazards in the Maryangdi River Basin Areas. ☂ Evaluate climate change risk based on the hazard and vulnerability in the area.
Activities	☂ Desk Study ☂ Preliminary Data Analysis ☂ Field Study and data Collection ☂ Detail study and Analysis ☂ Prepare draft report and financial. ☂ Enhance the draft reports and submit Final Reports. ☂ Preparation of articles and submit in journal for publication.
Expected Result	☂ Inventory of past water induced disaster in the Marshyangdi River basin: events in chronological order and respective damages spatially located on the map ☂ Assessment of past climatic trend: use temperature and precipitation data for the assessment. The analysis will be made separate for the period of before 1990 and after 1990 to understand the effect of climate change ☂ Preparation of climate model with the precipitation for various future period ☂ Preparation of water induced hazard map and vulnerability with and without climate change scenario
Relevance to Climate Change	The project is expected to significantly contribute to climate resilient development and have policy implications. This is principally based on the identification of past water-induced disaster locations within the basin and also future projections showing hazardous locations. In addition, the risk maps prepared with climate projections can be directly used for future planning leading to the implementation of various projects for carrying out mitigation measures, enhancing coping capacity, improving indigenous technology and implementing adaptive capacity development. These aspects can't be borrowed from the findings of other river basins as it varies from basin to basin due to variations in the ethnic community, local culture and other socio-economic factors. Likewise, any further development work needs to address the possible climate -induced hazard and disaster conditions within the area. This type of research work would produce unbiased findings which can be considered for future planning of various activities to reduce the impact of water-induced disasters (including climate change induced). The research findings could be the basis for policy implementation helping local governments to understand the disaster scenarios at present and projected for future so as to plan the mitigation and adaptation measures for short term, mid-term and long term planning.

23

Topic	**Fostering Climate Resilient Cities through Augmenting the Blue Land Uses: A case of Janakpur Municipality**
Thematic Area	Urban Settlement and Infrastructure
Geographic Area	Janakpur Municipality
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Ajay Chandra Lal, Department of Architecture and Urban Planning, Pulchowk Camus Institute of Engineering (IOE), TU
Team Members	Surveyor, GIS Expert and Hydrologist
Grant	USD 10,936
Contact Information	Institute of Engineering, Department of Architecture and Urban Planning, Pulchowk Campus, Lalitpur
	Tel 01 5011030 (Ktm), 44-520081 (Mahotari)
	Email ajay@ioe.edu.np
Goal	To contribute in devising policies at national and local level to make cities climate resilient in general and to devise strategies and model for augmenting blue land use and associated green land uses in cities for fostering cimate resilience at local level in particular.
Objectives	☂ To analyze the climatic data of Janakpur and similar towns in the central Terai region to outline the trend of temperature and precipitation over the decades to establish the climate change scenarios in 2015, 2050 and 2100 AD. ☂ To outline the impacts of climate change on city fabric and the inhabitants in Janakpur municipality along with the prevalent urbanization process. ☂ To develop an empirical relationship between ponds and climate change impacts. ☂ To map the blue land uses and its associated green land uses within the municipal jurisdiction. ☂ To outline the strategies and interventions to augment the blue land uses and associated green land uses for climate change adaptation at the local level. ☂ To develop a model for implementation of the designed program.
Activities	☂ Inform people and local institutions on Climate Change and its impact on Cities. ☂ Local government and institutions implementing CCA projects. ☂ Blue land use augmentation policy mainstreamed in local and national urban development policies. ☂ Informed media, academia and policy makers
Expected Result	☂ Trend and Impacts of climate change in Janakpur Municipality. ☂ Awareness Workshops. ☂ Strategic Framework for Augmenting Blue Land Uses and its surrounding area. ☂ Pilot Project Design ☂ Established relationship between water body and city climate change. ☂ Final Report and Policy brief. ☂ Scientific Paper, Talk Program on FM Stations and NEA. ☂ An academic module.
Relevance to Climate Change	The research will establish an empirical relationship between the pond with its surrounding ambience and climate change adaptation which will lead to develop a climate resilient city. It will have policy inputs for the national as well as local governments to conserve and even inject urban ponds with its surrounding green spaces in urban fabric to adapt climate change. The expected output of this research is the policy and strategic framework to rearrange the urban development process and enable local authorities to augment the blue land use as a strategic intervention for climate change adaptations at local level. The research will come up with adaptive use of ponds in an urban context and develop a mechanism to establish it as a center for urban activities.

24

Topic	**Sustainable Urban Transport Solutions to Mitigate Climate Change, A Case study of Kathmandu Valley, Nepal**
Thematic Area	Urban Settlement and Infrastructure
Geographic Area	Kathmandu, Bhaktapur and Lalitpur districts
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Ashim Ratna Bajracharya, Institute of Engineering, Department of Architecture and Urban Planning
Team Members	Fiedl Enumerators,Statistician, Environmental expertst
Grant	USD 13,569
Contact Information	Institute of Engineering, Department of Architecture and Urban Planning, Pulchowk Campus, Lalitpur
	Tel 01-4383259
	Email ashim@ioe.edu.np
Goal	To explore sustainable urban transport solutions to mitigate climate change.
Objectives	☂ To study travel behavior of commuters and travel patterns prevailing in the cities of Kathmandu Valley. ☂ To study the mutual interdependency of land use and transport planning in an integrated approach for sustainable urban mobility. ☂ To identify and implement models and Geo-information technology appropriate for the assessment of different scenarios. ☂ To evaluate different alternative approaches, based on qualitative and quantitative criteria for sustainable urban mobility to mitigate climate change and aid the decision support system.
Expected Result	☂ Current Land use and urban mobility pattern of urban areas within Kathmandu Valley. ☂ Travel behavior of a commuter. ☂ Impact of urban transport on climate change.
Relevance to Climate Change	The transport sector is one of the major sectors for energy consumption and Green house gas (GHSG) emission. The population of the Kathmandu valley is increasing rapidly and with it, is a steep increase in travel demand. Increased travel demand results in more commuters, more vehicles and more emission. As the level of GHG increases, it will have a severe impact on urban climate. So it is very crucial to promote sustainable transport development strategies to minimize the climate change impacts resulting from the transport sector. The findings from this research will help to provide useful information to the people and decision makers, in taking appropriate steps for achieving our goal to climate resilient development.

25

Topic	**Vulnerability of Livestock Farming Systems to Impact of Climate Change in Terai Region of Nepal**
Thematic Area	Agriculture and Food Security: Animal Husbandry: Climate Change Adaptation, Mitigation and improved livelihoods
Geographic Area	Chitwan, Morang, Sarlahi, Bara, Rupendehi and Banke
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Shiva Chandra Dhakal, Agriculture and Forestry University, Chitwan
Team Members	Agricultural economists, Finance and administrative officers and Enumerators
Grant	USD 10,302
Contact Information	Bikash Chowk, Krishnapur, Bharatpur Sub-metropolitan City-7, Chitwan District **Tel** **Email** nepal_dhakal@ymail.com
Goal	Increase livelihoods of the Nepalese livestock farmers through increased production and productivity from different species of livestock.
Objectives	☂ To measure climate change patterns in the Terai region of Nepal from the viewpoint of livestock sector. ☂ To determine the type and extent of adoption of climate change adaptation strategies by dairy farmers. ☂ To determine the vulnerability of the livestock production system to impacts of climate change. ☂ To assess factors affecting adoption of major climate change adaptation strategies in the livestock sector.
Activities	☂ Literature review. ☂ Questionnaire and checklist preparation. ☂ Pretesting of questionnaire. ☂ Orientation training to enumerators. ☂ Household survey and group discussions. ☂ Data entry. ☂ Data management and analysis. ☂ Report writing. ☂ Presentation. ☂ Publication and dissemination.
Expected Result	☂ Trend of climatic variable known ☂ Adopted adaptation strategies and level of adoption known\ ☂ Vulnerability of the Terai region to climate change impact assessed ☂ Factors affecting adoption of adaptation strategies identified
Relevance to Climate Change	The national target for achieving growth rate in the livestock sector during the twenty years periodic plan is 6.1% in 2015 from 2.9% at base year period (APP, 1995). But because the livestock sector is highly vulnerable to climate change and due to other technical and institutional obstacles related to it, the target rate could not be achieved. Studies on climate variability at the local level are very sporadic in spite of the accepted fact that the micro-level community vulnerability and adaptation assessment is more relevant than the mega-scale. This research work aims to study the effect of climate change in the regional level, especially in livestock sector. There is an urgent need to determine the location-specific adaptation to climate change and different strategies to improve the adaptive capacity of rural poor livestock keepers to attain improved livelihoods. This study thus aims to identify previous research gaps and impact of climate change on livestock production and its effect on livelihood in specific locations Identification of the impact of climate change helps to formulate appropriate coping strategies and provides recommendations for policy makers to give due attention to this phenomenon in order to foster sustainable farming.

26

Topic	**Impacts of Climate Change on Cereal Crop Production and on Food Security: A Case Study of Dhading.**
Thematic Area	Agriculture and Food Security: Adaptation in agriculture productivity and food security and food scarcity under climate change scenarios and adaptation strategies
Geographic Area	Dhuwakot, Nilkatha, Sangkosh and Muralibhanjyang VDCs of Dhading District
Duration	18 months: February 15, 2015 to August 14, 2016
Lead Researcher and Organization	Surya Mani Dhungana, Department of Agricultural Economics and Agribusiness Management Faculty of Agriculture, Agriculture and Forestry University
Team Members	Agronomist, social mobilizers, statisticians
Grant	USD 10,511
Contact Information	Narayanpur, Bharatpur Municipality-14, Chitwan District **Tel** **Email** suryamanidhungana@gmail.com
Goal	Assessing the adaptive capacity and household economy of cereal crops in the context of climate change and food security in mid hill of Nepal.
Activities	☂ To study the perceptions of climate change by farming communities in the study area. ☂ To find the indicators of climate change and pattern of climate change in the study area. ☂ To assess the impacts of temperature and rainfall variation in agriculture production of major crops in the study area. ☂ To examine the present food security situation and find the possible impacts on food security in the region. ☂ To provide policy implications for better management of crop production system in the context of climate change.
Expected Results	☂ Identified the factors determining the households' adaptation capacity to climate change in different VDCs. ☂ Assessed the impact of household economy in the climate-changing scenario. ☂ Investigated farmers' coping strategy for diseases & pest prevalence and weed invasion in crop production and change in crop calendar. ☂ Provided policy implications for better management of crop production system in the context to climate change.
Relevance to Climate Change	This research will contribute to the climate resilient development process indirectly since it will provide facts, figures and information to policy makers. The findings may be used for further discussion and then after will lead to government intervention. This study examines the cereal crop producers perception of climate change and its impact on crop production which is expected to be useful for the development of location specific adaption strategies to reduce vulnerability and food security. An important data base will be generated from this study which may serve as the base for future research

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Topic	**Carbon Sequestration in a Fire Ecosystem of Pine Forest**
Thematic Area	Forest and Biodiversity (Climate Change and Forest Fires)
Geographic Area	Ghatlang and Hakku VDCs of Rasuwa District
Duration	18 months: 15 February 2015 to 14 August 2016
Lead Researcher and Organization	Biva Aryal, Ph.D., Society of Natural Resources Conservation and Development (SoNaReCoD)
Team Members	Ecologist,Botanist, Forester
Grant	USD 11,301
Contact Information	House # 228/116, Gangkhel Marg, Kathmandu Metropolitan City-14, Kathmandu District **Tel** 01-4301499 **Email** aryalbiva@yahoo.com
Goal	The main aim of the study is to account the whole carbon flux and stock of the fire ecosystem and to provide the accurate information about distribution of char in soils & its stability.
Objectives	☂ Quantification of carbon stock under various intensities and frequencies of fire-affected forest. ☂ Estimation of soil organic carbon under various soil depths of fire- affected forests. ☂ Quantification of char in soil profile, characterization and its stability. ☂ Measurement of soil CO_2 flux from various fire-affected forest ecosystems.
Expected Result	☂ Baseline data on carbon pools of fire ecosystem. ☂ Accurate information about the distribution of char in soil and its stability. ☂ Estimation of carbon source and sink condition of the ecosystem. ☂ Quantification of sequestered carbon in the forest ecosystem and temporal ☂ carbon pools under the fire ecosystem ☂ Different fire frequencies and intensities result in a variation of the amount of carbon stored in the soil. ☂ Effects of existing forest management practices, temperature, moisture and soil properties on Soil CO_2 flux.
Relevance to Climate Change	The project will help to develop baseline data on carbon dynamics of fire-affected and non fire-affected forest ecosystems. The baseline data will be useful for carbon trading under the Clean Development Mechanism of the Kyoto Protocol and Reducing Emission from Deforestation and Forest Degradation for Developing Countries plus (REDD+) program of the United Nations Framework Convention for Climate Change. The distribution and flux of carbon in different soil depths as well as in the atmosphere through soil respiration will help to understand the effect of fire on alternation of carbon cycle in the forest ecosystems. Furthermore, the char produced during forest fires will help to understand the long-term geological carbon sink in soils. Climate risks cannot be eliminated, but negative impacts on people and economies can be reduced or managed. The outcome of the research will be instrumental for the development of climate resilience development policies which helps to minimize the costs and consequences of climate impacts. Overall, the project output will addresses the issue raised by National Adaptation Program of Action (NAPA).

28

Topic	**Selection of the best renewable energy resource for Nepal to mitigate the climate change: An Analytic Hierarchy Process (AHP) approach**
Thematic Area	Water Resources and Energy
Geographic Area	Jhapa, Nuwakot, Rasuwa and Kathmandu valley
Duration	15 months: 15 February 2015 to 14 May 2016
Lead Researcher and Organization	Prabal Sapkota, Kathmandu University
Team Members	Hydrologist, meteorologist, statisticians
Grant	USD 11,293
Contact Information	G.P.O. Box: 6009, Kathmandu Nepal **Tel** **Email** prabal@ku.edu.np
Goal	To identify the most important renewable energy resources for Nepal to solve the problem of energy crisis and mitigate climate change
Objectives	☂ To develop a model which could be a landmark for policy makers and researchers regarding energy selection to mitig;ate climate change in Nepal and also applicable to the global scenario. ☂ To find out the actual energy need of Nepalese people. ☂ To identify major hurdles (actors) in the development of energy projects in Nepal. ☂ To identify various sustainable energy resources which have a positive impact on the environment and to prioritize (rank) them considering several factors and sub-factors like: impact on environment, sustainability, job prospects etc.
Activities	☂ Questionnaire and procedure development for initial focus group discussion and interviews. . ☂ Identifying the energy need of local people and possible renewable energy resources. ☂ Identifying the major actors (hurdles) for the development of renewable energy in Nepal. ☂ Identifying the renewable energy alternatives to address the local needs. ☂ Analytical Hierarchy Process (AHP) Model development. ☂ Development and data collection with pair-wise comparison questionnaire. ☂ Analysis, Sharing and Finalization
Expected Result	☂ The most important renewable energy resources for Nepal to solve the problem of energy crisis and also mitigate climate change will be identified. ☂ Energy sources can be prioritized as per the need of the people and its effects in the environment and also the major actors in the launching and operating energy projects will be identified. ☂ Pair wise comparison using AHP theory will give the rankings of important renewable energy resources as per their contribution to climate change mitigation and local people's need. ☂ A guideline for launching and operating region specific appropriate energy projects will be provided along with recommendations in policy making to develop these energy systems.

Relevance to Climate Change	Climate resilience is the capacity of a socio-ecological system to absorb the shocks and still maintain functions in the face of external stresses posed by climatic changes. However, another aspect of resilience focuses on the capacity for renewal, re-organization and development. There is no doubt that the climatic changes and growing global warming has caused disturbances in the socio-ecological systems. In order to settle these disturbances new opportunities are explored, new alternatives need to be searched. This project aims to aid in enhancing the capacity of the socio-ecological system of the country to be more climate resilient by adapting and reorganizing the current energy services and developing new desirable arrangements that can improve the sustainability of the system, leaving it better prepared for future climatic changes. Further, the research considers socio-economic factors as one of the important factors during hierarchy development. With the help of sensitivity analysis, the most important renewable source to uplift socio-economic status of Nepalese people can also be obtained. The project will search for the most appropriate renewable resources—one with the least Green house gas emissions and also most suitable for the locale of the country. Once the most important energy resource is identified, its promotion and integration in the country's energy system—from policy making to installations, can be advocated. If the interest of the concerned actors can be piqued, then substantial changes can be made and the country can mitigate the disturbances caused by climatic changes to some extent. The information provided by the results of this study could provide some insights to the policy makers and concerned authorities regarding the best choice of renewable energy for mitigating the effects of climate change and reorganizing their priorities for sustainable development.

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Topic	**In vitro propagation of Paulownia tomentosa Steud. for commercial production and evaluation of its carbon dioxide sequestration ability in previously planted Paulownia trees.**
Thematic Area	Forest and Biodiversity
Geographic Area	Kathmandu and Lalitpur Districts
Duration	16 months: 15 February 2015 to 14 June 2016
Lead Researcher and Organization	Niranjan Parajuli, Ph.D., Department of Biotechnology, National College
Team Members	Plant Biotechnologist, Environmentalist, Lab technician, Economist, Field coordinator,
Grant	USD 11,917
Contact Information	Basukinagar Marg, House No. 67 Koteshwor, Kathmandu-35 **Tel** 01-4360096 **Email** parajuliniranjan@yahoo.com biotech_nist@yahoo.com
Goal	Develop new techniques for improved propagation of moisture-retaining and carbon storage vegetation that can be grown in urban areas.
Objectives, Activities and Expected Results	1. *In vitro* mass propagation of the *Paulownia* species and hardening of *in vitro*. 1. Regenerated plants into the field trials. 1. To optimize the protocol to produce as much healthy plantlets as possible since the present protocol is not effective to produce a maximum number of healthy surviving plants. 1. To estimate the potential of the carbon sequestration of the *Paulownia* species that have been acclimatized in the forest trial or community. 1. Enhancing livelihood options for the poor community that are dependent upon the forest resources.
Relevance to Climate Change	Efforts to increase terrestrial carbon sequestration are based on the principle that reforestation adds to the planet's net carbon storage and helps to mitigate the effect of global warming by slowing the growth of carbon emissions in the atmosphere. This project mainly focuses on reducing the amount of CO_2. It will contribute a lot to helping polluted urban areas. Urban areas are highly populated where larger quantities of energy are consumed every day. As a result CO_2 gas is released in a greater amount. CO_2 is one of the major GHG. Therefore reducing the level of CO_2 in the atmosphere is a major concern. Moreover, the *Paulowina* species used in this project have many other environmental benefits. For instance, the wide spreading roots of this plant can absorb large amounts of water keeping the area moist and cool. This phenomenon retains moisture and serves to provide a suitable habitat for different plants and animals and also to some microbes. The project work is primarily focused on micro propagation of *Paulowina* species. This is a powerful technique in producing disease-free plants. The adaptation ability of the plant is higher (as it can grow in wide range of temperature) and the adult plant obtained through this technique is equally beneficial to the community people as well as to maintain the balanced ecosystem.

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Topic	**Assessing the Impacts of Climate Change Induced Displacement from a Gendered Perspective in Darchula District, Far Western Region**
Thematic Area	Climate Induced Disasters: Assessments of climate change and disaster vulnerable groups, their livelihoods and adaptation priorities
Geographic Area	Darchula District
Duration	29 March 2015 to 28 June 2016
Lead Researcher and Organization	Sushila C. Nepali, Ph.D. Institutional Forum of Natural Resource Managers (FONAREM)
Team Members	Natural resource based management expert, Ecologist, GIS expert, Financial assistance
Grant	USD 11,990
Contact Information	Lazimpat, Kathmandu District **Tel** 01 4270907 **Email** sushinep@gmail.com | fobarem99@gmail.com
Goal	To analyze the impact of climate change induced displacement based on gendered perspective by analyzing the vulnerability, livelihoods and coping strategies.
Objectives	☂ To assess the vulnerabilities of the communities from a gender perspective of related climate-induced disasters in the study area. ☂ To identify men and women's particular skills and capacities in various aspects of their household livelihood strategies and natural resource management that lend themselves to mitigation and adaptation. ☂ To review the existing structures for people displaced or vulnerable to displacement from climate change disasters in the study area.
Activities	☂ Conduct literature review. ☂ Conduct group discussions to identify the vulnerability of both men and women. ☂ Identification of livelihood strategies through interviews. ☂ Develop GIS protocols for land use change. ☂ Conduct consultation meetings and group discussions for developing coping strategies.
Expected Result	☂ A document containing a detailed description and analysis of vulnerabilities and adaptive responses in relation to different genders and socio-economic strata shall be the major output of this research. ☂ The skills and knowledge based on men and women's capacities based on climate change impact adaptation and mitigation approaches will be documented. ☂ Finally this research will help to find out the structural state of the displaced persons and role of government to address their needs and mitigate resource conflicts.
Relevance to Climate Change	Looking at the disaster caused in Mahakali, Paudel, et.al 2013 highlighted that the disaster impact was due to not having preparedness and response plans and not having water induced disaster risk mitigation action plans both in Nepal or India. Some adaptation to current climate variability is taking place; however, this may be insufficient for coping with future changes in climate. Lack of awareness in policy change for climate resilient development needs to pursue a sustainable development path that can reduce vulnerability to climate change by enhancing adaptive capacities and increasing resilience. Women and gender experts should ensure that they are well informed about the gendered dimensions of climate sensitive sectors, particularly the existing inequalities between men and women and how climate change can exacerbate these inequalities. Nepal has developed the climate resilient pilot project strategies having the aims to address the highest priority risks identified during the preparation process and through consultation with vulnerable communities. These are (i) quantity and quality of water, (ii) food security, and (iii) eco-system health. This study will try to focus in all these aspects and look at the development of National Adaptation Program of Action (NAPA) to Local Adaptation Program of Action (LAPA) and further enhance the knowledge gaps in future policy planning.

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Topic	**Understanding climate change adaptation by farmers in crops variety in Nepal**
Thematic Area	Agriculture and Food Security: Food Scarcity under Climate Change Scenarios and Adaptation Strategies
Geographic Area	Jhapa, Sindhuli, Kalikot districts
Duration	12 months: 15 February 2015 to 14 February 2016
Lead Researcher and Organization	Madhav Dhital Made Nepal, Chitwan
Team Members	Horticulturist, Sustainable Agriculture Specialist,
Grant	USD 11,990
Contact Information	Shukranagar-3, Chitwan District **Tel** **Email** madhav.dhital021@gmail.com
Goal	Improved livelihoods and resilience of farmers, poor, disadvantaged and excluded communities in Nepal.
Objectives	☂ To assess the overall food scarcity situation across three different ecological zones of the country. ☂ To explore the impacts of climate change and adaptation strategies in agriculture crop varieties. ☂ To explore and recommend the potential policy and intervention options to improve the present and future situations in the country.
Activities	☂ The adoption of climate change on crop varieties in Nepal explored. ☂ The impacts of climate change on agriculture sector and existing adoption strategy studied. ☂ Climate change adoption based potential policy and intervention options properly investigated. ☂ The result of this research study among wide range of stakeholders and end users widely disseminated.
Expected Result	☂ Vulnerability assessment of agriculture sector in target areas. ☂ Tested adaptation measures that have information allowing farmers and agriculture officials to transition towards more adaptive strategies. ☂ Potential strategies for farmers to adopt crops that had a market demand to diversify their cash generation options. ☂ Improved techniques to develop crops that offer potential opportunities for cash returns.
Relevance to Climate Change	Climate change is becoming one of the major environmental issues in Nepal. There is evidence that climate change is already affecting the agriculture and weakening the livelihood assets of poor and marginalized communities. Losses and damage resulting from climate risks are attributed to insufficient public awareness, lack of (or inadequate)preparedness, lack of proactive risk management practices, low level of technical expertise and skills in adaptation to climate change (CC), and lack of reliable data and information, all of which enhance the vulnerability of agriculture-dependent livelihood activities to climate risks. Traditional farming system management practices and farmers' innovations are clearly a key element in local adaptation to climate change. Climate change cannot be divorced from sustainable land and resource management as sustainable management is a crucial dimension of climate change adaptation and impacts and may be the most effective way to frame the mitigation question. Incorporating local knowledge into climate change policies can lead to the development of effective, cost-effective, participatory, and sustainable adaptation strategies. Therefore, this study aims to explore farmer's perceptions and experiences of climate change on crop varieties in Nepal.

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Topic	**Assessment of climate change impacts on Helambu sub-watershed**
Thematic Area	Water resources and energy: i) Drinking water sources, accessibility and quality under project climate change impacts; ii) Climate change impact on watershed services.
Geographic Area	Helambu VDC, Sindhupalchok district
Duration	January 2015 to June 2016
Lead Researcher and Organization	Lachana Shresthacharya
Team Members	Project Advisor, Researcher, Statistician, GIS Expert, Finance and Admin Officer, Field Researchers, Key community members and Stakeholder representatives
Grant	USD 21,965
Contact Information	303/25 Nakhya Galli, Teku, Kathmandu Metropolitan City-12, Kathmandu **Tel** 01 4246259 **Email** lachanasthapit@gmail.com
Goal	Develop community resilience towards climate change in Helambu sub-watershed area.
Objectives	☂ To develop a watershed vulnerability assessment model for water and irrigation sectors in the Helambu sub-watershed. ☂ To study the effectiveness of current coping strategies in poor and well- off communities and recommend adaptation strategies for the future courses of action against climate change impacts in the region. ☂ Piloting of climate change resilient techniques. like drip irrigation, introduction of cash crops, crop rotation and improved irrigation practices For policy recommendation based on suitability ☂ To conduct capacity building workshop as well as preparation of guidelines for easier dissemination and sensitization. ☂ To provide a replicable basis for area of intervention in the Strategic Program for Climate Resilience (SPCR). ☂ To assess the responsibilities of local government and other agencies in preparation and implementation of Local Adaptation Program of Action (LAPA).
Activities	☂ Preparatory planning. ☂ Baseline survey (understanding climate change issues in context of project area) ☂ Preparation of adaptation strategy. ☂ Piloting of adaptation strategy. ☂ Dissemination.
Expected Result	☂ Development of a vulnerability assessment model suitable for the watershed and replicable for other similar ecological systems. ☂ Development of adaptation strategies. ☂ Increased Awareness to mainstream climate change adaptation at local level.
Relevance to Climate Change	Awareness building and consultation are key elements for development of climate change resilience. (MoEnv, 2011) Until now assessment and resilience development to climate change impacts on various sectors are limited to short term studies without sustained focus on replicable strategies and local level involvement (CDKN, 2013). The targets of this project closely relates to these issues as it is designed to develop a framework for assessment of vulnerabilities seen in a sensitive ecological system and conduct adaptation planning to develop climate resilience strategies. Furthermore, the implementation program employs adoption of adaptation strategies created in collaboration with local communities on the field level. It is an exercise in building knowledge and capacities of communities to limit the impacts on its valuable resources. The observations and results will be an overall validation of the planning and climate change research in mountainous ecology in Nepal.

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Topic	**An Assessment of Economic Loss due to Mahakali Flood Disaster of 2013 in Darchula in relation with the Climate Change Impact**
Thematic Area	Water Resources and Energy: Water-induced disasters
Geographic Area	Darchula District
Duration	18 months: 15 February 2015 to 14 August 2016
Lead Researcher and Organization	Mahendra Bahadur Gurung, The Small Earth Nepal (SEN)
Team Members	Water engineer, Environmental engineer, Economist, Environmental scientist
Grant	USD 15,700
Contact Information	Nayabaneshwor, Kathmandu, PO Box 20533, Kathmandu, Nepal **Tel** 014782738 **Email** info@smallearth.org.np mabg1954@yahoo.com
Goal	To estimate the economic loss due to the Mahakali Flood Disaster of 2013 in Darchula in relation with the Climate Change impact.
Objectives	☂ Carry out research work within the scope provided by the employer in Mahakali river at Darchula Khalanga, the capital of Darchula district. ☂ Identify the types of water-induced disasters that took place during the 2013 monsoon and the types and scales of damages impacted by the disasters. ☂ Determine the physical losses due to the damages, destructions and lost lives. ☂ Make an economic assessment of those losses considering various parameters and methods, and ☂ Prepare a standard report in such a way that it can be published in a journal of international stature.
Activities	☂ Collect secondary data from archives. ☂ Carry out Survey and Interviews to collect primary data. ☂ Data analysis and report preparation. ☂ Publication and dissemination of findings.
Expected Result	Project will provide useful guidelines for evaluating loss of natural damage due to climate induced disasters for future reference which can be replicated with necessary modification to other regions and areas. Damage and loss adaptive or restoration options for the future and suggestions for finding and calculating them will also be made.
Relevance to Climate Change	Climate resilience is generally defined as the capacity for socio-ecological systems that can absorb stresses and maintain function in the face of external stresses imposed upon it by climate change and that can adapt, reorganize, and evolve into more desirable configurations that improve the sustainability of the system, leaving it better prepared for future climate change impacts. Thus a climate resilient development process is a process that can absorb the stresses coming from the impacts of climate change and not only maintaining it, but also adapt, reorganize and evolve into more a sustainable process. The research project will contribute to the climate resilient development process a number of ways. As the rising number of water induced disasters is also an outcome of the climate change impact, the outcome of the assessment of losses will contribute to the policy update process at the national level. This research, although of an individual and small scale, can have a contribution of an integrated nature. This research project will provide a pragmatic guide for the local planning and programming agencies. This research project will more specifically enhance the institutional capacity of the local implementing agencies.

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Topic	**Climate change impacts on livestock raising and household economy in the Mustang District**
Thematic Area	Agriculture and Food Security
Geographic Area	Lomathan VDC, Kagbeni VDC, Kunjo VDC of Mustang District
Duration	December 2014 to June 2016
Lead Researcher and Organization	Shreeram P Neopane, Ph.D., Himalayan College of Agricultural Sciences and Technology (HICAST)
Team Members	Veterinary Doctors, , statisticians, agronomist, environmental experts
Grant	USD 21,417
Contact Information	PO Box 25535, Kalanki, Kathmandu
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	Fax 01-4273341
	Email spneopane@hicast.edu.np; spneopane04@yahoo.com
Goal	To increase the household economy by promoting adaptability measures for sustainable livestock rearing at the local level with livestock adaptation in the changing climate in Mustang District.
Objectives	☂ Develop and generate better awareness, skills, capacities and services for resilience of climate change impact to livestock. ☂ Involve men and women farmers in livestock related income generating programs like promoting goat for pashmina and meat, sheep for wool and meat, and yak for wool and hides. ☂ Promote rangeland productivity through an integrated management system combining pastures improvement, rotational grazing and animal pooling systems. ☂ Identification of grasses on the pasture and range land which can tolerate adverse climatic conditions. ☂ Identifying of the forage and fodder storage technique in adverse climatic conditions. ☂ Educate farmers about different livestock diseases.
Activities	☂ Site selection. ☂ Formation of reference groups ☂ Baseline survey. ☂ Key Informant Interview (KII) ☂ Meteorological data collection. ☂ Data entry, analysis and reporting. ☂ Focus Group Discussions ☂ Ranking of adaptive strategies. ☂ Case studies. ☂ Identification of adaptive strategies. ☂ Training on livestock rearing and management including diseases (Sheep, goat and yak-diseases). ☂ Training on management of rangelands [toxic plants, rotational grazing]. ☂ Introduce suitable forage species [fodder conservation]. ☂ Fodder and forage nursery establishment. ☂ Action Research [Evaluation of suitable forage under apple orchard, fecal examination for validation, analysis of toxic plant] ☂ Strengthening reference groups for technical services and interventions. ☂ Data analysis and reporting. ☂ Workshops [District and national level] ☂ Completion of final report

Expected Result	The impact of climate change on livestock production and livelihoods in the mid and high mountains will be assessed through recognizing the community perception and validating with observed situations.
Relevance to Climate Change	The knowledge generated from this research will contribute to establish the relationship amongst livestock, livelihoods and climate change in the district. The perception of the community on the occurrence of climate change and its effect on livestock production will be assessed. The strategies employed by the community to mitigate the effect of climate change will be validated and appropriate technologies and findings will be upscaled to similar areas in the country. These findings will contribute to mainstream climate change adaptation into development agenda and plans. The up scaling and dissemination to wider areas will be made through publications, workshop, trainings and other necessary means. The local resource persons developed in the form of reference groups will play a key role in dissemination of the findings within the district. The public sectors institutions (DLSO, DADO) will do the job in the country. The collaboration with DLSO during implementation and the permanent linkage with DLSO, entrepreneurs and with other farmer groups by demonstrating activities will also help to uptake the outputs.

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Topic	**Regeneration and Distribution Modeling of Larix spp. under Climate Change Scenarios in Nepal Himalaya**
Thematic Area	Forests and Biodiversity
Geographic Area	Kanchenjunga Conservation Area (Taplejung), Sagarmatha National Park (Solukhumbul) and Langtang National Park (Rasuwa).
Duration	15 months: 15 February 2015 to 14 May 2016
Lead Researcher and Organization	Prakash Chandra Aryal, Golden Gate International College
Team Members	Environmental Science/Ecology/ Botany, Environmental Science/GIS-RS Expert
Grant	USD 10,295
Contact Information	Dansing, Turang VDC-5, Gulmi District **Tel** 01 4423761 **Email** arc.prakash@gmail.com
Goal	Species distribution modeling under climatic change scenarios and analyzing regeneration pattern of *Larix* spp.
Objectives	☂ To study population status, productivity and regeneration pattern of the targeted species. ☂ To identify geo-climatically suitable areas for current and future climatic scenarios. ☂ To predict risk for species and population through land use change analysis.
Outputs	☂ Population status, productivity and regeneration patterns. ☂ Identification of a geo-climatically suitable area for current and future climatic scenarios. ☂ Change in geo-climatically suitable areas in two climatic scenarios.
Expected Result	☂ Population status, productivity and regeneration patterns. ☂ Identification of a geo-climatically suitable area for current and future climatic scenarios. ☂ Change in geo-climatically suitable areas in two climatic scenarios.
Relevance to Climate Change	Studies on the regeneration patterns of targeted species are sought in order to generate the information on the impact of climate change in the temperate belt of Nepal Himalaya which will be useful in developing conservation strategies of important other species in Nepal and other mountain areas. The outputs of the proposed project will give insights into climate-resilient development policy formulation. Policy/decision makers will have new and better insights into the ground realities regarding resource use and impacts of climate change at the local level.

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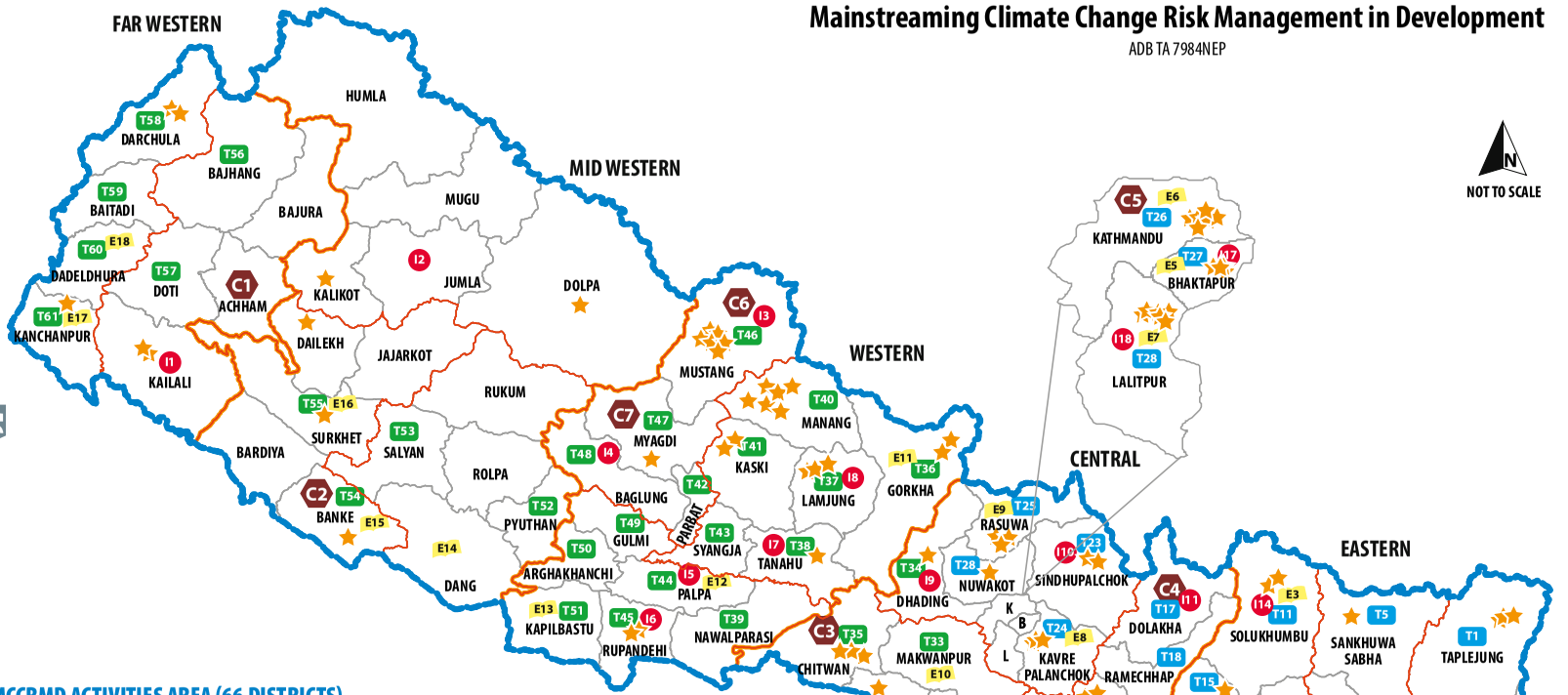
Topic	**Effect of Climate Change on Secondary Metabolite Production in Lichen of Nepal**
Thematic Area	Forests and Biodiversity: Climate change impact on habitat of key flag species
Geographic Area	Landhruk, Ghandruk, Sikles, Parche, Lumle, Taprang, Kimrung, Chhumrung, and Pokhara valley of Kaski District
Duration	18 months: 15 February 2015 to 14 August 2016
Lead Researcher and Organization	Bishnu Prasad Neupane School of Health Sciences, Pokhara University
Team Members	Chemist, Botanist, Statistician and Climate change scientist
Grant	USD 10,741
Contact Information	Pragartinagar, Sicktahan VDC-6, Rupandehi **Tel** **Email** bnsudesh8@gmail.com
Goal	To establish the lichen as a climate change indicator.
Objective	Examine how lichens respond to different climate conditions by evaluating the concentration of usnic acid and salazinic acid.
Activities	☂ Sample collection ☂ Voucher specimens of the both lichen species are collected and deposited. ☂ Raw extracts, TLC and HPLC chromatograms. ☂ Project report, publications (Journal articles, leaflets)
Expected Result	☂ Evaluating the bio indicator values of chemical signatures in lichens and explaining the impact of climatic factors on the synthesis of usnic acid and salazinic acid.
Relevance to Climate Change	Lichen communities have long been used as biological monitors, providing an inexpensive and effective means of assessing environmental change. They have been used to monitor air quality, forest health, and more recently, climate change. This project includes a series of experiments examining how lichens respond to different climate conditions by evaluating the concentration of usnic acid and salazinic acid. These compounds are known for their sensitivity to environmental temperature and climate change. Increases in temperature may require the increase of secondary metabolites such as salazinic acid and usnic acid to mitigate the effects of higher temperatures on lichen biology. A positive relationship has been found between temperature and production of these (Christopher et al., 2007). Therefore, the findings of project will contribute to predict the effect of climate change at different altitudinal gradients which would be an effective means of monitoring for climate resilient development process and policy makers. However the term climate-resilient development implies that adaptation to climate change should not be seen as a separate process, but a continuous and integrated one that addresses present and future climate risks. Promotion pathways: researchers will find a link up with neighboring universities and research center labs where works in similar field are undergoing. More often students will have friends in these neighboring teams and departments so the connections can be established. Similarly, research findings will be presented in national and international conferences for its promotion.

Government of Nepal
Ministry of Science, Technology and Environment

Pilot Program for Climate Resilience

Mainstreaming Climate Change Risk Management in Development

ADB TA 7984NEP



MCCRMD ACTIVITIES AREA (66 DISTRICTS)

C6	Sectoral Case Study Districts	8
T31	District Recived Training (Phase 1)	31
T55	District Receiving Training (Phase 2 Planned)	30
I2	Indigenous Case Study Districts	16
E18	Climate Change in Curriculum	18
★	Climate Change Research	42??

Pilot Program for Climate Resilience (PPCR)

Pilot Program for Climate Resilience (PPCR) financed by the Climate Investment Funds. This program provides financing for least-developed countries to pursue a climate-resilient development path that reinforces poverty reduction goals.

Nepal prepared the"Strategic Program for Climate Resilience" (SPCR) to outline its program to respond to priority climate risks. The SPCR complements the National Adaptation Program of Action (Forests and Biodiversity), Climate Change Policy, Local Adaptation Plans of Action (LAPAs).

The Ministry of Science, Technology and Environment is the Government of Nepal's focal ministry for the PPCR. The multilateral development banks—the Asian Development Bank (ADB), the International Finance Corporation (IFC) and the World Bank—administer the funds on behalf of the Climate Investment Funds and supervise the projects in collaboration with Ministry of Science Technology and Environment.

Nepal's SPCR has the following components:

1. Component 1: Building Climate Resilience of Watersheds in Mountain Eco-Regions
2. Component 2: Building Resilience to Climate-Related Hazards
3. **Component 3: Mainstreaming Climate Change Risk Management in Development**
4. Component 4: Building Climate Resilient Communities through Private Sector Participation

Mainstreaming Climate Change Risk Management in Development

PROJECT IMPACT: Nepal has increased resilience to climate variability and climate change.
OUTCOME: The Government of Nepal's infrastructure development programs, policies and projects incorporate safeguards to address the effects of climate change. This project aims to increase Nepal's resilience to climate variability and climate change. The expected outcome is Nepal's infrastructure development programs, policies and projects incorporate safeguards to address the effects of climate change.

The component has three **OUTPUTS:**

1. Climate resilient development
2. Knowledge Management
3. Managing for results across climate change programs

LEAD GOVERNMENT COUNTERPART: Ministry of Science, Technology and Environment

Prepared by International Center for Environmental Management (ICEM) for the Government of Nepal, Ministry of Science, Technology and Environment (MOSTE) and Asian Development Bank (ADB) as part of Pilot Program for Climate Resilience (PPCR) Mainstreaming Climate Change Risk Management in Development

Mainstreaming Climate Change Risk Management in Development
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