

UNDERSTANDING DEMAND AND SUPPLY OF
**CLIMATE CHANGE KNOWLEDGE
MANAGEMENT IN NEPAL**



NEPAL ACADEMY OF SCIENCE AND TECHNOLOGY (NAST)

UNDERSTANDING DEMAND AND SUPPLY OF
**CLIMATE CHANGE KNOWLEDGE
MANAGEMENT IN NEPAL**

© NAST and OPML, 2016

No use of this publication or its parts in any form may be made for resale or for any other commercial purpose whatsoever without prior permission in writing from Nepal Academy of Science and Technology and Nepal or Oxford Policy Management Limited.

This publication may be reproduced in whole or in part and in any form for educational or non-profit purposes without special permission from the copyright holder, provided that proper citation and acknowledgment of the source is made.

NAST and OPML, 2016. *Understanding Demand and Supply of Climate Change Knowledge Management in Nepal*. Nepal Academy of Science and Technology, Nepal and Oxford Policy Management Limited, India, Action on Climate Today Initiative

Contributing Authors:

PRACTICAL ACTION

Bimal Raj Regmi
Apar Paudyal

NCCKMC, NAST

Bimala Devkota
Pawan Kumar Neupane

OPML

Kai Kim Chiang
Simon Croxton

ISBN Number: 978-9937-9065-4-8

Foreword

Climate change is a growing global concern. Nepal, with its remoteness, undulating terrain, fragile landforms, extremely diverse landscape and unevenly distributed resources, is one of the countries most vulnerable to the impacts of climate change. In order to effectively respond to climate change, Nepal, through its Climate Change Policy 2011 and National Adaptation Programme of Action, mandates more than 80 per cent of the resources for climate change responses (adaptation) to be channelled to local level so that vulnerable poor communities are able to build adaptive capacity from climate change impacts.

To mainstream these initiatives and develop a strong knowledge base on climate change which can be fed into climate policies, resilience frameworks and overall response mechanisms, Nepal Climate Change Knowledge Management Center (NCCCKMC) was established at the Nepal Academy of Science and Technology (NAST) in 2010. NCCCKMC has since then been facilitating the mechanism through which climate change knowledge is incorporated into policy development and implementation at both national and local level with support from knowledge partners.

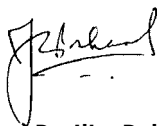
This study has explored and unpacked various aspects from local to national level in terms of strengthening climate change knowledge management in Nepal. This has provided essentially: a) approaches to strengthen information and knowledge generation at local and national level; b) a mechanism to enhance ownership of the NCCCKMC and make climate change knowledge accessible to all users; c) a way forward to enhance NCCCKMC's capacity, financial resources and relationship with knowledge partners for effective functioning; and d) more robust existing knowledge management systems to effectively guide decision making at policy, planning and implementation level.

Owing to this, the Act on Climate Today (ACT) initiative, in collaboration with NAST and Practical Action, aims to strengthen the climate change knowledge management mechanisms so that climate change knowledge is incorporated into policy development and implementation at both national and local level, focusing on both demand and supply sides of knowledge management. The study was conducted for a period of one year, with assessments at both national and sub-national level, particularly taking cases of Rukum and Dang Districts.


We would like to thank the UKaid for funding support to this publication. We would like to acknowledge the authors of this assignment, Bimal Raj Regmi, Apar Paudyal, Bimala Devkota and Pawan Kumar Neupane, and the support of the ACT Management and Technical Lead, Kai Kim Chiang, Simon Croxton, Tim Donaldson and Elizabeth Gogoi, for their encouragement, guidance and advice, which has been valuable at every stage of this work, from the design of the study to finalisation of this report. We are grateful to Joyce Mendez for providing inputs as an international knowledge management expert. We are also thankful to Anal Dhunganna and Suresh Raj Pandit, field researchers for providing valuable support during field research and consultation process.

We are indebted to all members of the research community for generously giving their time for interviews for, and to be engaged in, this research, particularly the respondents from Rukum and Dang Districts. We are also grateful to those policymakers, practitioners, academics and local government bodies who participated in this research and provided their useful insights. We would also like to acknowledge Mr. Naresh Sharma from Ministry of Population and Environment, staff members from National Climate Change Support Programme and Rupantaran Nepal for providing support in arranging field consultations. We would like to thank Practical Action's Gehendra Gurung, Dinanath Bhandari, Kriti Shrestha – for reviewing the report and providing their inputs and Sajiv Chaudhary for conducting online survey. We also thank Dr Buddhi Ratna Khadge, Secretary of NAST and Iswor Khanal of NAST for providing support in overall design and delivery of the study. We thank Anil Shrestha for copy editing and Practical Action's Archana Gurung and Upendra Shrestha for publication coordination.

We hope this document will be helpful in strengthening the climate change knowledge management in Nepal by adopting the key findings and recommendations to take future course of action at national and local level.



Professor Dr. Jiba Raj Pokharel
Vice Chancellor
Nepal Academy of Science and Technology



Cristina Rumbaitis Del Rio, PhD
Regional Programme Manager
Act on Climate Today (ACT)

Abbreviations

ACT	Action on Climate Today
ADB	Asian Development Bank
AEPC	Alternative Energy Promotion Centre
AF	Adaptation Fund
AIMS	Agriculture Information Management System
AIT	Asian Institute of Technology
AP	Asia Pacific
APAN	Asia Pacific Adaptation Network
APN	Asia Pacific Network
CAP	Community Adaptation Plan
CARE	Cooperative for Assistance and Relief Everywhere
CBO	Community-Based Organisation
CBS	Central Bureau of Statistics
CC	Climate Change
CCNN	Climate Change Network—Nepal
CCRC	Community Climate Resource Centers
CCU	Climate Carbon Unit
CDKN	Climate and Development Knowledge Network
CDM	Clean Development Mechanism
CFUG	Community Forestry User Group
CPGD	Climate Proofing Growth and Development
DDC	District Development Committee
DFID	Department for International Development
DHM	Department of Hydrology and Meteorology
DoA	Department of Agriculture
DoF	Department of Forest
DoLS	Department of Livestock Services
DoSC	Department of Soil Conservation
DRM	Disaster Risk Management
EBA	Ecosystem-Based Adaptation
EFLG	Environment-Friendly Local Governance Framework
FECOFUN	Federation of Community Forest Users Groups in Nepal
FGD	Focus Group Discussion
GCF	Green Climate Fund
GHG	Green House Gas
GIZ	Gesellschaft für Internationale Zusammenarbeit
GLOF	Glacier Lake Outburst Flood
GoN	Government of Nepal
Hi-AWARE	Himalayan Adaptation, Water and Resilience Research
HICAP	Himalayan Climate Change Adaptation Programme

HIMALICA	Rural Livelihoods and Climate Change Adaptation in the Himalayas
ICCA	Initiative for Climate Change Adaptation
ICIMOD	International Centre for Integrated Mountain Development
IDE	International Development Enterprises
IDRC	International Development Research Centre
IEC	Information, Education and Communication
INDC	Intended Nationally Determined Contribution
INGOs	International Non-Government Organisations
IoF	Institute of Forestry
IPCC	Inter-governmental Panel on Climate Change
ISET	Institute for Social and Environmental Transition
IUCN	International Union for Conservation of Nature
KM	Knowledge Management
KU	Kathmandu University
LAPA	Local Adaptation Plan of Action
LDCF	Least Developed Countries Fund
LDO	Local Development Officer
LFP	Livelihoods and Forestry Programme
LGB	Local Government Body
LI-BIRD	Local Initiatives for Biodiversity, Research and Development
MoAD	Ministry of Agriculture Development
MoFALD	Ministry of Federal Affairs and Local Development
MoFSC	Ministry of Forest and Soil Conservation
MoPE	Ministry of Population and Environment
MoSTE	Ministry of Science, Technology and Environment
MSFP	Multi-Stakeholder Forestry Programme
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
NARC	Nepal Agriculture Research Council
NASA	National Aeronautics and Space Administration
NAST	Nepal Academy of Science and Technology
NCKMC	Nepal Climate Change Knowledge Management Center
NCCSP	Nepal Climate Change Support Programme
NGONCC	NGO Network on Climate Change in Nepal
NGOs	Non-Government Organisations
NHRC	Nepal Health Research Council
NPC	National Planning Commission
NPR	Nepali Rupees
NRREP	National Rural and Renewable Energy Programme
NTNC	National Trust for Nature Conservation
OECD	Organisation for Economic Cooperation and Development
PA	Practical Action
PES	Payment for Environmental Services
PPCR	Pilot Programme for Climate Resilience
PU	Pokhara University

R4D	Research for Development
RECOFTC	Regional Centre for Community Forestry Training Centre
REDD	Reduced Emission from Forest Degradation and Deforestation
RIMS	Resource Identification and Management Society
RRC	Regional Resource Centre
SDC	Swiss Development Cooperation
SIDA	Swedish International Development Cooperation Agency
SPCR	Strategic Programme for Climate Resilience
SREP	Scaling Up Renewable Energy Initiatives
TU	Tribhuvan University
UGs	User Groups
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollars
USAID	United States Agency for International Development
VDC	Village Development Committee
WB	World Bank
WWF	Worldwide Fund for Nature

Executive Summary

The Climate Proofing Growth and Development (CPGD) project is funded by the UK aid from the Department for International Development (DFID). The programme has been branded as Action on Climate Today (ACT). The programme aims to improve resilience by directly incorporating climate change considerations into policy, planning and investment environments within each country. Practical Action is an implementing partner of the ACT programme in Nepal. The programme has supported the study on understanding the demand for and supply of climate change knowledge management in collaboration with Nepal Climate Change Knowledge Management Center (NCCKMC) at the Nepal Academy of Science and Technology (NAST). The proposed initiative seeks to strengthen the mechanism through which climate change knowledge is incorporated into policy development and implementation at both national and local level.

The broader objectives of the study were to: i) assess the demand side of knowledge management in Nepal, with specific focus on the way knowledge and information is currently generated, applied and demanded at local and national level; and ii) assess the supply side of knowledge management, with specific focus on the way knowledge and information on climate change is available, processed, packaged and made accessible to those involved in local government planning at sub-national (district) and national level.

The study used a mix of methods to generate information. It carried out a desk review to analyse the policy, programmes and projects on managing knowledge of climate change in Nepal. The desk review also analysed the institutional strategy and action plans, particularly of development partners, international and national non-government

organisations (I/NGOs) and research institutions related to demand for, and generation and sharing of, knowledge of climate change. Field work was carried out in Rukum and Dang Districts in mid-western region of Nepal. The aim of field work was to assess the demand for and supply of climate change knowledge at district and community level. The study interviewed 64 persons at district and national level to obtain an overview and suggestions on climate change knowledge management at these level. A Google-based online survey tool was used to map the perceptions of stakeholders, particularly to assess the effectiveness of the NCCKMC. Finally, two district- and one national-level stakeholder workshops were organised to draw stakeholders' feedback on ways to strengthen knowledge management work on climate change in Nepal.

The study found that, despite the establishment of the NCCKMC, there was absence of well-coordinated and harmonised institutional mechanisms to coordinate and manage generation, codification, sharing and use of climate knowledge in Nepal. Several institutions are working on climate change knowledge management in Nepal. Lack of coordination and consultations among these institutions, have resulted in overlaps and disjointed efforts instead of synergy. This has raised the issue of consolidation and management of knowledge, and has failed to capitalise on the potentials of the knowledge generated and lessons learned to be applied or implemented or translated into climate change programmes and strategies that will benefit Nepal.

One of the major reasons for the lack of coordination and synergy among the diverse efforts towards climate change knowledge management in Nepal is the project-based, top-down, resource-dependent nature of climate change knowledge generation and management initiatives at national

and local level. Within the current project-based landscape, knowledge generation, sharing and use only serve the purpose of meeting specific project targets and of fulfilling the requirements of funding agencies and implementation organisations. They do not look at the bigger long-term picture of climate change knowledge generation and management beyond project life and its long-term sustainability and are dependent to a large extent on ownership by public and private sectors.

Effective response to climate change is hindered by knowledge and technology gap. Although reliance on local knowledge and anecdotal evidence has helped the government and non-government sectors to initiate some activities at local level, it has also posed challenges in terms of managing the additional risks and threats to communities on top of the existing development challenges. This has, moreover, raised questions around the significance of existing interventions in terms of addressing specific climate-induced risks and vulnerability, particularly at local level. The current practice of treating development as adaptation without considering the future potential risk to climate change has limited the scope for innovation and knowledge generation on climate change adaptation, thus, leading to the risk of maladaptation.

There is a mismatch between the demand for and supply of climate change knowledge at local level. The demand for climate change information and knowledge at local and national level is enormous and diverse. Local communities are looking for answers to their day-to-day problems, particularly on how to deal with the questions related to the critical stress periods within their farming

systems and livelihoods as these are affected by erratic and changing climate. Rural households want a composite of knowledge advisories and technological packages to address the concerns of loss of life due to extreme events, declining productivity, crop failure and additional burden on farming due to pest and disease outbreak, water scarcity, family health issues and depletion of resources. In spite of their demand, Nepalese farmers and communities receive inadequate guidance and inputs from the agencies concerned. For example, the Department of Hydrology and Meteorology (DHM) disseminates annual monsoon forecasts from its central office down to its regional offices; however, the system to disseminate such information to local level where it is needed and how best to use the information for decision making is currently inadequate.

There is lack of an institutional culture and mechanisms for knowledge sharing among district-based agencies. The demand of district agencies is focused more on increasing access to technology and climate-resilient practices. District-level agencies wanted to see how climate change knowledge and evidence could improve extension and service delivery systems that they provide. They demanded access to, and availability of, different technological packages, materials (seeds, seedlings, hardware) and skills and capacity to respond to the demands of farmers and households. The stakeholders in the districts feel that supply of climate change knowledge is scarce and does not meet their demand. In addition, district-level agencies lack the practice of sharing and learning, thus, limiting the knowledge transfer.

There is an overwhelming need and demand for generating climate change knowledge at national level. The demand for climate change knowledge at national level is generating more evidence on climate change. Policymakers and development agencies are looking at strong scientific and local evidence that can demonstrate why climate change is an issue and where and how climate change is impacting local livelihoods. They want the agencies concerned to create an interface between basic and practical knowledge that gives clear policy and strategic messages on climate change to support their investments.

Practical and applicable climate change knowledge is the foremost priority at national level. INGOs and NGOs want more practical and instantly applicable knowledge of how to respond to climate change impacts as experienced in communities in Nepal, which, in turn, underscores the continuing relevance of generating fresh knowledge both on the ground and science-based, marrying the two, and consolidating, sharing and using such knowledge to better prepare Nepal's communities to the changes already taking place. INGOs see the usefulness of climate change knowledge to strategically guide practical actions and innovations to implement activities towards achieving long-term programme goals. They want specific knowledge of how best to address the demands of communities to appropriately respond to climate change issues already being felt at local level.

In concrete terms, INGOs want greater access to knowledge of location-specific technologies and products. NGOs, on the other hand, want information and knowledge related to climate to guide or inform them regarding the development of knowledge advisories addressing specific problems faced by communities in sectors such as agriculture, water resources, energy, forestry and public health. They also want skill and knowledge transfer to their staff so that they can support

communities to develop and implement effective climate change strategies and options.

The challenge for research institutions is how to forge an interface between basic and applied research.

Academic institutions and research organisations want access to methodologies, processes and research protocols that will facilitate generation of climate knowledge. They also feel strongly that access to international and regional knowledge and to current scientific and academic discourse can help raise the capacity of Nepal's research institutions for climate change research as well as applied research. These institutions also want more resources and capacity support in terms of motivating or providing incentives to research and academic institutions so that they can become more proactive and responsive to national and local demands for knowledge of climate change.

Despite the huge demand for knowledge at national level, the supply side of knowledge management is inadequate.

Nepal has numerous simultaneously operating knowledge centres and networks at national level. Many of these centres, however, are dysfunctional or have become inactive after some time. Furthermore, knowledge networks often operate in isolation, with very little linkage and coordination among themselves. The absence of learning and sharing mechanisms at national level disrupts information flow even among national-level institutions. The organisational working culture and the lack of ownership among institutions create a vacuum in climate change knowledge management. Knowledge management at national level is further constrained by limited financial resources and support from both national government and international agencies.

Following are the key recommendations of the study, mostly targeted at the Ministry of Population and Environment (MoPE), NCCKMC and the national agencies to strengthen the climate information services in Nepal:

NCCKMC should capitalise on the favourable policy environment for climate change to improve climate change-related knowledge management practices.

Nepal has significantly progressed in crafting national policies and a framework on climate change. Several national-level institutional mechanisms and financial flow systems provide mechanisms for partly strengthening the implementation of the climate change agenda in Nepal. Policy is, therefore, not a barrier to operationalising a climate change knowledge management system in Nepal. The country, however, lacks a clear vision, strategy and institutional commitment to knowledge generation and management. This is the reason the available knowledge has contributed little to operationalising a knowledge management policy and practices on climate change.

There is genuine and strong need for an overarching national strategy and roadmap on knowledge management to streamline ongoing initiatives and responses to climate change. There are opportunities for climate change knowledge management in Nepal. This and other research support the assertion that knowledge management could be streamlined and harmonised if government has clear national and local-level strategies on knowledge, and strong leadership and commitment. Policy, institutions and human resources are not an issue in climate change

knowledge management in Nepal. Knowledge management centres have already been established in Nepal. What is needed are joint proactive actions and a harmonised approach to climate change knowledge management among different agencies and stakeholders which can feed into policy making, planning and budgeting.

Climate change knowledge management should be mainstreamed within the policy and institutional mandate and work. There is need for state ownership and dedicated institutions to drive climate change knowledge management forward. A multi-stakeholder mechanism should be created for information and knowledge sharing and for learning at different level to allow innovations, ideas and learning to expand and flourish. It is also necessary to mainstream knowledge management within the government and non-government institutions to create a sustainable mechanism for learning and sharing.

Research and academic institutions should take the lead role in knowledge generation. Unless existing research institutions take the lead in knowledge generation, there will continue to be a mismatch in demand for and supply of climate change knowledge. Since many grey areas and knowledge gaps have been identified, the government and development agencies should invest in research and knowledge management.

Contents

FOREWORD	III
ABBREVIATIONS	V
EXECUTIVE SUMMARY	VIII
CHAPTER ONE: INTRODUCTION AND METHODOLOGY OF THE STUDY	1
1.1. Introduction	1
1.2. Stocktaking of existing studies on climate change knowledge management in Nepal	2
1.3. Objectives of the study	3
1.4. Scope of work	4
1.5. Expected output	4
1.6. Expected outcomes	5
1.7. Methodology of the study	5
1.8. Structure of the report	6
CHAPTER TWO: POLICY AND INSTITUTIONAL LANDSCAPE OF CLIMATE CHANGE KNOWLEDGE MANAGEMENT IN NEPAL	9
2.1. Policy landscape: policy environment at national level for promoting climate change knowledge management in Nepal	9
2.2. Institutional mechanisms: efforts to establish and promote climate change knowledge management	11
2.3. Development agencies priorities, foci and support for climate change and climate change knowledge management	12
2.4. Nature of climate change knowledge management initiatives in Nepal	13
2.5. Climate change knowledge management focus within academic and research institutions	15
2.6. Summary and conclusion	15
CHAPTER THREE: CLIMATE CHANGE INFORMATION AND FLOW	17
3.1. Data sources	17
3.2. Knowledge products	19
3.3. Summary	21

CHAPTER FOUR: CLIMATE CHANGE KNOWLEDGE	
DEMAND AND SUPPLY AT LOCAL LEVEL	23
4.1. Climate change knowledge generation at local level	23
4.2. Climate change knowledge demand at local level	25
4.3. Knowledge supply landscape at local level and the implications	30
4.4. Suggestions from local stakeholders on strengthening climate change knowledge management	33
4.5. Summary	35
CHAPTER FIVE: CLIMATE CHANGE KNOWLEDGE	
DEMAND AND SUPPLY AT NATIONAL LEVEL	37
5.1. Climate change knowledge generation at national level	37
5.2. Climate change knowledge demand at national level	40
5.3. Knowledge supply landscape at national level	42
5.4. Implications of climate change knowledge management at national level	45
5.5. Suggestions on improving the knowledge management system in Nepal	46
5.6. Summary	48
CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS	49
6.1. Conclusion	49
6.2. Recommendations	51
REFERENCES	53

Chapter 1

Introduction and methodology

1.1. Introduction

The Government of Nepal (GoN) acknowledges that the country's remoteness, undulating terrain, fragile landforms, extremely diverse landscape, and unevenly distributed resources pose different level of location- and context-specific climate change impacts. Thus, its National Adaptation Programme of Action (NAPA) and Climate Change Policy mandate that a large part of resources and efforts be channelled to support the most climate-vulnerable communities and people to adapt to climate change and improve livelihoods at local level. This will require working with local governments to integrate climate and disaster risks into local development planning processes. Mechanisms that have been established to do this include the Local Adaptation Plan of Action (LAPA) and the Environment-Friendly Local Governance Framework (EFLG).

Responding to the impacts of climate change effectively at national policy and local planning level requires robust and comprehensive information and a strong knowledge base. The potential for this information to provide crucial knowledge in the designing and implementation of climate-resilient policies, plans and programmes in Nepal was enormous. In 2010, the GoN established the Nepal Climate Change Knowledge Management Center (NCKMC) to facilitate the generation, management and dissemination of climate-related knowledge. The Alternative Energy Promotion Centre (AEPCC) has established a climate carbon unit to manage knowledge of climate change adaptation and mitigation. The Ministry of Forest and Soil Conservation (MoFSC) has established Reduced Emission from Forest Degradation and Deforestation (REDD) Implementation Centre to manage knowledge related to mitigation and REDD. Similarly, the Ministry of Agriculture and Development (MoAD) has established Agriculture Information Management System (AIMS) to consolidate climate information and develop these into practical agro advisories.

Issues have, however, arisen within the climate change knowledge management community about the effective functioning of the knowledge management centres (NCCKMC, 2012; Regmi and Bhandari, 2013). Initial interactions with key stakeholders in Nepal show that knowledge gaps exist within the climate change sector because: a) information and knowledge generation is weak, as research being undertaken at local and national level is inadequate; b) ownership of the knowledge management centres is low as knowledge is centralised and not accessible to the public; c) the knowledge management centres are not functioning satisfactorily due to lack of internal capacity and financial resources, and as their relationships with knowledge partners have not been maintained and strengthened; and d) the existing knowledge management system has not been able to effectively guide decision-making at policy, planning and implementation level due to its inability to process and package knowledge according to the demand and requirements of the various institutions in the country.

The need and scope for unpacking these issues and improving understanding of how climate change knowledge can be managed and further strengthened have been realised in Nepal. There is need to understand whether knowledge management reform is demanded by Nepalese stakeholders or not and whether opportunity really exists for it or not. There was also the demand for analysing both the demand¹ for and supply² of climate change knowledge at local and national level in order to understand the opportunity for reform and future course of action.

Access to and use of information is an important part of evidence-based policymaking and climate change planning and implementation. There is also a demand from the government and national-level stakeholders for assessing the status of knowledge flow and use in order

to develop a road map for effective climate change knowledge management at all level.

1.2. Stocktaking of existing studies on climate change knowledge management in Nepal

There have not been many studies on climate change knowledge management in Nepal. The first comprehensive scoping work was carried out by the Swedish International Development Cooperation Agency (SIDA), which was funded by the Climate Change Adaptation Knowledge Platform for Asia with support from the Institute for Social and Environmental Transition—Nepal (ISET–Nepal) in 2010. The study focuses on the scoping assessment of climate change knowledge platform in Nepal, which draws on works related to the Adaptation Knowledge Platform, in order to disseminate adaptation knowledge and exchange it with a wider audience. The study concludes that a key issue in knowledge management is that of providing access to funding and ensuring that research institutions are guaranteed intellectual independence. The study also recommends forming an adaptation knowledge platform to bring together policymakers, researchers, practitioners and business leaders (UNEP, 2010).

A study of knowledge management conducted by the Climate and Development Knowledge Network (CDKN) in 2014 assesses the Nepal Climate Change Knowledge Management Center and its effectiveness (NCCKMC, 2014). The study lists some of the weaknesses and opportunities of the NCCKMC, and offers some recommendations related to how the NCCKMC can improve its role and functions to coordinate and manage climate change knowledge in Nepal.

The Ministry of Science, Technology and Environment (MoSTE³) commissioned a study,

¹ Demand refers to the interest, flow and use of climate change knowledge in development planning and policy decision-making process.

² Supply refers to the processing (codification and synthesis), packaging (translation) and dissemination of climate change knowledge to improve local- and national-level planning and policy decision-making.

³ The GoN has reformed the ministries in December 2015. MoSTE has been reformed as Ministry of Population and Environment (MoPE) as the focal agency for climate change.

Indigenous and Local Knowledge and Practices for Climate Resilience in Nepal under the Mainstreaming Climate Change Risk Management in Development component of the Pilot Programme on Climate Resilience (PPCR). The study explores how indigenous and local knowledge and practices that are based on specific ethnic/social/cultural identity and that have been historically practised in a locality can be applied to climate change adaptation policies and programmes. The study reinforces that indigenous and local knowledge and practices help local communities adapt to climate change risks. It further argues that the communities that have scientific knowledge should closely work with local communities to generate new knowledge and improve practices to address climate risks for situation-specific contexts (MoSTE, 2015).

There are journal articles and book chapters which explore climate change knowledge in Nepal. There are also studies documenting indigenous knowledge to cope with climate change in the middle hills of Nepal (Baul & McDonald, 2014) and more specifically the relevance of local knowledge in effectively responding to climate-induced risk and hazard (Baul et al., 2013). A few studies document traditional knowledge, practices and technologies in agriculture (Maraseni, 2012; Regmi et al., 2009), forestry (Ahlborg & Nightingale, 2012) and tourism. There are also papers which demonstrate the limitations and barriers of knowledge management in Nepal, arguing that local knowledge is inadequate to respond to climate change impacts and hence generation of more basic and applied knowledge is needed (Regmi & Bhandari, 2013). Furthermore, a few studies exist that specifically look into the knowledge management issues of Nepal and identify some problems. A summary of the conclusions of these studies is as follows:

- There is a huge gap in information and knowledge base on climate change in Nepal, which has impacted decision-making at local level (Gautam et al., 2013; Regmi and Bhandari, 2013; Davis and Li, 2013).
- Knowledge management has not been a priority at central level and thus a sound evidence

base is lacking for scaling up current efforts and sharing learning widely (Climate Change Network Nepal [CCNN], 2011).

- Major knowledge—action gaps exist with respect to adaptation to climate change in the Asia Pacific region, including Nepal. Knowledge—action gaps arise because knowledge is missing, inaccessible or unused (Davis and Li 2013).
- There is inadequate focus on climate research and on strengthening the capacity of researchers, which has impacted knowledge generation and flow (NCCKMC, 2014).
- The responses to, and management of, climate change at local level are constrained by limited information and knowledge of climate change, inadequate access to information, knowledge and technology (Regmi et al., 2015).
- One of the major challenges to climate change knowledge in Nepal is lack of reliable data and information on climate change (Regmi and Bhandari, 2012).
- A key issue in knowledge management is providing access to funding and ensuring that research institutions are guaranteed intellectual independence (UNEP, 2010).

This research builds on the already existing knowledge and research works on climate change knowledge management in Nepal. It further expands the conclusions of the previous studies. In addition, it provides additional dimensions of the landscape of climate change demand for and supply of knowledge at local and national level. Furthermore, it outlines both opportunities and challenges of climate change knowledge management in Nepal.

1.3. Objectives of the study

The proposed initiative seeks to strengthen the mechanism through which climate change knowledge is incorporated in policy development and implementation at both national and local level.

The first sub-objective of this research was to assess the demand side of knowledge management

in Nepal, with specific focus on the way knowledge and information are currently generated, applied and demanded at local and national level.

The second sub-objective was to assess the supply side of knowledge management, with specific focus on the way knowledge and information on climate change are made available, processed, packaged and made accessible to those who need and use them, for example those involved in local government planning at sub-national (district) and national level.

1.4. Scope of work

This report focuses on two⁴ major aspects of strengthening the climate change knowledge management system in Nepal, described in the two clusters of questions below:

(i) Assessing the climate change knowledge context and demand at local and national level:

- How climate change information and knowledge are accessed, used, managed and disseminated at local level? Who is involved in knowledge management and dissemination?
- What is the actual local and national demand for climate change knowledge? In relation to type and format, is this demand fulfilled, or are there issues with its supply?
- Are there any examples where local agencies or stakeholders have accessed central-level knowledge (e.g. from NCCKMC) in making decisions on climate change plans and activities?
- What are the implications for knowledge management at local and national level,

in terms of impact on decision-making in policy and planning at central level and in implementation at local level?

(ii) Assessing the effectiveness of climate change knowledge actors in Nepal at local and national level:

- How is climate change knowledge generated at local and national level; who is involved in knowledge generation?
- To what extent is this information available to decision-makers?
- How useful is the current knowledge management system and what are existing strengths, weaknesses, opportunities and threats of and to knowledge management mechanisms and modalities?

1.5. Expected output

Based on the above, the report was expected to provide specific recommendations on the way the generation, flow and process of climate change knowledge management can be improved to ensure that relevant information is both available and accessible to those involved in national policy-making, including local government planning at sub-national level. The recommendations were expected to take into account the level of finance and institutional willingness that is likely to be available to support knowledge management activities. It was expected that the report will:

- Present the major findings of the consultations and discussions and clarify the perspectives and expectations of the various stakeholders;
- Describe the degree that information on climate change is currently generated, accessible and used by local- and national-level planners; and
- Provide a glimpse of current opportunities of and constraints on overall climate change

⁴ A third aspect "Assessing the effectiveness of current initiative of NCCKMC (supply of knowledge management services) at the local and national level" is captured in a separate internal report produced for the NCCKMC to strengthen the existing mandate and scope of NCCKMC.

knowledge management in Nepal, and practical recommendations for improving the effectiveness of climate change knowledge management.

1.6. Expected outcomes

The expected outcomes include: i) an assessment of the status of climate change knowledge flow and use; ii) an assessment of the demand for and supply of climate change knowledge management at local level; iii) an assessment of the demand for and supply of climate knowledge management at national level; and iv) the development of a roadmap to strengthen the knowledge management systems in Nepal.

This research study will also fulfil the demand of the GoN and the NCCKMC to establish functional and effective knowledge-sharing mechanisms on climate change operating across different level and inclusive of multiple stakeholders. The outcome of this initiative will provide feedback to the GoN and Nepalese stakeholders on how to strengthen the

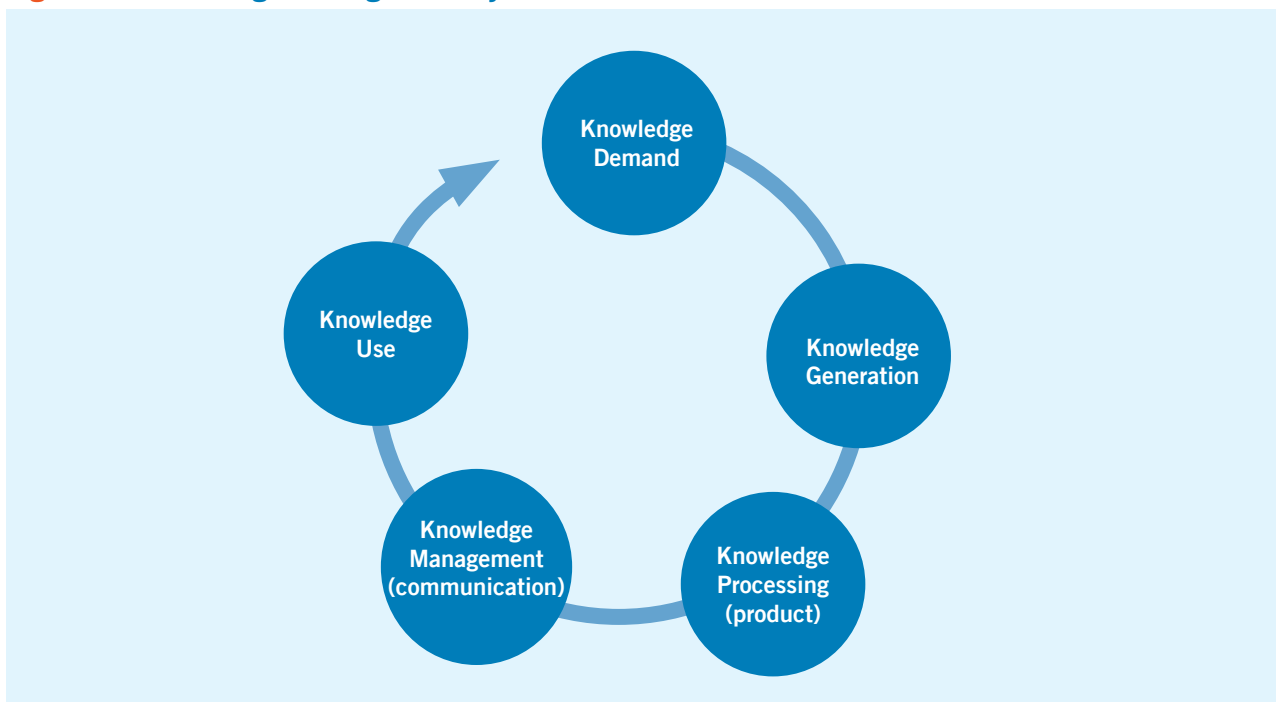
demand for and supply of knowledge generation and management and to develop both flexible and responsive short- and long-term sustainable mechanisms for knowledge management at national and local level.

1.7. Methodology of the study

1.7.1. APPROACHES

Knowledge management refers to the transformation of information into useful learning (Jennex, 2006). The study used the knowledge management framework which encompasses five major elements of knowledge generation and flow. These elements are: knowledge demand, knowledge generation, knowledge processing and packaging, knowledge dissemination and communication, and knowledge use (Figure 1). For example, knowledge demand is when people (the general public, policymakers, media, government, the private sector and others in Nepali society) seek knowledge and information, for example, on specific climate change topics. Knowledge generation creates knowledge and

Figure 1: Knowledge Management Cycle



information on specific topics targeted for specific audiences. Knowledge processing involves designing those knowledge products that suit targeted audiences and the general public. Knowledge management particularly involves the communication and dissemination of knowledge. Knowledge use is the application of knowledge by the users of particular domains of knowledge.

1.7.2. STUDY LOCATIONS

Analysis of climate change knowledge management at national level covered the major institutions and individuals involved in generation, processing, packaging, dissemination and communication or sharing of climate change knowledge.

Local-level study of climate change knowledge management was carried out in Rukum and Dang Districts in the mid-western region of Nepal. These districts were purposively selected to understand the knowledge management landscape at local level. Two major climate change programmes, viz. the Nepal Climate Change Support Programme and the Multi-Stakeholder Forestry Programme, are being implemented in both districts.

1.7.3. STUDY METHODS

Desk review: This included review of the existing database of the NCCKMC hub or library, as well as the existing policy, programmes and projects to map policy support, resource allocation and technical support.

National and local-level consultations: This included consultations and semi-structured interviews with government, donors, civil society, academic and research institutions at local and national level. The main objective of this method or study approach is to survey and understand the views of national- and local-level stakeholders on the demand for and supply of climate change knowledge management in Nepal.

Group discussions: This included group discussion with different stakeholders, including with government and non-government⁵ sectors and communities. Group discussion provides insights into the implications of knowledge management at local and national level.

Workshop: Two local-level workshops were organised, where major institutions involved in climate change knowledge management in Nepal were invited to participate. This forum provided space to discuss knowledge management opportunities and challenges in Nepal and to specifically get feedback on how to strengthen knowledge management and the NCCKMC. In addition, one national workshop was organised to present the draft findings and recommendations for validation by relevant stakeholders to influence future actions.

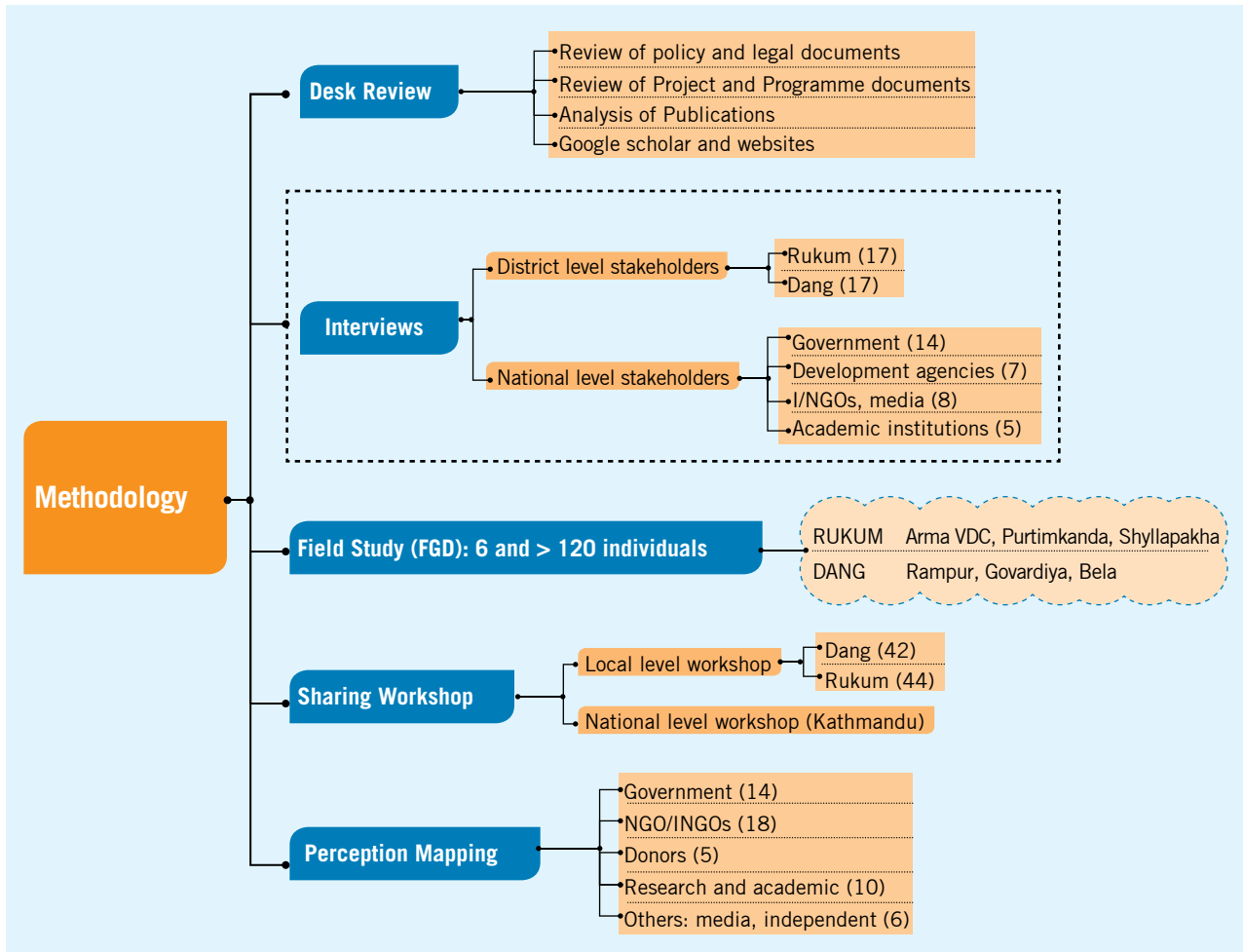
Perception mapping: For the case study of the NCCKMC, a Google-based perception mapping tool was used to design the perception mapping survey questionnaire. The objective of the mapping was to map the perceptions of overall effectiveness of knowledge management in Nepal and to seek suggestions for drawing a future roadmap for strengthening the NCCKMC. In Survey Monkey, key government stakeholders, academics, private sector and civil society members representing the Climate Change Network—Nepal, NGO Network on Climate Change and climate discussion groups were invited to participate in the perception mapping.

1.8. Structure of the report

This report contains highlights of the major findings of the study, provides an overview of current opportunities and constraints on overall climate change knowledge management in Nepal, and will serve as a launching pad for the design and delivery of additional support to the NCCKMC. The report provides specific recommendations on how climate

⁵ National and international non-government organization (INGOs).

FIGURE 2: OVERVIEW OF STUDY METHODOLOGY TO MAP CLIMATE CHANGE KNOWLEDGE MANAGEMENT



change knowledge is generated and processed and how these processes can be improved or finetuned to ensure that relevant and up-to-date or current information is made both available and accessible to those involved in national policymaking, including local government planning agencies and institutions at sub-national level.

This report is divided into six chapters. Chapter one, the introductory chapter, provides the background, objectives, methodology and scope of the study.

Chapters two to six present the major outcomes of the review and fieldwork. Chapter two lays down the policy and institutional landscape for climate change knowledge management in Nepal. Chapter three looks into data and information availability and applicability in the country. Chapters four and five offer more in-depth analysis and discussion on the demand and supply sides of climate change knowledge at local and national level. Chapter six summarises the findings and provides recommendations.

Chapter 2

Policy and institutional landscape of climate change knowledge management in Nepal

This chapter provides a background on the policy and institutional landscape of climate change knowledge management in Nepal. It is divided into five major sections. The first section discusses the policy landscape of knowledge management in Nepal. The second section highlights the major institutional structures and mechanisms for managing climate change knowledge. The third section includes an analysis of the strategies of development agencies and their priorities on climate change. The fourth and fifth sections look into the priorities and work of INGOs, NGOs and research institutions on climate change knowledge management.

2.1. Policy landscape: policy environment at national level for promoting climate change knowledge management in Nepal

NAPA, endorsed by the GoN in 2010, has set the objective of developing and maintaining a knowledge management and learning platform. It identifies institutional arrangements, e.g. NCKMC, for developing and maintaining a climate change knowledge management and learning platform. The key elements of this platform are: a) a web-based portal on climate change and development that provides a centralised platform for climate change practitioners in Nepal to conduct research, network, discuss and share climate change knowledge; b) a publicly-accessible climate change knowledge management centre; c) a moderated mailing list on climate and development topics; and d) regular updates on NAPA development to keep stakeholders sufficiently informed about the process (MoSTE, 2010). During the project, NAPA supported the NCKMC to serve as a platform for knowledge management and sharing. In accordance with MoSTE three-year reform plan (MoSTE, 2012), items were listed to develop and update the climate change knowledge management portal into science, environment and climate change by April 2013; however, no progress has been achieved so far. From 2015 onwards, MoSTE handed over the online portal login key to the NCKMC, which is now managed by NAST.

The GoN's Climate Change Policy 2011 envisions establishing a climate change centre with the objective of conducting climate change research and monitoring, and regularly providing policy and technical advice to the government. It is not clear from the policy document whether or not the climate change centre is the same as or different from the NCCKMC. It also envisions the establishment and maintenance of a state-of-the-art database of sectors and theme-based research, knowledge, data and reports (MoSTE, 2011). Although there has not been much progress in establishing the centre, according to the government officials concerned, it is still on the agenda of MoSTE.

The draft Low Carbon Economic Development Strategy of Nepal 2015, recently developed by MoSTE (now MoPE), has set one of the key strategies as research, development and promotion of climate-smart agriculture technology. The strategy emphasises research and development on low carbon development and climate. The strategy has identified the National Climate Change Centre, established under the Climate Change Policy 2011, as the institutional set-up of the strategy for research and development on annual greenhouse gas emission, appropriate technologies, research, development and technology transfer (MoSTE, 2015). In addition, the Intended Nationally Determined Contribution (INDC) document, recently submitted by the GoN to the United Nations Framework Convention on Climate Change (UNFCCC), also includes knowledge management as the priority for government action on climate change. MoPE is also planning to develop a national adaptation plan (NAP) for Nepal and has recognised the role of climate change knowledge management in mainstreaming climate change in the medium- and long-term development goals and plans.

Climate change knowledge generation and management are also reflected in other sectoral policies. Forest Policy 2015 has set its priority on carrying out studies or research for identifying specific impacts of climate change on the ecosystem and forest resources (MoFSC, 2015). Nepal REDD+ Strategy or Plan Strategy envisions establishing and maintaining a robust forest

management information system with strong monitoring, reporting and verification mechanisms. It further aims to establish a credible national measurement, monitoring, reporting and verification system with a well-functional forest management information and knowledge management system.

The Agriculture Development Strategy 2015 also includes research and knowledge generation on climate change. It prioritises research on stress-tolerant varieties and breeds of crops, livestock and fish, and development of climate-resilient agriculture that is at the same time higher in yield. Nepal's National Development Plan also includes government's priorities on climate change knowledge management. The Thirteenth Five-Year Plan focuses on establishing and strengthening a climate change knowledge management hub. The plan includes developing the National Climate Change Research Centre under the umbrella of the NCCKMC, NAST, in its main programme. The plan also envisages including climate change study in the curricula of formal and informal educational sectors (NPC, 2015). Only NAST has, however, allocated budget for the basic functioning of the NCCKMC, and the NCCKMC realises that additional budget needs to be allocated from government sources.

Climate change knowledge management is a growing priority within government research institutions in Nepal. The Nepal Agriculture Research Council (NARC) has identified a number of short-term knowledge generation work which focuses on: a) identifying and developing crop varieties, livestock and fish species that are tolerant to stress conditions and locally-emerging pests and diseases; b) supplying farmers with new crop varieties, livestock and fish species; and c) demonstrating appropriate farming practices to reduce vulnerability and maximise returns from new agricultural technologies (NARC, 2010). The Nepal Health Research Council (NHRC) has also included climate change in its research priorities. Its policy intends to promote multidisciplinary research on crosscutting issues such as gender, vector-borne diseases, climate change, influenza, nutrition, road traffic accidents, domestic violence and disabilities (NHRC, 2011).

In a nutshell, there are opportunities and scope within policies for knowledge generation and management. There is, however, lack of integration and mainstreaming of climate change in other sectoral ministries such as in energy, water resources, infrastructure, tourism, health and local development. Another policy issue on climate change is the lack of integration and implementation. Loopholes exist within policies in terms of identifying how knowledge generation, management and use in climate change management and use will be mainstreamed within the national plan and budgetary processes.

2.2. Institutional mechanisms: efforts to establish and promote climate change knowledge management

MoSTE, with the support of NAPA, established NCKMC in 2010 under NAST⁶. The NCKMC envisions establishing a strong and effective knowledge management centre, which will ensure the production and dissemination of climate change knowledge information in the country and strengthen the capacity of various stakeholders by providing them with the required information to respond to the challenges posed by climate change. The major function of the NCKMC is to enhance public access to climate change and related information in order to build their capacities to address the challenges posed by climate change, strengthen collaborative and interdisciplinary climate change research in Nepal, and facilitate the interface between scientific research and policymaking, decision-making processes and development planning.

Within MoSTE, the AEPC has established a climate and carbon unit (CCU) in 2010 with the objective of developing it as a centre of knowledge of climate change mitigation and adaptation. With the introduction of the National Rural and Renewable Energy Programme (NRREP) in July 2012, climate and carbon activities are dealt with by a dedicated climate and carbon unit under the Technical

Assistance Component of the NRREP. Furthermore, the NRREP is involved in updating the knowledge of evolving rules and regulations in different carbon markets⁷.

The REDD Implementation Centre, under MoFSC, is the lead institution for undertaking REDD readiness activities in Nepal. The MoFSC has established a three-tiered institutional mechanism for implementing REDD+, consisting of the REDD+ multi-sectoral, multi-stakeholder coordinating and monitoring committee as the apex body; REDD Working Group at operational level and REDD Implementation Centre as the coordinating entity. Besides these mechanisms, a stakeholder forum was established to engage a wide range of stakeholders in the REDD+ process⁸.

DHM, under MoSTE, is the nodal department for managing hydro-meteorological data. The department has been mandated by the GoN to monitor all hydrological and meteorological activities in the country. Its scope of work encompasses monitoring river hydrology, climate, agro-meteorology, sediment, air quality, water quality, limnology, snow hydrology, glaciology, and wind and solar energy. The department is also a focal point for the Inter-governmental Panel on Climate Change (IPCC)⁹ and, therefore, the key leading institution for generating and consolidating climate and weather data. The DHM was also involved in disseminating monsoon forecasts and data. It organises monsoon forum every year for reviewing and forecasting monsoon. Information dissemination is done from central level by using the national communication channel down to their regional offices.

Besides the government, several other national and regional institutions generate, manage and share climate change knowledge in Nepal. One of these institutions is the International Centre for Integrated Mountain Development (ICIMOD), a regional intergovernmental learning and knowledge-sharing centre serving eight regional member countries of the Hindu-Kush-Himalayas. ICIMOD serves as an

⁶ www.nast.gov.np

⁷ www.aepc.gov.np

⁸ www.mofsc-redd.gov.np (Ministry of Forest Soil Conservation REDD Implementation Centre)

⁹ www.dhm.gov.np

open house for knowledge initiatives on sustainable mountain development¹⁰. The centre can play an important role in providing strategic support to Nepal's knowledge management centres and provide both global and regional climate change knowledge.

Issues of ineffectiveness, however, bound existing institutional mechanisms and functioning of the NCKMC at central level. The NCKMC has been working since 2010 in a knowledge management function, but its management and functioning have not been able to meet both the demand for and supply of climate change knowledge in Nepal. The results of a perception mapping survey (n=54) brought forth issues and questions of the effectiveness and usefulness of the existing knowledge management centre. The institutional mechanisms for climate change knowledge management is fragmented and not linked with other networks sufficiently. The findings of this study show that most of the institutional mechanisms for knowledge management are focused on the national level, whilst there are none at local level. Although during the creation of the NCKMC, the Institute of Forestry (IoF) was identified as the regional knowledge management hub, it was not functioning for several reasons. Once project funding ended, linkages between the IoF and NCKMC ceased. The majority of interview participants at national level (n=24 out of 35) believe that institutional mechanisms at central level are isolated and not linked to each other. This has created a vacuum in facilitating the exchange of information and knowledge on climate change, which implies that there were gaps in institutional collaboration and joint work on climate change knowledge management.

2.3. Development agencies priorities, foci and support for climate change and climate change knowledge management

Climate change is now a priority for the majority of development partners in Nepal. Since 2010, the number of development partners interested and willing to invest in climate change projects and

knowledge generation has grown rapidly. There are more than a dozen development agencies working on climate change in Nepal. A review of development partners' strategy for bilateral support to Nepal, however, shows that out of the 15 major bilateral donors, only DFID, Asian Development Bank (ADB) and United Nations Development Programme (UNDP) have specific strategies on climate change knowledge management (Table 1).

The other development agencies lack focus on climate change knowledge management. All development agencies interviewed for this study (n=5) acknowledged that donor priority was on implementing climate change activities and there was only partial interest in generating knowledge. Donors are more interested to provide funding for implementation activities rather than for long-term research and studies. There seems to be a general assumption among development partners that climate change information and knowledge already exist and hence, generating new knowledge is not a priority. It might also be that the strategic focus of development agencies has guided their investment in donor assistance.

The funding on climate change knowledge management from international organisations (UNFCCC and its funding streams) is also inadequate. The low strategic focus of development agencies, including international organisations, on climate change knowledge management has huge implications for the ability to mainstream climate change generation in programmes and projects. There are already implications for lack of information and knowledge on climate change to how climate change adaptation and climate-resilient development projects were designed and implemented. Most climate change projects had used development scenarios and general socioeconomic information as basis for prioritising climate change projects and identifying climate vulnerable communities. There is anxiety among practitioners and policymakers that a climate

¹⁰ www.icimod.org

TABLE 1. DONOR STRATEGY ON CLIMATE CHANGE KNOWLEDGE MANAGEMENT

ICIMOD	Strategic goal: number 2 priority; actions include ensuring that high-quality solution-oriented research and knowledge products are delivered through significant improvement of communication and knowledge exchange within and outside the region, with the support of an enhanced knowledge management team.
UNDP	Build partnerships with the government, NGOs, international agencies and academic institutions and expand the institutional and knowledge base of climate change and Disaster Risk Management (DRM).
DFID	Strengthen information and knowledge on policy and implementation of climate change adaptation approaches to safeguard the livelihoods of climate-vulnerable households.
ADB	Build institutional capacities, including knowledge base and management systems on climate change, and apply risk-screening tools in designing projects. This includes establishment of critical data, knowledge and analytical bases.
Others (World Bank, GIZ and USAID)	Provide some level of support to enhance knowledge management in Nepal.

Sources: ADB, UNDP, DFID and ICIMOD institutional web pages

change project may end up not having any positive impact in terms of addressing the risks and vulnerability of communities.

2.4. Nature of climate change knowledge management initiatives in Nepal

There are numerous projects and programmes on climate change in Nepal. Majority of the initiatives of INGOs and NGOs was funded by bilateral and multilateral agencies. Support was also received from funding channels of UNFCCC such as the Least Developed Countries Fund (LDCF) and the Adaptation Fund (AF). Funding was also received from multilateral climate fund (e.g. Climate Investment Fund) and bilateral funds. Climate change projects have included limited activities on knowledge management, mostly focused on documentation of project output, good practices and lessons learned (Table 2).

Review of climate change projects shows that climate change knowledge management was previously not a high priority in Nepal. Only a few projects such as the PPCR, ICIMOD's knowledge-related projects in Hindu-Kush regions and CDKN initiatives have strategically focused on climate change knowledge generation and

documentation. PPCR provided support to the DHM to strengthen the climate portal. The project also provided research grant support to NAST to fund 34 researchers to carry out climate change research. The CDKN has supported the NCCMCK in generating knowledge on climate change (Table 2).

Climate change is a priority theme among many INGOs and NGOs working in Nepal. International organisations For example, Worldwide Fund for Nature (WWF), Practical Action, CARE and Oxfam generate climate change knowledge and knowledge products. NGOs like ISET—Nepal, Local Initiatives for Biodiversity, Research and Development (LI-BIRD), Rupantaran and Forest Action have played a central role in generating local-level information and knowledge on how climate change is affecting different sectors and different groups of people. With the recent Paris agreement and commitment to scale up the Green Climate Fund (GCF), including others, the financing on climate change for countries like Nepal might increase. The findings imply that availability of financial resources on climate change is not an issue, but how much will be prioritised for knowledge management is still uncertain.

The study, however, found a lack of strategic focus and vision of climate change knowledge management

TABLE 2. MAJOR PROJECTS AND PROGRAMMES FOCUSED ON KNOWLEDGE MANAGEMENT IN NEPAL

Agency	Project	Knowledge Management Focus
Climate Investment Fund (AEPC)	Scaling-up Renewable Energy Initiatives (SREP)	Developing AEPC as a knowledge centre of climate change mitigation and adaptation
DFID	CDKN	Strengthening NCCMC and mentoring climate change researchers through CDKN support around learning and knowledge sharing
DFID, Swiss Development Agency (SDC), Finland Embassy	Multi-Stakeholder Forestry Programme (MSFP)	Developing and applying knowledge and information management in forestry and climate change
GIZ, DFID, International Development Research Centre (IDRC)	ICIMOD (Adapt Himal, HiCAP, HIMALICA and Hi-Aware)	Generating knowledge of climate change impacts on natural resources, ecosystem services and communities dependent on them, contributing to policies and practices for enhanced adaptation
International Development Enterprises (IDE) (Rupantaran, Resource Identification and Management Society [RIMS])	Initiative for Climate Change Adaptation (ICCA)	Establishing Community Climate Resource Centres (CCRC)
ISET-Nepal	Adaptation Knowledge Platform	Assessing Climate Change Knowledge Platform in Nepal
International Union for Conservation of Nature (IUCN), UNDP	Ecosystem-based Adaptation	Generating and exchanging Ecosystem-Based Adaptation (EBA) knowledge
MoSTE UNDP (Technical Assistance)	NCCSP	Capacity building on knowledge management
USAID, National Aeronautics and Space Administration (NASA)	SERVIR ¹¹ hubs in ICIMOD	Serving the knowledge hub for Hindu-Kush-Himalaya region
USAID (CARE ¹² , NTNC ¹³ , WWF ¹⁴ , FECOFUN ¹⁵)	Hariyo Ban Project	Increasing government and private sector understanding of climate change vulnerabilities and adaptation options
IUCN, UNDP	Ecosystem-based Adaptation	Generating and exchanging EBA knowledge
UNDP	Community-based Flood and Glacial Lake Outburst Flood (GLOF) risk reduction, Climate financing	Development of early warning systems, Raise awareness and understanding among local communities
World Bank, Asian Development Bank, IFC	PPCR	Strengthening Nepal's system for generating, managing and sharing knowledge as an input to making the country climate-resilient with a knowledge management theme under the Strategic Programme for Climate Resilience (SPCR) aims to
World Bank	REDD Plus (REDD implementation center-MoFSC)	Undertaking REDD readiness activities in Nepal and REDD + strategy development

Sources: Project and programme database

¹¹ A joint development initiative of National Aeronautics and Space Administration (NASA) and United States Agency for International Development (USAID), SERVIR works in partnership with leading regional organizations world-wide to help developing countries use information provided by Earth observing satellites and geospatial technologies for managing climate risks and land use.

¹² Cooperative for Assistance and Relief Everywhere

¹³ National Trust for Nature Conservation

¹⁴ World Wide Fund for Nature

¹⁵ Federation of Community Forest User Groups in Nepal

initiatives among I/NGOs. Most climate change knowledge management work were scattered initiatives and often project-based. Their knowledge products were project specific and only served the project purpose and output. There is also a lack of long-term vision among these organisations on how they will contribute to knowledge management. Interviews with I/NGOs indicated that most operated within project boundaries and project activities. Project timeframes and resources determined their knowledge management focus and priorities.

2.5. Climate change knowledge management focus within academic and research institutions

Climate change has attracted the interest of researchers and academic institutions. Academic institutions in Nepal have, however, failed to mainstream climate change knowledge in research and academic programmes. Tribhuvan University, which is one of the oldest and biggest universities in Nepal, has not included climate change knowledge management among its research and academic priorities. Although Kathmandu University, Institute of Forestry and Agriculture and Forestry University have contributed in part to knowledge generation, processing and dissemination through academic research, such research was not adequate and systematic. There are also issues related to the quality of theses and publications on climate change published by the universities and colleges in Nepal. In addition, climate change knowledge management is a least priority among private colleges and other universities in the country.

Research and academic products such as theses and academic papers on climate change are just individual requirements. Application of academic knowledge in development is rare.

Most publications on climate change by research institutions are either too technical or too general with little usefulness to public policy and practice. The interviews with academic institutions showed that knowledge generation of academic institutions was not based on the demand for climate change knowledge at local and national level, but was driven more by individual interest. It served just as a requirement to complete students' academic degrees. This implies that knowledge generation has to be embedded within local- and national-level plans and priorities.

2.6. Summary and conclusion

This chapter presented the policy and institutional landscape for climate change knowledge management in Nepal. The review and analysis of information showed that there was significant progress in climate change policy and strategy. The policy has provided opportunities for climate change knowledge generation and management. There are also numerous institutions and mechanisms to generate climate change knowledge. The existing policy and institutional landscape is an opportunity to strengthen climate change knowledge management in the country.

Climate change knowledge management is, however, not the foremost priority of development agencies or the government. This overshadows the implementation of policies and specifically a policy vision to establish a climate change resource management centre. Although international and national NGOs and research institutions have included climate change in their priority working areas, knowledge generation is fragmented, often project-driven and ritualistic. These bottlenecks pose a major challenge to sustaining climate change knowledge management in Nepal. The next chapters discuss the demand for and supply of climate change information and knowledge at local and national level.

Chapter 3

Climate change Information and knowledge flow mechanism

This chapter looks into climate change information and knowledge flow mechanisms in Nepal. In particular, it analyses the data sources and publications related to climate change in order to understand how climate change data is generated and managed at local level. The first section analyses data sources and associated issues. The second section looks at published materials and their implications for enhancing knowledge of climate change in Nepal.

3.1. Data sources

The generation and management of climate data and information in Nepal are gradually improving. Although Nepal is listed by the IPCC as a climate change blind spot, where data and information on how climate change has been affecting the country, its agriculture and natural resources are lacking, slight progress has been noted in improving data generation and management. The recent initiatives on strengthening data and information have been helpful in developing both national- and local-level climate change projections.

The key government institution for generating data on climate change is the DHM. The DHM has 51 hydrological stations and 282 meteorological stations, providing temperature, rainfall and relative humidity data. It has established a climate data portal that includes data on maximum and minimum rainfall and temperature from existing and operational meteorological stations. Besides, NARC, in coordination with the DHM, is managing 36 agrometeorological stations in different parts of Nepal.

ICIMOD is also managing a portal and knowledge hub. The portal contains hydrology and glacial data and information. The Nepal Climate Change and Development portal, managed by the NCCKMC, also contains data generated by the DHM. Other agencies, which include the NHRC, the Forest Survey and Research Division, Kathmandu University, NAST and the Central Bureau of Statistics (CBS), have generated data and information. In addition, research institutions and NGOs have played a major role in generating raw data on climate change. Recently, the CBS, with a mandate from the National Planning Commission (NPC), is carrying out a national climate change survey to generate baseline climate change information, mostly relying on the perceptions of households at local level which will also combine local climate data and existing socio-economic information.

Climate-specific data and information is collated by MoSTE through the national communication reports. The government completed the First National Communication Report (2004) and the Second National Communication Report (2015). The Third National Communication Report is currently being prepared. The national communication reports generate baseline climate change information such as the greenhouse gas inventory and map climate change trends and impacts. Discussions during national and local stakeholder consultations have, however, indicated that communication reports were based on desk study and lacked wider consultation. The report also mostly used proxy indicators and data.

Most of the analytical information generated on climate change related to temperature and rainfall variations use available meteorological station data of the DHM. There is a challenge around adequacy of the station spread across the country to represent climatic phenomena observed over geographic variations in the country. There is absence of sufficient glacier and water flow monitoring station and data for the higher Himalayas. It is hard to draw any conclusions from these data and fit these into the local context. The downscaling data and projection of climate scenarios and information, including real time air and satellite, are not available.

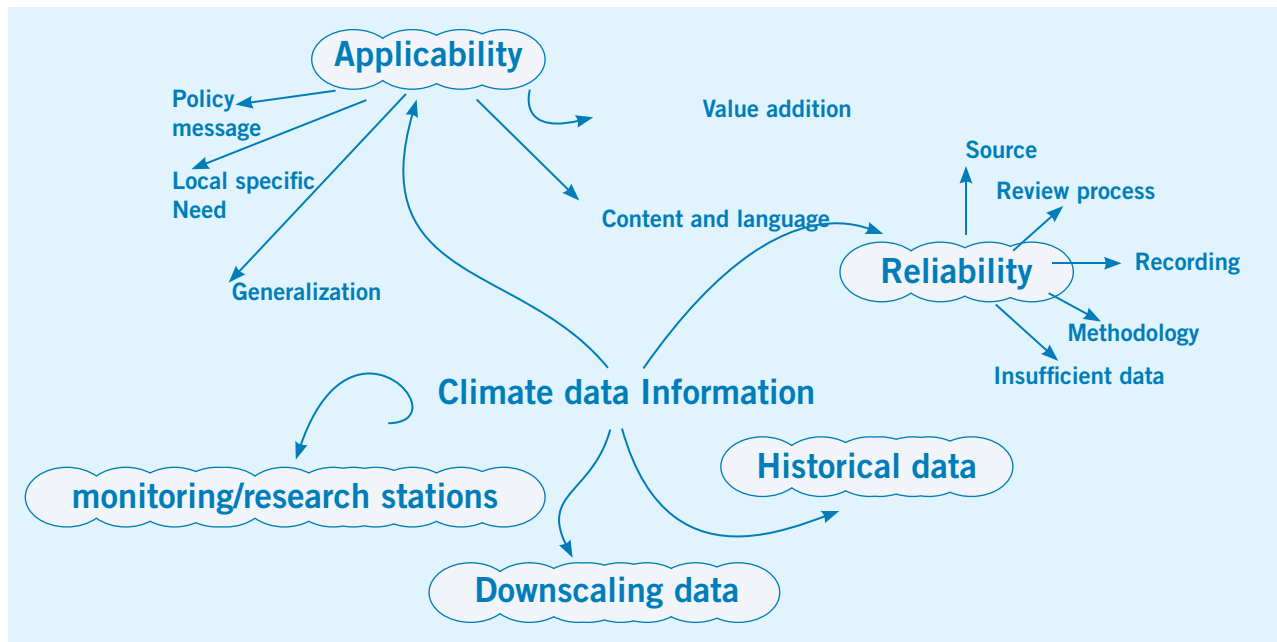
Due to the limited scope of data, it is difficult to derive any meaning or implication for temperature increases or changes in precipitation based on the DHM's existing dataset. However, DHM has received support from PPCR programme to upgrade current stations and install new representative stations (including radar sensors) as per World Meteorological Organisation (WMO) standards to partly fulfil the current gaps observed.

There was also the issue of availability of historical data. The available data in Nepal is only from the year 1970 onwards. Nepal is also using the baseline data for greenhouse gases of 1990 while preparing the national communication reports. These make projections at local and national level difficult to make. Another issue is the location of data generating research stations and their state or condition. The research stations do not represent the landscape around them due to their geographic and altitudinal variations. Most of the stations are located below 2,000 m and the Himalayan belt of Nepal is not represented.

Another issue emerging from the stakeholder consultations is that of reliability of data. Insufficient and missing hydro-meteorology data create discrepancies, which, in many instances, makes drawing conclusions and generalisation difficult. Although there were scattered data, they were not properly consolidated and used. The methodology for generating data and information also varies between institutions. This raises the issue of consistency in data generation methods. There was also lack of scientific and peer review mechanisms for quality control and scientific rigour (Figure 3).

All these issues combine to pose challenges to reliability and validity of data sources and accuracy of generated data and information. The compilation and consolidation of data generated by government and non-government sectors were not organised. There is a lack of a central depository system for climate change data nor was there an organised system for managing the data generated by individuals, projects, I/NGOs, academic institutions and other groups and institutions working on climate

FIGURE 3: CLIMATE CHANGE DATA AND INFORMATION ISSUES



change data. Data management was, therefore, poor and disorganised. The majority of the national-level stakeholders considered the issue of data management a difficult challenge. So, scattered data and information should be systematically collected, consolidated and organised.

During the national-level consultations, some stakeholders also raised the issue of applicability of data and information. Data generation in Nepal is often based on individual and project-based interest, rather than the demands of users or clients. Most of the data generated only serve the purpose of writing reports and do not provide advice to policymakers and development practitioners on how to improve climate change policy and practices. This means that climate change data generation and management in Nepal need further improvement.

3.2. Knowledge products

Climate change knowledge products started to be made accessible to the public in Nepal only after 1993¹⁶. The first climate-related paper, “Development of Climate Change Scenarios with Reference to Nepal”, was developed by M.L. Shrestha in 1997. There was slow progress in

developing climate-related knowledge products between 1998 and 2003. The GoN published the First National Communication Report in 2004. This report projected the baseline report on GHG emissions and the impact of climate change on different sectors. The first comprehensive report on climate change impact on the sector, Development and Climate Change in Nepal: Focus on water resources and hydropower, was prepared by the Organisation for Economic Cooperation and Development (OECD) in 2003.

There was rapid growth in knowledge management products after 2007, which peaked in 2009 and 2010, and further expanded between 2011 and 2015. Climate change knowledge products range from research papers, booklets, book chapters, technical papers, policy and legal documents, and project-based materials, among others. Other materials include programme documents, leaflets, brochures, posters and training materials. Most of these publications were, however, either unpublished or not peer reviewed. The recent IPCC fifth assessment report (2014), and in particular the South Asia section, only cited five publications from Nepal, indicating a need for generating more scientific and acceptable knowledge and knowledge products.

¹⁶ US Country Studies programme started to provide training and skills in GHG inventory and impact of climate change.

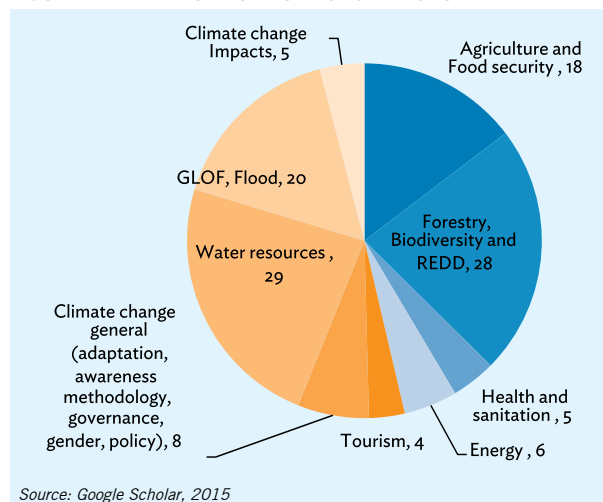
Martin Chautari published a compendium of climate change resource materials in 2010. Out of the 400 papers listed between 2007 and 2010, more than 40 per cent were published in periodicals or journals. The analysis of books or published reports (71), articles in periodicals or journals (162) and articles in edited volumes (56) shows that REDD, GLOF, water resources and climate change impact assessment dominated majority of the publications between 2007 and 2010 (Ghimire, 2010). Only 1 per cent of the materials were in the domain of energy and 3 per cent in health. There were no papers on tourism, infrastructure and sanitation.

Documents published between 2011 and 2014 were in the domains of agriculture, water resources, forestry and REDD. A bulk of the 124 documents published in 2015 in first half of the year (Jan-July) related to glaciers, water resources, REDD and agriculture (Figure 4). Although there has been a slight increase in the number of publications representing health, tourism, energy and sanitation in recent years, they are still inadequate in responding to the demands for climate change knowledge at local and national level. The high number of publications in sectors such as agriculture, water resources and forestry might be due to the availability of resources in these sectors.

Analysis of the documents published in 2015 shows that Nepalese professionals and researchers were taking the lead in climate change publications. In that year, majority of the publications (77 out of 124) were authored by Nepalese. More than 90 per cent of the papers reviewed also had Nepalese co-authors (Table 3). These knowledge products were, however, mostly dominated by publications from limited research and international academic institutions. More than 35 per cent of these publications, for example, were from professionals or experts of ICIMOD and published by ICIMOD itself. There were very little publications from I/NGOs, Community Based Organisations (CBOs) and the GoN practitioners working in Nepal.

Most published materials in books and journals are

FIGURE 4: TREND OF PUBLICATIONS IN 2015



not easily accessible. Out of the 77 peer-reviewed journal articles, only 11 are open access and 66 are closed and not accessible to the public (Table 3). This is also the case for edited books and book chapters, where 24 out of 26 chapters are not accessible to the public. The table shows that majority of the technical papers (12 out of 20) are open access and can be downloaded (Table 3). The majority of open access journals are published in Nepal. For example, most of the journal papers published in the Journal of Forest and Livelihood of Forest Action¹⁷ can be downloaded.

There are very few scientific and peer reviewed journals published in Nepal. The journals which often publish climate change findings and research output are: Forest and Livelihood, NAST Journal, Journal of Hydrology and Meteorology, Banko Janakari, Journal of Agriculture and Environment, Journal of Environment and Journal of Mountain Research and Development, among others. A vast number of unpublished reports and documents are in Google Scholar and in the domains of international and national NGOs and academic institutions. Most of these publications are project-specific reports and thus have issues of wider use and applicability.

There are, however, numerous project-related publications and unpublished papers in the form of project reports, technical reports, and monitoring and evaluation reports, all highlighting the lessons

¹⁷ www.foresaction.org.np

TABLE 3. AUTHORSHIP STATUS OF PAPERS PUBLISHED IN 2015

	Open	Closed	Nepali-led	Expat-led	Expat only
Books and book chapters	2	24	19	7	4
Technical reports	12	8	6	14	6
Journal articles (peer reviewed)	11	66	50	27	15
Total	25	98	75	48	25

Source: Google Scholar (2015)

learned of climate change interventions. These reports can be located within the institutions working on climate change and within the relevant projects. At present, LAPA, CAP and District Climate Change and Energy Strategy and Plan are being prepared in many districts. These plans document information on climate change and the local vulnerability. The implementation of adaptation strategies in several districts has also started, thus contributing to knowledge generation and learning. Most of the learning and knowledge is, however, not documented and not accessible; so, it is difficult to link the achievements made in knowledge management at local and national level.

There are problems related to knowledge products on climate change. Majority of the people interviewed (n=32) were of the view that most of the publications on climate change did not address the demand for climate change knowledge and information at local and national level. There is a lack of clear documentation of the demands for climate change knowledge at local and national level. There was also no clear strategy on research priority for climate change. Because of this, knowledge generation was often ad hoc and lacked a coherent policy direction.

Another important issue was that of the types of publications. Most of the publications were scientific in nature, technical and complex, and difficult for the ordinary public to either access or understand. The other concerns were related to language as most of the publications were in English.

3.3. Summary

This chapter analysed the status of climate change data and knowledge products. The analysis shows that there was partial progress in strengthening data generation sources at national level. For example, the DHM is strengthening its hydro-meteorology stations and recording methods. Downscaling of data and information, however, remains a big challenge. There are issues of reliability and applicability of climate change data generated as it lacks quality check and peer review process to review its quality and veracity. This shows the need for more systematic data generation from sources and its quality control.

The findings show that knowledge generation is encouraging in Nepal. There are increasing number of publications related to climate change in Nepal. The majority of the publications were in the subject domains of agriculture, forestry, water resources and glacier studies. Nepalese researchers were leading the majority of the publications in peer reviewed journals and books. Most of the published papers, however, related to few sectoral areas. There were relatively few publications on the domain of energy, tourism, health and urban sectors. There is a clear gap in knowledge generation in certain sectors such as health, tourism and economy. In addition, a large number of unpublished reports and publication materials within the domains of CBOs, projects, I/NGOs and government need to be consolidated, processed and packaged to meet the knowledge demand at local and national level. Most importantly, climate change knowledge has not been tailored according to the need of national policy and priorities and has not really supported to the national planning, budgeting and execution process.

Chapter 4

Climate change knowledge demand and supply at local level

This chapter discusses the demand for and supply of climate knowledge at local level. Particularly, it assesses the demand for climate knowledge management at district and community level, with specific focus on the way knowledge and information are currently and actually on demand at district and community level.

Dang and Rukum Districts in the mid-western region of Nepal were selected purposively for conducting case studies to understand climate change knowledge management at local level. A total of 34 persons (17 in each district) were interviewed in Dang and Rukum Districts. Interview subjects included staff or officials of district line agencies, NGOs, donor-funded projects, village development committee (VDC) secretaries, community facilitators and media personnel. Field assessment also encompassed six focus group discussions (FGDs) with communities in both districts.

The chapter is divided into three sections. The first section provides an overview of climate knowledge generation and demand at district and local level. The section also provides an overview of actual demand of local-level stakeholders in relation to climate knowledge and information. The second section assesses the available supply of this knowledge at local level and analyses implications for promoting climate change. The third section summarises the suggestions and recommendations offered by the stakeholders to improve the current demand for and supply of knowledge management at local and district level.

4.1. Climate change knowledge generation at local level

The generation of climate change knowledge at local level was driven by the communities' exposure and first-hand experience with climate-related events. The field findings showed that communities had rich first-hand experience and knowledge of how temperature and rainfall had varied and changed over time. During FGDs, a majority of the participants said that the temperature in their areas had increased in the last few years and that they had

personally experienced variability in rainfall in terms of its nature, timing, extent, frequency and impact. Community perceptions actually matched the analysis of climate data (1970–1999), which shows that the mid-western region experienced temperature increases by 0.60C (1970-2000) and great variability in rainfall (NAPA, 2010).

The local communities also indicated increased exposure to changes in climatic risks from variations in temperature and rainfall. Most community members had experienced the impact of changes on agriculture and water resources. For example, the communities in Purtimkanda VDC of Rukum District cited experiencing increased temperature, which had intensified dry seasons and droughts in their region, manifested in the drying of local springs and other water sources. The communities in Rampur VDC, Dang District discovered rainfall variability had resulted in the decline of crop yield and overall agricultural production. They also observed the outbreak of new diseases and pest in their agriculture farms (Table 4). The findings from their perceptions imply that the impact of climate change is clearly visible in the local areas.

Much of the information and knowledge on climate change was, however, based on the communities' perceptions, originating from their first-hand experience and exposure. The communities

interviewed realised that their understanding of the specific causes of climate change and whether or not the observed changes can actually be attributed to climate change impacts is limited. Aspects of knowledge and perceptions at community level are anecdotal or subjective and very difficult to attribute concretely to climate change. Issues in agriculture and water resources as explained by the communities seem to overlap with common development problems experienced at community level. The addition of impact and implications of climate change was difficult to understand just by analysing the communities' perceptions. Since there was no practice of investigation and research at local level, generation of knowledge was limited to anecdotal evidence.

The discussion and interview at district level showed that district line agencies had little role and contribution in generating climate change knowledge. According to the district line agencies, they were mandated to provide implementation support and extension services during implementation of local-level development activities. In both districts, the government line agencies had very limited contribution in generating climate change knowledge. Only the district forest office, district agriculture office and district soil and water conservation office had some level of engagement in providing technical support to

TABLE 4. TREND IN KNOWLEDGE GENERATION AT LOCAL LEVEL

Community	What kind of knowledge	How it is generated	Who is involved in knowledge generation
Community level (Dang)	Communities' perception of weather variability, change and impacts	Communities' own exposure and experience of changes observed in their environment and impact on their livelihoods	Household and communities
Community level (Rukum)	Communities' perception of variability in rainfall, increase in temperature and some evidence of impact	Communities' experience and local knowledge of climate variability, temperature increase and impacts	Household and communities
District level (Dang)	Participatory tools for vulnerability assessment and planning	Through exposure to training and workshops	Transferred from project to the practitioners
District level (Rukum)	Participatory tools for vulnerability assessment and planning	Through exposure to training and workshops	Transferred from project to the practitioners

Source: Field study in Dang and Rukum Districts

implement climate change adaptation and REDD pilot activities. The other development agencies in the district were also not engaged in generating and conveying or disseminating any type of climate information at local level.

Knowledge generation at district level was mostly carried out by or through climate change projects such as the NCCSP and the MSFP. Local NGOs involved in the NCCSP and MSFP have developed tools and techniques for assessing climate change impacts, for mapping vulnerability and for developing community and local adaptation plans. Knowledge generation at community level was mostly focused on methodology and tools for adaptation planning. The communities were not active in generating new information and knowledge on what and how climate change is impacting the different communities and households. Their role in climate change research, knowledge management and knowledge sharing was inadequate to meet their demand or need.

In summary, community and district-level consultations illustrate that there was very limited climate change knowledge generated at local level. The communities' perception was the only source of knowledge of climate change at local level. The findings show that communities' knowledge was derived from their experience and exposure to changes in nature as a result of climate change. Their knowledge was limited and did not extend to understanding the future risks of climate change. There was lack of knowledge of what could happen and how climate change was going to impact the wellbeing of their communities. District line agencies, despite their technical capacity, were not equipped to generate information and knowledge of climate change at their level. These findings support other studies (e.g. ISET, 2015), which show that the responses to and management of climate change at local level are constrained by limited information and knowledge of climate change, inadequate access to information, knowledge and technology (AIT-UNEP RRC.AP 2010; Regmi, et al., 2015).

4.2. Climate change knowledge demand at local level

This section outlines the demand for climate change knowledge at community and district level. The information in this section was derived from interviews, FGDs and the results of a district-level workshop. The findings show that there was varied demand for climate change knowledge at community level. Local stakeholders demanded concrete and specific knowledge, skills and technologies on how to respond to the impacts of climate change in the major sectors of agriculture, health and water resources.

4.2.1. KNOWLEDGE DEMAND AT COMMUNITY LEVEL

The consultations with communities showed that the communities' demand for climate change knowledge often related to their need for more information to understand the causes and impact of climate change. They shared that they had experienced some unusual changes in weather patterns and in the livelihood system such as in agriculture and forest resources, but they were not really sure whether climate change was the major cause for these events. The local stakeholders demanded more information and knowledge to enhance their understanding of the causes of rainfall variability, emergence of new pests and diseases in agricultural crops, declining yield of rice and maize, changes in the phenological characteristics of plant species and outbreak of invasive species (e.g. banmara- *Eupatorium adenophorum Sprengel*).

During community consultations, majority of the communities demanded knowledge of how to improve their current agricultural practices. They needed knowledge of new and innovative ways through which they could improve their current farming system, mostly involving seeding, planting, weeding, nutrient management, soil management, and harvesting and storage systems. They also demanded new technologies in agriculture that

could address drought and flooding conditions so that they could still grow their crops and support their livelihoods.

Another major area of knowledge demand was related to water management technologies. Majority of the communities and households consulted underlined the importance of receiving advisory services and mostly technological information related to managing the scarce water supply during winter months and, on the other extreme, excessive water during summer. They demanded more support in terms of water-efficient technologies and practices that could assist them address the current issues of drinking water supply, water for irrigation and household sanitation. (Table 5)

The demands for climate knowledge and information among the communities in Rukum and Dang were similar. The only difference was in the responses to climate-induced hazards. For example, the majority of the communities in the three VDCs

of Rukum District demanded specific knowledge and technologies for dealing with landslides. On the other hand, the majority of the communities in Dang District demanded knowledge support to address climate change issues. The local demand for knowledge differed based on location-specific risks and hazards in the community.

In summary, the responses from community-level consultations demonstrated that communities now need more practical and applicable knowledge of climate change. The narrative above and Table 5 show that communities demanded more specific knowledge of how climate change is impacting their livelihoods and what some of the implications are. They further demanded down-to-earth solutions in terms of the ways through which they could solve their day-to-day issues such as water scarcity, declining productivity, outbreak of disease and pest, extension or trans-boundary impact of disasters such as landslides, floods and droughts, and issues of hardship in farming and other household

TABLE 5. CLIMATE CHANGE KNOWLEDGE DEMAND AT LOCAL LEVEL

Categories	Community Responses
Cause and impact	Answers their state of confusion (what is causing the change and why). For example, whether or not the drying of water springs and natural wells is due to climate change; whether or not outbreak of pest (insects) and diseases in maize is caused by temperature increase; what is the impact of temperature changes and rainfall patterns in crop growth cycle; Is expansion of banmara (invasive weeds) related to climate change? Why have the flowering and maturity periods of certain species changed?
Agricultural practices and technology	Agriculture-specific, climate-related knowledge and technology to address issues of declining crop productivity, outbreak of pests and diseases in maize, paddy, vegetables, and expansion of invasive weeds. Specific queries were: What kind of agricultural practices and technology can resist weather and climate changes, for example, what specific management practices within the cropping cycle (from seedling–growth–maturity and harvesting) can make our farming system more climate-resilient?
Seeds and materials	Stress-tolerant varieties of crops (rice, wheat, maize) and vegetables, improved management practices (stress management) to deal with crop loss, weed invasion, and pest and disease outbreak. New varieties or crops that can tolerate prolonged drought, flood submergence, etc.
Technologies (for water management)	Technologies that can minimise the landslide hazards and land degradation issues; water management technologies that address excessive water during the rainy season; access to clean energy; technologies that can minimise stresses and maximise resilience. Specific queries were: What innovations can we introduce in normal development technologies (e.g. check dams, bioengineering) that can address climate change impacts?
Health	Causes of appearance of new diseases (skin-related), outbreak of certain diseases (malaria, Japanese encephalitis, diarrhoea)

Source: Field study in Dang and Rukum Districts (2015)

activities such as supply of potable drinking water and water for health and sanitation.

4.2.2. DEMAND FOR CLIMATE CHANGE KNOWLEDGE AT DISTRICT LEVEL

This section analyses the demand for climate change knowledge at district level. The information presented in this section was derived from district-level consultations and district workshops organised in both Dang and Rukum Districts. The findings of the two consultations show that there was enormous demand for climate information and knowledge at district level, and the demand usually revolved around technological products and access to materials (Table 6).

The demand for climate change knowledge at district level varied according to the mandate, interest and working areas of the district line

agencies and NGOs. The demand of the Agriculture Office focused on the technological products, for example new ways of farming, stress-tolerant seeds and materials, insect- and pest-resistance methods, new methods of seed sowing, transplanting and intercultural operations. They argued that climate change knowledge should help better design agro-advisory extension packages that can answer farmers' day-to-day questions related to responding to the impacts of climate change.

The District Forest Office was more interested to get knowledge support to understand the impact of climate change on species composition and on the growth and yield of forest species. It also needed specific knowledge of how to adjust nursery management and silvicultural practices, fire management and control of invasive species like banmara. In the discussion, forest officers

TABLE 6. DEMAND FOR CLIMATE CHANGE KNOWLEDGE AT DISTRICT LEVEL

District agency	Knowledge demand
District Agriculture Office	Information and knowledge generated from research and study on seed varieties or technologies that can address the issues of water-logging, drought, insect or pest outbreak and other problems due to climate change observed at local level. There was also request for more linkages to research-based institutions and for agro-advisory extension materials and packages.
District Forest Office	More information and knowledge of how climate change impacts vegetation and species composition and disease and pest outbreak, including spread of invasive weed and other species.
District Soil Conservation Office	More information on technologies that can address current and future climate risks related to soil and water management and conservation.
District Livestock Office	More evidence of how climate change affects the livestock sector and specific things we can include in our extension system.
District Health Office	More evidence and knowledge of the implications of climate change for human and eco-health and how to prepare to address them.
District Development Office	More information and knowledge of how we can strategically plan, budget, monitor and deliver development activities that can also address climate change issues, at the same time.
Local NGOs	More skill and knowledge transfer in terms of effective adaptation technologies that can address specific climate change issues observed at local level, e.g. how we can tackle issues of climate change leading to decline in crop productivity. Publications and IEC materials from central level.
INGOs	More research and evidence of how to integrate climate change in development plans or its delivery process.

Source: Responses at district-level consultations and workshops (May–June 2015)

demanded more skills and knowledge of carbon mapping and inventory. Similarly, the Soil Conservation Office was interested in new and efficient soil and water management technologies that can address the scale of impact caused by landslides, flooding and river bank erosion.

The Livestock Office had narrowed its information and knowledge need to the effects of climate change on the livestock sector. They demanded more basic knowledge and evidence of how climate change affects the livestock sector and specific things they could include in the extension system of their offices. The District Health Office also had very little information on climate change. It demanded more research output and knowledge of prevailing diseases and its relationship with temperature and rainfall changes. The District Development Office demanded more skills and knowledge of mainstreaming climate change in development.

NGOs and projects had knowledge demands slightly different from those of district offices of the government. The majority of the NGO representatives interviewed and consulted for the study demanded knowledge to better understand how they can assist communities and district government line agencies assess climate change impacts, identify vulnerable areas and design effective adaptation responses. They demanded knowledge of technological tool kit, knowledge products and information materials to make them more capable of facilitating climate change responses at local level.

In summary, although knowledge demand at district level was specific and based on the institutional mandate of each organisation or office of the district, there were striking similarities in the demand for knowledge at district level. Government line agencies were more interested to have access to new innovations, technology, technological products and skills in the use of new technologies so that they could pass on these skills to their constituents through the agricultural extension service. They demanded easy access to and more

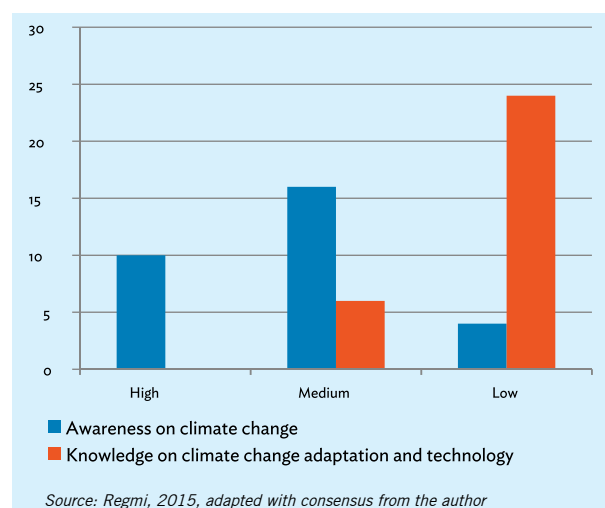
concrete evidence of the impact of climate change. NGOs and project stakeholders demanded more knowledge of processes, methods and knowledge products that can facilitate them in delivery of goods and services to communities.

4.2.3. DIFFERENCES IN PRIORITY FOR KNOWLEDGE DEMAND AT LOCAL LEVEL

Local-level discussions showed that climate change awareness at community and district level was generally high. There was a general level of awareness of climate change, for example, the major cause of climate change and its impact at local level among local stakeholders. FGDs also brought out the point that the majority of the participants could explain what climate change is and why it is becoming a concern that should involve them directly. The communities also explained the linkages between climatic parameters (temperature and rainfall) and changes observed in water availability, species growth and crop productivity.

The priority of the majority of the community and district-level stakeholders was specific knowledge of how to respond effectively to climate change impacts. Regmi (2015), a study carried out in Pyuthan and Nawalparasi Districts, also shows that local communities have a general awareness of climate

FIGURE 5: STATUS OF KNOWLEDGE AND AWARENESS OF CLIMATE CHANGE AT LOCAL LEVEL



change but lack of knowledge on how to respond immediately and effectively (Figure 6) to its impacts at local level. These communities were asked about their general awareness and knowledge of technology and practices related to dealing with climate change. These findings suggest that knowledge generation and knowledge transfer on climate change should be a priority at local level. In FGDs in Arma VDC, Rukum District, the communities claimed that “we know now that our crops (e.g. maize) are drying up due to droughts, but we do not know how to fix the problem (Photo 1)”. Farmers expressed that solution-based climate change knowledge was what was needed at local level.

There are internal differences in demand for climate change knowledge at local level, differences largely affected by gender, education and social class differences of the affected communities or respondents. Regmi (2015) shows that better-educated men who have been exposed to the outside world are more aware and have knowledge of climate change impacts compared to women with less education and less exposure to the world outside their districts and communities. In one of the exercises carried out with general members, an executive member of the community forestry

user group (CFUG) and project staff in Rukum and Dang Districts, differences in perception and knowledge demand emerged. Users demanded basic information and knowledge of climate change, whereas more advance knowledge was the priority demand for knowledge among executive members (Table 7). Hence, the government should consider differential knowledge demands from various groups (men, women, the educated and the less educated) in designing a knowledge generation strategy on climate change for communities.

In summary, knowledge of understanding, planning and implementing climate change adaptation activities are the priority of local-level stakeholders and communities. There is a general awareness of climate change, but communities lack access to specific knowledge to be able to respond effectively to impacts at local level. There are differences in knowledge demand among the local-level stakeholders based on their profile. Therefore, a blanket approach to knowledge management will not address specific demand of stakeholders at local level. There is need to understand the demand for climate change knowledge based on geographical location, community composition, gender and class, among other factors.

PHOTO 1: THE IMPACT OF DROUGHT ON MAIZE CROP IN ARMA VDC OF RUKUM DISTRICT



Photo: Practical Action

TABLE 7. DIFFERENCES IN PRIORITY FOR CLIMATE CHANGE KNOWLEDGE AT LOCAL LEVEL

Knowledge demands	Priority of CFUG executive members	Priority of general members	Priority of practitioners
Basic data on climate change	5	1	4
Basic knowledge of climate change (mostly related to carrying out adaptation practices)	1	2	2
Need for a climate change resource centre for knowledge exchange	4	5	5
Climate change technologies and practices	3	3	1
Capacity and skill transfer	2	4	3

Source: Group discussions in Dang and Rukum Districts. 1 = High; 5 = Low
Notes: CFUG: Community forestry user group

4.3. Knowledge supply at local level and the implications

There is a mismatch between the demand for and the supply of climate change knowledge at local level. The demand for information and knowledge of climate relevant services is high, but the supply does not exist. The knowledge supply mechanism at local level is very weak. There is actually no proper mechanism through which climate change knowledge is shared and transferred at district and community level. It was found that the current knowledge supply system at district and local level is ad hoc and project-based. There is also no proper institution responsible for consolidating and transferring knowledge for those it is needed.

Although the district line agencies and their extension service centres are responsible for providing technical knowledge to farmers and local communities, they are not involved in knowledge transfer with regard to climate change. Majority of the district line agencies and communities in this research accepted that, in the absence of transfer of knowledge of climate change, the coping and adaptation responses are inadequate and ineffective.

There were two projects related to climate change being implemented in Dang and Rukum districts. These projects have, however, not been able to transfer the practical knowledge that is actually required to deal with climate risk and impact. Most of the information and technology transferred by these projects are general development practices. According to the local communities, these technologies can address the current development issues in the short run, but they fail to respond to the additional risks and impact of climate change. The district line agencies also felt that there is inadequate supply of relevant knowledge and technology to meet the demand of local communities. The lack of knowledge transfer at community level is having negative implications for the effectiveness of service delivery.

4.3.1. IMPLICATIONS OF CLIMATE CHANGE KNOWLEDGE TRANSFER

Managing climate knowledge at local level was more of a project- and activity-based approach for most stakeholders than long-term need of helping communities better prepare for climate hazards, adapt to and be resilient to the changes taking

place. The study districts were selected from the project areas of the NCCSP and the MSFP as these two projects supported climate change activities, such as disaster risk reduction and livelihood improvement. Both projects also supported the communities for climate change awareness, preparation of community and local adaptation plans to identify vulnerable communities and areas for climate change adaptation support. The projects were also helpful in documenting some of the information about climate change impacts in their project implementation areas (Table 8).

In FGDs, majority of the communities perceived that information and knowledge generated and supported by the project were useful and helped them better understand the impact of climate

change in their specific areas as well as general information about the causes of climate change, implement climate change activities and improve their capacity for planning (Table 9). A large number of interviewed district agencies felt that climate change knowledge transfer helped them develop and prepare CAPs and LAPAs. In an interview, NCCSP project staff said that the project was helpful in developing processes, in identifying the most vulnerable households and in targeting these households.

4.3.2. LACK OF FOCUS ON CLIMATE CHANGE KNOWLEDGE MANAGEMENT

This study found that long-term knowledge generation was not the priority and mandate at district level, although most of the I/NGOs were

TABLE 8. IMPLICATIONS OF CLIMATE CHANGE KNOWLEDGE TRANSFER

Knowledge level	Communities	NGO/project practitioners	District line agencies
Awareness	High level of awareness among executive members	High level of awareness among the practitioners	High (for DoA, DoF, DoSC, DoLS) Medium to low (for other agencies)
Skills and capacity	Became able to develop adaptation plans	Became able to develop LAPAs	Became able to develop climate change plans (DoA, DoF, DoLS, DoSC, DDC)
Implementation	Received financial support to implement LAPA (NCCSP, MSFP)	Facilitated implementation of LAPA (MSFP)	Selected line agencies are implementing climate change activities
Recognition	Recognised local knowledge and perceptions	Recognised their facilitation skills	Recognised their development experiences

Source: Local and district-level consultations in Dang and Rukum Districts

TABLE 9. USEFULNESS OF CLIMATE CHANGE KNOWLEDGE AT LOCAL LEVEL

Level of awareness and understanding	Local level (n=34)
Understanding the impact of climate change in different sectors	8
Raising general awareness of communities	7
Building capacity of practitioners	5
Developing plans and specific activities	9
Decision-making on resource investment	1
Assessing the effectiveness of interventions	0
Addressing climate specific risk and impacts	5

Source: Individual consultations with district line agencies in Dang and Rukum Districts

engaged in project implementation and activity-based sporadic knowledge and information generation at local level. Information generation was the least priority for these institutions, and the research, knowledge and information generation on climate change were not relevant at local level.

Climate change knowledge management was also not the priority of district line agencies. District line agencies related to health, water and women development had no organisational activities related to generation, processing or sharing of climate change knowledge. The District Agriculture Office was, however, engaged in transfer of knowledge of climate change technologies, albeit to a limited extent. For example, the District Agriculture Office in Dang promoted drought- and flood-resistant varieties ('sukhadhan') to farmers.

There was absence of a systematic knowledge management and sharing mechanism at district level. In climate change, aside from one or two workshops and training events, there was absence of a knowledge management system. None of the district-based agencies or other institutions had taken the lead in climate change knowledge management work. Although there were opportunities for knowledge documentation, this was not the priority for the district agencies. For example, there was room for documenting the communities' perceptions and knowledge of weather variability and climate change, but none of the district agencies documented existing climate change knowledge and awareness at community level.

The majority of the district line agencies mentioned that there was no system of exchanging information and knowledge between district line agencies. Knowledge-sharing and transfer mechanisms do not exist at this level. During interviews and local and national consultations, they stated that one of the main reasons for the absence of information and knowledge exchange mechanisms was the lack of a culture of appreciation and sharing within the district

agencies, i.e. appreciating what others have done and complementing each other's activities. Stakeholders also stated that priority was not given to knowledge management within government programmes and within projects funded by development agencies.

Communication analysis was carried out with representatives of local government bodies, donor-funded projects in Rukum (MSFP and NCCSP), NGOs, CFUGs and households and other stakeholders. These various stakeholder groups were asked to rank their organisations on the criterion of knowledge and information sharing and receiving information from others, where a ranking of '1' is considered the culture of least sharing and receiving knowledge and information and '5' the most ideal culture. Analysis of findings shows that mechanisms for sharing and learning climate change knowledge within the districts were poor (Table 10). Only two projects on climate change had shared some level of climate-related information and knowledge with their clients, but even this sharing was a one-way information flow. The rest of the agencies neither shared information on climate change from others nor received it from them.

The lack of investment in knowledge generation, knowledge management and knowledge transfer affects decision-making at local level in a negative way. Communities and practitioners working at local level designed most activities on climate change adaptation. The knowledge and experience of local planners was mostly drawn from their perceptions of weather and climate changes. Planners and decision-makers relied more on business-as-usual scenarios and current risks. According to the planners, they had limited access to scientific and technological knowledge of climate change. These had negative implications for actions guided by limited knowledge and experiences of climate change adaptation. The following three cases present some of the challenges of climate change interventions at local level.

TABLE 10. COMMUNICATION AND KNOWLEDGE FLOW AT LOCAL LEVEL

	Information sharing	Information receiving
NCCSP	3	2
MSFP	2.5	3
NGOs	2.5	2.5
CFUG/UGs	2	2
Households	1.5	2
Local government bodies (LGB)	2	1

Source: FGD, 2015

4.4. Suggestions from local stakeholders on strengthening climate change knowledge management

The district agencies, as well as the communities, in Rukum and Dang have provided suggestions to improve the climate change knowledge management

Case Study One: River bank protection work in Bela VDC

Riverbank protection was part of LAPA of Bela VDC, Dang District. Riverbank protection was proposed as a response measure within LAPA to deal with river bank erosion and flooding issues along the banks of the Rapti River. One of the projects provided NPR 1.6 million (US\$ 1,600) under the Climate Change Project in 2014 to implement riverbank protection work.

Stone and gabion check dams were used along the Rapti River as a river protection measure under the river protection initiative. However, flooding damaged the gabion check dam and caused erosion (Figure 9). No specific engineering design within the implemented interventions considered the dynamics of the Rapti River during

PHOTO 2: DAMAGED RIVER BANK PROTECTION WORK IN BELA VDC, DANG DISTRICT

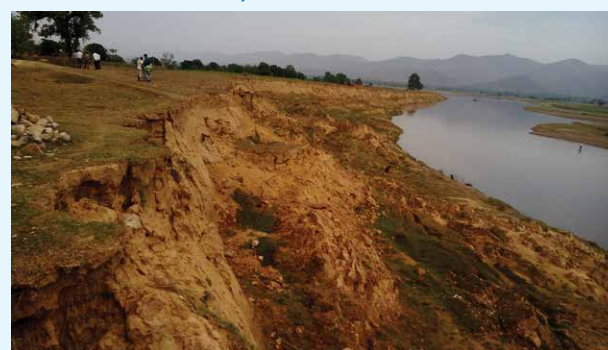


Photo: NCCSP

floods or the future scenarios of risk and impact from climate change. This example provides a strong case to illustrate the need to consider scientific and technical knowledge in identifying and designing technologies that can resist flooding and riverbank erosion.

Case study two: Landslide protection in Syalapakha

The Kauchhe Khajimela CFUG, Syalapakha, Rukum District, invested Rs. 42,750 (USD 470) and community labour to arrest landslides, targeting 84 households, in 2014. The households planted bamboo, broom grass (amriso), Persian lilac (bakaino), napier grass and Himalayan bamboo (nigalo) to protect the river bank from

erosion due to landslides. During the monsoon, however, the protected structure was completely eroded by a landslide. This happened because the community did not consider the changing pattern of rainfall and the long-term risks associated with landslides. Because of inadequate design, neither resources nor the community response could prevent destruction caused by the landslide. This is why climate change risk scenario should be considered in the design of development structures.

Case study three: Gharikhola drinking water supply project

The Drinking Water and Sanitation Subdivision in Rukum District implemented the Gharikhola Drinking Water Supply Project in Ward 2 of Ghartigau in Purtimkanda VDC, Rukum District. The project was started in 2010 and was completed in 2014 (Figure 9). Total budget for the project was NPR 980,000 (US\$ 9,800). The project beneficiaries were 60 households representing the majority Magar and Chhetri communities in the area.

During the visit to Purtimkanda VDC, it was found that the project almost failed due to lack of a climate-resilient design. Communities in Purtimkanda raised the issue of this project during FGDs. According to them, the spring's water had dried up, rendering the project a total failure. Water availability was reduced to 10 per cent compared to four years ago when the project was started. This case illustrates that the implementing agencies failed to consider the impact of climate change and the drying of springs and water sources. There was also a lack of analysis of future risks posed by climate change as the design only considered the current status of the resource.

In summary, it was found that most of the climate change adaptation activities were

PHOTO 3: WATER INTAKE OF GHARIHOLA DRINKING WATER PROJECT



Photo: Dinesh Acharya

development interventions rather than climate change adaptation. In the absence of climate change knowledge, the interventions were short-sighted and unsustainable. In hindsight, the communities also analysed that project activities were fragmented and mostly duplicated or copied previous development interventions without consideration of specific context differences. In truth, climate change will result in increasing uncertainty and variation of extremes temperature and drought. There will be fluctuations on a cyclical basis, with an overall increasing rise in temperature. What is needed is building the capacity of communities to deal with these fluctuations when they happen and to be able to have multiple coping mechanisms when things fail. Low cost, low technological solutions should be encouraged in this case.

work. The suggestions from communities indicate that they were more interested to have a knowledge sharing and learning mechanism at community level which could provide them with instant ways and knowledge of how to respond to climate change challenges at local level. The communities suggested that the learning and sharing mechanism should facilitate their access to innovations and technologies on how to respond to climate change more immediately and effectively. The communities suggested packaging and disseminating more applicable knowledge to respond to various

challenges and impacts of climate change at local level (Table 11).

The communities furthermore suggest that knowledge products be in the local language and easy to understand. In the FGD in Bela VDC, communities suggested making knowledge products that can help them solve some of the issues related to climate change they are currently facing. For example, they wanted locally useful techniques to control pests and disease outbreak and knowhow on how to apply them. In Putrimkanda VDC in Rukum District, communities interested to have direct

communication with the district line agencies in order to express their concerns related to farming systems and to get appropriate and timely advice.

The district-based government and NGOs in both Dang and Rukum Districts suggested having district- and local-level climate change knowledge-sharing and learning mechanisms. Stakeholders in Dang District suggested that central government establish climate change knowledge management centres. District agencies asked the central government and development agencies to invest more in generating applicable technologies and knowledge products to solve local climate change issues in their districts and communities. Stakeholders in Dang District wanted the central government to design a package of knowledge and technologies that can address issues in agriculture, water resources and infrastructure (Table 12).

The district-level stakeholders also suggested strengthening knowledge-sharing mechanisms among local institutions by organising regular interactions, information sharing mechanisms, meetings, etc. Stakeholders in Dang District demanded that the government take the lead in documenting and disseminating good practices and local knowledge and technology on climate change adaptation. In Rukum District, during the interview,

majority of the district line agencies recommended that the agencies concerned design and package climate change information and knowledge products based on local- demands.

4.5. Summary

This chapter analysed climate change knowledge at local level. The findings show that local knowledge of climate change was generated at community level. Communities hold rich experience and local knowledge of how climate change is impacting rural livelihoods. There is, however, scope for further strengthening and enriching the communities' knowledge through research and study. There is need to complement local knowledge with scientific studies and basic research in order to ensure reliability and validity of the information and knowledge generated at local level.

The chapter looked into the demand for climate change knowledge at community and district level and found that local-level actors were more interested in new and innovative technologies and skills and capacity to respond to climate change issues at local level. Furthermore, they demanded applicable and practical knowledge specific to agriculture, livestock, forestry, health, water and infrastructure, and issues and subjects relevant at

TABLE 11. COMMUNITY SUGGESTIONS AND RECOMMENDATIONS ON KNOWLEDGE MANAGEMENT

Dang	Rukum
<ul style="list-style-type: none"> • Establish a community resource centre at VDC level • Conduct orientation and empowerment classes about climate change in every tole and VDC • Use local language and communicate messages through wall paintings • Orient and train communities in climate change knowledge management to be delivered by local organisations and facilitated by local facilitators • Wall paintings and quizzes are effective; expand these initiatives to other areas • Envision community's role in knowledge generation and consolidation 	<ul style="list-style-type: none"> • Generate climate change knowledge and information as per the demand of communities and households • Increase technical capacity and human resource in climate change needs at VDC level • Focus more on understanding how climate change issues can be better addressed at local level • Link central-level knowledge to local-level knowledge • Transfer the practical and applicable knowledge advisories in time, for example, monsoon update and its implications for rice planting

Source: District-level workshops in Dang and Rukum Districts

TABLE 12. SUGGESTIONS OF DISTRICT LINE AGENCIES IN DANG AND RUKUM DISTRICTS

Dang	Rukum
<ul style="list-style-type: none"> • Establish VDC- and district-level climate change knowledge management centres • Prepare simple, easy to understand information kits in the local language • Disseminate local knowledge, experiences and practices through information kits • Policy-level interventions or policies should guide local-level knowledge management needs • Support human resource development or capacity building in climate change knowledge management • Document local knowledge and publication • Organise learning and sharing mechanisms such as community meetings, exposure visits, fairs and competitions • Establish resource centre at district and state level • Organise timely information sharing, for example, timely sharing of weather information for farmers 	<ul style="list-style-type: none"> • Design climate change course at primary school level for knowledge sharing • Transfer technical knowledge about material selection for infrastructure construction and other technical designs • Promote climate change field schools as part of knowledge transfer to farmers • Form model VDCs (one VDC one plan) demonstrating coordination among government offices and stakeholders • Enhance coordination among different partners working on climate change to promote learning and sharing mechanisms at local level • Promote knowledge generation aimed at looking at impacts of climate change in agriculture, food security and health, among others • Mandate government organisation at district level for research, knowledge consolidation and knowledge management.

Source: District-level workshops in Dang and Rukum Districts

local level. On the other hand, the supply of climate change knowledge was weak. The lack of sufficient information and knowledge of how to respond to climate change impact has created problems

of effectiveness of intervention. The findings imply that there is an urgent need to address the mismatch in the demand for and supply of climate change knowledge at local level.

Chapter 5

Climate change knowledge demand and supply at national level

This chapter discusses the demand for and supply of climate change knowledge at national level. It assesses the demand side of knowledge management at national level, with specific focus on the way knowledge and information are currently demanded. It highlights both successes and failures of climate change knowledge management at national level. Furthermore, it specifically provides examples of the progress made so far and the problems associated with knowledge management.

The chapter is divided into four sections. The first section dwells on generation of, and demand for, climate change knowledge at national level. The second section provides an overview of the national-level stakeholders' demand in relation to climate change. The third and fourth section assesses the supply of climate change knowledge at national level and its implications on integrating climate change knowledge in policy, planning and budgeting process. The fifth section outlines the suggestions and recommendations offered by the national stakeholders to improve knowledge management on climate change at national level.

5.1. Climate change knowledge generation at national level

Generation of climate change knowledge has expanded at national level. Most of this work focuses on understanding how climate change is impacting different sectors. As explained in chapter one, most of the knowledge generated at national level focuses on understanding the dynamics of glacier lakes, GLOFs, change in water regimes, impact of climate change on agriculture, and the potentials for carbon storage and carbon trading. In conclusion, most of the knowledge generated at national level concentrates in areas of water resources and agriculture, as can be garnered from knowledge products and information materials (Table 13).

TABLE 13. STATUS OF KNOWLEDGE GENERATION AT NATIONAL LEVEL

Thematic areas of climate change	What kind of knowledge	How it is generated	Who is involved in knowledge generation
Climate change adaptation	How communities and sectors have adapted to climate change impacts and what can be done to address the risks	Through research, document review, project learning or lessons	Researchers, academics, I/NGOs practitioners, NARC
Climate change mitigation	REDD, clean energy (biogas, solar, micro hydro, improved cooking stove)	Through research, piloting work and project learning	Researchers, government (AEPC) and INGO practitioners, CFUG networks
Climate change impacts	Impacts of climate change on agriculture, water, biodiversity, health and across region and gender	Through desk study, student research, perception mapping of communities	I/NGO practitioners, researchers
Climate change methodology and tools	How to carry out vulnerability assessment and adaptation planning	Through experiences in Participatory Rural Appraisal (PRA) and development engagement	Development practitioners, donor projects, I/NGOs
Climate change policy, strategies and action plans	National policy, strategies and action plans	Through donor-funded project support	Government, consultants, I/NGOs, donors

Source: National-level stakeholder consultation (February–June 2015)

NARC has carried out research to assess carbon dioxide increase and how crops respond under different temperature changes. It has also developed climate stress varieties to cope with droughts and floods. It has developed submergence-resistance rice (Swarna Sub 1 and Sub 2, Shamba mansuli) to address the problem of flooding and its impact on paddy cultivation. Furthermore, it has released stress-tolerant wheat varieties (Bijay and Gautam) and as an alternative variety (Tarahara-1) for wet and dry conditions. It has recommended direct seeding rice variety (Shukkha dhan) as the drought-tolerant variety for dry areas. The direct sowing method has added advantage, as it avoids zero tillage practice and thus reduces carbon emissions.

The government and I/NGOs have identified technologies suitable or adaptable to climate change. These include water-efficient technologies for dry conditions, water management practices to maximise water storage during monsoon and water usage during winter, improved cropping system and soil and nutrient management, and

improved early warning system for minimising flood hazards. Recently, Practical Action and LI-BIRD identified and promoted climate-smart agricultural technologies and the concept of climate-smart villages in different parts of Nepal. For example, Practical Action identified improved varieties and management practices for sugarcane and maize that can withstand climate stresses in the low-lying plain areas of Nepal. In addition, the government and I/NGOs have jointly piloted EBA approaches to demonstrate the concomitant benefits of adaptation and mitigation.

Some progress was made in generating information and knowledge regarding climate change mitigation and low carbon development path. AEPC implemented the Clean Development Mechanism (CDM) project in December 2005. It has invested in climate-resilient technologies such as biogas support programme, micro-hydro, improved water mill, improved cooking stove and expansion of solar home systems. MoFSC carried out work to generate baseline information on the carbon storage potentials of Nepal's forest resources and tested

climate-friendly practices such as the Payment for Environment Services (PES).

Most of the work of international and national NGOs focused on identifying tools and methods for assessing climate change impacts, identifying vulnerable sectors and communities, and designing appropriate adaptation technologies for climate change adaptation. NGOs were involved in developing specific methods and approaches for participatory vulnerability assessment and adaptation planning, carbon accounting, cost-benefit analysis, economic analysis, LAPA or CAP planning. For example, the Livelihoods and Forestry Programme (LFP), MSFP, Hariyo Ban and ICCA have supported communities to develop watershed-, VDC- and CFUG-level community and local adaptation plans.

Some achievements were made in generating knowledge related to improved forecasting and early warning system. The DHM is the lead agency for flood forecasting and it operates through its Flood Forecasting Division. The department maintains a web portal (www.hydrology.gov.np) that has station records and standardised alert and early warning system. Practical Action-Nepal pioneered to use these information to reach out to communities through a community-based early warning system

in several river systems in Nepal. UNDP has established a community based GLOF early warning system in Tsho Rolpa and an early warning system in the Imja Glacial Lake.

The findings of this study show that the available climate change information and knowledge has contributed to improved and science-informed planning and decision-making at national level. Out of the 34 respondents at national level, 10 said that the knowledge available on climate change was useful for them in designing climate change programmes and projects. Some of the interviewed stakeholders (n=4) said that the knowledge helped in formulation and implementation of informed policies and programmes. The knowledge increased the understanding of national-level stakeholders on climate change impacts on different sectors (Table 14). The findings also implied that the stakeholders did not use the available knowledge and information wisely in areas such as designing demand-based knowledge products for farmers and local communities.

The study shows that climate change knowledge generation was still scattered and disorganised. As expounded in chapter one, generation of climate change knowledge was not the priority of national-level institutions. Chapter two also concluded

TABLE 14. PERCEPTIONS OF USEFULNESS OF CLIMATE CHANGE KNOWLEDGE AT NATIONAL LEVEL

Benefits of knowledge sharing and management	National level (n=33)
Understanding the impact of climate change in different sectors	5
Building capacity of practitioners	3
Developing a plan and specific activities	3
Decision-making on resources investment	2
Assessing the effectiveness of interventions	1
Addressing climate-specific risks and impacts	4
Developing proposals and programmes	10
Developing policy and strategies	4
Mainstreaming climate change within the programme	2

Source: Consultations with national stakeholders

that knowledge generation focused only on some sectors and it was driven more by individual and institutional interests. Although generation of climate change knowledge has recently been reflected in the strategies of research institutions, these strategies are still inadequate.

There is also lack of a clear strategy on knowledge generation at national level. As many as 30 of the 34 stakeholders interviewed said that the government did not have a clear strategy on climate change research and knowledge management. In the absence of such a strategy and demand for knowledge generation at national level, knowledge generation is dispersed and disintegrated. In conclusion, the findings in this chapter indicate need for a clear strategy and a roadmap for climate change knowledge generation at national level based on community needs and demands.

5.2. Climate change knowledge demand at national level

Mapping the demands for climate change knowledge at national level shows the inclination of stakeholders to access evidence, technology and skills. The government stakeholders wanted more evidence for how climate change impacts the socioeconomic development and how the government should respond to the changes.

NGOs were more interested in finding practical application of knowledge of climate change technology and resources applicable to mountain farming, disaster preparedness, adaptation to changing climate in crop cultivation, response to droughts and floods, among others. Similarly, INGOs demanded more of technological and scientific knowledge and evidence that could guide them in designing climate change projects (Table 15).

The discussion at national level also brought to light that the demand for climate change knowledge among academic and research institutions was more towards having access and linkages to the international research centres. Researchers wanted more information on local and national demands on problems related to climate change. Development agencies, on the other hand, demanded more information and knowledge of how climate change is a major threat to development and the socioeconomic losses and costs associated with it. Donors were looking for more evidence to guide their decisions on resource investments and allocation. Mass media was interested in knowing the headline message on what and how climate change impacts the nation and society.

The discussions with the national-level stakeholders identified key areas for further research and

TABLE 15. DEMAND FOR CLIMATE CHANGE KNOWLEDGE AT NATIONAL LEVEL

Agencies	Knowledge demand
Government	More evidence-based policy, planning and financing guidance and information on areas to plan and prioritise, where to invest and how best to mainstream climate change in development; and capacity and skills to implement these adaptation measures
NGOs	More practical and applicable information, knowledge and technology on climate change, mostly how to implement and transfer skills and capacity
INGOs	Technological and scientific knowledge of which areas to prioritise and invest in, more skills and capacity to train communities to adjust to the changes
Academic and research institutions	Resource access for carrying out research and publications on climate change, more linkages with the outside world and scientific updates
Development agencies	More information and knowledge on how climate change is a major threat to development and knowledge on where to invest
Media	Simple headline messages on what and how climate change impacts Nepal and its rural communities

Source: National-level consultation and workshop

technological development. Stakeholders demanded more knowledge generation in the areas of understanding how climate change impacts the crop growth cycle and how to respond to climate change stresses on agriculture and natural resources and on hazards that affect communities. Water resources professionals were more interested to understand the causes of change in water dynamics

and knowledge of water-efficient management technologies. Forestry professionals wanted to understand how climate change impacts vegetation growth, vegetation shifts and changes in species composition. Likewise, the interest of health professionals was on disease patterns and public health implications of climate change (Table 16).

TABLE 16. SPECIFIC RESEARCH AND TECHNOLOGY NEEDS ON CLIMATE CHANGE AT NATIONAL LEVEL

Sectors	Research	Technology
Agriculture	<p>Understand how climate change is impacting the growth cycle of major crops (rice, maize, wheat, buckwheat), pulses (red bean, lentils, cowpea), fruits (apple, mango); shifting of crops, mostly how temperature variation could impact flowering, fruiting and ripening stages of fruits and crops for mid-hills, terai and mountains</p> <p>Pest and diseases: how temperature and rainfall variability could trigger an environment for new pest and disease emergence</p> <p>Livestock sector needs more evidence mostly of how to develop stress-tolerant livestock feed (fodder and forage)</p>	<p>New seeds and varieties of cereal crops (rice, maize, wheat)</p> <p>New seeds and varieties of fruits (apple)</p> <p>Technologies that can make crops grow under extreme conditions such as over-flooding, drought, hailstone</p> <p>Need for further experiments using closed chambers</p> <p>Modelling of vulnerability of crops</p>
Water Resources	<p>Understand the dynamics of water resources, for example how climate change is impacting the drying of water springs and natural wells.</p> <p>Study of water basin and how climate change impacts the water flow and water storage system</p>	<p>How to manage excess water during the monsoon and shortage of water during lean water periods (winter)</p> <p>Technologies that can retain water and efficiently manage water supply</p> <p>Need for a permanent water resource monitoring stations</p>
Health	<p>How disease patterns are changing under climate change. Which diseases are expanding, or which disease or health issues are caused by changes in climate.</p>	<p>Health management practices to cope with climate change issues</p>
Forest and Biodiversity	<p>How the phenological characteristics (seed germination, flowering, fruiting and growth) of forest and NTFP species are changing.</p> <p>Has vegetation shifted due to climate change? Which are the species being rendered extinct and which new species are emerging? Is climate change impacting the habitat of wildlife? Why are invasive species like banmara expanding?</p>	<p>Technologies for improved germination of nursery seeds</p> <p>Improved methods for accounting carbon capture and storage</p> <p>National Forest Information System/</p>
Disaster	<p>Highly précised disaster data and information on science</p> <p>Drought, landslide, flooding monitoring data</p>	<p>Hazard Map and Hazard monitoring tools</p>
Tourism	<p>Specific study to identify the impact and implications of climate change for the tourism sector and communities dependent on it.</p>	<p>Impact study and scoping for adaptation interventions</p>
Urban	<p>Look at how urban sector will be impacted by climate change and how to make urban sector more climate resilient</p>	<p>Pilot projects on Urban resilience and Climate-Smart cities</p>

Source: National consultation and workshop

During the national workshop on climate change knowledge management, the participants mentioned evidence-based, sector-specific knowledge and technology for policymakers as necessary. The existing policies are sound; yet policymakers should be supported with more practical and evidence-based sector-specific climate change knowledge, technologies and skills. Loopholes and grey areas exist within the policies, which could undermine knowledge management adaptation work. For example, the existing policies (Climate Change Policy and sectors development policies) put more emphasis on implementation on adaptation activities without recognising that knowledge generation is an important aspect of knowing what practice or technology or activity is suitable to reduce the location- and community-specific risks and hazards. Knowledge management support to policy could help the government implement appropriate policies and programmes. There was a suggestion to focus on research and linkage of the research work with climate change science and practices.

5.3. Knowledge supply at national level

This section discusses the supply of climate change knowledge. It particularly looks into how climate change information can be consolidated, processed, packaged and disseminated to users at national level. It also looks at the major agencies involved in climate change knowledge management and their contributions to knowledge consolidation and dissemination.

The desk review and consultation with stakeholders showed that there is good progress on climate change knowledge management at national level. As discussed in chapter one, there are various institutional mechanisms and modalities for knowledge management at the centre. One of the major knowledge suppliers of climate change is the NCKMC managed by NAST. The

centre was engaged in generation, consolidation and dissemination of knowledge. The NCKMC also manages the Nepal Climate Change and Development Portal (www.climatenepal.org.np) for consolidating information, forging discussions among users and increasing access of users to climate change knowledge.

Apart from the NCKMC, CCNN and NGO Network on Climate Change (NGONCC) have been actively disseminating and conducting discussion on climate change related events, reports and relevant information in the online Google groups since 2009.

AEPC within MoSTE has established CCU. Its mandate is to act as a knowledge centre for climate change adaptation and mitigation. In addition, the MoFSC has established REDD Implementation Centre. The centre was engaged in coordinating with stakeholders engaged in the REDD sector to undertake REDD readiness activities in Nepal. The centre has also established mechanisms for learning and sharing among the forestry stakeholders. Within the forestry sector, there is Forestry Nepal which is a web-based knowledge sharing mechanism. The website aims to facilitate online networking, provide a platform for sharing news and information on the forestry sector in Nepal, and to promote forestry science to the general public.

MoAD, with support from the SPCR, has developed Agriculture Management Information System (AMIS)¹⁸. The prime objective of this system is to provide critical and timely agro-climate and weather information to farmers in order to increase productivity and reduce losses from meteorological and hydrological hazards. Farmers, farming communities and other stakeholders all over the country can equally obtain relevant agro-climatic and weather information disseminated through the ICT-enabled AMIS web portal, linking the AMIS portal into World Agro-Meteorological Information Service (WAMIS) (<http://www.wamis.org>).

¹⁸ MoAD. www.namis.gov.np

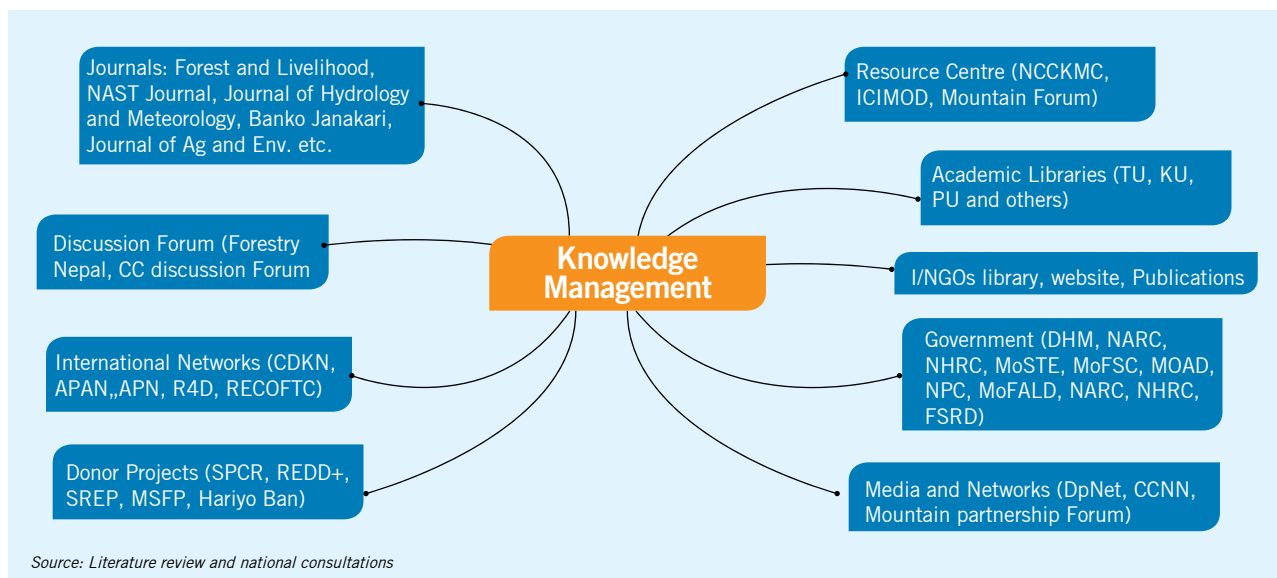
The DHM also manages a climate change web portal. This portal aims to increase access to information on climatic data and information. Besides the government, international organisations like ICIMOD are managing a knowledge management hub for climate change-related knowledge consolidation and sharing. Other regional networks such as the CDKN, the Centre for People and Forests (RECOFTC), Asia Pacific Adaptation Forum (APAN), Mountain Forum, Asia-Pacific Network, Adaptation Forum and others supply climate change-related information and knowledge (Figure 10).

Bilateral and multilateral donor-funded projects on climate change were also a major source of climate information and knowledge at national level. Projects funded by the ADB, World Bank (WB), UKaid, USAID and Danish Embassy supplied climate-relevant information and knowledge to government policymakers and practitioners. In addition, INGOs, NGOs and academic institutions have delivered climate change information and knowledge through publications, web sites, web portals, workshops and training events.

These vast and diverse efforts notwithstanding, climate change knowledge management initiatives at national level were overall infrequent and often disorganised and duplicated each other in both scope and functions. For example, within MoSTE, three major knowledge management mechanisms have similar roles and mandates. Both the NCCKMC and CCU are mandated to manage climate-related knowledge. Similarly, the NCCKMC and DHM have climate change portals for data storage and management. Clearly, climate change knowledge management initiatives are not well-coordinated and connected.

There were often weak linkages between various knowledge management centres at national level. Majority of the national stakeholders consulted (30 out of 34) said that the NCCKMC, DHM, CCU and ICIMOD's Knowledge Management Centre lacked functional coordination among each other. In addition, academic institutions and their respective knowledge management units such as libraries have poor linkages with the climate change knowledge management centres. Besides ICIMOD, most of the knowledge management centres at national level were only engaged in collecting and sharing information without any consolidation, packaging and processing.

FIGURE 9: KNOWLEDGE MANAGEMENT AT NATIONAL LEVEL



The Google survey of 54 national-level stakeholders and users of the NCCCKMC showed that there were problems with the knowledge management centre. The majority of the survey participants felt that the NCCCKMC was not functioning satisfactorily. They identified issues around poor management of knowledge management portal, inadequate sharing of information and weak networking among knowledge partners. More than 52 per cent of the participants perceived that the NCCCKMC had made insufficient efforts on increasing public access to information and increasing networking and collaboration with other organisations. The survey results also showed that the NCCCKMC's role in processing and packaging knowledge and information was unsatisfactory.

In summary, the survey of the NCCCKMC showed that the climate change knowledge management centre was functioning in an ineffective manner. Another major challenge of knowledge management at central level is the functioning, sustainability and effectiveness of the centre. The existing knowledge management centres (such as NCCCKMC, CCU) were established through project financial support. Once the project was completed, the operation and sustainability of these institutions suffered. For example, the NCCCKMC was active and functional when NAPA provided financial resources and it also worked quite well

during the period it was receiving support from the CKDN. However, recently it had problems with continuing the activities it carried out with NAPA and CDKN support. For example, the operation of the Nepal Climate and Development Portal could not be continued and the portal was not functioning satisfactorily. The recent review of the portal shows that it has not updated its knowledge products. Likewise, its discussion forum was non-functional and news and information sharing was irregular (Table 17). In conclusion, the findings imply that the challenges of knowledge management at national level are continuity, sustainability and operational functioning.

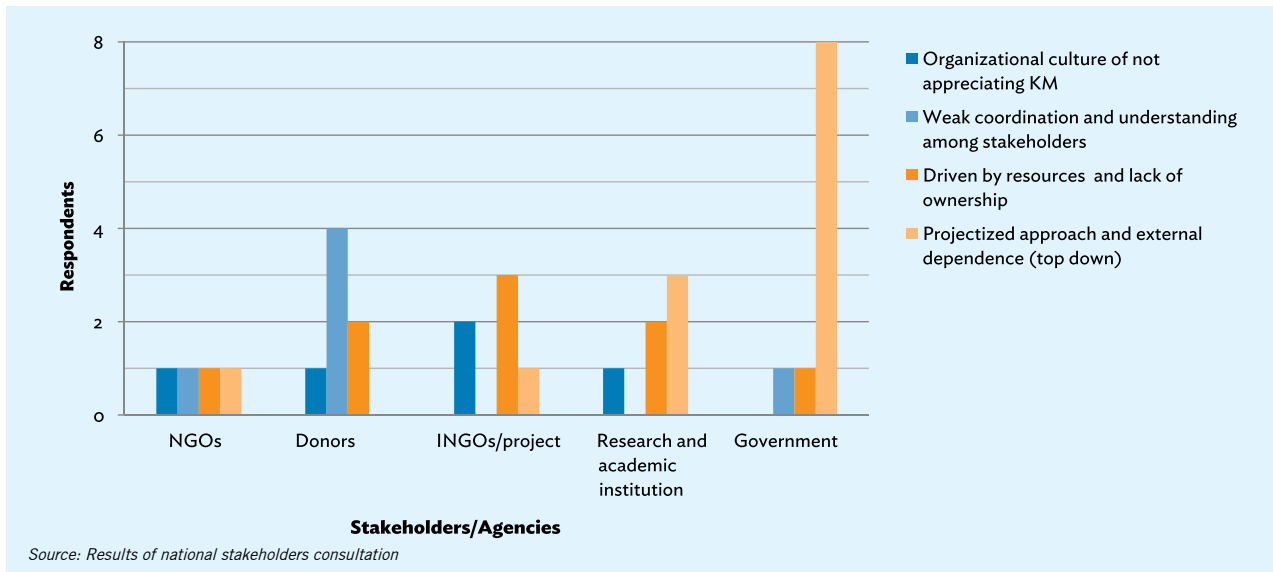
In addition, during the national-level consultations, stakeholders provided several insights into the constraints on effective climate change knowledge management at national level. Government stakeholders and research and academic institutions felt that knowledge management work was more project-based, top-down, donor-dependent and external funding agency-driven. For example, the DHM is now facing problem in the operation and maintenance of the climate portal because the consultant who was responsible for establishing the portal left after the project was over. There was almost no skill and knowledge transfer from the consultant or the project.

TABLE 17. ISSUES OF THE KNOWLEDGE MANAGEMENT PORTAL

KM aspects or dimensions	Climate change and development portal
Layout and content, capacity	Contents limited and not attractive Limited to 6 GB (1 GB increased recently)
Resources	Contains only 123 publications (4 publications of 2014 and 1 publication of 2015)
Knowledge partners	51 national institutions listed and it is only limited to national actors registered with the portal in 2010; 20 projects are listed but outdated
Discussion	Discussion board is included in the web page but no such listing of discussions
News and information sharing	Only news and information of 2014-08-12 is included. Events, jobs, training are included in the website under resources but there is no information
Access (visitors)	Not known

Source: Desk review as of August 2015

FIGURE 10: LOOPHOLES IN CLIMATE CHANGE KNOWLEDGE MANAGEMENT AT NATIONAL LEVEL



Development agencies have different views and argue that weak coordination among agencies and lack of understanding were the major bottlenecks in climate change knowledge management. International and national NGOs, on the other hand, perceived that lack of resources and little ownership by stakeholders were the constraints on climate change knowledge management in Nepal (Figure 11). The findings imply that organisational culture, unfavourable knowledge sharing and management, weak coordination, a top-down, donor-driven approach and lack of ownership are the major bottlenecks in climate change knowledge management in Nepal.

5.4. Implications of climate change knowledge management at national level

There are positive implications of a working knowledge management centre at national level. The supply of knowledge at national level has contributed in no small measure to changing the policy landscape of Nepal. Policy advancement on climate change happened quickly because knowledge, information and evidence for climate change have been available at national level. Institutional and financial mechanisms have also been in place to drive the climate change

agenda forward. For example, advancement in climate change knowledge in Nepal has helped in financially leveraging and attracting funding from international and national bilateral sources. Currently, numerous projects and programmes on climate change are being implemented at community level by the government and INGOs.

Several issues and the lack of a strategic focus on climate change knowledge management in Nepal have, however, affected the flow and progress of climate change knowledge management for the community's benefit. The majority of the central-level stakeholders interviewed (31 out of 34) argued that the absence of specific knowledge generation and transfer and climate change interventions has resulted in failure to address climate risk and impact at community level. Most of the development activities were treated as climate change due to the absence of knowledge of what should constitute adaptation activities. Policymakers were more concerned about the issues of translating policies into action. According to them, they had limited knowledge of how to design climate change activities and how to prioritise them (Table 18).

One of the major challenges in lack of knowledge transfer was treating development as climate

change. There were issues of attribution. For example, the budget code identifies 10 major climate relevant programmes which are mostly traditional development activities. There are often mismatches in defining climate relevance and attributing development activities to climate change. There were also issues of existing capacity and skilled human resources within the government for planning and implementing climate change interventions. There is low level of knowledge and understanding among practitioners and planners about what should be done differently in climate change. The findings imply that there is a chance to dilute and fragment climate change agenda if it is treated synonymous to development.

The lack of knowledge and skills was already impacting the quality of service delivery and technology transfer in climate change. As discussed in chapter two, several maladaptation practices generated from the lack of skill and knowledge transfer on climate change to practitioners and community members. All national-level stakeholders interviewed (n=34) felt that knowledge and skill transfer was inadequate at implementation level. The findings imply that, in the absence of sufficient knowledge and information on climate change, the interventions at national and local level would fail to respond effectively to climate change impacts.

5.5. Suggestions on improving the knowledge management system in Nepal

Suggestions and feedback were provided by the national stakeholders during the interview and at the national-level workshop. Majority of the interview participants saw the need to harmonise the current knowledge management centre and institutional mechanism to bring more synergy and collaboration in knowledge management work of different organisations. They also suggested an independent knowledge management network with a clear strategic vision of knowledge management. Furthermore, they suggested that the knowledge management centre should have a roadmap on how it wants to function and operate efficiently and in a more effective manner, addressing the previous problems of inefficiency, ineffectiveness, and lack of synergy and coordination.

The national-level consultation meeting also highlighted several other areas of climate change knowledge management. Consolidation of knowledge is important to bring various data and information sources in a common place or platform. Stakeholders also suggested review, validation and processing and packaging of useful and applicable knowledge based on local and national demands and user requirements. Some

TABLE 18. SOME ISSUES OF LACK OF KNOWLEDGE MANAGEMENT FOCUS AT NATIONAL LEVEL

Categories	Implications
Policies and strategies	a) How climate change knowledge feeds into the policy making, planning, budgeting and implementation; b) Translation of policies into action (how to do?)
Projects and programmes	Additionality and attribution issues (how climate change is different from development; is it old wine in a new bottle or different?)
Institutional mechanism	Capacity and leadership
Financial mechanism	Budgeting and planning issues, Attribution issues, mismatches in climate change relevance (e.g. budget code), Lack of monitoring and evaluation mechanisms, translation of 80% financing at the community level
Sectoral focus and plans	Lack of clarity on what specific things we can do in climate change

Source: National-level consultation, 2015

stakeholders suggested development of policy briefs that contain basic messages about the findings of national and international research in specific subject areas, targeting differences within users and clients. The majority of those interviewed suggested developing knowledge products in form like technology and information kits and knowledge packages for communities, local agencies, practitioners and policymakers.

Suggestions were also received to improve communication and dissemination mechanisms at national level in order to improve knowledge transfer and increase access of vulnerable households and communities to climate change knowledge products. They suggested establishing two-way information and knowledge flow to bridge the gap between the demand for and supply of climate change knowledge. Some stakeholders suggested bundling knowledge products into advisory packages to suit the various user and client needs in Nepal.

During the national-level workshop, some stakeholders offered the following suggestions to improve the demand for and supply of climate change knowledge management. These recommendations were mostly meant for MoSTE and NCKMC:

- Mainstream climate information services into policy making, planning and budgeting at national and local level. There should be a mechanism through which information and knowledge on climate change feeds into policy and planning at various levels.
- Improve mechanisms for linking climate change knowledge at local level. There should be a regular, forward-looking and lively mechanism linking local with national-level demand and need for knowledge so that demand for information can be understood. This mechanism will help in generation, processing, packaging and dissemination of knowledge.
- Ensure knowledge supply. Supply should focus on knowledge pulling, processing, packaging and dissemination at all level through local media and knowledge products.
- Make client-oriented knowledge products. The climate change knowledge product should consider the demands of target groups or clients, sector-specific knowledge requirements and reliable knowledge products.
- Expand knowledge users and networks to include private sector. Involvement of the private sector in knowledge management is crucial to ensure its role and contribution to knowledge generation and communication.
- Consider the knowledge interface. Climate change knowledge management should consider the knowledge interface and include climate change in existing technology and practices and incorporate it in policy.
- Strengthen the processing and packaging of climate change information and knowledge. Knowledge processing should be on the basis of target users (policymakers, researchers and practitioners). Sort information on the basis of product type (journal, book and poster). Information and knowledge products need to be packaged on the basis of theme and clients' needs.
- Improve communication and dissemination mechanisms. The communication and dissemination mechanism should consider two-way information flow, mode of dissemination (hardware and software), language compatibility and means of communication. The NCKMC should be responsible for appropriately channelling information to its users.
- Improve access to information and knowledge. One of the major issues of climate change knowledge management is access of users to information and knowledge. Priority should be given to making the knowledge management system easier and more efficient so that it can increase users' access to knowledge. Another issue is appropriateness of knowledge materials. Knowledge clients should have

access to useful and applicable materials which can assist them in decision making.

5.6. Summary

This chapter analysed the demand for and supply of climate change knowledge at national level. It explored the demand side of knowledge management at national level with specific focus on the way knowledge and information are currently demanded at national level. The findings identified both successes and failures of climate change knowledge management and analysed the causes of success and failure.

This chapter shows that there were numerous knowledge management networks and organisations working in knowledge generation at national level. The bulk of knowledge that is generated on climate change is, however, not accessible to the public. Even with regard to accessible knowledge, there are issues of their applicability and usefulness. The study also found climate change knowledge demand higher at national level. Majority of the national-level stakeholders demanded evidence that potentially support their planning and decision-

making. Stakeholders also urged to have more focused policies and strategies on knowledge generation based on local and national needs.

Analysis of supply side climate change knowledge at national level shows that climate knowledge was scattered, fragmented and disorganised. There is also inadequate knowledge sharing among the institutions involved in climate change. Although many institutions and knowledge centres generate and manage climate knowledge, synergy and linkages were lacking among knowledge centres. Disorganised knowledge management at national level has negative implications for ensuring smooth access of local and national-level stakeholders to climate knowledge and exchange of information and knowledge among stakeholders. The findings imply that a harmonised and coordinated approach to knowledge management is necessary at national level. It also means that the government, private sectors and civil society should work together to make best use of climate change knowledge in improving the policy making, planning, budgeting and execution of adaptation and mitigation measures.

Chapter 6

Conclusion and recommendations

Chapter six outlines the study's conclusion and recommendations based on its major findings. It summarises the outcomes of the consultations and field visits carried out at local and national level. The chapter also provides practical recommendations for improving effectiveness of climate change knowledge management at national level. A section of this final chapter includes scope for further and future studies.

6.1. Conclusion

Chapter two highlighted the overall landscape of climate change policy and institutional mechanisms in Nepal. The findings show that climate change policy was not a barrier to climate change knowledge management in Nepal. Policies in Nepal are progressive and have given strategic direction to the need to strengthen knowledge generation and managing and increasing stakeholders' access to climate knowledge. However, there are challenges towards implementation of policies and action plans. The lack of strategic focus of development agencies and government financial mechanisms are barriers to knowledge management in Nepal.

Climate change is a growing interest and is becoming a major investment pillar and focus of international and national NGO. There are pieces and parcels of work on climate change knowledge generation and management. Most of the work of I/NGOs are, however, more project-focused, accountable to funding agencies and short-term. The knowledge generated from projects and programmes of I/NGOs often fulfilled project objectives, but they are not shared with the wider public.

An increasing number of academic research institutions and researchers are engaged in climate change knowledge generation. Knowledge generation often mismatches actual demands of local and national stakeholders. Most of the knowledge generated is either too academic or too

technical and lack relevance to policy and practices. Research is also guided by personal interest and thus fails to generate practical and applicable knowledge.

Chapter three provided information and analysis of data sources and knowledge products available in Nepal. The information shows that there was some level of climate relevant data generated recently by the DHM, including some research institutions. There were, however, issues of inadequacy, reliability and applicability of data sources. The existing data generating system was insufficient to capture the diverse ecological landscape and variations. The findings imply that there is need for more grounded and applicable information on climate change.

The generation of knowledge products through publication in journal articles and books has improved drastically in recent years. The engagement of Nepalese professionals and researchers in publications has rapidly increased in recent years. Most publications are, however, not easily accessible to policymakers and the general public. This has raised questions on the applicability and usefulness of the publications. Some sectors, such as health, tourism and energy are lagging behind in publications. The findings conclude that knowledge generation has to be wider and broader in scope to include the lagging knowledge sectors of health and energy.

Chapter four looked at climate change knowledge demand and supply at local level. The findings show that the community's local knowledge and first-hand experience in climate change contributed in a major way to knowledge generation, which helped the communities understand the physical changes and impact of climate change on local resources and livelihoods. However, knowledge supply was limited to projects. The chapter provided some examples of how adaptation activities could be a failure in the absence of climate change knowledge.

Local communities and district agencies demanded more investment and support in terms of generating

information on and knowledge of how climate change is impacting the communities and their livelihoods. The communities also demanded skill, knowledge and technology transfer in areas such as agriculture, forestry, health, development and infrastructure. The chapter outlined some of the challenges of knowledge management at local level. The challenges were mostly related to limited access to information and knowledge at district and community level, weak coordination among agencies and poor learning and sharing mechanisms.

Chapter five assessed the demand for and supply of climate change knowledge at national level. At national level, information and knowledge helped the national government and stakeholders formulate informed national policies, strategies and projects and help source financial resources to implement projects. Compared to the positive contribution, there were more issues at national level in terms of how lack of knowledge and information had an impact on the quality of services and the planning process. In the absence of climate change knowledge, there were issues around policy implementation and attribution in terms of why climate change is different from development.

In conclusion, most of the results and findings presented in this paper are new findings which contribute to body of knowledge. It also supports the previous findings of the work carried out by various agencies. The findings show the disparity between the demand for and supply of climate change knowledge at local and national level. Most of the initiatives on climate change knowledge generation and management were short-term and fragmented. In the absence of a clear strategy and well-coordinated responses or action knowledge management initiatives had little contribution to improving policy and practices in Nepal and preparing communities in advance to the changes. The findings also reveal that the lack of systematic knowledge generation and flow, climate change responses at community level were ineffective and had little impact on reducing climate risk and vulnerable and poor households and communities.

6.2. Recommendations

The study has come up with some recommendations for improving climate change knowledge management in Nepal. These recommendations are meant specifically for MoPE as it is the focal ministry for coordinating climate change in Nepal. Some recommendations are for the NCKMC to consider for strengthening efforts for better information sharing and networking among knowledge partners. The recommendations should also be considered by relevant development agencies and international organisations as climate change knowledge partners while providing technical and financial resources for MoPE and the NCKMC.

RECOMMENDATIONS FOR MoPE AND OTHER NATIONAL-LEVEL CLIMATE CHANGE STAKEHOLDERS

a. Develop a national climate change knowledge management strategy and action plan

There is need for an overarching, integrated and visionary climate change knowledge management strategy at national level. The strategy should have a clear vision and a technical, institutional and financial roadmap. The strategy should also have both short- and long-term action plans that focus on a research strategy outlining local and national demands; a knowledge consolidation approach and action plan; knowledge packaging and processing; a knowledge dissemination and communication plan; and knowledge use. Furthermore, the strategy should clearly mention how it intends to promote collaborations, linkages and networks with local, sub-national, national and international resource centres and knowledge users and partners.

b. Develop a national research strategy on climate change

One of the urgent needs in relation to climate change knowledge generation is developing a research strategy based on local and national demands. The research strategy should categorically list all the major areas of research in various climate sensitive sectors. For example, the national-level research strategy for agriculture should

include the problems in the farming system such as crop productivity, pest and disease outbreak, and crop growth. This strategy should be the guiding knowledge generation strategy of the government, donors, research organisations and the non-government sector.

c. Generate climate change knowledge advisory

The demand at local level is for climate knowledge advisories, which refer to sector-specific advisories on climate change responses based on households' and communities' needs. Knowledge advisories should contain a composite of products, technology and materials, along with associated knowledge and capacity to disseminate them. The experiences of MoAD and Practical Answers on information knowledge management and responding to farmers' queries could be used as lessons to generate climate change knowledge advisories.

d. Enhance the capacity of national research and academic institutions

The national research institutions should play a major role in generating climate change knowledge. The agriculture, health, forestry and science and technology research centres should be supported in building their institutional capacity and human resources so that they can lead climate change research in their respective sectors. There is also need for providing access to funding. The academic skills and capacity in carrying out climate change research should be enhanced. In the academic sector, it is necessary to forge alliances between the natural and the social sciences to generate more applicable knowledge.

e. Enhance organisational responses to knowledge management

Individual and institutional commitment is needed to ensure sustainable mechanisms for climate change knowledge management. It is necessary to change the mindset and the working culture of individuals and institutions and to focus on changing our working culture into one that enables learning and sharing and appreciating what others have done and how we can contribute. For example, the shared learning dialogue promoted by ISET-

Nepal could be further scaled up and internalised to promote the learning and sharing mechanism. Climate change knowledge management should be part of the institutional strategy and priority of the government, development agencies and the private sector.

f. Invest in generating more climate-specific knowledge of knowledge-deficit sectors

It is necessary for the government and development agencies to invest in research and knowledge generation work specific to sectors such as health, energy, tourism and urban, which are not currently explored or researched. At least one detailed climate change impact assessment report, like the report on vulnerabilities, including climate change atlas laying climate information and vulnerability maps, should be developed every three to five years.

g. Promote use of climate change knowledge for improved policy formulation, planning and decision-making

The evidence-based policy making, planning and budgeting should be the priority at national and local level. The government and civil society along with other stakeholders should work together to develop mechanism and strategies to exchange information and knowledge on climate change that can feed into the policy making, planning, budgeting and implementation.

RECOMMENDATIONS FOR NCKMC

g. Harmonise and link the existing knowledge sharing and learning platforms at national level

There is need for harmonising and linking various knowledge-sharing and learning platforms. This could be done by developing at least one or two common learning and sharing platforms at national and local level. The learning and sharing platforms could be sectoral or general and can be an opportunity to create synergy and collaboration among institutions working on climate change knowledge management. This national platform should build regional collaborations to improve exchange of knowledge, information and methods within and between countries.

h. Address the mismatch between demand and supply by linking local demand for and supply of climate change knowledge management

In order to address the mismatch between local knowledge demand and supply, there is need for developing mechanisms on how local and district demands can be considered while developing a national knowledge management strategy and action plan. This mechanism will also help link local and national-level stakeholders to exchange information and knowledge on climate change. This can be done by establishing district-level climate change knowledge management centres and linking them with an existing national-level centre such as the NCKMC.

i. Decentralise climate change knowledge management

Knowledge management needs to be decentralised to translate learning into action. Decentralising knowledge means establishing both knowledge generation and management mechanisms at district and community level. The knowledge generation and management role can be played by government line agencies, research institutions or academic institutions.

j. Improve quality and content in sources of knowledge

The quality of sources of information needs to be improved to make knowledge more applicable, reliable and useful. Knowledge products should be tailor-made to suit users' demand. There is also a need for a committed institution that manages climate data and regularly carries out monitoring. The NCKMC should be further strengthened to ensure quality and content of the sources and its information and knowledge.

k. Engage the private sector in climate change knowledge management

The private sector should be engaged in climate change knowledge management. They can play a role in packaging and processing climate change information and knowledge. For example, the private sector could be engaged in producing knowledge products and in managing the information and communication system.

References

- Agrawala, S., Raksakulthai, V., van Aalst, M., Larsen, P., Smith, J., & Reynolds, J. (2003). Development and climate change in Nepal: Focus on water resources and hydropower. *Organization for Economic Cooperation and Development, Paris, 64*.
- Ahlborg, H., & Nightingale, A. J. (2012). Mismatch between scales of knowledge in Nepalese forestry: Epistemology, power, and policy implications. *Ecology & society, 17*(4).
- AIT-UNEP RRC.AP. (2010). The Scoping Assessment on Climate Change Knowledge Platform in Nepal – Summary. Regional Climate Change Knowledge Platform for Asia and ISET Nepal.
- Baul, T. K., & McDonald, M. A. (2014). Agro-biodiversity management: using indigenous knowledge to cope with climate change in the Middle-Hills of Nepal. *Agricultural Research, 3*(1), 41-52.
- Baul, T. K., Ullah, K. A., Tiwari, K. R., & McDonald, M. A. (2013). People's local knowledge of climate change in the Middle-Hills of Nepal. *Indian J Tradit Knowl, 12*(4), 585-595.
- Climate Change Network Nepal - CCNN. (2011). Governance of Climate Change Adaptation Finance in Nepal. Briefing Paper. Kathmandu. Nepal.
- Davis, M. & Li.L (2013). Understanding the Policy Contexts for Mainstreaming Climate Change in Bhutan and Nepal: A Synthesis. Regional Climate Change Adaptation Knowledge Platform for Asia, Partner Report Series No. 10. Stockholm Environment Institute, Bangkok. Available online at www.asiapacificadapt.net or www.weADAPT.org.
- Gautam, M. R., Timilsina, G. R., & Acharya, K. (2013). Climate change in the Himalayas: current state of knowledge. *World Bank Policy Research Working Paper, (6516)*.
- Ghimire, S. (2010). Climate Change in Nepal/Himalaya: A Bibliography. Martin Chautari. Kathmandu, Nepal.
- Government of Nepal. (2004). First National Communication Report Submitted to UNFCCC. Kathmandu, Nepal.
- Intergovernmental Panel on Climate Change- IPCC. (2014). Fifth Assessment Report on Climate Change. UNFCCC. www.ipcc.ch
- Jennex, M. E. (Ed.). (2006). Knowledge management in modern organizations. Igi Global.
- Lebel, L. (2014). Closing knowledge-action gaps in adaptation to climate change in the Asia-Pacific region. *International Journal of Environment and Sustainable Development, 13*(2), 204-222
- M.L. Shrestha. (1997). "Development of Climate Change Scenarios with Reference to Nepal" developed by M.L. Shrestha and published in Proceedings of the Workshop on Climate Change in Nepal. Vol. 25.
- Maraseni, T. N. (2012). Climate change, poverty and livelihoods: adaptation practices by rural mountain communities in Nepal. *Environmental Science & Policy, 21*, 24-34.\
- Ministry of Forest and Soil Conservation (MoFSC). (2015). Forest Policy 2015. Government of Nepal.
- Ministry of Science, Technology and Environment (MoSTE). (2010). National Adaptation Programme of Action (NAPA). Government of Nepal.

- Ministry of Science, Technology and Environment (MoSTE). (2011). National Climate Change Policy 2011. Government of Nepal.
- Ministry of Science, Technology and Environment (MoSTE). (2015). Draft Local Carbon Economic Development Strategy of Nepal. Government of Nepal.
- Ministry of Science, Technology and Environment (MoSTE). (2012). Three year reform plan 2012/13 to 2014/15. Government of Nepal
- Ministry of Science, Technology and Environment (MoSTE). (2015). Indigenous and Local Knowledge and Practices for Climate Resilience in Nepal. Mainstreaming Climate Risk Management in Development, Ministry of Science, Technology and Environment (MoSTE), Kathmandu, Nepal.
- Ministry of Agriculture Development (MoAD). (2015). Agriculture Development Strategy, Government of Nepal.
- National Agriculture Research Council (NARC). (2010). NARC's Strategic Vision for Agricultural Research (2011-2030). Meeting Nepal's Food and Nutrition Security Goals through Agricultural Science & Technology. Government of Nepal.
- National Health Research Council (NHRC). (2011). National Health Research Policy of Nepal. Ministry of Health and Population. Government of Nepal.
- National Planning Commission (NPC).(2015). Thirteenth Five-Year Plan. Government of Nepal.
- NCKKMC. (2014). Final Evaluation: Support to Strengthening Nepal Climate Change Knowledge Management Center. NAST
- Regmi, B. R., & Bhandari, D. (2013). Climate change adaptation in Nepal: Exploring ways to overcome the barriers. *Journal of Forest and Livelihood*, 11(1), 43-61.
- Regmi, B. R., Star, C., Paudyal, A., & Karki, R. C. (2015). Strengthening Climate Change Adaptation in Nepal: Needs and Perspectives. In *Climate Change in the Asia-Pacific Region* (pp. 245-262). Springer International Publishing.
- Regmi, B. R., L. Thapa, R. Suwal, S. Khadka, G.B. Sharma and BB. Tamang. (2009). 'Agro-biodiversity Management: An Opportunity for Mainstreaming Community-based Adaptation to Climate Change'. *Journal of Forest and Livelihood* 8(1):113-121.
- Regmi, B., & Bhandari, D. (2012). Climate change governance and funding dilemma in Nepal. *TMC Acad J*, 7(1), 40-55.
- Regmi, B.R. (2015). Identifying operational mechanisms for mainstreaming climate change adaptation in development in Nepal. PhD Thesis. Flinders University, South Australia.



NEPAL ACADEMY OF SCIENCE AND TECHNOLOGY (NAST)

ACTION ON CLIMATE TODAY (ACT)

Action on Climate Today (ACT) is a five-year initiative that works closely with governments (Afghanistan, India, Nepal and Pakistan) to develop strategies to combat the impact of climate change. Funded by the UK Department for International Development (DFID), ACT began in 2014 with the aim to help partner countries integrate climate change into their policies, plan and budgets. We provide active support in the following fields.

- Support the design and delivery of climate resilience.
- Promote investments for climate compatible development.
- Build the climate change knowledge of decision makers.
- Attract further climate change investment from the public and private sector.

ACT believes that only a collective effort will help us solve one of the biggest problems facing humanity. Join us. We must ACT Today.

ACTION ON CLIMATE TODAY (ACT)

OPM New Delhi Office, 4/6 First Floor
Siri Fort Institutional Area
New Delhi 110049, India
Tel: +97 11 48081111
E-mail: info@actiononclimate.today
Website: www.actiononclimate.today

NEPAL ACADEMY OF SCIENCE AND TECHNOLOGY (NAST) NEPAL CLIMATE CHANGE KNOWLEDGE MANAGEMENT CENTER (NCCKMC)

Khumaltar, Lalitpur, Nepal
GPO Box: 3323, Kathmandu
Tel: +977 1 5547715, 5547717
E-mail: ncckmc@nast.gov.np
Website: www.ncckmcnast.org.np
Web Portal: www.climatenepal.org.np

PRACTICAL ACTION

Indira House, House No.1114
Panipokhari, Kathmandu, Nepal
Tel: +977 1 4423 639, 4423 640
E-mail: practicalaction@practicalaction.org.np
Website: www.practicalaction.org/nepal



Oxford Policy Management

