

# Enhancing climate services for building livelihood resilience and risk reduction in Chitwan

5–9 January 2020 | Chitwan district, Nepal

## Executive summary

---

Chitwan district has been selected for the piloting of climate services at the local level for the tourism and agriculture sectors. Funded through UKAid, the project will be implemented over a two-year period that ends in March 2022. The project goal is to improve livelihood and enhance resilience of people in the tourism and agriculture sectors as a result of reduced risks and vulnerabilities with the use of climate information services. The targeted outcome are:

Improved capacity of local institutions, tourism stakeholders, extension workers, and farmers to integrate climate information services into their decision making

Establishment of a user-driven climate service information system and user interface platform for sustainable and resilient tourism and agricultural management practices

To increase the climate resilience of various stakeholders, it is important to provide contextualized, relevant, tailored and timely

information about weather and climate change across space and time. Risk communication and sharing of weather advisories and seasonal information in real time or periodically can make the tourism and agriculture sectors safe and resilient and help increase agricultural productivity.

As part of the piloting, we made a scoping visit to Chitwan from 5 to 8 January 2020. This was the first step in the implementation process, and the goal was to understand the context and map out potential stakeholders in tourism and agriculture. The objectives of the visit were two-fold. The first was to gain a comprehensive understanding of user landscape – types of users; users' needs, priority areas, awareness, and cultures; types of methods and services, and users' ability to utilize these; and capacity building requirements. This was done through face-to-face bilateral meetings and stakeholder consultations. The second was to build partnership with local service agencies, stakeholders and users to secure collective ownership and active participation in implementing project activities. We used an exploratory and iterative process and a dynamic approach to gather sector-specific and localized climate information. Such a procedure allowed us to engage with diverse stakeholders, to understand and identify their needs and the potential to collaborate with them.

Flash flood and floodplain dynamics have disrupted tourism-related business in Chitwan. Changes are observed in plant and animal behaviour and ecosystem responses – e.g., early shedding of tree leaves, early bird calls and sightings of peacocks, increased incidences of wild animals (elephants and rhinos) entering human settlements, and decreased habitat and grasslands. Impact-based weather forecasts could help hotels, restaurants and bars in planning responsive services for optimal guest experience and safety.

Some of the barriers identified for provision and use of climate services included inadequate research, lack of preparation and tools for risk reduction, and lack of skilled human resources and experienced cooperatives and organizations in the field. Most importantly, lack of collaboration and coordination among and at different levels of government (local, provincial and federal) is seen as a major issue.

Flood and drought, hailstorm and frost are frequently occurring climate hazards that result in loss of agricultural productivity, environmental and infrastructural damages, and yield reduction. Reliable, timely and comprehensible climate information is valuable to farmers, agriculture

cooperatives and the private sector. During the consultation, the farmers of Chitwan said they really need sector-specific information. They saw their lack of knowledge about the source of information as a major barrier. They also noted that due to inadequate technical human resources as well as limited reach to information technology, they are unable to receive reliable and timely information to support their decision making. And in some cases, they were not able to comprehend the received information because of the technical jargons or scientific terms used.

It is clear that the tourism and agriculture sectors need to be strengthened. There is a need to improve information mechanisms to ensure that stakeholders are better prepared to combat the effects of the changing climate.

Based on inputs from stakeholders and the findings of our scoping mission, a focused and structured discussion will be held with key selected stakeholders. They will be engaged in co-developing climate services for Chitwan and also serve as primary users of the services. The engagement modality will be discussed and adopted based on mutual agreement.

## Abbreviations and acronyms

<b>AAB</b>	Agriculture Advisory Bulletin
<b>AFU</b>	Agriculture Forestry University
<b>AKC</b>	Agriculture Knowledge Centre
<b>BCC</b>	Biodiversity Conservation Centre
<b>CBFEWS</b>	Community Based Flood Early Warning System
<b>CF</b>	Community forest
<b>CNP</b>	Chitwan National Park
<b>CS</b>	Climate services
<b>CTDC</b>	Chitwan Tourism Development Committee
<b>DADO</b>	District Agriculture Development Office
<b>DHM</b>	Department of Hydrology and Meteorology
<b>DoA</b>	Department of Agriculture
<b>EO</b>	Earth Observation
<b>FECOFUN</b>	Federation of Community Forestry Users Nepal
<b>FORWARD</b>	Forum for Rural Welfare and Agricultural Reform for Development
<b>GDP</b>	Gross Domestic Product
<b>GESI</b>	Gender Equality and Social Inclusion
<b>GFCS</b>	Global Framework for Climate Services
<b>GIT</b>	Geospatial Information Technology

<b>HKH</b>	Hindu Kush Himalaya
<b>HPAI</b>	Highly pathogenic avian influenza
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>KBK</b>	Krishi Vigyan Kendra
<b>MoALD</b>	Ministry of Agriculture and Livestock Development
<b>MoCTCA</b>	Ministry of Culture, Tourism and Civil Aviation
<b>MoFSC</b>	Ministry of Forest and Soil Conservation
<b>NARC</b>	National Agriculture Research Council
<b>NGO</b>	Non-governmental organization
<b>NTB</b>	Nepal Tourism Board
<b>NTNC</b>	National Trust for Nature Conservation
<b>PIU</b>	Project Implementation Unit
<b>PMAMP</b>	Prime Minister's Agriculture Modernization Project
<b>PPCR</b>	Pilot Programme for Climate Resilience
<b>RHAN</b>	Regional Hotel Association Nepal
<b>SAARC</b>	South Asian Association for Regional Cooperation
<b>SMS</b>	Short message service
<b>TOC</b>	Theory of Change
<b>UN</b>	United Nations
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organization
<b>UNFCC</b>	United Nations Framework Convention on Climate Change
<b>WTTC</b>	World Travel and Tourism Council

# Introduction

---

## 1.1 Background

Significant changes in climate caused by extreme weather and slow onset events are impacting the Hindu Kush Himalaya (HKH), including Nepal (Wester et al., 2019). As per Article 2 of the Paris Agreement, efforts to limit global average temperature increase to 1.5°C above pre-industrial levels would significantly reduce the risks and impacts of climate change (UN, 2015). However, even if global warming is limited to 1.5°C, warming will likely be at least 0.3°C higher in the HKH. The slow onset event evolved gradually from incremental changes (UNFCCC, 2012) and the increasing occurrences of extreme events pose a major threat to livelihoods and sustainable development. The magnitude and frequency of their recurrence hampers hard-earned development gains and erodes social safety and economic security.

Climate change will have significant impacts on different ecosystems (e.g., river, wetland, forest, grassland) and the ecosystem goods and services on which Nepal's rural communities depend for their livelihood. In particular, the tourism and agriculture sectors are intrinsically linked with ecosystem and ecological processes, which are regulated by climate. Since climate is a key variable in the development of these two sectors, the unprecedented changes in weather, season and climate patterns have caused huge damages to infrastructure, business and crops, and claimed many lives. Very often, the loss and damage caused by climate variability and the impact of climate change is overwhelming. Article 8 of the Paris Agreement recognizes the importance of averting, minimizing and addressing loss and damage caused by climate change impacts, including extreme weather events and slow onset of events (UN, 2015). Such recognition must be followed by action, particularly by building capacity of vulnerable communities to cope with loss and damage associated with such change (Mechler et al., 2019). In addition, given the rapidity, frequency and scale of climate change impacts, decision makers have to take steps and make choices, often in reactive mode.

Tourism and agriculture are major sources of revenue and employment in Nepal. The tourism sector contributed USD 2.2 billion to the national

economy, equivalent to 7.9% of the total economy, and supported 1.05 million jobs (WTTC, 2019). It is a major driver of Nepal's economy, contributing 57% to the country's GDP in FY2017/18 and 52% in FY2016/17, compared to 26% in 1980 (Sharma, 2018). According to the Nepal Economic Survey (2019), the agriculture sector, which comprises agriculture, forest and fisheries, contributes a significant 26.98% toward the national GDP. The sector accounts for about two thirds of employment, mostly at subsistence level. Tourism and agriculture are two sectors most vulnerable to the impact of climate variability and change and extreme weather events. In the last fiscal year (2018/19), around 40 thousand hectares of land suffered damages, impacting major crops like paddy, wheat and corn, vegetables, fruits and fishery. Similarly in the preceding year, flood disaster caused damages across 145 thousand hectares.

To minimize loss and damage to tourism and agriculture, it is necessary to come up with innovations that enable decision makers to effectively respond to climate variability and change. An important step entails increasing decision makers' ability to adapt to change and build their resilience. Provision of climate information and services can help decision makers prepare for climate variability and climate change impacts and build resilience. Demand for useful climate-related knowledge and information is increasing, both globally and locally. Existing climate information has little practical value for decision makers at the local level as much of the information is generalized and static and therefore has little relevance in specific local contexts. Tourism and agriculture based on climate-smart information can help close the gap between climate science and policy.

Impacts of climate variability and change are felt most acutely at the local level. We need to develop climate information products that are dynamic and locally relevant to help communities make informed decisions and take action when confronted with risks. Vulnerable sectors such as tourism and agriculture need to be supported through climate services to build user-friendly climate knowledge, enhance the capacity of sector-specific decision makers and improve information accessibility and availability. Climate knowledge and information such as real time, seasonal, short and long term climate forecast services are important for managing climate variability and change related risks, opportunities, investment and policy planning for livelihood resilience building and sustainable development. To meet this demand, there is a real need to devise customized local climate service products that meet the needs of and are relevant to

sector-specific decision makers.

## 1.2 Understanding the sectors

### 1.2.1 Tourism

Chitwan is known for its rich biodiversity. Chitwan National Park (CNP) in particular is a world-renowned destination for wildlife-based ecotourism. Chitwan is also a heartland of many diverse and indigenous ethnic groups with a rich cultural and social heritage. Community-based ecotourism seeks to harness such richness by promoting the philosophy ‘Conservation for Prosperity’.

The tourism management plan of CNP and its buffer zone (2017/2018–2021/2022) has outlined a vision that embraces this philosophy. The vision is ‘to become one of the best model destinations for development, promotion and management of community-based inclusive and conservation oriented sustainable ecotourism.’ Goals set to address the vision include preserving biodiversity and cultural heritage to enhance livelihood conditions of communities and also contribute to national economy (MoFSC, 2017a).

For systematic management of ecotourism in CNP, a cluster approach to tourism has been

adopted to develop hub areas. These areas include Sauraha and surrounding areas; Kasara-Meghauri and surrounding areas; Amaltari-Triveni and surrounding areas; and Madi, Green Valley and surrounding areas.

#### TOURISM PERFORMANCE

Tourism is the most important contributor to the economy of Chitwan. Eighty five percent of the total revenue generated by CNP comes from tourism (MoFSC, 2017a). Since the establishment of CNP in 1973, the park has been receiving impressive numbers of tourists. The natural and cultural capital of Chitwan serves as key pull factors. Around 140,000 tourists visited CNP in 2017, and 100,000 of them visited the Biodiversity Conservation Centre (MoCTCA, 2018; NTNC-BCC, 2019). As of 2017/2018 a total of 162,483 tourists have visited CNP (Table 1). Of them 79% are international tourists, 9% are from SAARC countries and 12.5% are domestic tourists respectively. The length of stay of these tourists stood at 2.6, 1.75 and 1.3 days, with average spending per day amounting to NPR 6000, NPR 4500 and NPR 2500 respectively.

A total of 169 hotels and resorts with room and bed capacity of 2479 and 5442 respectively provide accommodation services. Besides this, 5 villages

**TABLE 1** TOURIST GROWTH PERFORMANCE AND TARGETS

Tourism attributes	Indicator	
Tourist arrival	Domestic tourists (No.)	20,155
	SAARC (No.)	14,689
	International tourists (No.)	127,639
Length of stay	Domestic tourists (No.)	1.3
	SAARC (No.)	1.75
	International tourists (No.)	2.6
Average expenditure/ day	Domestic tourists (NPR)	2500
	SAARC (NPR)	4500
	International tourists (NPR)	6000
Accommodation service	Hotel and resort (No./Room/Bed)	169/2479/5442
	Community homestays (Village/No./Room/Bed)	5/72/149/317
Employment	Direct (No.)	3000
	Indirect (No.)	9000
Ancillary service providers	Nature Guides (No.)	390
	Cultural/Ethnic Museum (No.)	3
	Tourist Information Centre	3
	Entry posts (No.)	10
	Tourist police posts (No.)	1

Source: MoFSC, 2017a.

provide 72 homestay services with room and bed capacity of 149 and 317 respectively.

The CNP provides direct and indirect jobs to 3000 and 9000 people. A large number of local people, especially those from the Tharu indigenous group, are employed in hotels/resorts and as guides. A total of 390 certified nature guides provide services such as safari, walk/hike and canoeing. The Tharu Cultural Museum, the Tourism Information Centre and the army check posts are other facilities that enhance the experience and ensure the safety of tourists.

### TOURISM AND CLIMATE CHARACTERISTICS

Chitwan Valley has a tropical and subtropical climate dominated by the summer monsoon. CNP experiences three distinct seasons every year, viz. winter, summer and monsoon (see Table 2). Winter weather is pleasant with around 45% humidity. It is the main tourist season for all types of wildlife based ecotourism activities (wildlife watching, forest walk, jungle safari, and bird watching). Summer is hot and humid, particularly from April to June, with 100% humidity. This is the second best tourist season. This is also a season of storm and thunder (especially March and May). Summer being a dry season, chances of forest fire (man-made) are high. Monsoon is the wettest month (July to August). Annual rainfall is around 2600 mm; 80% of annual which is received during monsoon. The river gets flooded and roads become impassable. Autumn (September to November) and spring (February to April) are the best seasons for observing migratory birds. These birds join the resident birds in and around CNP and the buffer zone area. CNP along with its buffer zone is classified as an Important Bird and Bio-diversity area (IBA).

TABLE 2 CLIMATE CHARACTERISTICS AND TOURISM		
Season	Months	Mean temperature
Winter	October to February	25°C drops to 8°C
Summer	March to June	Maximum 37°C
Monsoon	June to September	25°C to 34°C

Source: MoFSC, 2017b.

### 1.2.2 Agriculture

Chitwan is considered to be the most agriculturally commercialized district of Nepal and agriculture remains the primary sector of economy in the district. About 34.7% of land is agricultural land and

grassland; the total cultivable land area is 46,894 ha, out of which 44,532 ha is cultivated (DADO, 2014). Being highly dependent on agriculture, the district is most vulnerable to the impact of extreme events arising from change in weather and climate. The agriculture sector is dominated by small-holdings that are totally dependent on prevailing weather and climatic conditions – either reap a bumper harvest or suffer crop or yield losses due to extremes and variability, with hugely adverse ramifications for livelihood as well as food security. Chitwan's agriculture sector encompasses various areas such as crop production, fruit and vegetable cultivation, livestock and fishery as well as poultry and beekeeping.

According to a study by Paudel et al (2014), over the past decades, there has been a rapid change in the system of cropping in the district. Farmers have adopted new cropping systems, shifting from the traditional rice-wheat-maize to rice-vegetable-maize and maize-millet systems. New varieties of vegetables are included in their cropping system. There is also crop diversification; perennial or multi-year fruits like banana, papaya and lemon are now being planted to maximize profit while minimizing undesired impacts.

Despite local coping mechanisms, farmers have reported heavy crop losses due to extreme events like storm (World Bank, 2009), hailstorm (The Himalaya Times, 2018) and new pests like fall army worm (reliefweb, 2019).

Climate information services are necessary to support decision-making along the entire agricultural value chain, from land preparation to household consumption or a market outlet. Most farmers integrate crop, livestock and fishery farming in order to spread risks across the different enterprises. Grasslands are also an important part of the agricultural system as grass is a major source of animal feed and is used to make bedding and silages for the lean season. Majority of households rear poultry; fishery is also being practiced.

Irrigation water is critical for agricultural production. Over two-thirds of farming communities depend on canals for farm water, and the rest depend on tube wells, boring and natural flow.

Rice-wheat-fallow (22.82%) and rice-wheat-maize (8.65%) and rice-fallow-fallow (7.79%) is the major cropping pattern on khet land. Maize/millet-fallow (28.2%), maize/upland rice-fallow (22.38%) and maize-tori-fallow (11.58%) is the major cropping pattern on bari land.

A substantial proportion of farm products go to the market as a source of cash income for the farming households. Majority of the products are sold at the farm gate. Other market outlets include rural haat bazaar, local vendors and retailers, and in some cases, distant markets.

The use of fertilizers and chemicals in the district is low compared to the nationally recommended dosages although such inputs are easily available at agro-vet suppliers and outlets, and agricultural cooperatives. These input suppliers also provide information on safe use of fertilizers and agro-chemicals. There is strong community support and communal cohesion that is further enhanced through a good network of agricultural extension points

Provision of reliable and timely climate information through focused agromet advisory services is key to enhancing agricultural productivity and hence improving the livelihood of farming communities. To enable people to adapt to the effects of climate change and variability, we need relevant climate information and the capacity to take action based on such information. In order for climate services (CSs) to be truly effective, they need to be combined with agricultural, financial, and social services. It is important to identify and understand existing information mechanisms, including strengths and constraints, to develop targeted climate risk information and design responses.

The farming communities are aware of the climate extremes and variability that have increased in frequency and severity in recent times. Flood and drought, hailstorm and frost are frequently cited as climate hazards that result in productivity loss, damages and yield reduction. Lowered water table and challenges in groundwater abstraction are experienced regularly.

Climate forecasts and outlooks, with alerts and early warnings of severe events, are provided by responsible agencies, but such information rarely elicits corresponding responses, either due to lack of capacity or people's inability to understand the message. Radio and TV are commonly used to communicate forecast and warning information to farmers, though there is potential for use of siren, mobile SMS, telephone, newspaper, display boards and web-based service dissemination systems.

## SECTION II

# Case study site

---

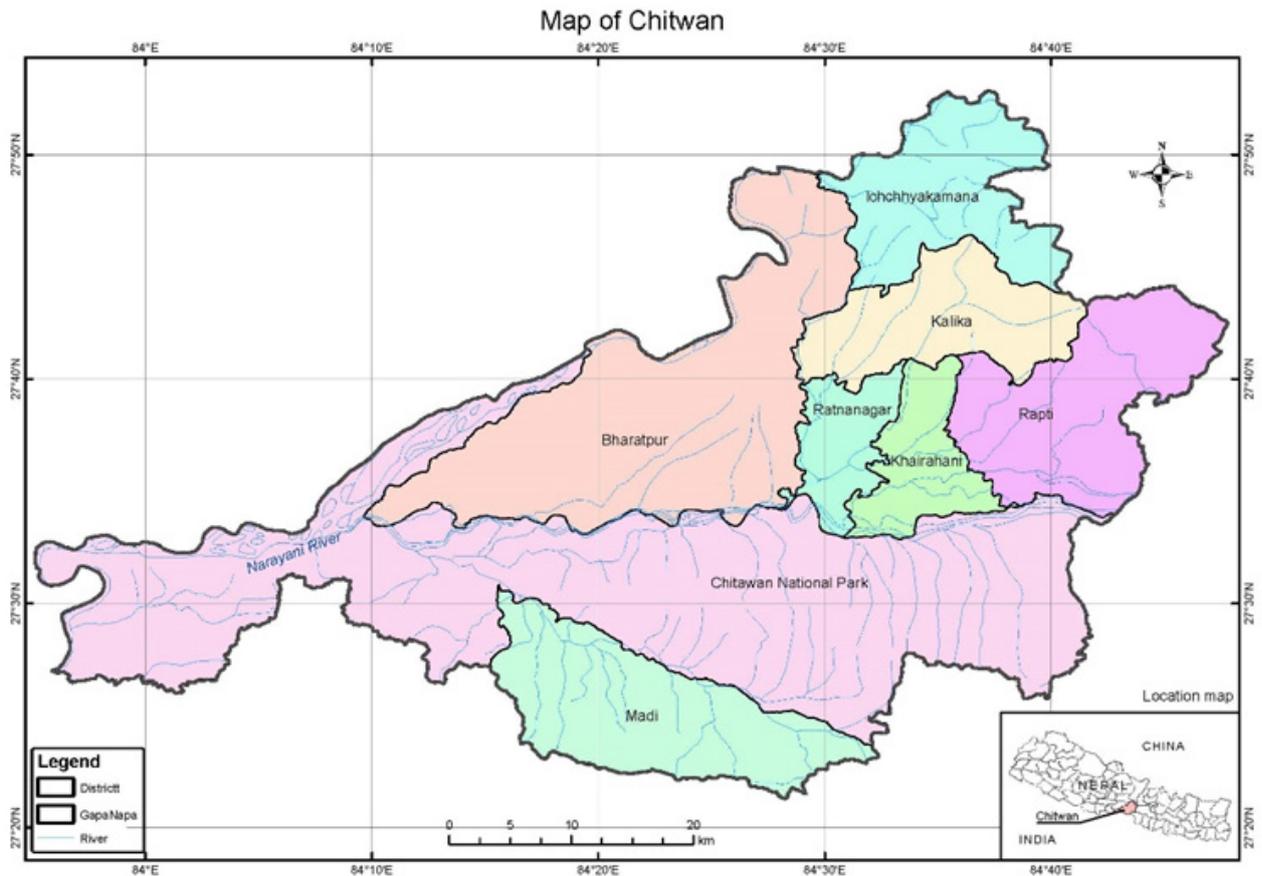
Located in the southwestern part of Province 3, Chitwan is one of the most important districts of Nepal (Map 1). Extending at an elevation from 110–655 m, the district has a population of 566,661 (MoFSC, 2015). Women make up 52% of the total population. Culturally, the district is inhabited by people from hilly area and indigenous groups such as Tharu, Chepang, Bote, Musahar, Darai and Kumal (Lipton and Bhattarai, 2014). The district is endowed with rich biodiversity, agro-biodiversity and cultural diversity.

Chitwan National Park (CNP), Nepal's first national park, is a UNESCO heritage site (Pun, 2004) and one of the last refuges of single-horned Asiatic Rhinoceros and Bengal Tiger. The park is one of the last surviving examples of a natural ecosystem in the Terai region, and supports rich flora and faunal diversity. CNP is a renowned destination for wildlife-based tourism. Community-based ecotourism is also promoted with the goal of achieving both conservation and prosperity.

Chitwan is an important bread-basket of Nepal. The local population largely depends on agriculture for their livelihood, making agriculture one of the main economic activities. Around 30.79% of the population is engaged in agricultural enterprises. The agricultural sector in the district encompasses crop production, fruit and vegetable cultivation, livestock and fishery as well as poultry and bee-keeping.

Tourism and agriculture, which are the mainstay of the district's economy, are highly vulnerable to climate change. Climate change impacts pose a very high threat to the ecosystem, ecological processes, species and biodiversity, and socioeconomic development. In order to enhance people's socioeconomic and socio-cultural wellbeing, it is necessary to minimize climate-related threats and maximize opportunities arising from climate variability and climate change impacts.

Chitwan district has been selected for the piloting of local level climate services in the tourism and agriculture sectors. For years, many programmes, projects and initiatives have targeted the district following numerous strategies and approaches to integrate climate risks/resilience and opportunities into plans, policies and budgets/fiscal decision-



making. There is no denying that impacts of past interventions are visible on the ground, but the challenge remains in sustaining information services that are responsive to the evolving agricultural situation. In general, climate services have yet to become an integral input to the decision-making process. Climate information services acquire practical value when they fit the user context in two ways. First, in building sector-specific climate service products and delivery mechanisms and second, in addressing socio-cultural needs (e.g., women, marginalized groups and youths). It is important to co-design and co-develop timely, relevant and contextualized climate service products through collaborative partnerships with stakeholders.

This project supported through UKAid seeks to localize climate services in Chitwan. Localizing climate services entailed several research and development (R & D) processes: explore the climate knowledge/information landscape; investigate the barriers in the availability and uptake of climate services; identify priority interventions with greatest benefits possible within the limits of project resources and time; and upscale results and learnings under expanded development assistance.

### SECTION III

## Scoping study

To kickstart the project, a scoping visit to Chitwan was carried out by the ICIMOD team comprising Mandira Singh Shrestha (Programme Coordinator), Anu Kumari Lama (Tourism Specialist), Ganesh Bhattarai (Programme Officer), Karma Tshering (Remote Sensing and Geographical Information Specialist), and Santosh Raj Pathak (Partnership Officer), from 5–8 January 2020 (see Annex 1).

The main purpose of the scoping visit was to engage in a collaborative process to explore, assess and understand the sectoral dimensions (agriculture and tourism) of climate variability and climate change impacts for mapping key concepts (related to climate service product needs, design, development and dissemination aspects) and potential stakeholders, and to identify issues/opportunities and gaps from the community/decision makers' perspective.

### 3.1 Methodology

The scoping study entailed developing an overview of sector-specific climate service product needs, design, development and dissemination specific to climate variability and climate change impacts and meeting with key stakeholders. The study followed a systematic approach to collection, synthesization and summarization of information/knowledge. This helped in identifying major issues/opportunities, priority areas and the future course of action.

The methodology adopted involved mixed research methods ranging from desk research, in-house and external partners' meeting, bilateral meetings with stakeholders, consultation through stakeholders' workshops and field visits. Stakeholders' consultations (for meeting and workshops) were conducted using broad guiding questions, interactive discussions and group work.

#### SECTION IV

## Multi-stakeholder consultations

### 4.1 Tourism sector

Multi-stakeholder consultations in the form of informal group meeting, bilateral meeting and consultative workshop were carried out to explore, investigate and understand context-specific needs related to climate services and tourism.

#### 4.1.1 Informal group meeting

An informal discussion lasting one and a half hours was held with around 10 stakeholders actively engaged in ecotourism development in Chitwan district. Annex 2 provides the list of meeting participants.

#### MEETING HIGHLIGHTS

- Climate variability and climate change impacts
  - Accounts of climate impacts primarily focused on extreme events. The 2017 floods became the central discussion point where many recounted the ordeal they faced and

how they were able to save their lives. The flash flood and the floodplain dynamics have had untold consequences downstream and disrupted tourism-related business operation.

- Weather anomaly, fluctuating and unpredictable weather cause cancellations of flight, hotel/tour bookings and elephant safaris
- Reduced slow monsoon and increased intense monsoon
- Changes in plant and animal behaviour and ecosystem responses e.g., early shedding of tree leaves, early birding call, sighting of peacock, increased incidence of wild animals (elephants and rhinos) entering human settlements
- Decreased habitat and grasslands; decreased spring-shed and spring water; reduced wetland and change in river dynamics; increased settlement along the river leading to narrowing of the once very wide floodplains
- Increased spread of invasive species (lantana, parthenium) is choking native vegetation, transforming wild habitats, reducing forage stock and forcing wildlife migration.
- Bush thickening, affecting the dryland ecosystem
- Information availability and use
  - Weather forecast information through ACU Weather, DHM and social media such as twitter as one of the means for acquiring those information
  - Flood early warning via short message service (SMS) one hour prior to the event
  - Risk communication is important and very useful. However the SMS alert only enabled the receiver to save their own life and not their assets/property. Receiving the SMS 3–4 hours earlier would have prevented significant loss and damage.
  - Weather forecasts given at short time intervals are often of limited reliability. Around 2–3 days weather forecast would be valuable for preparedness.
  - Timely and reliable weather forecasts providing actionable lead time for preparedness
  - Impact-based weather forecast would help hotels, restaurants and bars to plan responsive services for optimal guest experience.

- Climate service provision for decision making
  - Timely, relevant and easily accessible DHM forecasts usable in any decision-making context
  - Location-based alert information for active users
  - Availability of long-term hydro-meteorological data, flood monitoring data
  - Access to sufficiently processed long climatological time series in order to conduct ecological studies, and developing management plans for the national park
  - Availability of subject-specific experts who can help analyse and translate such data into sector specific application in specific areas of conservation to sustain the vitality of the tourism sector.
  - Upstream/downstream connectivity and cooperation between India and Nepal
  - Decadal scenario based forecasting for climate change
  - Building capacity to adopt technology based information and solutions

The points participants made during the discussion were largely shaped by their awareness of climate variability and climate change impacts. Increased frequency and severity of extreme weather events and erratic weather have made it difficult for communities to cope with disasters. Participants emphasized the need for climate services that are time- and location-specific, and highlighted upstream-downstream linkage, analysis, interpretation, access, availability, delivery and uptake of climate information. They also highlighted the need for awareness raising and capacity development.

#### 4.1.2 Bilateral meeting

A bilateral meeting with representatives from Chitwan Tourism Development, Nepal Tourism Board (NTB), helped to understand the scope and scale of tourism development, challenges and opportunities in the district. Main points from the meeting were:

- **Tourism sector:** Tourism is a priority sector for the local government, which has identified 60 destinations (Bharatpur – 29, Ichyakamana – 7, Madi – 7, Ratnagar – 6, Rapti – 4, Kalika – 4 and Khairahani – 3). However, lack of collaboration

and coordination among and at different levels of government (local, provincial and federal) is a major issue.

- **Investments:** Major investments for developing recreational sites are increasing. The Rhino Park covers 376 ha of community forests; there is a Fun Park at Sameshwori Gadi-Madi Municipality; and many more big hotels and resorts are being built. However, majority of this investment is by non-locals.
- **Tour packaging and marketing:** Unfair competition for local businesses and service providers. Major and high-end tour and hotel packages are sold by Kathmandu and India with no intermediaries from Chitwan.
- **Marketing and promotion:** Growing numbers of budget and domestic tourists. Growth in quantity without quality is damaging Chitwan's image and hampering business sustainability. Business sustainability is also affected by the limited tourist season. There is no clear marketing and promotional strategy and mechanism for increasing quality tourists and off-season tourism products and packages.
- **Research and development:** Lack of research and development to inform market intelligence, tourism growth trends and how climate change will affect the tourism sector.

#### 4.1.3 Half-day consultative workshop

Anu Kumari Lama, Tourism Specialist, ICIMOD, provided an overview of the consultative workshop. The decision makers participating in the workshop represented various levels and areas of the tourism sector and decision making. The consultative workshop began with a thematic presentation on mainstreaming climate science into policy decision through climate services for sustainable ecotourism development in Chitwan. The presentation focused on key concepts (climate services, wildlife and community based ecotourism) and linkages between climate and tourism, and explained why user-centric climate services are necessary for developing sustainable ecotourism in Chitwan. The presentation was followed by a group discussion. The participants were divided into three groups based on their thematic interest and expertise: a) forest user group, b) policy group c) private sector. A set of guiding questions was provided for group work and the rapporteur of each group presented the findings.

Annexes 3, 4, 5 and 6 provide the lists of tourism stakeholders, workshop agenda, guiding questions and findings from the workshop.

## 4.2 Agriculture sector

### 4.2.1 Bilateral meetings

Bilateral meetings were held to understand the current scenario of climate services in Chitwan, the roles played by different institutions, and avenues for future partnership. The following organizations were consulted during the bilateral meeting:

- Khairehani Municipality
- Agriculture Knowledge Centre
- Prime Minister’s Modernization Project
- Agriculture and Forestry University
- Forum for Rural Welfare and Agriculture Reform for Development

Highlights of the bilateral meeting:

#### KHAIREHANI MUNICIPALITY

The meeting was held with the Mayor of the municipality, Lal Mani Chaudhary. Discussing tourism development, he talked about Khairehani municipality’s focus on recreational infrastructure – establishing parks and camping/picnic spots, creating artificial lakes, promoting jungle safari and installing viewpoints with visual access to both high mountains and lowlands of contrasting splendour. He shared that tourism developers are already investing in hotel and resort construction.

The municipality has huge potential for fruit and vegetable production. Chaudhary said climate services can significantly help them realize the potential. The municipality has at least 150–200 commercial farmers who produce a variety of crops, and this number will definitely increase once all government plans for facilitation and support are carried out. The municipality is working closely with development partners like the UNDP, JICA, Red Cross, etc. providing technical and financial support for increasing production of fruit and vegetable and expanding fisheries and cereals through community engagement. For livestock-related economic activities, Ward 7 has installed a feed factory to cater to poultry and animal farms.

The municipality works closely with donors and partners in flood risk management, such as the Lutheran World Foundation. It is implementing the second phase of the CBFEWS project in Ward 11 and 12. He noted that drought is also experienced in isolated pockets

#### PRIME MINISTER’S AGRICULTURE MODERNIZATION PROJECT

The meeting was held with the Project Implementation Unit (PIU) head, Megh Nath Timilsina, and technical focal points for the zones.

The PMAMP is a 10-year project supported by the central government with an exclusive mission to embark on agricultural modernization and enhance productivity, reduce costs of production and import substitution. In Chitwan, the project specifically focuses on four agricultural commodities viz. rice, banana, vegetables and honey. The project follows a collaborative agricultural development strategy prepared by indigenous interests, indigenous investment and internal institutional human resources.

As a transition is made from subsistence of market orientation, this project aims to develop a Small Business Agricultural Production Centre (at the pocket level/up to 10 ha), a Commercial Agricultural Production Centre (at the block level level/150ha), and a Commercial Agricultural Production and Processing Centre (at zone level/1000ha). The Chitwan PIU is currently implementing a rice super-zone and zones for vegetable, banana and beekeeping.

Small Business Agricultural Production Centre	Pocket level	Up to 10 ha
Commercial Agricultural Production Centre	Block level	10–150 ha
Commercial Agricultural Production and Processing Centre	Zone level	150–1000 ha

During the consultation, it became evident that there is no explicit mention of harnessing climate services in the project plan. But given the scope and size of the project, and the economic transformation expected upon the project’s conclusion, there are several entry points for delivering effective and timely climate services to improve production, processing, value-addition, marketing, product diversification, etc. The agromet advisory bulletins disseminated by the National Agriculture Research Council (NARC) are generalized information. Deterministic weather forecasts and climate

outlooks are provided by the DHM. There is also a mobile app called Hamro Krishi.

All these weather and climate information sources need to be available at the local level and even the growing-area level. They must be specialized to target specific agro-animal-insect based farms to be of any use to the farmers. Further, opportunities exist for climate services to support decisions and practices in irrigation, pest and disease control, phenological monitoring, harvest and marketing. The current Agriculture Advisory Bulletins (AAB) do not intrinsically integrate weather and climate information into practical advisories, and still need to be tailored to specific needs of farmers.

### **AGRICULTURE KNOWLEDGE CENTRE**

Formal and informal consultation was held with the head of the Agriculture Knowledge Centre (AKC) Rajan Dhakal. Dhakal provided information on organizations and producer associations active in Chitwan and recommended a bilateral meeting with them. He said that agriculture plays a key role in Chitwan's economy and is a major source of employment. AKC actively participated in and contributed to the stakeholder workshop.

### **FORWARD**

The meeting with FORWARD, a local NGO, was very informative. The NGO representatives explained the critical role they play in areas that remain peripheral to the government's reach and radar. However, their work is not particularly focused on climate-related aspects of socioeconomic development. The organization has done some work in urban disaster response and relief associated with adverse climate impacts, but it has little or no experience factoring in climate as a resource in agriculture or tourism. Its recent projects were loosely connected to climate resilience and climate-smart agriculture but lacked in-depth application of weather and climate information.

### **MEETING WITH AGRICULTURE FORESTRY UNIVERSITY, RAMPUR**

A meeting was held with the Vice Chancellor Sharada Thapaliya, Rector Manraj Kailakshapati, Dean Jay Prakash Dutta and Director of Planning Arjun K. Shrestha of the Agriculture Forestry University (AFU). Prof. Shrestha provided an

overview of AFU's activities, followed by an interaction where they discussed possible collaborations.

Prof. Shrestha gave a presentation on AFU, with a mention of ICIMOD's involvement in strengthening the capacity of faculty members in GIS and GIS-related lab facilities. ICIMOD had also supported the development of teaching capacity in Earth Observation (EO) and Geospatial Information Technology (GIT). AFU's strategic and operational plans are framed around three pillars – teaching, research, extension KBK (Krishi Vigyan Kendra). The university includes the faculties of agriculture, animal, vet, fisheries, and forestry. Besides the central campus, AFU runs a number of agro-ecological zone constituent colleges in Sindhuli, Pakhribas, Kaski, Kailali, Mahottari-Bardibas, Udayapur, Rolpa/Banke, etc. It runs agriculture science centres in Gorkha-Ghyalchok, Kalikot, Dhading and Daman.

A special service window that AFU provides directly to the farmers is the Farmer Call Centre, which functions as an outlet for extension services to the local farmers. PG curriculum on climate change impact on horticulture is an example where the University's particular focus is on climate. Many of the programmes and courses taught in the university are structured around the core principle of "learning for entrepreneurial experience". The university has broad-based partnerships with the following entities:

- PMAMP, Ministry of Agriculture and Livestock Development (mainly in joint internship programme)
- AKC (Krishi Gyan Kendra) (for extension of agriculture technologies and collaboration for internship)
- NARC (for wheat improvement research)
- Cornell University (for seed village model)
- MoALD (for PPCR agromet advisories and up-scaling of innovations for addressing field problems)

Vice Chancellor Thapaliya wrapped up the meeting and highlighted key takeaways from the discussion. She reiterated that there is no question that climate services are important for farmers. AFU would welcome further discussion on the modality of collaboration and a mutually beneficial frame of engagement.

### 4.2.2 Half-day consultative workshop

A half-day consultation workshop was jointly organized by ICIMOD and the Agriculture Knowledge Centre (AKC) on 8 January. The AKC took the lead in identifying the right stakeholders and farmers' representatives for the workshop. The main objective of the workshop was to assess the current status of climate information services in agriculture and get a sense of current and potential stakeholders for future partnership. A total of 27 participants attended the workshop and actively contributed to it.

A presentation was made by Ganesh Bhattarai, followed by a group discussion. The participants were divided into three groups based on their thematic interest and expertise: a) livestock and fisheries, b) agriculture c) beekeeping. A set of guiding questions was provided for the group work and the rapporteur of each group presented the findings. Annexes 7 and 8 provide the lists of agriculture stakeholders and discussion findings. The workshop agenda and guiding questions were the same as those from the tourism stakeholder consultation.

### 4.2.3 Field visit

The Mayor of Khairehani Municipality accompanied the team to show the Kankali Community Forestry User Group's effort to promote tourism and conserve the forest. The Community User Group had developed picnic spots with good facilities, walking trails as well as a road leading to the viewpoint and the temple on top of the hill.

## SECTION V

# Mapping climate service needs

## 5.1 Understanding climate services

Climate service is the production and delivery of climate related information for any kind of decision making (Harjanne, 2017). It involves the process of production, translation, transfer and use of past, present and future climate data and information to support climate smart policy, plan and practices. Global Framework for Climate Services (GFCS) supports the development and application of science-based climate information and services for effective decision making. However, it draws attention to regional and national needs to enable society to better manage risks and opportunities arising from climate variability and change (Shrestha and Rasul, 2019). Agriculture and tourism are two of the prioritized sectors for which the GFCS aims to build resilience and reduce risks.

The climate service continuum stretches between production and user interface, with the delivery mechanism playing a crucial role (See Figure 1). At the production level, generation and curation of knowledge (e.g., data, information) occurs on different time scales and as per sectoral and societal needs. It is important to disseminate such knowledge through packaging and various products (apps, maps, infographics, etc.) to ensure effective decision making by policy makers and practitioners at the user end of the continuum.

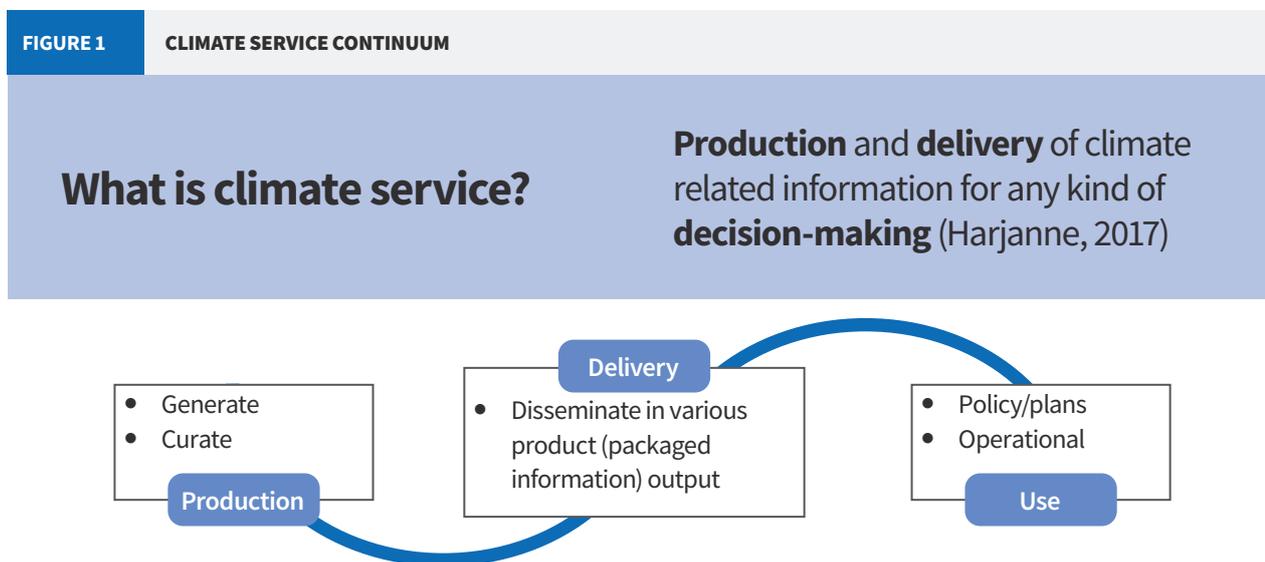


Figure 1: Climate service continuum

There are both technical and practical implications of climate service provision. At the technical end there is a need to strengthen monitoring and observation as well as improve modelling and prediction capabilities to improve our understanding of climate and to develop core prediction tools, applications and products that are essential for the ongoing development and continuous improvement of climate services.

At the practical end, while climate services provide information that has utility value for policy and practice based decision making, it is important that the production and dissemination of climate information take users' needs into consideration so that the knowledge generated is contextual, credible, trusted, and understood by the users (McNIE, 2013). For effective climate services focus on co-design and co-production of knowledge, collaborative partnerships, institutional dynamics, good governance and capacity building is critical.

## 5.2 Tourism sector

### 5.2.1 Climate variability and climate change impacts

During the interactions with various stakeholders in the tourism and agriculture sectors, they gave vivid accounts of the changes observed in weather and disaster events. Such events are differentially impacting the stakeholders, resulting in diverse kinds of loss and damage. Risk communication and sharing of weather advisories and seasonal information in real time is crucial for informed decision making by various stakeholders. Some of the impacts of climate variability and change in Chitwan are provided in Table 3.

These findings provide sufficient preliminary evidence that climate impacts are resulting in loss and damage of livelihoods (tourism and agriculture) at ecological, economic and societal levels. This has given rise to complex vulnerabilities and risks in both tourism and agriculture.

### 5.2.2 Climate knowledge and information use

Scientific knowledge about climate variability and change can help stakeholders build an effective response mechanism, given that the knowledge is curated and packaged in a context-specific manner. Climate services should take societal needs into account and science must be part of the climate services system. Table 4 provides an overview

of the availability of climate services, sources of information, barriers to use and uptake, and institutions that are providing or in need of such services.

## 5.3 Agriculture sector

### 5.3.1 Climate variability and change impacts

Daily weather, climate variability and climate change play a major role in determining the form of agriculture and agricultural practices and finally agricultural productivity and the livelihood of farmers. Increase in the amount of rainfall is having a major impact on agriculture (IPCC, 2007). Variation in weather and climate further impacts crop production and livestock due to changes in pest and disease occurrence, soil metabolic process and moisture content of soil. In addition, climate change and variability affects income distribution and ultimately the livelihood security of farming communities (Lettenmaier et al, 1994).

According to a study carried out by Paudel et al. (2014), annual and seasonal rainfall in Chitwan lacked a clear trend between 1970 and 2007, but a clear increasing trend is observed for both minimum and maximum temperature. Occurrence of extreme events and variability in temperature has increased the vulnerability of crops to biotic and abiotic stresses and altered the timing of agricultural operations.

During the consultation meeting, the effect of extreme weather, climate variability and climate change was discussed under three sub-sectors.

For the agriculture sector, the participants discussed the following:

- New and increased disease and pest (army worm in rice, fall army worm in maize, weevil in banana, black and loose smut in rice, banana leaf and stem scaring beetle). Cold wave and winter rain causing wilt in banana and tomato, partially filled grain in maize, black smut/ loose smut in paddy.
- Reduced water availability and drought is causing reduced yield of both field crops and fruits. Cultivation of Chaite dhan (spring rice) has been difficult as water for irrigation is limited. Rain pattern is changing; crops that used to be planted in the month of Asoj (autumn) are now planted in Shrawan/ Bhadra (monsoon); and crops suffer damage due to rainfall during harvest.

Perceived impact of weather, climate variability and climate change on livestock & fisheries:

- Outbreak of disease (e.g., HPAI, Khoret, etc.); difficulties in raising and saving goats and brooding chickens
- Late outsourcing of crops for livestock; sometimes the field remains unirrigated
- Excessive production of weeds leading to reduced supply of nutrients to primary crops
- Reduced production of Prolactin Hormone leading to reduced production of milk, eggs (in chickens) and reduced oxygen content in ponds
- Temperature increase leading to increase in mortality rates of birds and fish during summer; and low temperature during winter leading to increasing deaths of fish

**TABLE 3**

**SLOW ONSET AND EXTREME EVENTS AND THEIR IMPACTS**

<b>Tourism sector</b>		
<b>Slow onset event</b>	<b>Threats</b>	<b>Impacts of slow onset weather events</b>
Increased temperature	Habitat degradation	Wildlife migration to new locations
	Decreased grasslands	Impact on insects and other species
Changing rainfall cycles	Bush thickening	Impact on species diversity
	Decreased number of rainy days	<ul style="list-style-type: none"> <li>• Decrease in agricultural production</li> <li>• Traditional ways of farming and local species are being replaced.</li> <li>• Altered the growth cycle of various agricultural products like fruits.</li> <li>• Impact on irrigation canal and crop production</li> </ul>
Seasonal anomalies	Reduced wetlands	<ul style="list-style-type: none"> <li>• Decreasing water level in the river resulting in decline of aquatic animals</li> <li>• Impacts the income of fishing communities Musahar/Majhi</li> </ul>
	Increased invasive species	<ul style="list-style-type: none"> <li>• Loss of habitat and food of wildlife causing wildlife to enter human settlements and increased human-wildlife conflict.</li> <li>• Displacement of local species of plants</li> <li>• Decreasing biodiversity</li> <li>• Reduced wetland area; most turning into pastures</li> <li>• Changes in forest areas and grasslands</li> </ul>
<b>Extreme weather events</b>	Early leaf shedding	<ul style="list-style-type: none"> <li>• Impacts on wildlife habitat</li> <li>• Flights/hotel/safari cancellation</li> </ul>
	Early bird calling	
Extreme rainfall (too much and too little)	Sighting of previously uncommon bird species (peacock)	<ul style="list-style-type: none"> <li>• Increased flood risk for human settlements and wildlife</li> <li>• Impact on tourist travel and safety</li> <li>• Tourist guides' jobs at risk</li> <li>• Reduced wildlife population</li> <li>• Increased use of insecticides and pesticides</li> </ul>
	Reduced visibility	
Effect of human health	Disease	<ul style="list-style-type: none"> <li>• People facing health issues from a younger age</li> <li>• Discovery of new diseases</li> </ul>
Extreme heat	Forest fire	<ul style="list-style-type: none"> <li>• Loss of biodiversity</li> <li>• Loss of wildlife.</li> </ul>

TABLE 4

CLIMATE SERVICE LANDSCAPE IN CHITWAN

Groups	Availability	Medium of dissemination	Barriers to use and uptake	Institutions providing climate services	Institution in need of climate services
<b>Forest User Group</b>	Information available but not timely	Radio, TV, mobile	<ul style="list-style-type: none"> <li>No information on forest fire</li> <li>Lack of timely information</li> <li>Information not available in local languages like Tharu, Maithali</li> </ul>	<ul style="list-style-type: none"> <li>Department of Hydrology and Meteorology</li> <li>Municipality</li> </ul>	<ul style="list-style-type: none"> <li>Municipality</li> </ul>
<b>Policy group</b>	Scattered information available	Telecommunication, digital media through DHM, governmental and non-governmental organizations	<ul style="list-style-type: none"> <li>Topographical barrier resulting in lack of information</li> <li>Technological barrier reducing access to latest technology and network</li> <li>Language barrier in diverse ethnic groups</li> <li>Skilled human resource</li> <li>Delayed dissemination of information</li> </ul>	<ul style="list-style-type: none"> <li>Department of Hydrology and Meteorology</li> <li>Governmental and non-governmental organizations</li> </ul>	<ul style="list-style-type: none"> <li>NTNC</li> <li>CTDC</li> <li>RHAN</li> <li>CNP</li> <li>CF</li> <li>FECOFUN</li> <li>District natural disaster relief committee-Red Cross</li> <li>Supporting agencies and stakeholders</li> <li>Local level government</li> </ul>
<b>Private sector</b>	Available information is not sufficient.	Digital media, telecommunication, airport and NGOs (Sahamati)	<ul style="list-style-type: none"> <li>Inadequate research</li> <li>Lack of preparation and tools for risk reduction</li> <li>Lack of skilled human resources</li> <li>Lack of cooperatives and organizations working in the area.</li> <li>Lack of coordination among concerned organizations</li> <li>Lack of water resources causing increase in use of insecticides and pesticides</li> <li>Habitat loss causing migration to new locations</li> </ul>	<ul style="list-style-type: none"> <li>Ministry of Forest and Environment</li> <li>Sahamati</li> <li>Practical Action</li> <li>ICIMOD</li> </ul>	<ul style="list-style-type: none"> <li>Ministry of Forest and Environment</li> <li>Sahamati</li> <li>Practical Action</li> <li>ICIMOD</li> </ul>

The impact of extreme weather, climate variability and climate change on beekeeping:

- Reduced production of honey due to several factors such as delay in flowering of crops resulting in inadequate nectar; increase of invasive insects and decrease of friendly insects; destruction of oilseed crops, a major source of nectar, by heavy rainfall
- Excessive production of Catweed (Banmara) and other weeds
- Degradation in the quality of queen bees; change in the size and behaviour of queen bees
- Bee producers and bee enterprises have been hit hard.

### 5.3.2 Climate change knowledge and information use

Climate information is useful at various levels in Chitwan.

#### FOR POLICY MAKERS

Available, accessible and useful information can help agricultural decision-makers understand climate impacts on agricultural development and food systems and estimate populations at risk of food insecurity (risk mapping). Once they understand how climate change affects the well-being of livestock and crop phenology, they can carry out

well-timed interventions and investments. Climate information can also help them monitor and predict year-to-year variations in productivity, develop early warning systems for agriculture and food security, identify longer-term trends for potential impacts.

#### FOR THE PRODUCERS OF INFORMATION

Climate information is valuable for government and research institutions, development organizations working in agriculture and other local providers of agriculture information. In Chitwan's context, AKC, agriculture units based at municipal offices and NARC can use climate information to advise farmers on crops and crop varieties, animal and fish breeds, cropping patterns, intercultural operations and other inputs, livestock stocking advisory, scheduling vaccination for livestock, etc. Similarly climate information can be part of advisories against extreme weather, diseases and pests. It can also be useful while planning produce marketing and post harvesting operations.

#### FOR USERS OF CLIMATE SERVICES

Reliable, timely and comprehensible climate information is valuable to farmers, agriculture cooperatives and the private sector. They can use climate information services in their day-to-day operations. During consultation, farmers in Chitwan said they really needed sector specific climate information, especially for livestock, fisheries, crops and bees. They also emphasized the need for such information in relation to crop planning, pest and disease forecasting and application of fertilizers/pesticides.

#### BARRIERS TO USE OF INFORMATION

At the consultation workshop, the three groups identified several barriers to the use of climate information for the agriculture sector. Some participants reported that a few farmers did receive the agriculture information including climate information disseminated by the Pilot Project on Climate Resilience (PPCR) via SMS; however, for the most part, farmers relied on TV, FM radio, PPCR website, newspaper and social media for the information they needed.

Lack of knowledge about the source of information was considered a major barrier. Similarly, due to inadequate technical manpower and the intended beneficiaries' lack of access to technology, it is difficult for them to understand or use the information received through different means. Lack of dedicated local organizations providing climate services, and unavailability of instruments and weather forecast stations were also mentioned as barriers to receiving and use of climate services information. Another barrier was the lack of an agricultural plan or a contingency plan at the local level.

#### SECTION VI

## Stakeholder mapping

---

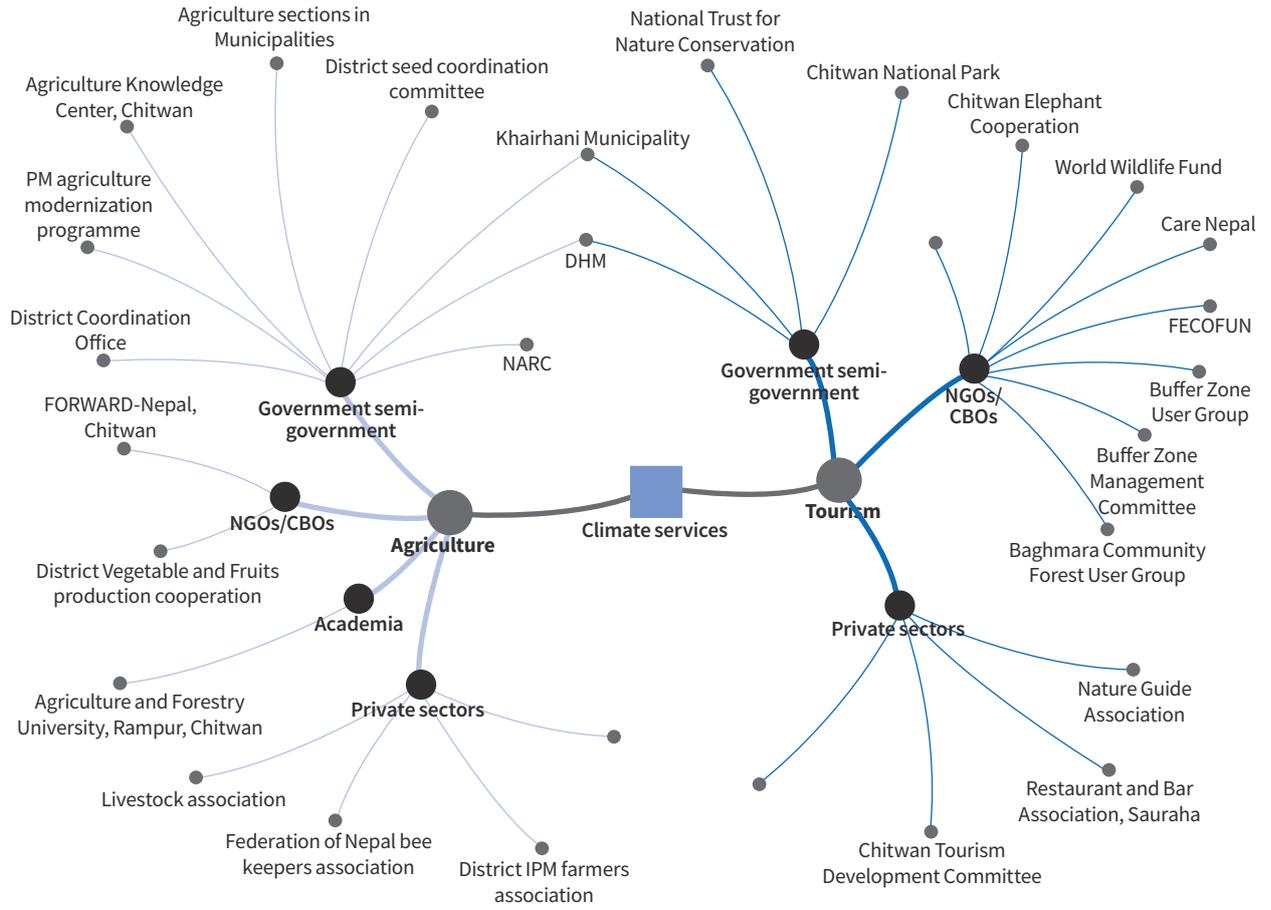
The three-day scoping fieldwork gave ample opportunity to interact with diverse stakeholders from the tourism and agriculture sectors. A map is presented below classifying the stakeholders based on the type of institution and possible engagement in the tourism and agriculture sector. The map provided clarity about stakeholders from different areas (government agencies, private sector, NGOs, academia) who could play a critical role in co-development, validation of services, use of services and scaling them. An initial mapping exercise of diverse stakeholders provided a holistic view of these institutions and networks (see Figure 2).

### 6.1 Tourism institution mapping

Tourism is a multi-dimensional sector and encompasses various facilities and services such as accommodation, homestays, restaurants, and recreational/cultural activities. Several institutions (government, private sector, NGOs, community-based organizations) are responsible for managing these facilities and services and make policy decisions. If we categorize tourism institutions according to ecotourism typology, majority of them fall under the disseminator and user end of the climate service use continuum (see Table 5).

**FIGURE 2**

**INSTITUTIONAL MAPPING OF TOURISM AND AGRICULTURE SECTORS**



**TABLE 5**

**TOURISM INSTITUTIONS IN CLIMATE SERVICE USE CONTINUUM**

Ecotourism typology	Producer	Disseminator	User
<b>Wildlife based</b>			
National Trust for Nature Conservation/Biodiversity Conservation Centre	X	X	
Chitwan National Park	X	X	
Baghmara Community Forest User Group		X	X
Buffer Zone Management Committee		X	X
Buffer Zone User Group		X	X
Chitwan Elephant Cooperatives		X	X
Elephant safari group		X	X
Elephant Breeding Centre			X
Gharial Breeding Centre			X
7 resorts inside CNP run by park concessionaires			X
Nature Guides Association		X	X
Community Based Anti-Poaching Unit		X	X
Regional Hotel Association, Sauraha		X	X
Hotel Development Committee, Nawalpur		X	X
Restaurant and Bar Association Nepal		X	X

Ecotourism typology	Producer	Disseminator	User
Chitwan Tourism Development Committee		X	
Rural Municipality, Municipality and Metropolitan		X	X
World Wildlife Fund	X	X	
Care Nepal	X	X	
FECOFUN		X	X
<b>Community Based Ecotourism</b>	<b>Producer</b>	<b>Disseminator</b>	<b>User</b>
Darai Community Homestay		X	X
Tharu Museum			X
Women's Group		X	X

## 6.2 Agriculture institution mapping

Sectors	Producer	Disseminator	User
<b>Government institutions</b>			
Agriculture Knowledge Centre, Chitwan	X	X	
Prime Minister's Agriculture Modernization Programme, PIU, Chitwan	X	X	
District Coordination Committee, Chitwan		X	
Municipal Agriculture Sections		X	
Nepal Agriculture Research Council	X	X	
<b>Producers' association/Farmers' group</b>			
Chitwan Banana Producers Association		X	X
Federation of Nepal Beekeepers Association		X	X
Vegetable Producers Association		X	X
Livestock Farmers Association		X	X
District IPM Farmers Association		X	X
District Seed Coordination Committee		X	X
<b>Cooperatives</b>			
Janajagriti Cooperative		X	X
District Vegetable and Fruit Production Cooperative			
<b>NGO/INGOs</b>			
Forward Nepal		X	
<b>Academic institutions</b>			
Agriculture and Forestry University	X	X	X
<b>Farmers</b>			
Commercial farmers		X	X
Subsistence farmers			X
<b>Private sector</b>			
Wholesaler			
Agro-based industry			

Note: The list of institutions is not an exhaustive list but consists of only those which were identified during the scoping study.

## Reflections on initial findings

The scoping study used an exploratory and iterative process to gather sector specific and localized climate information. This allowed us to engage with diverse stakeholders and to understand and identify their needs and the possibilities for collaboration.

The three-day scoping fieldwork in Chitwan allowed us to scan the landscape of climate service users, the impacts of climate variability and change on tourism and agriculture, and the kinds of information that shape decision making. It is evident that the sectors are impacted by both slow-onset weather and extreme events. Although the loss and damage caused by extreme events appear important and need to be taken into account when planning measures to build resilience and reduce risks, slow onset weather events are likely to increase and will have long-term effects. Combined exposure to slow and extreme events will have complex impacts on tourism and agriculture. There should be an integrated regional framework for resilience building and risk reduction through climate services. Adapting the existing GFCS to the regional and national context will be crucial. This requires developing an integrative model/framework for effective climate service provision.

We interacted with various stakeholders (both communities and institutions) from the tourism and agriculture sectors. They are differentially impacted by climate variability and change, and suffer different types of loss and damage. Linking the production, dissemination and use of climate services is a complex process; it entails integrating climate, social, political and economic aspects. Risk communication and sharing information (as SMS, advisories, stories, news) of different kinds (real time, forecasts, scenarios) and at different timescales through different products is crucial. A strong and reliable institutional structure and governance mechanism, capacity building (awareness, training, management), research and development and financial arrangements need to be developed for effective delivery and use of climate information.

The scoping study also allowed us to learn about the institutions and the possibility of partnering with them for the piloting of the climate services project.

An in-depth institutional mapping is needed to guide the selection of the best entities for collaboration. Based on the rapid appraisal during the scoping exercise, we can narrow down the list of potential partners to a few key agencies with common concerns and the passion for collective learning in a shared domain of climate services.

It is clear that the tourism and agriculture sectors require further support, especially for strengthening information systems and decision making mechanisms. During consultations, participants stressed that strong information mechanisms would help them prepare against the impacts of the changing climate. Some of the stakeholders still seem unsure about the kind of services that are required; this is understandable as everything couldn't be discussed during the short time we had. However, many stakeholders seem to understand the concept and the need of climate services. We also realized that national stakeholders like the DHM, DoA, NARC and a few other agencies will have an important role in facilitating the co-development and implementation of the project in the region.

For tourism, potential partners include the National Trust for Nature Conservation (NTNC)/ Biodiversity Conservation Centre (BCC), CNP and Khairahani Municipality, primarily because they are major institutions promoting wildlife based and community based ecotourism. The NTNC/BCC and CNP have institutional memory acquired over many decades, expertise and capacity for managing ecotourism, research, study and networks. The structural and functional mechanisms for governing ecotourism destinations are in place. They also have strong engagement with various stakeholders, who will be equally important for ICIMOD during the various stages of service product development.

Kheraini Municipality at first glance looks more promising as a key partner considering the resources available for the piloting and the mayor's political will and enthusiasm for engaging us in his efforts to promote community-based ecotourism in his area. Kheraini Municipality also hosts an agriculture zone under the PMAMP and a responsible body for developing policies for the municipality. It will be a very important partner for the co-development of service products for both tourism and agriculture.

For agriculture, a possible mechanism for implementing climate services is a consortium of relevant institutions including government, academic and non-government organizations, with the Agriculture Knowledge Centre playing a key role. Based on discussions with multiple institutions, a

few specific commodities should receive priority. It is important to emphasize sustainability from the outset and the prospect of securing additional funding in the near future.

Agriculture and Forestry University (AFU) is another important potential partner for given the resources (primarily knowledge) they would bring in. They can also be a strong research partner that supports the co-development and validation of the services.

## SECTION VIII

# A way forward

---

The scoping was carried out as the first step in the pilot implementation process to understand the sectoral context and issues/opportunities related to climate services and to map out potential stakeholders for potential collaboration. Based on inputs from the stakeholders and our observations during the scoping mission, there is a need of focused and structured discussions with key identified stakeholders who will be engaged in the co-design, co-development and primary use of the services.

Partnership, collaboration and engagement with stakeholders also need to be discussed based on mutual interest, capability and agreement. The co-development of climate service products for information sharing, communication and technology transfer mechanisms are also important for institutional capacity building and strengthening of local partners engaged in climate service information dissemination.

Some of the follow-up actions that could be undertaken are:

- Develop a preliminary action plan using a TOC approach
- Identify key stakeholders for the co-design and co-development and validation of needs assessments and baseline surveys.
- Develop/formalize partnerships (through letters of agreement) with key local partners to co-design and co-develop climate service products and ensure institutional ownership and sustainability of the interventions

- Plan and prepare for the inception workshop
- Update and endorse action plan
- Present and discuss the scoping, needs assessment and baseline survey outputs
- Brainstorm and finalize interventions
- Develop an engagement strategy for climate service products co-development, packaging and dissemination
- Develop a mechanism for information, communication and technology transfer

Selection criteria for potential pilot intervention and partners:

- Relevance, urgency
- GESI
- Efficiency
- Co-development, co-implementation and engagement of stakeholders
- Sustainability
- Impact – replication/upscaling and outscaling
- Win-win action, no risk or within acceptable risk
- Co-benefits
- Awareness, capacity building and strengthening
- Willingness to take ownership, learn and innovate
- Availability of human, financial and material resources
- A timeframe that ensures that key results are achieved within the project period
- Others

# References

---

- Becken, S., Lama, A.K., & Espiner, S. (2013). The cultural context of climate change impacts: Perceptions among community members in the Annapurna Conservation Area, Nepal. *Environmental Development*, 8, 22-37. <http://dx.doi.org/10.1016/j.envdev.2013.05.007>.
- IPCC (2007). *Climate change 2007: the physical science basis: summary for policymakers*. Geneva: IPCC. <https://reliefweb.int/report/nepal/nppo-nepal-declares-invasion-american-fall-armyworm-spodoptera-frugiperda-nepal>
- <https://thehimalayantimes.com/nepal/strong-winds-and-hailstorm-destroy-crops-worth-millions-in-chitwan/>
- Harjanne, A. (2017). Servitizing climate science—Institutional analysis of climate services discourse and its implications. *Global Environmental Change*, 46, 1 – 16.
- Lettenmaier, D.P., Wood, E.F., & Wallis, J.R. (1994). Hydro-climatological trends in the continental United States, 1948-88. *Journal of Climate*, 7(4), pp.586-607.
- Lipton, J.K., & Bhattarai, U. (2014). Park Establishment, Tourism, and Livelihood Changes: A Case Study of the Establishment of Chitwan National Park and the Tharu People of Nepal. *American International Journal of Social Science*, 3 (1), 12 – 24.
- McNie, E. (2013). Delivering Climate Services: Organizational Strategies and Approaches for Producing Useful Climate-Science Information. *Weather, Climate and Society*, 5 (1), 14-26. Retrieved from [https://www.researchgate.net/publication/270719366\\_Delivering\\_Climate\\_Services\\_Organizational\\_Strategies\\_and\\_Approaches\\_for\\_Producing\\_Useful\\_Climate-Science\\_Information](https://www.researchgate.net/publication/270719366_Delivering_Climate_Services_Organizational_Strategies_and_Approaches_for_Producing_Useful_Climate-Science_Information)
- Mechler, R., Bouwer, L.M., Schinko, T., Surminski, S. & Bayer, J.L (eds) (2019). *Loss and Damage from Climate Change: Concepts, Methods and Policy options*. Basel, Switzerland: Springer International Publishing. Retrieved from [http://pure.iiasa.ac.at/id/eprint/14506/1/2019\\_Book\\_LossAndDamageFromClimateChange.pdf](http://pure.iiasa.ac.at/id/eprint/14506/1/2019_Book_LossAndDamageFromClimateChange.pdf)
- MOCTCA. (2018). *Nepal Tourism Statistics 2017*. Ministry of Culture, Tourism and Civil Aviation, Singha Durbar, Kathmandu, Nepal.
- MoFSC (2017a). *Chitwan National Park and Buffer Zone Tourism Management Plan (2017/18 – 2021/22)*. Ministry of Forest and Soil Conservation, Chitwan National Park Office, Kasara, Chitwan.
- MoFSC (2017b). *Chitwan National Park and its Buffer Zone Management Plan (2013 – 2017)*. Ministry of Forest and Soil Conservation, Chitwan National Park Office, Kasara, Chitwan.
- MoFSC. (2015). *Strategy and Action Plan 2016 – 2025: Chitwan-Annapurna Landscape, Nepal*. Ministry of Forest and Soil Conservation, Singha Durbar, Kathmandu, Nepal.
- NTNC-BCC. (2019). *National Trust for Nature Conservation/Biodiversity Conservation Center. Annual Report. 2017/18 (2074/75)*. National Trust for Nature Conservation/Biodiversity Conservation Centre, Ratnanagar Municipality – 6, Sauraha, Chitwan, Nepal.
- Paudel, B., Acharya, B.S., Ghimire, R., Dahal, K.R., & Bista, P. (2014). Adapting agriculture to climate change and variability in Chitwan: Long-term trends and farmers’ perceptions. *Agricultural Research*, 3(2), pp.165-174.
- Pun, D.P. (2004). *Rural Landscape Change: Landscape Practices, Values and Meanings, Case of Jagatpur VDC, Chitwan, Nepal*. Masters Thesis. Department of Geography. Norwegian University of Science and Technology (NTNU), Trondheim, Norway
- Sharma, S. (2018). *How Export of Services can Balance Nepal's Trade*. Retrieved from <https://www.newbusinessage.com/MagazineArticles/view/2351>
- Shrestha, M., & Rasul, G. (2019). *Climate Services to build resilience communities in the Hindu Kush Himalaya*. International Centre for Integrated Mountain Development, Kathmandu, Nepal.
- UN (2015). *Paris Agreement*. Retrieved from [https://unfccc.int/sites/default/files/english\\_paris\\_agreement.pdf](https://unfccc.int/sites/default/files/english_paris_agreement.pdf)
- UNFCCC (2012). *Slow onset events. Technical Paper*. Retrieved from <https://unfccc.int/resource/docs/2012/tp/07.pdf>

Wester, P., Mishra, A., Mukherji, A., & Shrestha, A. B (eds) (2019). *The Hindu Kush Himalaya Assessment—Mountains, Climate Change, Sustainability and People*. Springer Nature Switzerland AG, Cham.

World Bank. (2009). Feasibility study for agricultural insurance in Nepal. Finance and Private Sector Development Unit, South Asia Region Global Facility for Disaster Reduction and Recovery. (PDF) Agriculture Insurance in Nepal: Case of Banana and Livestock Insurance. Available from: [https://www.researchgate.net/publication/305442122\\_Agriculture\\_Insurance\\_in\\_Nepal\\_Case\\_of\\_Banana\\_and\\_Livestock\\_Insurance](https://www.researchgate.net/publication/305442122_Agriculture_Insurance_in_Nepal_Case_of_Banana_and_Livestock_Insurance) [accessed Mar 10 2020].

WTTC (2019). *Nepal 2019 annual research: Key highlights*. World Travel and Tourism Council: London, United Kingdom.

# Annexes

## Annex 1: Scoping study visit programme

S.N	Date	Description	Location
1	Sunday 5th January	Scoping study team travel from Kathmandu to Chitwan  Meeting with National Trust for Nature Conservation/ Biodiversity Conservation Centre (NTNC/ BCC), Chitwan National Park (CNP) and tourism stakeholders	NTNC/BCC Meeting Hall
2	Monday 6th January	Meeting with Lal Mani Chaudhary, Mayor, Khairini Municipality  Meeting with Megh Nath Timilsina, Prime Minister's Agriculture Modernization Project, Unit Head  <i>Lunch</i>  Meeting with Bishwo Raj Subedi, Nepal Tourism Board  Meeting with FORWARD NGO team	Mayor's Office, Khairini Municipality  Prime Minister's Agriculture Modernization Project, Bharatpur  Office of the District Coordination Committee, Bharatpur Municipality  FORWARD Office Hall, Bharatpur Municipality
3	Tuesday 7th January	Field visit to community forest and visitors' park  Preparation for the half-day tourism stakeholders consultative workshop  13:00–14:00 - Lunch  Half-day tourism stakeholders consultative workshop	NTNC/BCC Hall  NTNC/BCC Hall
4	Wednesday 8th January	Agriculture Forestry University  <i>Lunch</i>  Stakeholder consultation	Rampur  Krishi Gyan Kendra
5	Thursday 9th January	Scoping study team travels back to Kathmandu	

## Annex 2: List of participants of the informal stakeholder consultation

Stakeholder Group	Representative	Mobile
Regional Hotel Association of Nepal (RHAN)	Tika Giri	9841509764
National Trust for Nature Conservation (NTNC)/ Biodiversity Conservation Centre (BCC)	Baburam Lamichhane	9855066006
Elephant Cooperative, Sauraha	Rishi Ram Tiwari	9855057182
Restaurant and Bar Association of Nepal (REBAN)	Kapil Regmi	9845160163
Baghmara Community Forest	Jit Bahadur Tamang	9855080337
NTNC/BCC	Ram Kumar Aryal	9855057012
NNTNC/BCC	Anil Prasai	9851081389
Regional Hotel Association of Nepal (RHAN), Sauraha	Ram Mani Khanal	9855017271
Chitwan National Park (CNP)	Rishi Ranabhat	9864280521

## Annex 3: Tourism-related institutions in Chitwan

1. Rural Municipality, Municipality and Metropolitan
2. Buffer Zone Management Committee
3. Buffer Zone User Group
4. Baghmara Community Forest User Group
5. Community Based Anti-Poaching Unit
6. Women's user groups' souvenir shop
7. Elephant safari group
8. Chitwan Elephant Cooperatives
9. The Elephant Breeding Center at Khorsor
10. Tharu Museum
11. Gharial Breeding Center
12. 7 resorts inside the CNP run by park concessionaires
13. Federation of Nepalese Chamber of Commerce and Industries
14. Homestay Association of Nepal
15. Regional Hotel Association, Sauraha
16. Hotel Development Committee, Nawalpur
17. Chitwan Tourism Development Committee
18. Nature Guide Association
19. National Trust for Nature Conservation
20. World Wildlife Fund
21. Care Nepal
22. FECOFUN
23. CNP Chief Conservation Officer
24. Restaurant and Bar Association, Sauraha

## Annex 4: Half-day consultation workshop

1. Introduction (5 min)
2. Project brief (10 min)
3. Presentation on ‘Mainstreaming climate science for effective decision making: Climate Service for sustainable ecotourism’ (15 min)
4. Group discussion on key guiding questions (60 min)
5. Presentation by the rapporteur (30 min)
6. Next steps (15 min)

## Annex 5: Guiding questions

1. Nature and magnitude of weather/climate impacts and consequences?
2. Sources of climate services and types of services?
3. How are they delivered/disseminated/communicated?
4. Utility value of current climate services?
5. The barriers to effective reception, uptake, response, follow-up?
6. Institutions for mainstreaming climate services into decision-making process?
7. Institutions (producers and disseminators) for generating, translating and disseminating climate services information?
8. Way forward to entry points and interventions for co-designing and co-developing climate services information?

## Annex 6: Group discussion findings

### Group 1: Forest user group

#### 1. IMPACTS OF CLIMATE CHANGE

- Decreasing water level in river and riverine areas and decreasing aquatic animal population
- Decreased production of agricultural goods
- Decreasing grassland has affected insects and other species residing there
- Extreme rainfall patterns (too much or too little) causing environmental problems – landslides and flood

#### 2. AVAILABILITY OF INFORMATION

- Information (piecemeal) available but is not timely. Delayed information is useless as it doesn't help people take precautionary actions.

#### 3. SOURCES OF INFORMATION

- Department of Hydrology and Meteorology (DHM), radio, TV, mobile, etc.
- Information is received in Nepali language. Information dissemination in local languages like Tharu, Maithali would have been better.
- Information on rainfall is being received through local radio and TV.

#### 4. BARRIERS

- No information regarding forest fire
- No timely information. Local level information could be received on time if a municipality level officer could facilitate information dissemination.

#### 5. WAY FORWARD

- Establishment of information boards in certain places could be useful.
- Early warning system should be managed.
- Improve management of riverine communities to decrease flood based risk

- Introduction of new technologies to reduce crop damage
- Increase public awareness and information provision for conservation and management of forest and species
- Train local government and local NGOs to disseminate information and to manage instruments

**Group members:**

Chitrasen buffer zone community forest user group  
 Tikauli buffer zone community forest user group

**Group 2: Policy group**

**1. IMPACT OF CLIMATE VARIABILITY AND CHANGE**

Changing rainfall cycle

- Decreased number of slow rainy days.
- Increased extreme rainfall events (too much and too little), drought, floods and landslides

Increase of invasive plant species has led to:

- Loss of wildlife habitat and food causing wildlife to enter human settlements and increased human-wildlife conflict
- Displacement of local species of plants
- Decreasing biodiversity
- Reduced wetland area, turning most wetlands into pastures
- Changes in forest areas and grasslands

Effect on agriculture and human health

- Traditional ways of farming and local species are being replaced
- Altered the growth cycle of various agricultural products like fruits
- New diseases have been discovered
- People are facing many health issues even at a young age

**2. AVAILABILITY OF CLIMATE INFORMATION**

Information available but in a scattered form

**3. SOURCES OF INFORMATION**

Mobile, Facebook, social media

Apps and websites

FM radio, TV, news media

Department of Hydrology and Meteorology (DHM)

Governmental and non-governmental organizations

Public awareness programmes

Information boards

**4. IMPORTANCE OF CLIMATE SERVICES**

For risk reduction

Pre-preparedness against risks

Emergency preparedness and response during disasters

Overall damage reduction

**5. BARRIERS**

Topographic barriers make information inaccessible to targeted recipients

Technological barriers

Language barrier makes it difficult for diverse groups to understand the information

Lack of skilled human resources

Delayed dissemination of information

**6. CONCERNED INSTITUTIONS**

Government system as a whole

NTNC, CTDC, RHAN, CNP, CF, FECOFUN

District Natural Disaster Relief Committee - Red Cross

Non-governmental organizations and schools and colleges

Service centres: ICIMOD, supporting agencies and stakeholders

Cooperating organization: Local level government and concerned organizations

## 7. WAY FORWARD

Training for concerned people at local level e.g., ward-level actors

Development of technology for receiving information

Pre-preparedness training and strategies for reducing the risk

### GROUP MEMBERS

NTNC: Anil Pudasaini

Bharatpur Metropolitan City: Bishwa Raj Subedi

Chitwan Tourism Development Committee (CTDC): Khem Bhatta and Sudeep Bhatta

FECOFUN: Surbir Pokharel

TAAL: Ram Prit Yadav (former warden)

## Group 3: Private sector

### 1. CLIMATE CHANGE IMPACTS

Reduced level of water in river, riverine areas, lakes, wetlands

Affected aquatic life and consequently the jobs and income of the fishing communities - Musahar/Majhi

Impacted the irrigation canal and crop production

Water scarcity has caused reduction in wildlife population

Unpredicted weather changes - irrational rainfall has impacted tourist travel itineraries. Guides' jobs are at risk.

### 2. AVAILABILITY OF INFORMATION

Information is available only during flood (as early warning); no other information has been received.

Existing information is not sufficient and cannot be put to practical use.

### 3. SOURCES OF INFORMATION

Internet and mobile messaging

FM radio, Facebook, airport and from Sahamati, an NGO

## 4. BARRIERS

Not enough research

Not enough pre-preparedness and sources/tools for risk reduction

Lack of capability, technical and practical knowledge and skills

Lack of cooperative and organizations working in this area

Lack of coordination among concerned organizations – Ministry of Forest and Environment, Sahamati, Practical Action, ICIMOD

Lack of water resources has led to increased use of insecticides and pesticides

Habitat loss causing wildlife to migrate to new locations

## 5. CONCERNED INSTITUTIONS

Ministry of Forest and Environment, Sahamati, Practical Action, ICIMOD

### A WAY FORWARD

Cooperation between various institutions

Finding practical solutions to the problems

Context-specific, solution-oriented information and cooperation

### GROUP MEMBERS

Nature Guides Association

Darai Community Homestays

Tharu Museum

Tour company

## Annex 7: Agriculture related institutions participating in stakeholder consultation

The consultation workshop held on 8 January had 27 participants (4 females) representing the 12 organizations listed below:

- Agriculture Knowledge Centre, Chitwan
- Prime Minister's Agriculture Modernization Project & coordinators of four zones (banana, bee, mustard, rice)
- Veterinary hospital and livestock services expert centre, Chitwan
- Agriculture section of the Municipality office of Jagatpur, Khairahani, Ichhakamana, Kalika
- District vegetable and fruit production cooperative
- District IPM Farmers Association
- District Coordination Office, Chitwan
- Chitwan Banana Producers Association
- Federation of Nepal Beekeepers Association
- Agriculture and Forestry University, Rampur, Chitwan
- District Seed Coordination Committee
- Livestock Farmers Association

## Annex 8: Agriculture stakeholder consultation

A half-day consultation workshop was jointly organized with the Krishi Gyan Kendra on 8 January. Krishi Gyan Kendra took the lead in identifying the right stakeholders and farmers' representatives for the workshop. The main objective of the workshop was to assess the current status of climate information services in agriculture and get a sense of existing and possible stakeholders for future partnership. The workshop was attended by a total of 27 participants.

Mandira Shrestha gave a brief overview of ICIMOD's Climate Services Initiative and the purpose of the visit. Her presentation touched on the following subjects:

- Background of ICIMOD and the CS initiative
- Climate risk sensitive growth sectors
- Challenges and lessons learnt
- Climate services information value chain process
- Role of ICIMOD
- Objective of the consultation

Ganesh Bhattarai presented on the role and application of climate services in agriculture. His presentation focused on the following themes:

- Definition of climate services and the GFCS-identified five goals and five pillars
- Discussion on how climate information services could be useful in agriculture
  - Climate information services for decision makers
  - Climate information services for farmers' decision making
- Current climate services dissemination system in Nepal
- Major challenges in the adoption of the agriculture advisory bulletin
- Available climate information products at ICIMOD

## Group discussion

A focused group exercise was organized where the participants discussed in three groups: agriculture; livestock and fisheries; and beekeeping. The discussion was guided by the following key questions:

- Current sources of climate information for agriculture, both historical and forecast related
- What agriculture advisories do you receive? What is the source? How do you use them?
- What climate-related issues have farmers been facing?
- Is there a particular region or group to be targeted? Why?
- Specific areas/crops where climate services are much needed and are useful?

### GROUP 1: LIVESTOCK AND FISHERIES

1. Impact of weather, climate variability and climate change

#### Agriculture

New and increased diseases and pests (army worm in rice, fall army worm in maize, weevil in banana, black and loose smut in rice, banana leaf and stem scaring beetle)

Reduced water availability and drought are causing reduced yield of both field crops and fruits. Cultivation of Chaite dhan (spring rice) has been difficult as water for irrigation is limited.

Cold wave and winter rain causing wilting in banana and tomato, partially filled grain in maize, black smut/loose smut in paddy.

Crop damage due to rainfall during harvest time

Shifting rain pattern (crops that used to be planted in Asoj are now planted in Shrawan/ Bhadra)

#### Livestock and fisheries

Outbreak of disease (e.g., HPAI, Khoret, etc.)

Late outsourcing of crops; sometimes fields remain unirrigated.

Excessive production of weeds leading to reduced supply of nutrients to primary crops.

Reduced production of prolactin hormone leading to reduced production of milk

Reduced production of eggs (in chickens)

Increased temperature leading to increased mortality rates in birds and fishes

Reduced oxygen content in ponds

Low temperature leading to increasing deaths of fishes.

Difficulties in raising and saving goats and brooding chickens.

## Beekeeping

Reduced production of honey due to several factors

Delay in flowering of crops resulting in inadequate nectar

Excessive production of catweed (banmara) and other weeds

Degradation in the quality of queen bees, change in the size and behaviour of queen bees

Increase of invasive insects and decrease of friendly insects

Destruction of oilseed crop, a major source of nectar, by heavy rainfall

- 2 Sources of climate services, barriers to use them:

SMS are received by few farmers through the PPCR project, otherwise, information is sought on need base from

- Social Media,
- T.V
- F.M / Radio
- Mobile
- Website (PPCR)
- Newspaper
- Radio, Television, etc.

The barriers to use of the information are:

- Lack of knowledge about the source of information
- Very limited technical manpower available
- Lack of dedicated organization providing climate services

- Technology has not reached the intended beneficiaries.
  - Lack of agriculture plan and contingency plan
  - Instruments and weather forecast stations
3. Organizations currently providing various kinds of information:
- Provincial Department of Water and Climate
  - Bee development Center under Ministry of Agriculture and Livestock Development
  - Nepal Beekeepers Association – province/local level
  - GIZ
  - PPCR project – mobile app
  - Agriculture Knowledge Centre – medium of promotion, advertising
  - Local level – promotion, advertising medium
  - Nepal Beekeepers Association – promotion, workshop
4. Organizations that could use and provide information:
- AKC
  - PMAMP
  - Local government
  - AFU
  - NARC
  - Irrigation Development Kendra
  - Prime Minister’s Irrigation Modernization Project
  - Nepal Beekeepers Association
  - Local level
  - Bee Development Center

5. Specific sectors that need to be targeted for climate services information:

#### **Agriculture**

- Cereal crop seed production
- Banana farming
- Vegetable farming

#### **Livestock**

- Hens
- Fishes
- Goats
- Kid (baby goat), lamb

#### 6. Recommendations

- Development of an information system that could reach the farmer’s level.
- Establishment of an information system to address concerns related to livestock, fisheries, crops and bees in each district
- Crop planning according to climate data
- Pest and diseases forecasting system
- Fertilizers/pesticides application according to climate data
- Widened outreach through mass media, mobile applications, social media and the agriculture extension system

The desired information should be:

- Accurate
- Timely
- Easily accessible (e.g., SMS)
- Specific (e.g., crop calendar)

Report prepared by Anu Kumari Lama, Ganesh Bhattarai, Karma Tshering, Santosh Raj Pathak, and Mandira Singh Shrestha

Edited and laid out by the Production Team, Knowledge Management and Communication Unit, ICIMOD

**ICIMOD gratefully acknowledges the support of its core donors:** the Governments of Afghanistan, Australia, Austria, Bangladesh, Bhutan, China, India, Myanmar, Nepal, Norway, Pakistan, Sweden, and Switzerland.

---

© ICIMOD 2021

**International Centre for Integrated Mountain Development**  
GPO Box 3226, Kathmandu, Nepal  
T +977 1 5275222 | E [info@icimod.org](mailto:info@icimod.org) | [www.icimod.org](http://www.icimod.org)