BOGATAN LAGAM KARNALI WATERSHED PROFILE

STATUS, CHALLANGES AND OPPORTUNITIES FOR IMPROVED WATERSHED MANAGEMENT

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Cover photo: Community members of Simchaur, Doti and the Paani team engage in a focus group discussion on the issues of rural road construction and its impact on aquatic animals, in particular fish species, in the Bogatan Lagam Karnali watershed.

Photo credit: USAID Paani Program

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STATUS, CHALLENGES AND OPPORTUNITIES FOR IMPROVED WATER RESOURCE MANAGEMENT

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ABBREVIATIONS

BZFC	Buffer Zone Community Forest
BZMC	Buffer Zone Management Committee
CAPA	Community Adaptation Plan of Action
CBAPU	Community-based Anti-poaching Unit
CBS	Central Bureau of Statistics
CBOs	Community-based Organizations
CFUGs	Community Forest User Groups
CIP	Community Irrigation Project
CSOs	Community Service Organizations
DADO	District Agriculture Development Office
DCC	District Coordination Committee
DDC	District Development Committee
DDRC	District Disaster Risk Reduction Committee
DEECC	District Environment and Energy Coordination Committee
DFO	District Forest Office/Officer
DFRS	Department of Forest Research and Survey
DSCO	District Soil Conservation Office/Officer
DSCWM	Department of Soil Conservation and Watershed Management
EAP	Emergency Action Plan
EIA	Environmental Impact Assessment
FEDWASUN	Federation of Drinking Water and Sanitation Users Nepal
FGD	Focus Group Discussion
GON	Government of Nepal
GP	*Gaun palika* or rural municipality (new federal administrative unit; formerly Village Development Committee)
IEE	Initial Environmental Examination

IRBM	Integrated River Basin Management
IUCN	International Union for Conservation of Nature
KII	Key Informant Interview
LAPA	Local Adaptation Plan of Action
LSGA	Local Self-Governance Act
MOE	Ministry of Education, Science and Technology
MOFSC	Ministry of Forest and Soil Conservation
MOAD	Ministry of Agriculture and Livestock Development
MOFE	Ministry of Population and Environment
MOFALD	Ministry of Federal Affairs and General Administration
MEWRI	Ministry of Energy, Water Resources and Irrigation
MOPIT	Ministry of Physical Infrastructure and Transport
MOFALD	Ministry of Federal Affairs and Local Development
MSC	Multi-stakeholder Consultation
NEFIN	Nepal Federation of Indigenous Nationalities
NFIWUAN	National Federation of Irrigation and Water Users' Association
NP	*Nagar palika* (new federal administrative unit; district level)
NPC	National Planning Commission
NRM	Natural resource management
PAANI	USAID Paani Program
USAID	United States Agency for International Development
VDC	Village Development Committee
WECS	Water and Energy Commission Secretariat
WWF	World Wildlife Fun

ACKNOWLEDGEMENTS

Water is the single most important natural resource underpinning Nepal's economy and livelihoods. Inclusive, sustainable management of water resources depends on strengthening community resilience and protecting healthy, biodiverse ecosystems in the face of both development and climate change.

This discussion draft watershed profile is the result of many people working together. Most significant were the generous contributions of time, thoughtful attention, and ideas of members of many community forest user groups (CFUGs), cooperatives, water user groups, and, especially, the communities dependent on aquatic biodiversity and local water management. Leaders of Jorayal, Chure, Baddi Kedar, and Mohanyal rural municipalities and the newly elected local government bodies engaged deeply in the assessment and prioritization and committed themselves to collaborate and integrate the priority agenda into local planning processes.

The USAID Paani Program—युएसएड पानी परियोजना—is grateful for the privilege of having been invited to support the above efforts. The Paani Program (Paani) is a consortium of DAI, WWF, SILT, and NESS that works closely with Nepal's Water and Energy Commission Secretariat (WECS) and draws on the support of the WECS' member agencies. Paani enriched the watershed profile by compiling and reviewing secondary data and by collaborating with NFIWUAN who carried out surveys to assess community perceptions and biophysical conditions. Thanks are also due for several other collaborating government agencies, civil society organizations, and federations for their consistent cooperation and contributions to prepare this watershed profile. These groups include NFIWUAN, FEDWASUN, NEFIN, and associated government line agencies and non-government organizations, who gave their full cooperation and support at the national, district and local levels. Any errors in this discussion document are those of the USAID Paani Program team.

EXECUTIVE SUMMARY

This profile assesses the status, major challenges and opportunities for water resource management for the multiple users within the Bogatan Lagam Karnali watershed in far western Nepal.

The USAID Paani Program — also known as Paani, युएसएड पानी परियोजना— facilitated the preparation of this profile, in close coordination with the Government of Nepal and local stakeholders and with support from the United States Agency for International Development (USAID). Paani aims to increase the knowledge, engagement, and benefits of local water users in target river basins to build local water resource management capacity.

This profile provides critical baseline information for local government, community, civil society, and private sector stakeholders within Bogatan Lagam Karnali to strengthen water resource management in a way that benefits human development and protects the natural resource base upon which well-being depends. This profile also helps local stakeholders to design and test interventions to strengthen community resilience and conserve freshwater biodiversity, for which additional resources are available through the Paani local grants program.[1]

The Bogatan Lagam Karnali (Figure 1) watershed stretches across the districts of Doti and Surkhet in far western Nepal and the newly-established Provinces 6 and 7. The total area of the watershed is 205 km^2 and ranges in elevation from 2,357 m in the north to 313 m in the southern reaches. The watershed contains 36 tributaries and streams, all of which flow into the Karnali River.

The watershed is characterized by rugged terrain and sharp hills that descend sharply from north to south. The climate of the watershed changes from warm temperate in the north to sub-tropical in the south. Monsoon rainfall soaks the watershed from June through August as temperatures soar into the high thirties.

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[1] It should be noted here that the research for this watershed profile, and the other profiles under the USAID Paani Program, was conducted before and after the country elected to move to a federal system of government. This change means that former governmental units, such as village development committees (VDCs), will be gradually superseded by new units such as the municipality (*nagarpalika)*, rural municipality (*gaunpalika*) and province.

Watersheds as a unit of analysis do not align with past or current administrative units; however, as our research began and ended after this change, you will note references to both the new and old forms – VDC, gaunpalika (GP) and nagarpalika (NP). When we refer to liaising with or providing support to local governments, we are making reference to the units as assigned by the new federal system.

Watersheds occasionally sit within a single province, but more commonly extend across two provinces, which presents a particular incongruence when offering recommendations for action. However, for biological and socio-economic research, a watershed is optimal because it provides a discrete area in which to examine the effects of climate change and human-environmental interactions. As all rain water and snow melt drain toward a primary river in watershed, so does this area provide a unique record of environmental and socio-economic change?

The total population of Bogatan Lagam Karnali is 16,251, of which 60% are Brahmin, Chhetri, or Thakuri. Janajatis make up 22% of the population, and 16% are Dalit.

Agriculture is the largest source of livelihood, although migration abroad and in country have become more common for young men. The watershed has little infrastructure in terms of roads, irrigation, and hydropower. Magars, a Janajati group, have assumed a leading role in protecting natural resources in the watershed.

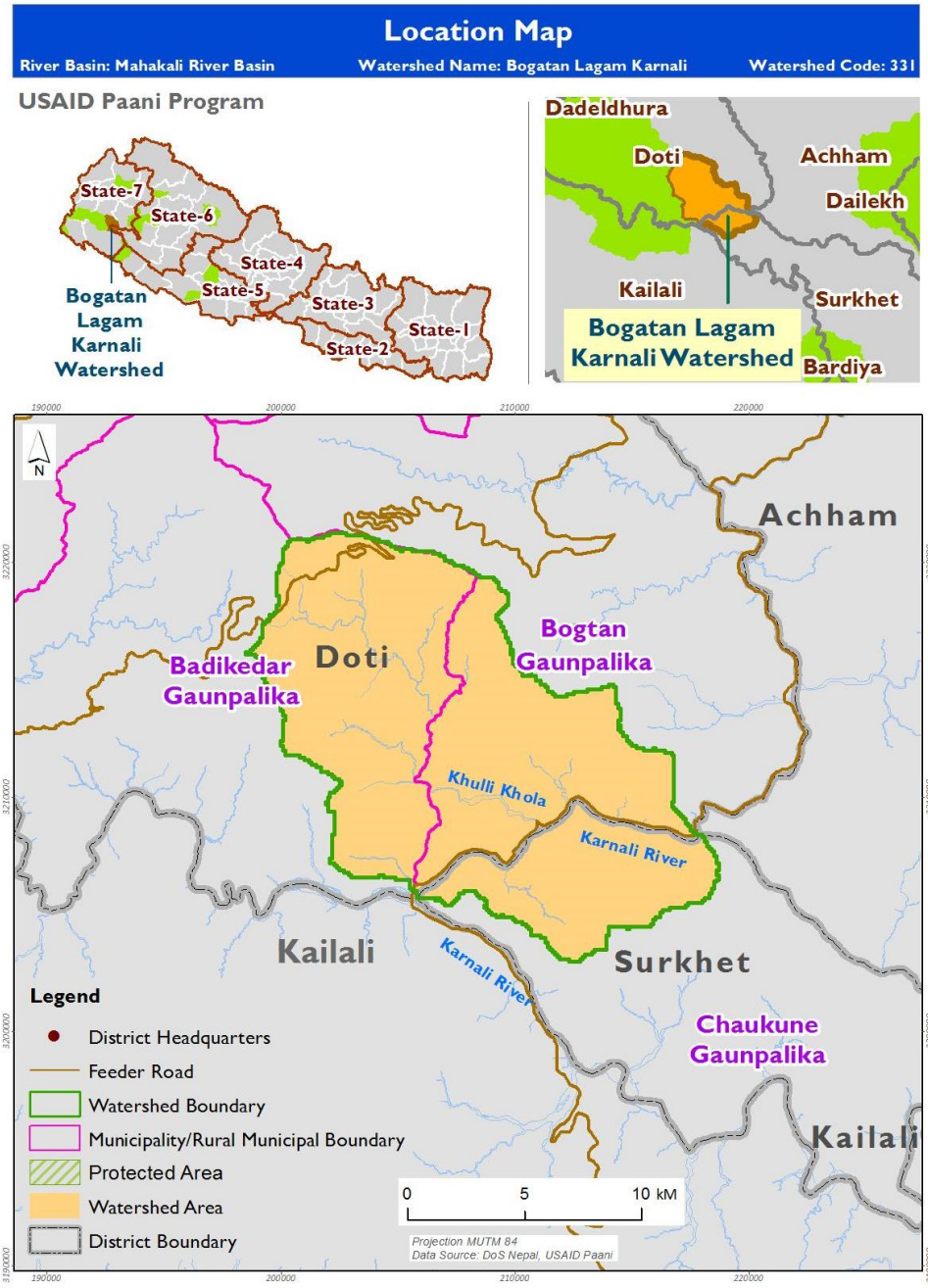


Figure 1: Location map of Bogatan Lagam Karnali watershed

Priority Issues for the Bogatan Lagam Karnali Watershed

The Bogatan Lagam Karnali watershed covers part of Doti and Kailali districts in Province No. 7 and part of Surkhet district in Province 6. Most of the areas in this watershed stretch from plains in the south to hilly areas in the center of the country. The issues and challenges for Bogatan Lagam Karnali are summarized in Table 1 and described below with recommendations for addressing each challenge.

Table 1: Priority issues for watershed health in the Bogatan Lagam Karnali watershed

SN	Priority Issue	Impacts
I	Drying water sources	Increasingly intense rainfall events combined with longer dry spells have led to decreased water availability overall in the watershed, affecting livelihoods and diminishing valuable ecosystem services.
II	Destructive fishing practices	The rise in use of destructive fishing practices, such as poison and electric current, has contributed to a decline in fish populations in the watershed. As well, many vulnerable Dalit and Janajati households rely on fishing as an alternative food and income source.
III	Landslides	Despite good forest cover in Bogatan Lagam Karnali, the fragile Churiya landscape and increasingly intense rainfall events have increased the number of landslides in the watershed. These landslides pose threats not only to human settlements, but also impact the health and biodiversity of aquatic life in the rivers.

I. Drying water sources

Data and community observations for the watershed over the past 10 years show an increase in temperature but a decrease in rainfall. Households report that dry spells are longer and water sources are drying up in many locations. Some reported that the drying up of water sources may be linked with road construction in the watershed. Insufficient water levels have been reported in numerous locations around the watershed and this decrease in available water for irrigation and domestic use has led to conflicts in some communities.

Recommendations

- Establish water conservation measures such as recharge ponds, infiltration ponds, rainwater harvesting, and other multiple-use water techniques;
- Develop and implement Water Use Master Plans (WUMP) in the watershed;
- Protect existing water sources through improved catchment management of natural springs;
- Introduce more climate-smart watershed and agricultural practices such as drip and sprinkler irrigation, mulching, organic farming, and increased use of drought-resistant crops and forest species; and

- Support local government to develop and implement environmental-friendly road construction guidelines.

II. Destructive fishing practices

Growing interest in capture fishing has led to a rise in the use of destructive practices, such as gill nets, poison, and electric currents. These practices kill fish at an unsustainably high rate, leading to a decline in fish stocks. In Bogatan Lagam Karnali, households say that the Mauwa, Katai, Pansa, and Kalesha fish species have been particularly affected. Although there are no traditional fishing communities located in Bogatan Lagam Karnali, many households – particularly Dalit and Janajati – rely on fishing as an alternative income source and to bolster family food security.

Recommendations

- Raise community awareness about the impacts of destructive fishing practices;
- Support the government to enforce the Aquatic Animals Protection Act in local rivers; and
- Form community groups to monitor and regulate fishing practices in the watershed.

III. Landslides

The Bogatan Lagam Karnali watershed is especially prone to landslides due to the steep topography combined with the fragile geologic composition of the hills in this area. Local road construction aggravates this condition as road building often does not observe necessary environmental precautions. The landslides pour tremendous amounts of sediment into the river, polluting water sources and impacting aquatic habitats. Communities are in personal physical danger and often lose significant property in the falling debris.

Recommendations

- Provide training on low-cost bioengineering techniques to minimize the impact of landslides;
- Support implementation of Environment Friendly Local Governance (EFLG) frameworks, Local Disaster Risk Management Plans (LDRMP), Local Adaptation Plans of Action (LAPA), and Water User Master Plans; and
- Advocate for environment-friendly construction with local development agencies.

1. BOGATAN LAGAM KARNALI WATERSHED: NATURE, WEALTH AND POWER

The Bogatan Lagam Karnali watershed profile is organized around three interrelated themes that influence the management and overall health of the watershed: nature (environment and natural resources), wealth (socioeconomics and infrastructure—the many ways that people **use** nature), and power (governance and institutions—the ways that the different people and groups **make decisions** together about the watershed and its uses)[2]. The analysis draws on multiple data sets associated with these themes to identify critical issues and opportunities for this watershed. We introduce this watershed in terms of its local natural and social dimensions. Then we examine how climate change and other drivers affects local livelihoods and fresh water biodiversity.

In 2016-17, the USAID Paani Program conducted a series of literature reviews, household surveys, focus group discussions, and key informant interviews to characterize the watersheds, including the identification of priority threats and opportunities. Through an exit workshop, the Paani team shared preliminary results with multiple stakeholders, based on which priority issues and environmental assets were identified by location and impact groups. During the exit workshop, the Paani team also identified champions among stakeholders and local government agencies for leveraging funds and expertise to support water resources management initiatives.

Paani took the critical feedback and suggestions to identify priority issues and actions, and with the participants, developed a 20-year vison for improving watershed management. The representatives of elected local bodies also expressed eagerness to allocate their resources in support of activities in all aspects of watershed conservation.

Related annexes
Annex 1: Methodology

[2] The full text from which this report's structure was taken (NATURE, WEALTH, & POWER 2.0: Leveraging Natural and Social Capital for Resilient Development) is available here: https://rmportal.net/library/content/nwp-2.0

2. NATURE

In this section, we review the status of the environment and natural resources in the Bogatan Lagam Karnali watershed, paying special note to trends and changes that may threaten the health and sustainability of these assets.

2.1 BOGATAN LAGAM KARNALI WATERSHED

The Bogatan Lagam Karnali watershed stretches over an area of 205 km^2 and extends partly over two districts in the far- and mid-western regions of Nepal. The majority of the watershed lies in Doti district and a small portion in Surkhet district. Under Nepal's new federal structure, this watershed extends from Badikedar GP to Bogatan GP in Doti and Chaukune GP in Surkhet.

The topography of the Bogatan Lagam Karnali Watershed is characterized by steep, hilly terrain with large variations in elevation. The highest ridge point of the watershed is 2,357 m and the lowest point is 313 m. The geology of the watershed is characterized by carbonaceous rock, limestone, and dolomite.

The Karnali River runs through the watershed, and the many streams and tributaries in Bogatan Lagam Karnali drain into the Karnali as it makes its way toward confluence with the Mahakali River. The major natural resources in Bogatan Lagam Karnali include the water, forests, gravel deposits, and numerous species of flora and fauna.

The watershed is predominately populated by Brahmin/Chhetri/Thakuri households (65%), followed by Dalit (27%), and Janajati groups (7%). Agriculture is the primary source of income (76%) and farmers earn most of their take home through staple crops, such as rice, wheat, and millet. Livestock rearing (6%) and seasonal migration (14%) are also significant sources of livelihood in the watershed followed by wage employment (3.5%), off farm activities, and traditional occupations.

2.2 WATER AVAILABILITY AND QUALITY

The Bogatan Lagam Karnali watershed is a complex network of 36 rivers and streams – a total of five river systems – with a total drainage density of 1,433 km^3.

The Seti and Karnali rivers join together just before entering the Bogatam Lagam watershed from the West. The watershed boundaries include Badikedar and Bogtan GP within Doti district and Chaukune GP in Surkhet. There are four sub-watersheds within the Doti portion of Bogatan Lagam Karnali: Upallo Sisnigaad, Tallo Sisnigaad, Ghagalgaad, and Budhigaad. In Surkhet, Lomu Khola is the only sub-watershed.

The major tributaries of Bogatan Lagam Karnali watershed are Bandgaad, Guinada Khola, Pogade Khola, Baral Khola, Buda Khola, Bhatmare Khola, and Kuntadagaad (figure 2).

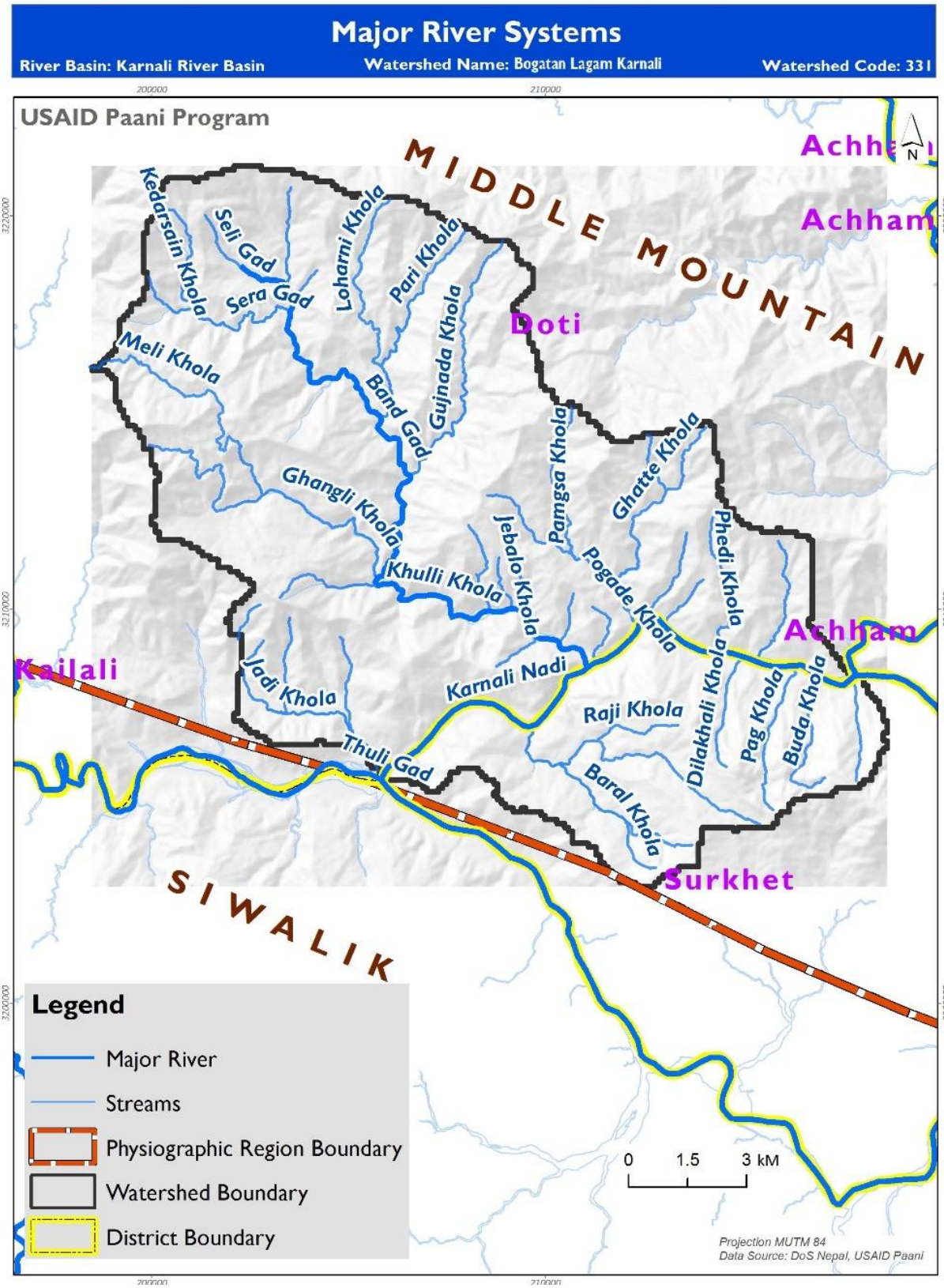


Figure 2: Map of major rivers in the Bogatan Lagam Karnali watershed

The Bogatan Lagam Karnali watershed and its tributaries are the main source of water for domestic and agricultural uses, although local springs play an important role as well. Seventy percent of households draw water from piped systems, which indicates good community coverage for drinking water. The remaining households draw water from a variety of sources, including wells, rivers, lakes, rain water harvesting, and groundwater extraction. Still, availability is a nagging issue as 79% of households report difficulty in obtaining sufficient drinking water.

Water accessibility, on the other hand, indicates the degree of ease for users to obtain water for domestic and agricultural needs. Seventy-nine percent of households said they needed less than 15 minutes per day to collect drinking water. Nine percent spend between 30-60 minutes per day, and less than 5% reported having no access to available water resources. Of those families needing more than 30 minutes per day to fetch water, 75% cited long distances to water sources as the major impediment. Many Dalit households reported that caste-based discrimination around water sources persists in many places.

As in many parts of Nepal, water, lakes, and rivers hold a sacred significance in the communities of the Bogatan Lagam Karnali watershed. Magars, who make up 16% of the total watershed population, conduct numerous religious ceremonies near water sources, which, in some cases call for cleaning the water source and planting trees around it. The disappearance of water sources will impact these important rituals as well.

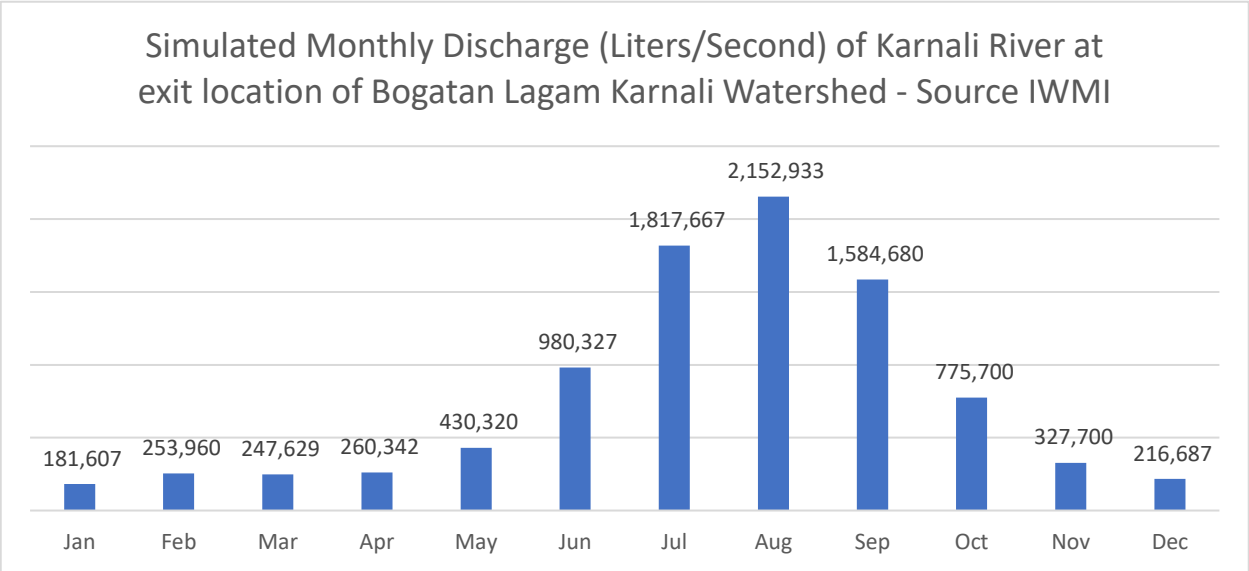
Focus group discussions revealed that many households are deeply concerned with drying water sources in the face of diminished annual rainfall amounts. These complaints were especially acute in the following locations: Kattai, Mauda, Pansa, Bajada, Kipalla, Garada, Reuka, Airekot, Dududi, Kalena, Kante, and Malla Katai.

Water discharge in five tributaries of Bogatan Lagam Karnali watershed was estimated using the float method during Paani water quality survey in October 2017 (Table 2).

Table 2: Discharge value of rivers in the watershed

Name of Rivers / Streams	Latitude	Longitude	Elevation (m)	Estimated Discharge (L/S)
Guinada Khola	29.0352396	80.99931956	1,017	261
Barkha Khola	29.02789154	81.00902239	1,356	329
Sim Khola	29.02793996	81.00912382	1,341	83
Kauli Khola	29.02164033	80.99884567	949	93
Kuntegada Khola	29.02159988	80.99799778	829	645

Water discharge in the Karnali river main stem at the outlet of the watershed has been modeled by IWMI and estimated at 2,152,933 liters/second at the height of the monsoon (August) and as low as 181,607 liters/second in January.



Because the Bogatan Lagam Karnali watershed is located at the lower part of the Karnali River basin, the trend observed in river discharge is the result of changes in climatic variables at the river basin scale rather than the changes at the scale of Bogatan Lagam Karnali watershed.

Water quality monitoring was conducted at 10 sites in the Bogatan Lagam Karnali watershed. Water samples were collected and tested for pH, iron, nitrite-nitrogen, ammonium, phosphate, and temperature. The water quality was found to be within acceptable ranges in all categories except pH, which was slightly low at Dhameli, Silghatta, Guenada, Guena Dovan and Kedarsain. Ammonium levels were slightly elevated at Dhameli. The water was sampled at several location in the watershed using an Akvo Caddisfly kit.

Related annexes

Annex 5: Lakes, streams, rivers, and sub-watersheds
Annex 13: Irrigation projects
Annex 14: Water quality

2.3 LAND USE AND LAND COVER

Forest covers nearly 80% of the land in the Bogatan Lagam Karnali watershed, followed by 18% for cultivation, and the remaining 2% by rivers and streams (figure 3). The forest is the major natural resource of the watershed comprised primarily of oak, rhododendron, Sal, Chir pine, and mixed-broad leaved forest (figure 4). The forest is located in the Churia region of Nepal, a geological formation known for its fragility and susceptibility to flooding and landslides. For this reason, conservation of forests, Churia, and aquatic biodiversity are closely linked. Terrace farming is widespread in the watershed: wheat, millet, rice, potato and maize are the dominant crops.

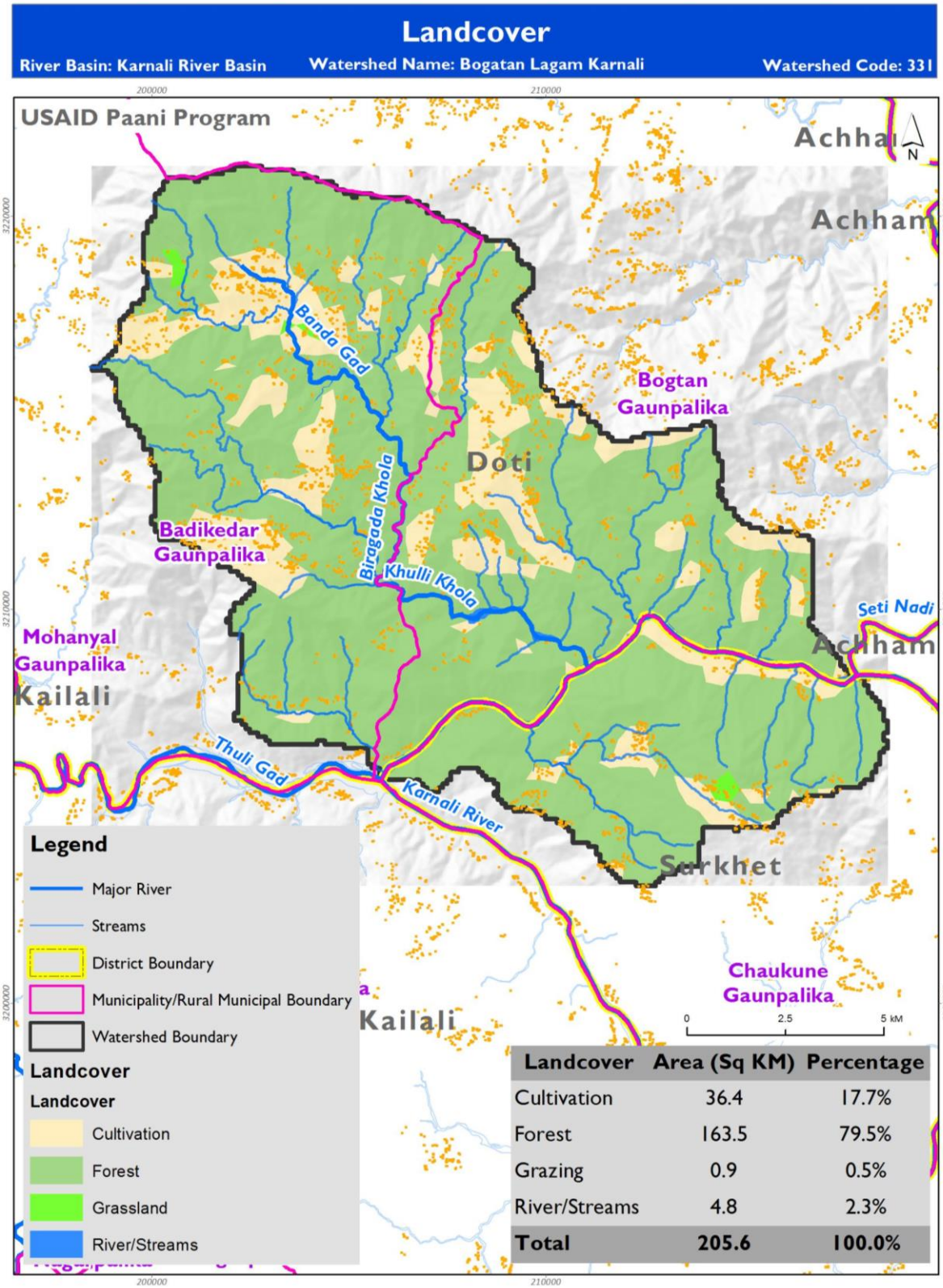


Figure 3: Land cover in the Bogatan Lagam Karnali watershed

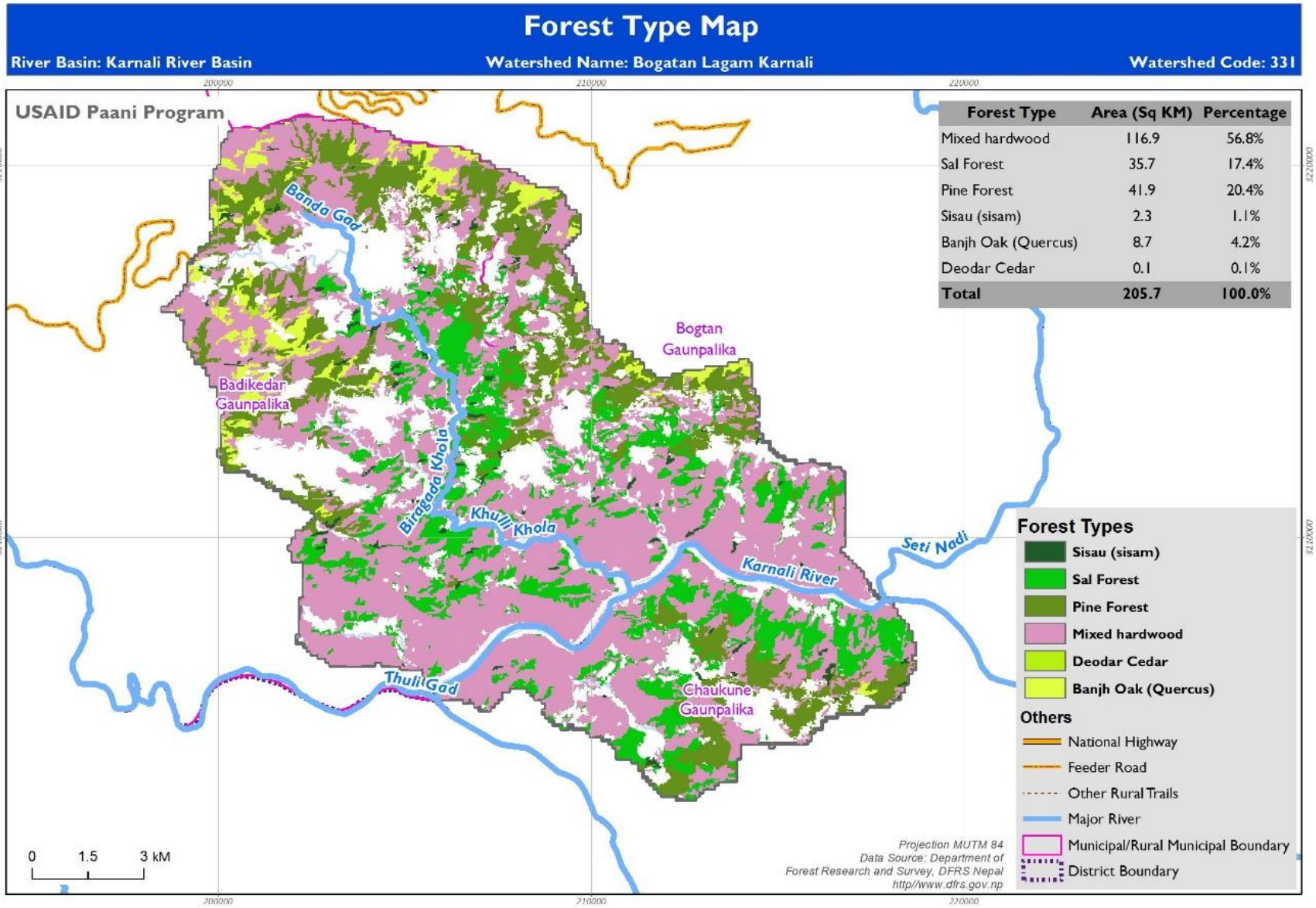


Figure 4: Forest cover by type in the Bogatan Lagam Karnali watershed

Despite the significant forest coverage in the watershed, loss and gain data from Global Forest Watch (Figure 5) from 2000-2016 show that forest cover has decreased 135 ha in some areas (0.8%) while 32 ha (0.2%) have been added in other parts. Looking more closely at Figure 5, we can see that large patches of forest loss have been reported in Badlikedar and Chaukune GPs.

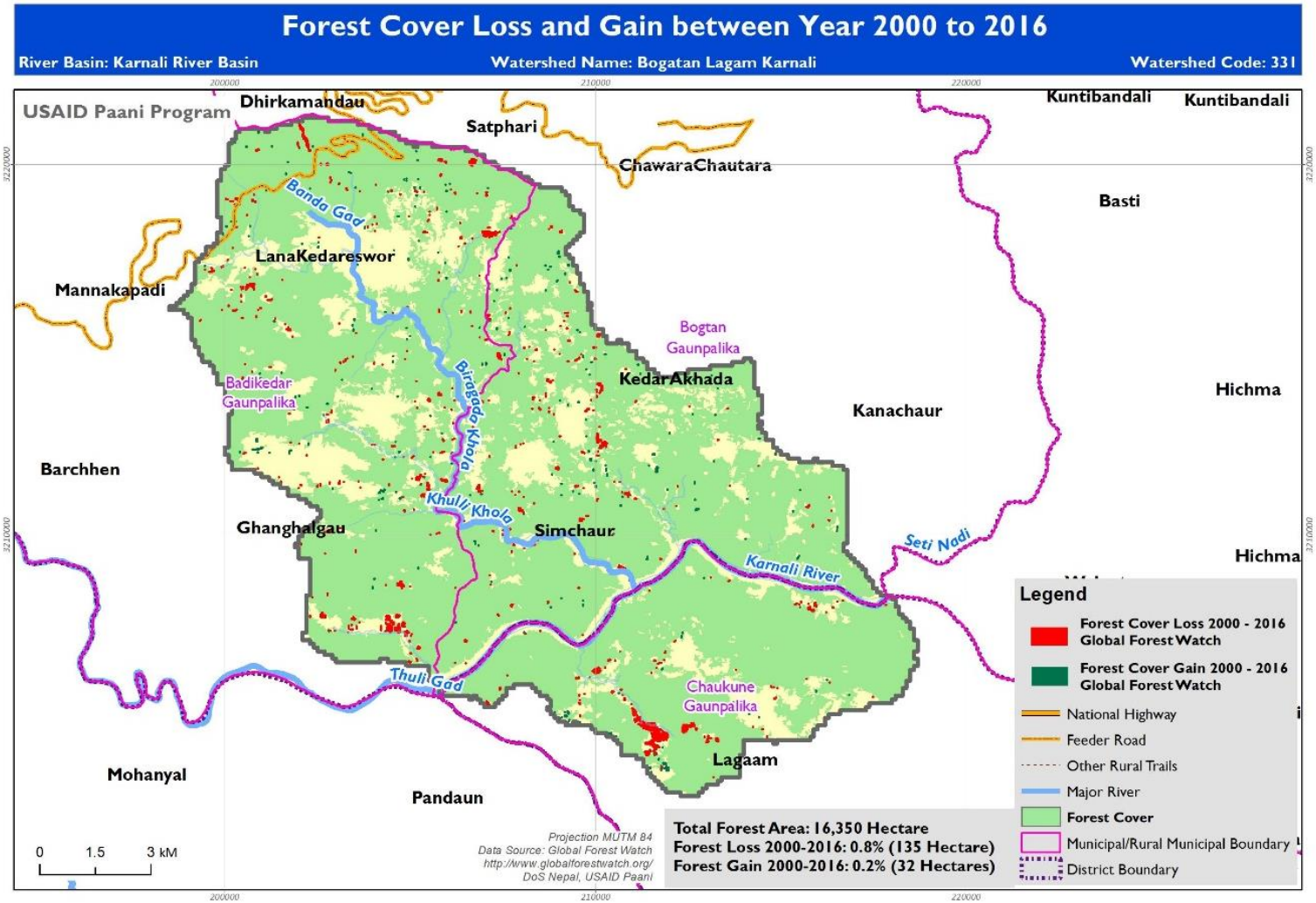


Figure 5: Forest loss and gain in the Bogatan Lagam Karnali watershed, 2000-2016

Related Annex

Annex 6: Forest types and composition

2.4 BIODIVERSITY AND INVASIVE SPECIES

The Bogatan Lagam Karnali watershed contains numerous and diverse habitats for terrestrial species among its numerous forests, rangelands, and wetlands. The forests are dominated by pine (*pinus roxburgii)* and mixed broad-leaved trees including *sal* (*shorea robusta*) in lower altitudes and *quercus* at higher elevations.

The biodiversity of the watershed is also supported by the numerous waterways that flow into the Karnali River. Numerous species of mammals, birds, and reptiles can be found across the region. Some notable mammal species include musk deer, Himalayan thar, wild boar, leopards, and monkeys. Bird species are wide and varied, including *danphe, munal, kaliz, lueche, titra, dhukur,* and *banjh.*

Through focus group discussions, local residents noted 17 species of fish in the watershed, including *kuera, satto, gerara, oyara, asla, kaloch, pangar, sueni, githi,* and *geraj*. A majority of respondents said they perceived the number of native fish species to be decreasing, primarily due to the rise in destructive fishing practices (e.g., gill nets, poison, and electric current).

A few invasive species were also reported in the watershed, particularly in the areas of Simchaur, Badikedar, Bogatan, Kedaraakhada and Lagam. Respondents also noted the recent appearance of several new weed species in the fields, including: *hanuman jhar, mawobadi jhar* and *ban jhar.* These weeds diminish agricultural production. Siam weed (*chromolaena odorata*), another aggressive weed species, has been found in the local forests.

Related annexes
Annex 8: Fish and aquatic life
Annex 9: Mammals and population trend
Annex 10: Reptiles and population trend
Annex 11: Birds and population trend

2.5 CLIMATE AND PHYSIOGRAPHY

There are four prominent climatic seasons in Nepal: winter (Dec.-Feb.), spring/pre-monsoon (Mar.-May), summer/monsoon (June-Sept.) and autumn/post-monsoon (Oct.-Nov.). Temperature and rainfall variations persist not only by season but also by altitudinal gradients.

The climate is characterized by cold and mist with occasional frost in December and January. The climate is predominantly temperate and sub-tropical and monsoon rain provides more than 90% of the annual total. The average monthly temperature ranges from 5.5° C during winter season and 30.5° C during the summer season. The DHM data shows that the annual average rainfall is estimated to be 1,328 mm between the months of June and October.

2.5.1 RAINFALL

There are no rainfall stations in the watershed; data was collected from the nearest stations in Katai, Dipayal, and Banga Camp to conduct a rainfall analysis (Figure 6).

The Theissen polygon method was used to estimate the average rainfall of the Bogatan Lagam Karnali watershed (Figure 7). The highest amount of rainfall is recorded in July at 450 mm compared to November, which recorded no rainfall during that month. The average dry season rainfall (Nov. – May), monsoon rainfall (June – October) and the annual rainfall were estimated as 332 mm, 1,328 mm and 1,659 mm, respectively.

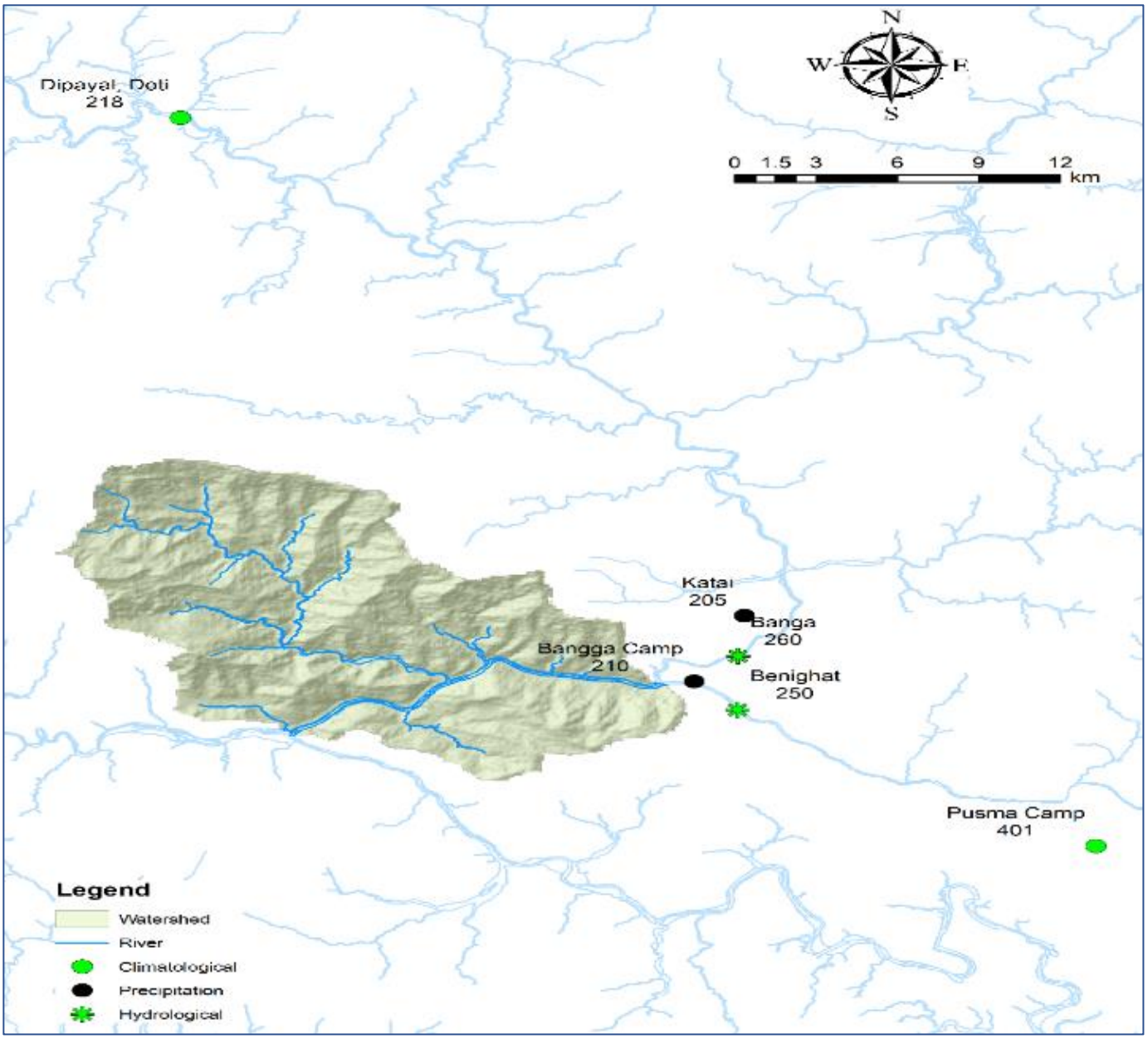


Figure 6: Locations of rainfall stations in the Bogatan Lagam Karnali watershed

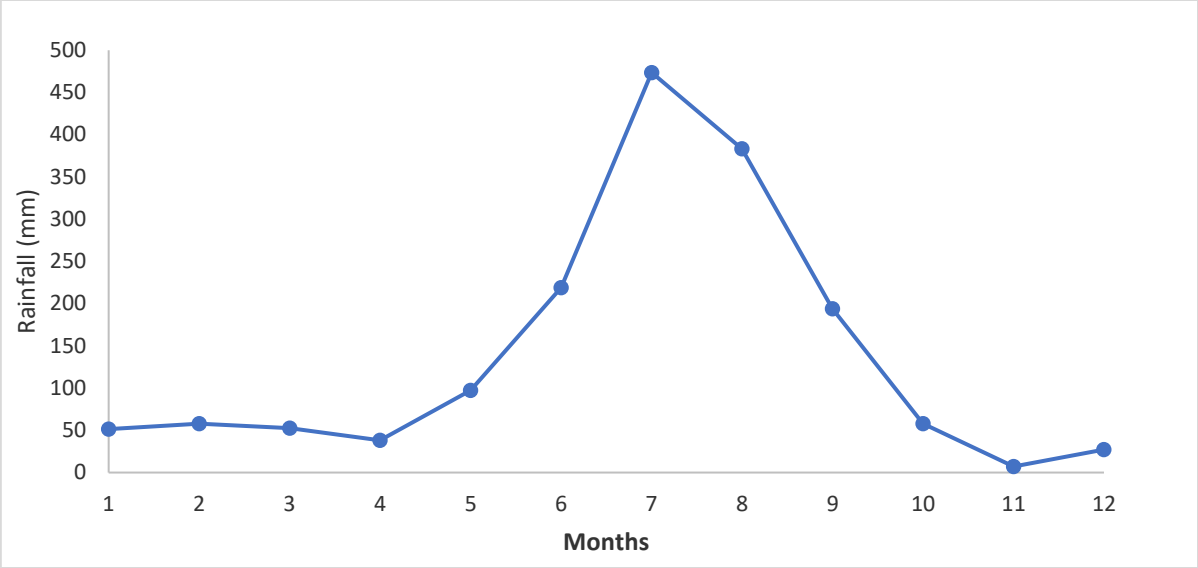


Figure 7: Long-term average monthly rainfall in the Bogatan Lagam Karnali watershed

2.5.2 TEMPERATURE

Air temperature varies by altitudinal gradients. The average annual high temperature for the watershed is 23°C, while the low average annual temperature is 10.7°C. For mean annual temperature distribution in Bogatan Lagam Karnali, see Figure 8.

As with rainfall data, temperature stations are scarce in Bogatan Lagam Karnali; thus, figures and estimates are derived from information taken from the nearest available stations in Dipayal and Pusma Camp. In addition to the seasonal temperature variations, which are expected, differences in topography also induce spatial variation of temperature. In Figure 9, the annual mean temperatures reflect the sharp topography of the watershed from north to south, with the average temperature range shifting swiftly from 14-16°C in the north to 16-18°C in the south.

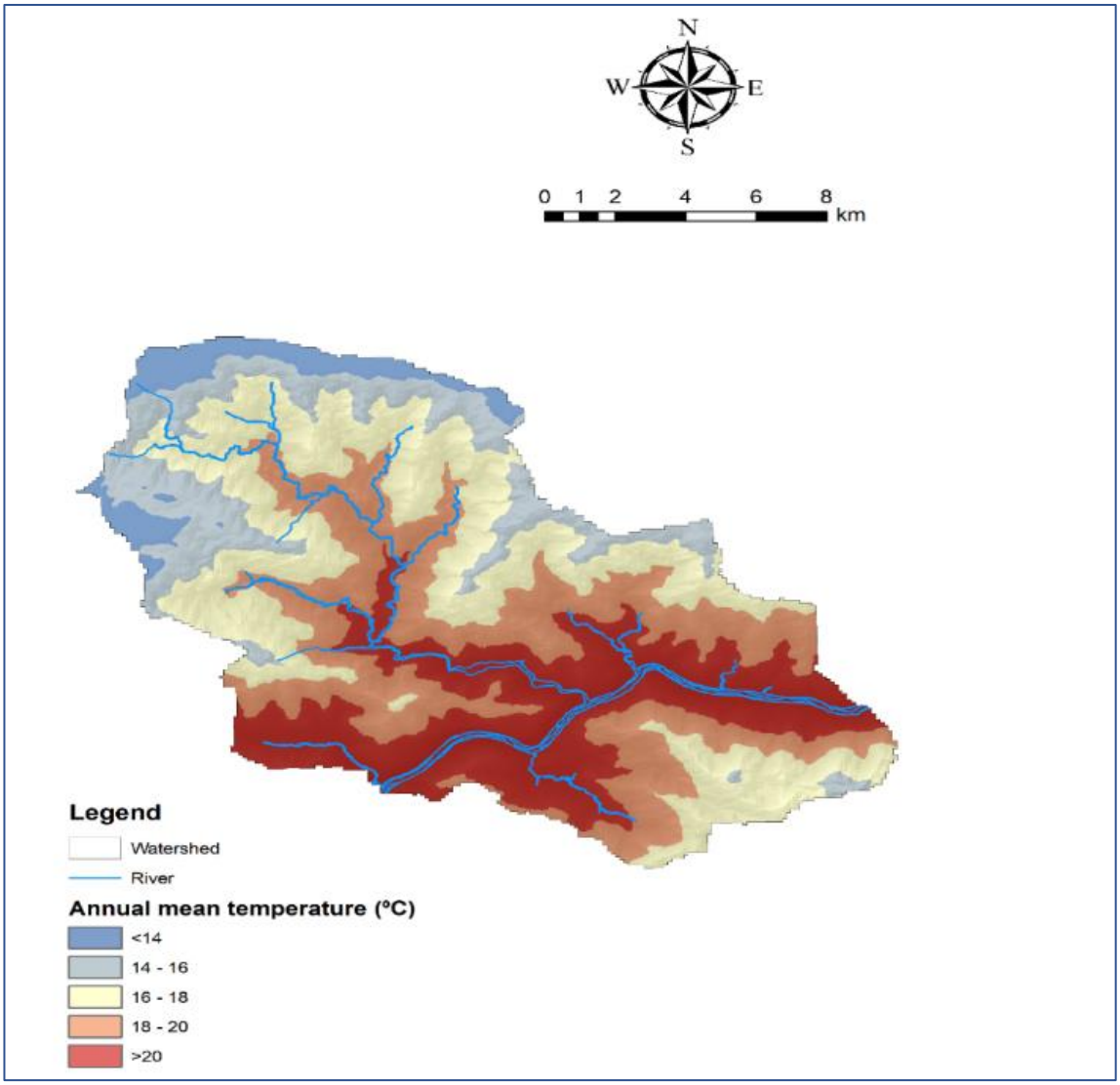


Figure 8: Mean annual temperature (°C) distribution

The changes in rainfall and temperature over time have been noted by households in the watershed. More than 80% of the respondents said overall temperature had increased in the past ten years, while 98% said that rainfall had decreased. These changes have affected agriculture as well: 72% of respondents said that overall production had declined, and many noted that fruit and summer crops were now maturing earlier in the season.

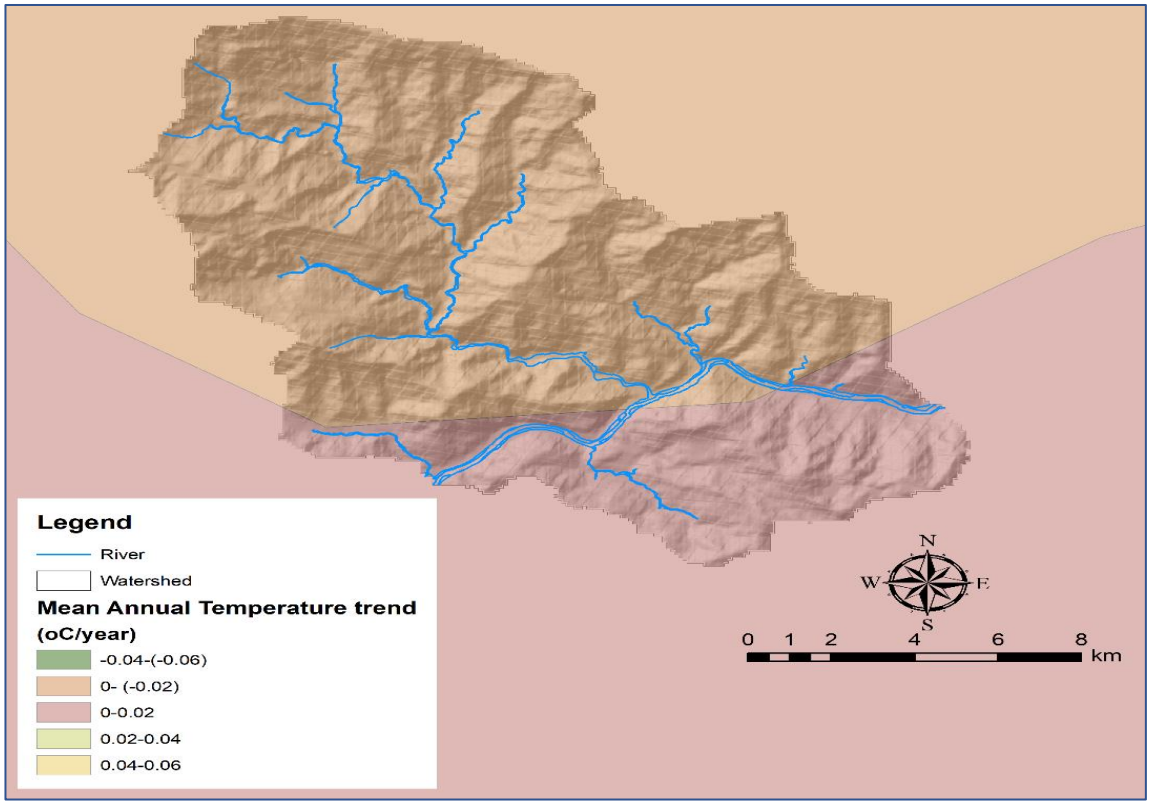


Figure 9: Long-term annual mean rainfall trend observed in Bogatan Lagam Karnali watershed

Related annexes
Annex 4: Temperature and precipitation

2.6 CLIMATE RESILIENCE AND DISASTER RISK REDUCTION

Increased human activity combined with climate change impacts are escalating environmental degradation in many parts of the Bogatan Lagam Karnali watershed, and, in some cases, increasing the likelihood and intensifying the effects of natural hazards such as drought and landslides. In this context, watershed residents are beginning to realize the importance of climate resilient activities to fortify their livelihoods in the short- and long-terms. Field observations documented numerous households adopting practices to adapt to changes brought by climate variability, including water collection tanks, plastic tunnel farming, and kitchen gardening, among others.

At the policy level, the government of Nepal has developed a National Adaptation Plan of Action (NAPA), while delegating authority to the NPs and GPs to develop Local Adaptation Plans of Action (LAPA) and Community Adaptation Plans of Action (CAPA). Nepal's current NAPA promotes climate-smart technologies as described above and advocates for building capacity in rural districts to diversify livelihoods and income sources as another source of buffer against future shocks.

Currently, only two VDCs (Lanakedarshwar and Kedarakhada) have developed LAPAs for their communities.

With the rise in natural hazards, disaster preparedness has become an important consideration for communities. The Doti District Relief committee is preparing a District Disaster Preparedness and Response Plan (DPRP) for the area. This plan will include not only preventative techniques for minimizing the physical effects of floods and landslides, but also include important information on how households should respond in the event of a disaster. While this DPRP is a welcome document, disaster preparedness is generally low in this watershed.

There are presently no early warning systems functioning in the watershed to warn residents of impending disasters.

Working with local residents to establish the nature and degree of natural hazard risks in their areas, Table 3 presents vulnerability ratings from four location in the Bogatan Lagam Karnali watershed.

Table 3: Climate hazard vulnerability ratings for selected GPs, NPs, or previous VDCs

VDC (District)	Drought	Landslide	Forest fire	Soil erosion
Ghagal (Doti)	High	High	Medium	Moderate
Kedaraakhada (Doti)	High	Moderate	NA	Moderate
Lanakedareswar (Doti)	High	Moderate	NA	Moderate
Simchaur (Doti)	High	High	Medium	Moderate

GESI issues: In the Bogatan Lagam Karnali watershed, many Dalit and Janajati families live near rivers, roads, and community forests, as they are landless. These locations are particularly susceptible to the effects of natural hazards – especially floods, landslides and forest fires – putting these vulnerable populations at greater risk compared to the general population.

3. WEALTH

The population of the Bogatan Lagam Karnali watershed is 16,251 (CBS, 2015), of which 49% are female and 51% male. Brahmins, Chhetris, and Thakuri ("high caste" groups) comprise 60% of the population followed by Dalits at 22% and 18% Janajati. The primary Janajati groups are Magar, Gurung, and Tamang, all of whom are heavily engaged in fishing.

Agriculture is the primary livelihood (76%), while many (14%) are involved in seasonal migration for work. Migration from this area flows to northern India, where farm hands can find employment in June and November, and then return home to complete their own planting and harvests. All respondents who said they migrated seasonally were Dalit. In our survey, many women said they were involved in agriculture, having to spend more time weeding their crops than in past years.

Per a NFIWUAN survey in 2017, only 7.6% of households held a bank account in a recognized financial institution. In the watershed, there are banking centers located only in Dipayal. A few cooperatives exist for savings and financial transactions.

To bolster livelihood security, numerous forms of climate-smart technologies were being employed to offset the potential impacts of climate change and natural hazards, including tunnel farming, rainwater harvesting, and kitchen water reuse. In spite of these practices, 46% of respondents in our surveys claimed no knowledge of available climate-smart technologies.

3.1 FISHING PRACTICES

Fishing in the watershed is characterized by traditional and non-traditional practices. Commonly used traditional methods include net casting, fishing hooks, draining water, and trapping fish in rice paddies. In recent years, however, harmful non-traditional methods (e.g., poison and explosives) are becoming more popular and causing fish populations to decline.

Although there are no traditional fishing communities in Bogatan Lagam Karnali, many Dalit and Janajati households rely on fishing to provide an alternative income source and bolster family food security. Fish caught from local rivers can be taken to nearby hotels and market centers for sale.

3.2 AGRICULTURE PRODUCTIVITY

Agriculture is the primary livelihood in the watershed, and 17.8% of the land is dedicated to farming. Major crops include rice, millet, maize, wheat, barley, buckwheat, mustard, and potato, among others.. These declines have made food security an increasingly precarious challenge as more than half of households have less than 6 months food sufficiency (Table 4).

Table 4: Food sufficiency levels by household in the Bogatan Lagam Karnali watershed

Food sufficiency level	Households	Percentage (%)
Less than 3 months	8,095	19.56

3 to less than 6 months	14,458	34.94
6 to less than 9 months	9,590	23.17
9 to less than 12 months	6,680	16.14
12 months or more	2,559	6.18
Total	**41,382**	**100.00**

Source: DADO Doti, Annual Report, 2016

Irrigation at present plays only a minor role in agricultural productivity and tends to be a seasonal option in most cases. Surplus production for market sale is taken to collection centers in either Simchaur, Chamarachautara, Bagchheda, and Sunalek, from where it is transported to larger outlets in Dhangadi and Dipayal. Several community-managed seed banks (in Dipayal and Dhangadi) sell high-quality seed to local farmers.

3.2.1 SOIL MANAGEMENT AND FERTILITY

A large majority of households expressed concern about soil fertility in the Bogatan Lagam Karnali watershed: 88% say climate change has led to decreased soil fertility over the past decade. Other households are concerned that traditional links between forest, livestock and cropping systems are breaking down due to climate change impacts. To cope with these changes, many famers have begun opting for chemical fertilizers instead of traditional manures, while other farms use both.

Deforestation, habitat degradation, over grazing, non-point source pollution and agricultural runoff were listed as additional threats to soil fertility. Agricultural runoff, in particular, was cited as problematic due to increasing soil erosion combined with terrace farming on the steep topography of the watershed. Many households said improved access to agricultural inputs and modern farming technologies could help restore soil fertility as it is more difficult to secure reliable farm labor due to migration.

Local governments, through the DADO, are working with farmers to increase the adoption of more environmentally-friendly techniques and technologies for pest management and soil fertility. A few examples of these include Gabion walls to stem soil erosion, and plantation on barren lands to improve water retention.

By the Soil and Water Conservation Act (1982), the government does hold authority to declare watershed areas as "protected" and to implement conservation measures in these areas through participatory action. The Act recommends that local governments plan and implement poverty alleviation programs to discourage unsustainable production on available lands. Though the objectives of the Act promote long-term holistic planning to improve soil and water, implementation of the legislation has lagged behind intention.

3.3 INFRASTRUCTURE

The design and construction of infrastructure, such as roads and hydropower plants, have an impact on the health of the watershed. For example, poorly designed rural roads on steep slopes can greatly increase soil erosion and landslides. Similarly, hydropower plants that divert or impound water will restrict the amount of water available for aquatic life that people depend on for their livelihoods.

Irrigation canals, while bringing benefits to one group of farmers, can also reduce the amount of water available to other farmer populations. As demonstrated by these examples, it is important that the design, construction and operation of infrastructure projects account for the full range of social, economic, and environmental impacts within the watershed while also providing equitable distribution of benefits.

3.3.1 HYDROPOWER

Currently, there are no hydropower plants operating in the Bogatan Lagam Karnali watershed; however, the planned construction of the West Seti Hydropower plant upstream could impose significant impacts on households and the environment. West Seti is planned to be operational by 2023.

The planned location for West Seti is 35 kms north of the watershed. When operational, the plant will restrict downstream water flow, which will impose numerous impacts in terms of irrigation, drinking water, and the overall health of aquatic life. Furthermore, fish migration upstream for spawning will be diminished, and thus fish stocks will be expected to decline, affecting vulnerable households that rely on fish to bolster their livelihoods.

The settlements in Bogatan Lagam Karnali perceived to be particularly vulnerable include Gaguda, Kanachaur, Chamarachautara, and the southern part of Simchaur.

3.3.2 GRAVEL MINING AND CONSTRUCTION MATERIALS

Gravel mining for construction is presently not a relevant watershed health issue in Bogatan Lagam Karnali.

3.3.3 ROADS

The Bogatan Lagam Karnali watershed contains 80.81 km of earthen roads; none of it is gravel nor black topped. While traffic and road coverage are quite sparse, another 131 kms of road are planned for construction over the next decade.

In focus groups discussions, local residents said that many existing roads were not built according to environment-friendly guidelines and have contributed to increasing soil erosion and landslides. Shallow failures (i.e., foundation weakness) have been observed along the road from Simchaur to Chamarachautara. These failures are complicating water quality and water conveyance in the affected area.

Related annexes

Annex 12: Road networks in the Bogatan Lagam Karnali watershed

3.3.4 IRRIGATION

While irrigation is necessary to improve livelihoods and economic development in the watershed, the amount of water diverted affects aquatic life. Keeping minimum flows intact is crucial to maintain watershed health. Environmental assessments are required for medium and large irrigation projects (>300 ha), but not for smaller schemes.

There are 10 irrigation projects within the Bogatan Lagam Karnali watershed, but these are highly affected at present by the availability of water throughout the year. Only 13% of households use canal irrigation, and in this group only 33% are able to use their systems all year-round. The District Irrigation

Office is working to expand these systems to more households with support of donor agencies and government funding.

Due to erratic rainfall and a long dry season, irrigation water sources are necessarily varied. Seventy-eight percent of irrigation users harvest rainwater for their systems, while 33% take water from nearby rivers, 7% use available lakes and ponds, and less than 1% use water collection tanks.

Traditional irrigation systems are still in use, where the community combines its efforts to construct and maintain canals. However, these systems are old and vulnerable to natural hazards and extreme rainfall events.

Irrigation schemes and user groups appear to be inclusive in Bogatam Lagam Karnali, as women, Dalits and persons from other marginalized groups were observed to be present and participating at local meetings. However, we note that 90% of women were engaged in water user groups, while 89% of men participated in irrigation user groups, suggesting that traditional gendered divisions of labor (e.g., domestic v. extra-household) influence how and to what extent women have proper authority and representation in natural resource issues.

The lack of irrigation for much of the population in Bogatan Lagam Karnali could lead to future conflicts. In Ghangal (Badikedar GP), complaints about theft of water from irrigation canals has led to the installation of a security guard and the implementation of penalties against those caught stealing.

Related annexes
Annex 13: Irrigation projects

3.4 SOLID WASTE AND MANAGEMENT

Solid waste (e.g. garbage, plastics) in the watershed emanates from a number of sources, including the lack of personal and village-wide sanitation systems, which threaten water quality and aquatic life.

Non-point source pollution, such as kitchen and household wastes, is a rising concern. Eighty-two percent of respondents said they burn their trash, while 15% said they dumped their waste into nearby rivers. Household wastewater is less of a concern, as 87% of households said they use this water in their gardens. However, 38% said they would dump wastewater in local sewers and 26% said they channeled wastewater directly to rivers and lowlands.[3] Such practices can alter the water quality and disturb aquatic ecosystems.

Point source pollution from service industries is not significant in Bogatan Lagam Karnali, but growing urban settlements (e.g., Simchaur, Sunalek, Dhameli, Lagam, Rantola, and Attarkanda) should be monitored in the future.

[3] These figures add up to more than 100 because respondents were allowed to select more than one mode of disposing wastewater.

4. POWER

In this section of the report, we detail and analyze the social, institutional, and regulatory structures through which water resources management, aquatic biodiversity management, and adaptation to climate change are planned and operationalized within the Bogatan Lagam Karnali watershed. Analysis indicates there is a need to better understand how current institutional arrangements related to, for example, fisheries and gravel mining are positioned (or not) to improve resource sustainability and benefit sharing with local populations.

4.1 ACCESS AND INCLUSION

In this section, we review issues of access and include in regard to natural resource use and management in the Bogatan Lagam Karnali watershed.

4.1.1 ACCESS TO WATER FOR DOMESTIC AND AGRICULTURAL USE

Drying water sources are a major cause for concern in the Bogatan Lagam Karnali watershed. While the issue of drying springs is still not perfectly understood, many water sources have been swept away by soil erosion, landslides, forest fires, and improperly constructed roads.

Water accessibility indicates the degree of ease for users to obtain water. Obstacles to water accessibility can be physical (e.g., distance to water points) or cultural (e.g., water sources available only to certain castes), or both. Again, due to drying water sources, many communities reported varying degrees of access to springs and community spouts. In the Bogatan Lagam Karnali watershed, 33% of respondents said they did not have equal access to water.

Access to water can also create conflict, particularly in regard to caste-based discrimination, which forbids lower castes from taking water from taps and sources used by higher caste families. These access differences violate article (24) (1) of the Constitution Nepal, which states that no person shall subjected to discrimination based on his or her original, caste, tribe, community, profession, occupation, or physical condition.

The Constitution of Nepal stipulates that the state, local and federal levels of government exercise the power of the State of Nepal pursuant to article 56(2). Certain legislative and executive powers have been invested in local level government (*nagarpalika* and *gaunpalika*), such as environmental conservation and biodiversity, local roads, agriculture, irrigation, drinking water supply, small hydropower, disaster risk reduction, and conservation of watersheds and wildlife (Schedule 8). The federation, state, and local levels of government hold concurrent power on a range of other issues, including forest and jungle management, water use, ecology and biodiversity (Schedule 9). The willingness and ability of government entities to exercise these powers has significant implications for the conversation of freshwater biodiversity and community resilience.

These new governance responsibilities suggest the time is appropriate to work closely with local authorities to develop plans to promote improved watershed health.

Related annexes
Annex 17: Water and sanitation user groups

4.1.2 ACCESS AND INCLUSION IN LOCAL NRM PLANNING

The land, water, flora and gravel of the Bogatan Lagam Karnali watershed comprise the major natural resources of the area. And each of these faces numerous threats from, among others, deforestation, habitat degradation, unsustainable agricultural practices, and non-point source pollution. These challenges are exacerbated by the watershed steep topography and a general lack of suitable land for crops.

For these reasons, awareness, access and inclusion of local NRM planning is a strong indicator of watershed health.

There is relatively strong network of user groups in the watershed, including 32 community user forest groups (CFUG), 10 irrigation user groups, and 15 water user groups. There is only one indigenous committee dedicated to natural resource issues. Fifty-two percent of respondents in Bogatan Lagam Karnali said they knew about NRM committees active in the community; however, just 15% of respondents claimed membership in an active NRM group. Of the 15% of respondents who claimed membership in an NRM group, 62% were Brahmin/Chhetri/Thakuri, 19% Dalit, and 19% Janajati.

Guidelines for user groups, such as CFUGs stipulate that a woman must be elected or appointed to a leadership position and that the executive committee needs to include representatives of persons from all castes and ethnicities in that area. Other provisions require that persons from marginalized groups be included in leadership posts. Looking specifically at CFUGs, 82% of the membership is male and 18% female.

Table 5: Key offices in Bogatan Lagam Karnali for addressing natural resource issues

Office	Location	Remarks
Governmental		
District Agriculture Development Office (DADO)	Doti, Surkhet	Starting work with capture fishery groups to discuss sustainable harvest practices
District Coordination Committee (DCC)	Doti, Surkhet	Works with local mayors and village heads to coordinate natural resource sharing in Bogatan Lagam Karnali
District Forest Office	Doti, Surkhet	Liaising with CFUGs to insure clear understanding and proper enforcement of use and conservation guidelines
District Soil Conservation Office	Doti, Surkhet	Turning focus to the effects of development activities on soil erosion and soil fertility
Nongovernmental		
Community forest user groups (CFUG)	33 formed; numerous locations	Share responsibility for sustainable use and management of community forests

Alliance for Agriculture	Doti, Surkhet	Sponsoring coordination meetings between farmers and agriculture-related government offices
Rural Access Program	Doti, Surkhet	Endorsing environment-friendly road construction practices in the watershed

Respondents reported a lack of transparency in sharing the key decisions and financial details to members of user group committee, and complained about unequal access to benefits and exposure packages such as trainings, workshops and meetings.

4.1.3 ACCESS TO BENEFIT SHARING IN THE WATERSHED

User groups for water, forests and irrigation are entities that employ participatory practices to insure equitable distribution of benefits derived from natural resources.

As more than 70% of Nepali households depend on agriculture, community management of water and forests has been a critically important, and largely successful, intervention in terms of increasing efficiency and equitable distribution of water for irrigation and forest restoration, and developing broad strategies for livelihood improvement and poverty reduction.

Irrigation in Bogatan Lagam Karnali is one potential area for development through collaboration with user groups. Only 13% of households have access to irrigation, and only 33% of that group have access to water year-round.

Increasing the number of irrigation canals would be an obvious improvement, but many Dalit and Janajati express concerns that they do not benefit from these advances proportionate to the Brahmin/Chhetri/Thakuri population. Furthermore, many Dalits and Janajati are landless, which means they could not derive any direct benefit from expanded irrigation. It is important to ask how they can share in these benefits.

Related annexes

Annex 15: Community forest user groups
Annex 17: Water and sanitation user groups

4.2 COMMUNITY ACTION AND RESPONSE

This section provides detail on community planning and response to climate change and disaster risk, how communities collaborate for improved natural resource management, and the status of local compliance with existing environmental policies and regulations. Taken together, these aspects of community action reveal significant information about a watershed population's ability to adapt to future challenges.

4.2.1 CLIMATE CHANGE ADAPTATION AND DISASTER RISK REDUCTION

As a majority of the population in Bogatan Lagam Karnali is dependent on agriculture, variations in temperature and precipitation are causing serious livelihood distress to communities in the watershed. To adapt to these changes, many farmers have adopted climate-smart technologies to strengthen their crops and livestock and to promote resilient food systems. Some of these technologies include tunnel farming, rainwater harvest, recharge ponds, and kitchen water reuse.

At the policy level, the government of Nepal has developed a National Adaptation Plan of Action (NAPA), while delegating authority to the NPs and rural municipalities to develop Local Adaptation Plans of Action (LAPA) and Community Adaptation Plans of Actions (CAPA). Nepal's current NAPA promotes climate-smart technologies as described above and advocates for building capacity in rural districts to diversify livelihoods and income sources as another source of buffer against future shocks.

Currently, only two VDCs (Lanakedarshwar and Kedarakhada) have developed LAPAs for their communities.

Water use master plans (WUMPs) provide comprehensive and long-term vision to communities looking to improve equity and efficiency in water use. The Rural Village Water Resource Management Program (RVWRMP) has developed WUMPs for Bogatan, Kedarkhada, and Lanakedarshwor, in conjunction with the local DDC and VDCs.

But perhaps of greatest concern regarding disaster preparedness is the general lack of knowledge among the population regarding the government's planning processes for developing LAPAs and CAPAs. Nearly 95% of respondents claimed no knowledge about LAPAs or CAPAs in their communities. Stronger participation and transparency for these processes could cultivate stronger "buy-in" from local residents to realize the potential gains of these plans.

4.2.2 COMPLIANCE WITH LAWS AND POLICY PROVISIONS

Surveys and focus groups revealed a generally low knowledge of existing environmental policies and provisions, and an equally low compliance with these regulations where they were known. The primary reason for this is the remote location of many communities in the Bogatan Lagam Karnali watershed where they have limited interaction with government officials and representatives. As a result, creating a culture of environmental conservation and a shared interest in promoting watershed health will require significant outreach to equip citizens with relevant information.

For example, despite the existence of the Aquatic Animals Protection Act 1961, the use of harmful, non-traditional methods of fishing (e.g., gill nets, poison, electric currents) continues to rise and decimate local fish populations. Weak enforcement of this legislation allows these practices to continue unchecked. Our survey supports the need for stronger enforcement of this law: 91% of respondents said that fish stocks were decreasing in the watershed.

4.3 GOVERNANCE

Governance and its responsiveness to community needs and aspirations provides a key focal point for managing natural resources sustainably, strengthening community resilience, and conserving freshwater biodiversity.

Through FGDs and KIIs, respondents expressed their growing awareness of the need to develop stronger relations between upstream and downstream communities. In spite of the many regulations providing vision on issues related to watershed health, there was a general consensus that the lack of implementation would lead to conflict between communities on issues of fish, forests, and water. Moreover, the growing amount of infrastructure development has raised general concern about e-flows and maintaining sustainable agricultural production.

Survey responses indicate that coordination between VDCs, municipalities, districts and provinces is quite low. For this reason, formal and informal institutions and organizations in Bogatan Lagam Karnali need to increase the representation of women and marginalized persons in the watershed. Similarly, village and municipality level governments need to make their planning and budgeting processes (e.g., LAPA, CAPA, WUMP) transparent and participatory. Building consensus and ownership between government and citizens will improve the potential to create conditions favorable to conserving aquatic biodiversity and promoting community resilience.

Related annexes

Annex 18: Existing policy provisions and status of enforcement
Annex 19: Key stakeholders – organizations and offices

5. PRIORITIZATION OF MAJOR THREATS AND OPPORTUNITIES

During the multi-stakeholder consultation (MSC) exit workshop, participants listed the major threats, challenges, and opportunities for watershed health in Bogatan Lagam Karnali. Their comments are summarized in Table 6.

Table 6: Threats, challenges and opportunities for improved watershed health

Threats and challenges	Opportunities
• Boundary disputes in new federal system for resource conservation and utilization • Changing climate causes increase in epidemics, drought, disasters, disease, migration, environmental deterioration, and scarcity of water • Over-exploitation of resources • Lack of well-defined sustainability plans for projects • Unplanned construction of physical infrastructure and rapid urbanization • Limited coordination and collaboration between projects and government line agencies • Limited implementation of policy provisions • Unsustainable collection of resin • Weak implementation of laws and poor monitoring and evaluation • All concerned governmental organizations seek only to establish their rights and control over water resources rather than plan for improved conservation • Low priority from government agencies for conserving wetland and freshwater biodiversity	• Economic development and employment opportunities through management of irrigation, ecotourism, and water quality • Support from government and donor agencies • Optimizing the inclusive provisions of the 2015 Constitution • Coordinating with newly-elected local government representatives • Building community ownership and readiness • Developing disaster management and relief programs at local level through various organizations. • Developing disaster risk management guidelines at local level • Preparing and implementing LAPAs, CAPAs, LDRMPs, and WUMPs • DDRC working as rescue and relief agency in the district • Innovating new technologies such as drip irrigation, rainwater harvesting, and plastic ponds • Increase in management regimes for community leasehold and private forests • Reclamation of degraded land with fruit tree cultivation, river bed farming, agroforestry systems, and cultivation of high value crops

6. VISION AND MISSION OF BOGATAN LAGAM KARNALI WATERSHED

This Bogatan Lagam Karnali watershed profile has been prepared through various consultative processes, actively engaging with stakeholders from media, civil society organizations, government agencies, government offices, and environmental research institutions (e.g., universities).)

6.1 VISION OF BOGATAN LAGAM KARNALI WATERSHED

A two-day vision workshop was held in December 2017. Among the many tasks completed, participants were asked to draft a vision statement for the watershed. The responses were collected and synthesized into the following:

"To promote an inclusive, equitable, prosperous, and biodiverse watershed through sustainable agriculture, eco-tourism, and good governance."

7. RECOMMENDATIONS

This Bogatan Lagam Karnali watershed profile assesses the status, major challenges and opportunities facing water resources management for the multiple users located within the region. Based on the discussion at the workshops, stakeholders proposed the following recommendations to improve climate change adaptation and freshwater biodiversity in the watershed:

- Establish water conservation measures such as recharge ponds, infiltration ponds, rainwater harvesting, and other multiple-use water techniques;
- Develop and implement Water Use Master Plans (WUMP) in the watershed;
- Protect existing water sources through improved catchment management of natural springs;
- Introduce more climate-smart watershed and agricultural practices such as drip and sprinkler irrigation, mulching, organic farming, and increased use of drought-resistant crops and forest species;
- Support local government to develop and implement environmental-friendly road construction guidelines.
- Raise community awareness about the impacts of destructive fishing practices;
- Support the government to enforce the Aquatic Animals Protection Act in local rivers;
- Form community groups to monitor and regulate fishing practices in the watershed.
- Advocate for environment-friendly construction with local development agencies; and
- Provide training on low-cost bioengineering techniques to minimize the impact of landslides; and,
- Support implementation of Environment Friendly Local Governance (EFLG) frameworks, Local Disaster Risk Management Plans (LDRMP), Local Adaptation Plans of Action (LAPA), and Water User Master Plans.

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ANNEXES

Annex 1: Profile methodology

The overall objective of the watershed profiling process is to develop and enrich a shared understanding among key stakeholders about the major issues that affect local watershed health and water resource management. This watershed profile reflects the collective understanding and aspirations of people in the Bogatan Lagm watershed and concerned institutions so they can provide baseline information to help identify priorities for project design and implementation. Moreover, the profile can support the development of tools for watershed planning and approaches for collaborative management moving forward. The profile serves as a foundation for:

- Building consensus and common understanding among the Bogatan Lagam Karnali watershed's stakeholders on the current situation and future;
- Establishing a benchmark for activities targeting human and ecological communities in the watershed by describing the existing interaction between people and nature;
- Identifying potential priority areas for stakeholders to plan and work together on local-level activities to improve watershed management of the Bogatan Lagam Karnali area where the USAID Paani Program and other projects can provide support; and
- Providing a platform for consultation and advocacy for Bogatan Lagam Karnali watershed stakeholders through which they can participate in decision-making at the river basin and policy levels.

The watershed area was delineated using GIS tools during the watershed prioritization stage. This profile was prepared by drawing on a range of data sources including,

1. Secondary literature and information related to biophysical conditions, socio-economic characteristics, infrastructure, vulnerability and disaster risk, and freshwater biodiversity of the watershed;

2. An entry multi-stakeholders consultation [MSC] conducted to

    a) Share preliminary results of watershed conditions;

    b) Identify priority threats, vulnerabilities, and biodiversity values by location and impact groups; and

    c) Prepare detailed plans for the key informant interviews (KII), focus group discussions (FGD), and water quality and water discharge measurements;

3. Household (HH) surveys to assess the differential impacts of various environmental issues;

4. FGDs to assess the severity of environmental threats and significance values associated with Paani focal interests; and

5. KIIs to explore the causes and intensity of the particular environmental issues in the watershed. Different guiding checklists designed around Paani focal interest areas, cross cutting areas, were used while conducting surveys including governance, gender and social inclusion and policy (Figure 9, below).

The consolidated data collected through these methods were presented to group leaders at the exit MSC workshop to provide the participants with a share foundation for identifying and prioritizing watershed health issues in Bogatan Lagam Karnali. We also used this information to identify possible solutions and champions for leveraging knowledge and support through partnerships with local agencies and organizations.

The HH survey data (Table 7) were organized into four broad categories: a) climate change and biodiversity; b) livelihoods and well-being; c) water sources; and d) water quality. The surveys were conducted in locations that were selected during the entry MSC as participants indicated specific issues and challenges appropriate to their respective areas.

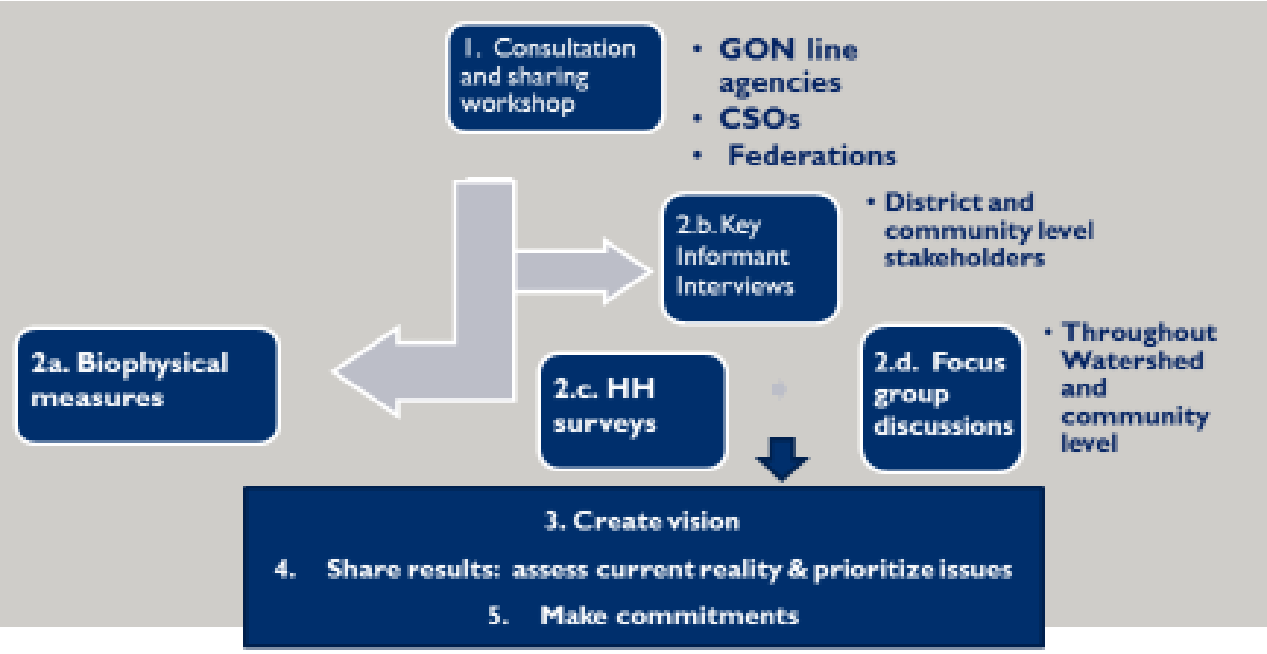
Table 7: Household (HH) surveys by topic and number conducted

Subject of HH survey	Number conducted
Biodiversity and climate change	86
Livelihoods and well-being	139
Water sources	144
Water quality	119
Total	**488**

To prioritize the collected issues, we held an exit MSC in which we presented preliminary findings and asked the participants to rank these issues in order of importance as well as potential actions and outcomes for addressing these issues. The participants were divided into groups to generate potential mission statements for the watershed. We brought the various statements together and synthesized the ideas into the mission statement located at the front of this profile:

"To promote an inclusive, equitable, prosperous, and biodiverse watershed through sustainable agriculture, eco-tourism, and good governance."

Figure 10: Methodological approach illustrated



Annex 2: Land use and land cover

Table 8: Land use by area and percentage in the Bogatan Lagam Karnali watershed

Type	Area (sq km)	Percentage
Cultivation	36.4	17
Forest	163.5	79.5
Grazing	0.9	0.5
River/Streams	4.8	2.3
Total	**205.6**	**100**

Annex 3: Population

Table 9: Population in Bogatan Lagam Karnali by municipality, sex, and caste/ethnicity

Municipality	Total population						
	Sex dist.			Population by caste/ethnicity			
	M	F	Tot	Janajati	BCT	Dalit	Other
Badikedar GP	2,609	2,740	5,349	0	3,978	1,371	0
Bogatan GP	1,753	1,825	3,578	119	2,221	1,238	6
Chaukune GP	901	936	1,837	371	1,303	127	36
	5,263	**5,501**	**10,763**	**490**	**7,502**	**2,736**	**36**

Annex 4: Temperature and precipitation

In addition to the seasonal temperature variation, the topographical variations also leads to spatial variation of temperature within the watershed. Long-term temperature data recorded in the Rapti, Karnali and the Mahakali River basin were used to determine the temperature change rate with respect to the elevation change. Temperature was observed to decrease at an average rate of 4.4 °C, 4.6 °C, 4.6 °C and 4.8 °C per 1 km rise in altitude in winter, pre-monsoon, monsoon and the post-monsoon seasons respectively. Similarly, the annual average temperature observed to decrease the rate of 4.9 °C per 1 km rise in altitude.

Long-term average monthly temperature variation (daily average) in Bogatan Lagam Karnali watershed is shown in Figure 4. The average monthly temperature of the watershed varies from 10.7 °C, in winter, to 23.3 °C in summer. Similarly, the maximum and minimum monthly temperature varies from 5.2 °C and 16.3 °C respectively in winter to 19 °C and 28 °C respectively in summer. The maximum temperature in Bogatan Lagam Karnali watershed in observed in May and the minimum temperature is observed in January.

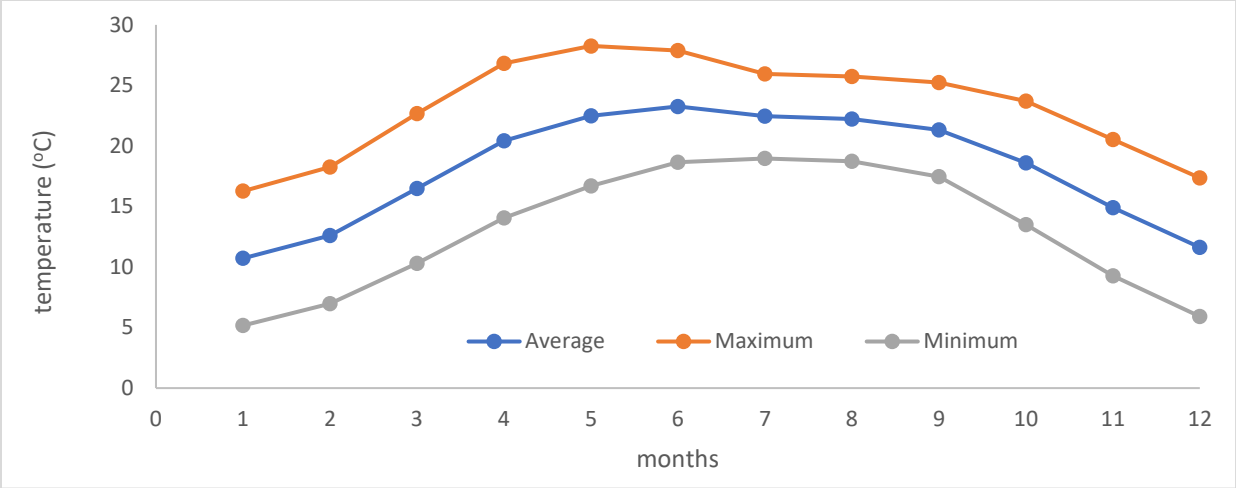


Figure 11: Maximum, minimum and average long-term monthly temperature (°C) in Bogatan Lagam Karnali watershed

Table 10: Detailed temperature and precipitation figures

Month	Max. temp (°C)	Min. temp (°C)	Avg temp (°C)	Monthly avg. precip (mm)
January	21.4	5.9	13.65	42
February	25.7	7.4	16.55	49.8
March	30.7	11.3	21.00	39.3
April	33.6	15.7	24.65	38.5
May	38.6	19.3	28.95	90.3
June	40.5	24.1	32.30	155.7
July	33.7	24.7	29.20	238.6
August	33.8	24.0	28.90	243.2
September	33.3	22.9	28.10	140.9
October	31.2	15.3	23.25	45.8
November	27.1	9.1	18.10	6.3
December	23.3	5.5	14.40	31.2

Source: District Profile, DDC, Doti, 2070

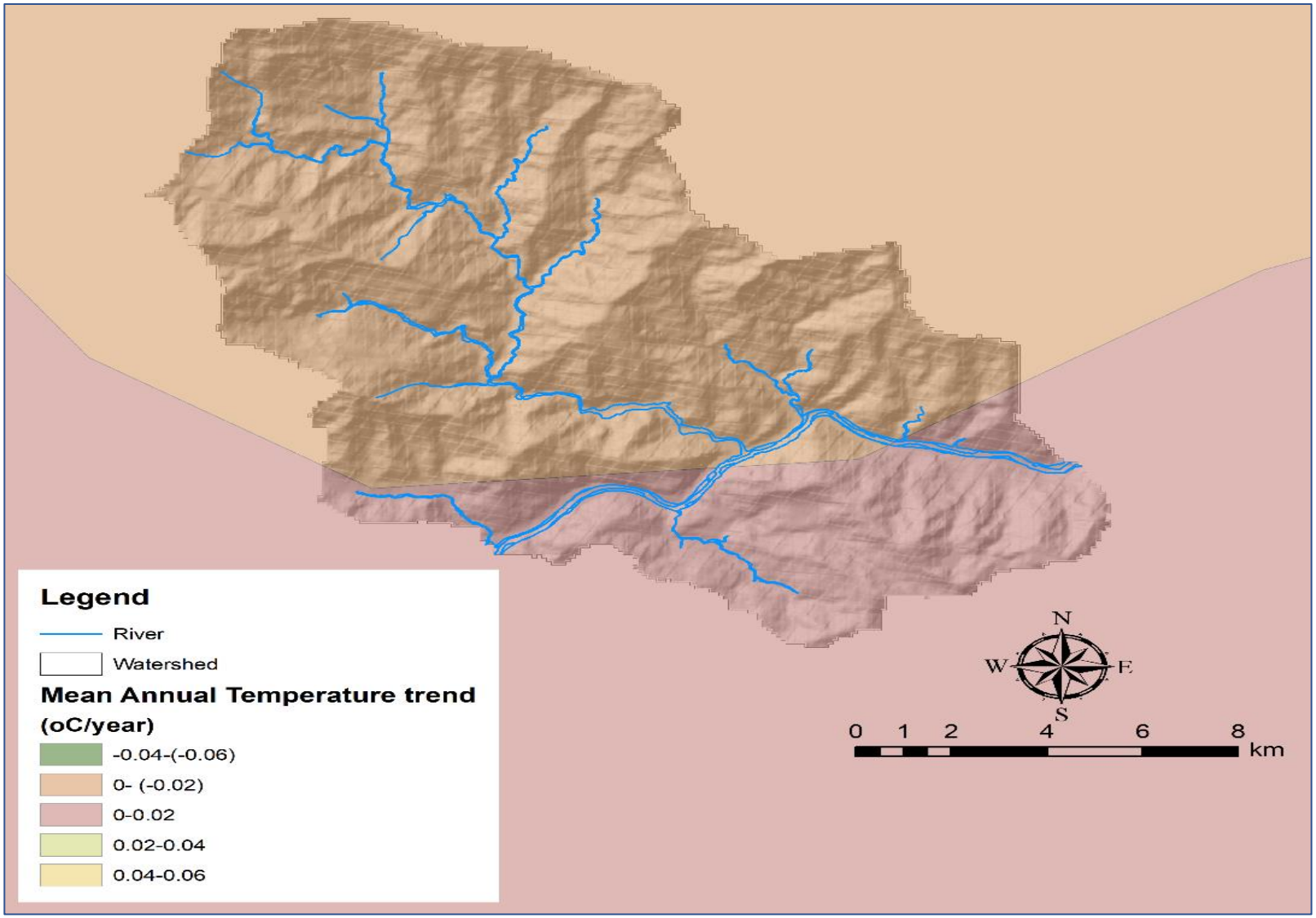


Figure 12: Annual mean temperature change in the Bogatan Lagam Karnali watershed

Annex 5: Lakes, streams, rivers, and sub-watersheds

Table 11: Types of water bodies in Bogatan Lagam Karnali watershed

SN	Water Bodies	Description
1	Large rivers	The Karnali river is a large, snow-fed river system flowing through the middle of Bogatan Lagam Karnali.
2	Small rivers	Small rivers are susceptible to landslides, river cutting and silt deposition, which affect their flow and water quality. These rivers provide much-needed water for agriculture, livestock and domestic uses. Small rivers in Bogatan Lagam Karnali include, Kedarsain Khola, Seligaad, Dhameli Khola, Bandgaad, Guenada Khola, Barkha Khola, Silgatta, Koiladi, and Kimade.
3	Head water streams	Locally originated, these streams are ephemeral and seasonal source of water for recharge and rice farming. In Bogatan Lagam Karnali, there are three major headwater streams – Meli Khola, Serigaad, Bandgaad – and 36 small rivulets.

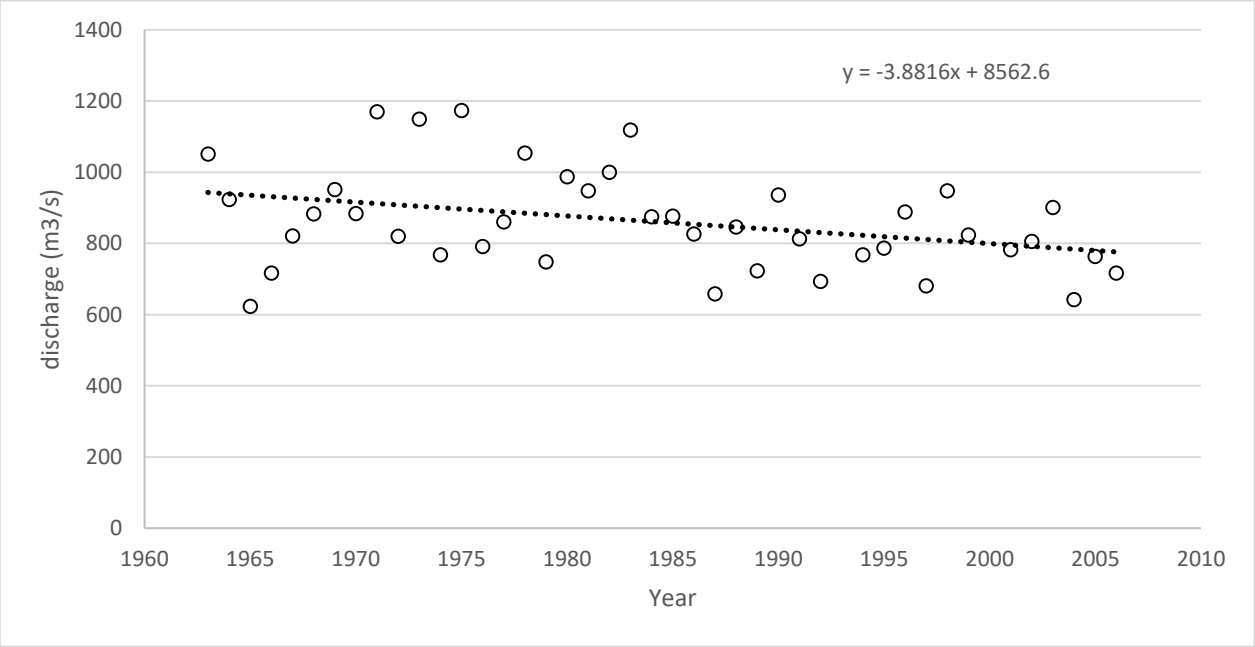


Figure 13: Rates of stream discharge at various temporal scales

Table 12: List of identified sub-watersheds in the Bogatan Lagam Karnali watershed

SN	Name	Area (sq km)	VDCs
1	Upallo Sisnigaad	48.119	Lanakedareswor, Mannakapadi
2	Tallo Sisnigaad	38.354	Lanakedareswor, Ghagal, Simchaur
3	Ghagalgaad	38.037	Ghagal, Simchaur,
4	Budhigaad	37.96	Kanachaur, Kedaraakhanda, Simchaur
5	Bheri Khola	31.108	Dhirkamandu, Satferi, Gaguda, Chamarachautara, Lanakedareswar, Simchaur
6	Dhobi Khola	23.405	Chamarachautara, Simchaur, Kedaraakhanda
7	Galagaad	39.85	Kanachaur, Kedaraakhanda
8	Sinigaad	30.478	Kanachaur, Kedaraakhanda
9	Tunigaad	29.848	Dhirkamandu, Satferi, Lanakedareswar

Annex 6: Forest types and composition

Table 13: Forest types by area and percentage

Species	Area (Ha)	Percentage
Chir pine	38,069	29.50
Mixed broad-leaved	37,400	29.00
Sal	26,240	20.40
Lower temperate oak	22,323	17.30
West Himalayan fir hemlock oak	2,303	01.80
Mountain oak rhododendron	2,546	01.98
Lower tropical sal and mixed broad leaved	37	00.03
Total	**128,920.5**	

Source: DFO Report 2016, Doti

Annex 7: Climate change impacts biodiversity and vulnerabilities

Table 14: Climate change impacts and communities impacted

Vulnerability	Impacted communities	Impact	Priority	Basis of Prioritization
Drought and drying water sources	Simchaur, Kedarankhada, Ghangal,	Diminished agricultural production Timing shifts in production	High	Field observation

	Manakapadi, Lanakedareswar	Forest fire risk Diminished interest in agriculture; more outmigraiton Water scarcity and low water availability		and MSC workshops
Landslide	Simchaur, Ghangal, Kedarankhada, Aladi Muda, Guinada, Lagam Simli,	Property destruction Loss of life Infrastructure damage (e.g., irrigation canals, water sources)	High	Field observation and MSC workshops

Annex 8: Fish and aquatic life

Table 15: Types of fish and population status

Type of fish	Status
Rare and endemic fish	In Seti Nadi, 17 different locally named fish species have been reported, according to participants of focal group discussions. These are distinguished by local names such as including *kuera, satto, gerara, oyara, asla, kaloch, pangar, sueni, githi,* and *geraj.* Seven species of fish considered "rare and endangered" by the IUCN are found here: *sahar, zebra machha, buche asla, zsala soal, chuche zsala, tite machha,* and *raja bam.* 90% of respondents report native fish species have been decreasing, due perhaps to harmful fishing practices such as explosives and poison.
Commercially useful native fish	*Sahar, buche asla, asala soal, chuche asala, raja bam*

Annex 9: Mammals and population trend

Table 16: Types of mammals, location, and population trend

Local Name	Type	Trend	Location
Sill fish (Salak)	Terrestrial	Decreasing	all parts of watershed
Wild boar	Terrestrial	Increasing	all parts of watershed
Water cockcrows	Aquatic	Decreasing	all parts of watershed
Rabbit	Terrestrial	Decreasing	all parts of watershed
Charibag	Terrestrial	Decreasing	all parts of watershed
Deer	Terrestrial	Decreasing	all parts of watershed
Malsapro	Terrestrial	Decreasing	all parts of watershed
Fox	Terrestrial	Increasing	all parts of watershed
Elephant	Terrestrial	Increasing	all parts of watershed
Common leopard	Terrestrial	Decreasing	all parts of watershed
Jangali bandel	Terrestrial	Increasing	all parts of watershed
Bear	Terrestrial	Increasing	all parts of watershed
Nyaurimusa	Terrestrial	Increasing	all parts of watershed
Porcupine	Terrestrial	Decreasing	all parts of watershed
Musa	Terrestrial	Increasing	all parts of watershed
Ghoral	Terrestrial	Increasing	all parts of watershed
Tiger	Terrestrial	Decreasing	all parts of watershed

Annex 10: Reptiles and population trend

Table 17: Reptile species, location and population trend

Name	Types	Status / Trends	Affected Locations
Green snake	Aquatic / Terrestrial	Decreasing	all parts of watershed
Crocodile	Aquatic / Terrestrial	Decreasing	all parts of watershed
Tortoise	Aquatic / Terrestrial	Decreasing	all parts of watershed
Boa snakes	Aquatic / Terrestrial	Decreasing	all parts of watershed

Cobra	Aquatic / Terrestrial	Decreasing	all parts of watershed
Dhaman	Aquatic / Terrestrial	Decreasing	all parts of watershed
Karet	Aquatic / Terrestrial	Decreasing	all parts of watershed
Lizard	Terrestrial	Decreasing	all parts of watershed
Frog	Aquatic / Terrestrial	Decreasing	all parts of watershed

Annex 11: Birds and population trend

Table 18: Bird species, location and population trend

Name of species	Types	Status/Trends	Location
Vulture	Terrestrial	Decreasing	all parts of watershed
Kukleruwa	Terrestrial	Decreasing	all parts of watershed
Woodpecker	Terrestrial	Decreasing	all parts of watershed
Dhukur	Terrestrial	Decreasing	all parts of watershed
Bhadrai	Terrestrial	Decreasing	all parts of watershed
Eagle	Terrestrial	Decreasing	all parts of watershed
Kalij	Terrestrial	Decreasing	all parts of watershed
Titra	Terrestrial	Decreasing	all parts of watershed
Bakulla	Terrestrial	Decreasing	all parts of watershed
Dhanus	Terrestrial	Decreasing	all parts of watershed
Kalukhate	Terrestrial	Disappear	all parts of watershed
Holeso	Terrestrial	Disappear	all parts of watershed
Kokalsaro	Terrestrial	Disappear	all parts of watershed
Kafalpakyo	Terrestrial	Disappear	all parts of watershed
Neula	Terrestrial	Decreasing	all parts of watershed
Bheguda	Terrestrial	Decreasing	all parts of watershed
Fiste	Terrestrial	Decreasing	all parts of watershed
Ranicharo	Terrestrial	Decreasing	all parts of watershed
Danfe	Terrestrial	Decreasing	all parts of watershed
Munal	Terrestrial	Decreasing	all parts of watershed

Annex 12: Road networks

Table 19: District and Village Road Core Networks (VRCN) in the Bogatan Lagam Karnali watershed

Communities connected	Total (km)	Existing roads at risk?	New roads planned?	Green construction?
Durgamandu – Satpheri – Lanakedareshwor - Bagchedda	3.35	Yes	Yes	No
Rajpur – Ranagau – Durgamandu – Basudevi – Tikhatar – Gagauda - Chamarachautara - Kedarakhada – Kanachaur - Beni	67.5	Yes	Yes	No
BP Nagar – Barchhain – Khadeuli – Bachcheda – Sunalek – Ghangal – Simchaur – Kedarakhada - Lodeghat	9.96	Yes	Yes	No
Total	**80.81**			

Source: Annual Road Map, Doti, 2016

Annex 13: Irrigation projects

Table 20: List of irrigation projects by name, location, area, and population served

SN	Name and location	Area covered (ha)	Households benefited	Population
1	Nikalakhet Irrigation (Ward 5)	16	50	235
2	Silban Irrigation (Ward 5)	10	50	300
3	Pallakhol Irrigation (Ward 5)	9	50	175
4	Thaplekhola Irrigation (Simchaur, Ward 6)	25	40	160
5	Sadhepanidada Irrigation (Ward 6)	15	30	150
6	Ultepani Irrigation (Simchaur, Ward 4)	7	20	100
7	Kulban Irrigation (Wards 6-7)	50	100	450
8	Syaule Irrigation (Ward 5)	8	12	120
9	Bagarkhola Irrigation (Ward 9)	9	15	45
10	Dankhola Irrigation (Ward 5)	50	300	600

	Total	**199**	**997**	**2,335**

Annex 14: Water quality

Table 21: Water quality by river/stream and tested aspect

	Name of the river/stream				
	Bandagaad	**Guenada Dovan**	**Guinadagaad**	**Barsa Khola**	**Seligaad**
Conductivity (µS/cm)	83.9	129.5	119.5	142.3	77.2
Temp °C	31.7	23.1	22.9	23.2	25.6
Iron (mg/L)	0.12	0.0	0.05	0.08	0.25
pH	7.7	6.7	7.1	7.4	5.7
Nitrate Nitrogen (mg/L)	0.3	4.4	1.6	1.4	4.4
Nitrite Nitrogen (mg/L)	0	0.0	0.0	0.0	0.06
Ammonium (mg/L)	3.0	0	0	1.0	0
Phosphate (mg/L)	20	9.3	1.5	0.3	7.9

	Name of the river/stream				
	Silghatt Khola	**Kedarsain Khola**	**Dhameli Khola**	**Koiladi Khola**	**Kimade Khola**
Conductivity (µS/cm)	96.9	37.3	83.1	441.9	482.2
Temp °C	31.5	25.6	31.7	24.1	24.1
Iron (mg/L)	0.01	0.14	0.45	0.05	0.05
pH	6.2	5.5	8.2	7.8	6.1
Nitrate Nitrogen (mg/L)	4.4	1.4	0.5	0.5	0.2
Nitrite Nitrogen (mg/L)	0	0.01	0.01	0.0	0.0
Ammonium (mg/L)	7.0	5.0	3.0	2.0	4.0

Phosphate (mg/L)	2.1	2.1	37.5	22.0	13.0

Annex 15: Community user forest groups

Table 22: Community user forest groups by location, area and representation

Name	Location and ward	Area (ha)	Households	Male	Female
Devi	Kedarakhada - 4,5,6	85	194	15	3
Nava Durga	Kedarakhada - 6,7,8	300	74	13	2
Bannali	Kanachaur – 5	65	81	13	4
Rani Pale Tatha Olla Sal	Simchaur - 6,7,8,9	110	111	17	
Ranipale	Simchaur – 4	80	35	11	2
Masani	Simchaur - 3	128	79	11	3
Laxmi	Simchaur - 9		39	11	3
Jauda Khal	Simchaur – 5	22	37	11	2
Kedar	Simchaur – 6	61	60	13	4
Mauri	Simchaur – 6	402	107	11	2
Pokhar Tola Dahi Changle	Simchaur – 7	26	60	13	3
Dhami Danda	Mannaakapadi - 1,2	65	69	9	
Beytal	Mannaakapadi - 7	198	36	15	3
Mohanel Boytal	Mannaakapadi - 8,9	551	74	13	4
Melghadi	Mannaakapadi - 8	296	35	11	3
Kalipal	Mannaakapadi - 6	197	75	19	5
Kunthola Rani	Kedareshwar - 2	50	31	9	
Malika	Kedareshwar - 3,7	120	120	16	4
Dhari	Kedareshwar - 5	75	49	9	3
Raniban	Kedarshwar - 1,2,3,7	100	102	15	6
Kedareshwar	Kedareshwar - 4	175	85	15	4
Bidatopani	Kedareshwar - 3,8,9	150	66	13	4
BP Nagar	Berchen - 9	2,050	451	29	4

	Niranli - 7,8				
Mohanyateshwar	Berchen – 6	1,448	108	13	4
Masani Jana Kateyn	Berchen – 5	500	51	11	3
Nava Durga	Berchen - 7	892	90	15	
Devi Durga	Berchen - 1,3	1,083	74	11	3
Betal Baba	Berchen - 5	300	23	9	2
Ranipokhari	Lagam - 7	202	104	11	4
Chandni	Lagam - 8	111	82	11	5
Suntola	Lagam - 9	164	40	11	1

Annex 19: Existing policy provisions and status of enforcement

Table 23: Current policy provisions and relevant observations

Policy Provision	Ground Reality	Recommendations
Municipalities (local governments) are empowered to prepare and implement programs with regard to forests, vegetation, biodiversity, soil conservation, and environmental conservation in the village development area (per section 28(h) of the LSGA, 1999). Rural Municipalities are required to assist environment conservation by managing air, land and water pollution within their jurisdiction; this work includes conserving forest, plants and other natural assets, and collecting, transporting, and disposing solid waste of the municipality area (per section 96(1)(c) of the LSGA).	Although the LSGA has been in force for the past 18 years, local bodies have not given priority to developing separate programs for conserving biodiversity. The municipalities in the watershed area have also focused limited energy on collecting and disposing waste. People not aware of the existing Aquatic Animal Protection Act, 1961.	Need greater focus on conservation of aquatic biodiversity through site-specific policy provisions in support of local communities and establishment of strong monitoring mechanisms. Awareness raising and formulation of local level by-laws and strict implementation are needed

Annex 17: Water supply and sanitation user groups

Table 24: Water supply and sanitation user groups by location and area

SN	Name	Location	Households	Population
1	Rantola	Lanakedareshwor - 5,7,3	139	903.5
2	Chotadi Sasad	Lanakedareshwor - 1,2	52	338
3	Thoplekhola, Gogane & Ultechaur	Lanakedareshwor - 1	65	422.5
4	Sulad	Lanakedareshwor - 9	32	208
5	Bhawanibhabarrasim Mul	Lanakedareshwor - 4	52	338
6	Challechada	Lanakedareshwor - 8	41	266.5
7	Ramana	Lanakedareshwor - 5	40	260
8	Chachada	Lanakedareshwor - 4	35	227.5
9	Udpurnapanemul	Lanakedareshwor – 2,9	35	227.5
10	Jugepaniudgada	Lanakedareshwor - 5	27	175.5
11	Rikhaya Babankharka Yekalkada	Lanakedareshwor - 5	12	78
12	Khurliganga, Chochankhola	Lanakedareshwor - 9	39	253.5
13	Harkate, Bagpani, Masanedeu	Lanakedareshwor - 3,6	26	169
14	Silkhola	Lanakedareshwor - 6	42	273
15	Attarkanda	Lanakedareshwor - 6	18	117
	Total		**655**	**4,258**

Annex 18: Statuses of existing environment management plans

Table 25: Existing environment management plans by location, type, and current status

Previous VDCs	LAPA	WUMP	EFLG	LDRMP	Need of awareness
Simchaur	0	1	2	1	Yes
Kedaraakhanda	1	1	2	1	Yes
Lanakedareswar	1	1	2	1	Yes
Ghagal	0	1	2	1	Yes
Lagam	1	0	2	1	Yes

Legend: 1=in place; 2=not in place; 3=needs updating; 4=implemented; 5=not implemented (Source: Paani FGDs and KIIs, 2017).

Annex 24: Key stakeholders – organizations and offices

Table 26: Key organizations and offices relevant to watershed health

SN	Name	Address	Contact No.	Mobile No.
	A. Government Organizations			
1	District Coordination Committee	Shilgadhi, Doti	094-420244	9858430222
2	District Soil Conservation Office	Shilgadhi, Doti	094-420258	9848662200
3	District Forest Office	Shilgadhi, Doti	094-420145	9858440145
4	District Agriculture Dev. Office	Shilgadhi, Doti	094-411126	9841418318
5	District Livestock Service Office	Shilgadhi, Doti	094-420114	9858440142
6	Division Irrigation	Rajpur, Doti	094-440168	9847858460
7	Women and Child Dev. Office	Shilgadhi, Doti	094-420078	9842670435
8	District Technical Office	Shilgadhi, Doti	094-420194	9858440194
9	Dipayal Silgadhi Municipality	Shilgadhi, Doti	094-420297	9848301476
10	Water Induced DC Division	Shilgadhi, Doti	094-440317	9858440317
11	District Health Office	Shilgadhi, Doti	094-420043	9858440017
12	District Administration Office	Shilgadhi, Doti	094-420133	9858437777
13	Centre Burea of Statistics	Rajpur, Doti	094-440153	9848450143
14	Road Division	Kulpate, Doti	094-440151	9759003487
15	Hydrology and Meteorology Office	Rajpur, Doti		
16	District Education Office	Shilgadhi, Doti	094-420135	9759003931
17	Silgadhi Water Users Committee	Shilgadhi, Doti	094-420607	9848597309
	B. NGOs / Programs in Doti			
1	KISAN	Shilgadhi, Doti		
2	Promoting Agriculture, Health and Alternative Livelihoods (PAHAL)	Shilgadhi, Doti		9868448374
3	Rural Village Water Resources Management Project (RVWRMP)	Shilgadhi, Doti	094-420166	
4	Rural Access Programme (RAP)	Shilgadhi, Doti		9741094824
5	Khapatad Tourism Board	Shilgadhi, Doti		
6	SUAAHARA - Good Nutrition	Shilgadhi, Doti		9848024247

7	Multi-sectoral Nutrition Plan (MSNP)	Shilgadhi, Doti		
8	Suklaphanta Wildlife Reserve Management Committee	Shilgadhi, Doti		
9	Curriculum Development Committee	Shilgadhi, Doti	094-420381	9848767391
10	Good Neighbors	Shilgadhi, Doti	094-420554	9858440002
11	Nepal Red Cross	Shilgadhi, Doti		9848414080
12	Rural Development Service Center (RDSC)	Dipayal, Doti		9849431462
13	Community Development Fund (CDF)	Shilgadhi, Doti	094-420020	9841674340
14	World Vision	Shilgadhi, Doti	094-420068	9858423406
15	United Missions to Nepal (UMN)	Shilgadhi, Doti	094-411220	9846080356
16	Energy Development Council (EDC)	Shilgadhi, Doti		9848431220
17	Source Nepal	Shilgadhi, Doti		9848438644
18	Feminist Dalit Organization (FEDO)	Shilgadhi, Doti	094-420002	9848434479
19	Samaj Sewa Doti	Shilgadhi, Doti	094-411020	9848474501
20	Rural Development Center	Shilgadhi, Doti	094-420340	9848438684
21	Integrated Social Development	Shilgadhi, Doti		9848431261
22	Disability Welfare Association	Shilgadhi, Doti	094-411093	9759000757
23	Society for Environmental and Economic Development	Shilgadhi, Doti		985844011
24	Nepal Environment and Education Development Center	Shilgadhi, Doti		9848797555
25	Local Initiatives for Biodiversity, Research and Development (LI-BIRD)	Shilgadhi, Doti	094-420601	9856036999
26	Family Planning Association	Shilgadhi, Doti	094-420042	
27	Nepal Federation of Irrigation Water Users' Association, Nepal (NFIWUAN)	Shilgadhi, Doti		9848474940
28	Nepal Federation of Indigenous Nationalities (NEFIN)	Shilgadhi, Doti		
29	Federation of Drinking Water and Sanitation Users, Nepal (FEDWASUN)	Shilgadhi, Doti		
30	Nepal Federation of Environmental Journalists (NEFEJ)	Shilgadhi, Doti		9848438644
31	Federation of Nepalese Chambers of Commerce and Industry (FNCCI)	Shilgadhi, Doti	094-440108	
32	Seti Technical Institute	Bhagetada, Doti	094-412176	
33	Nepal Electricity, Dipayal	Shilgadhi, Doti	094-412183	
34	Vijaya Development Resource Center (VDRC)	Shilgadhi, Doti		

35	Environment, Culture, Agriculture, Research and Development Society, Nepal (ECARDS)	Shilgadhi, Doti		
36	HELVETAS (Switzerland)	Shilgadhi, Doti		
37	Food and Agriculture Organization (FAO)	Shilgadhi, Doti		
38	Food First Information Network (FIAN)	Shilgadhi, Doti		9848624135
39	International Wheat and Maize Improvement Center (CIMMYT)	Shilgadhi, Doti		
40	Rural Prosperity Initiative	Shilgadhi, Doti		
41	World Food Programme (WFP)	Shilgadhi, Doti		9848524553
42	Kedar Rural Development Socity	Shilgadhi, Doti		9848525522
43	Save the Children	Shilgadhi, Doti		9741065293

Annex 25: Vision building framework employed for compiling the Bogatan Lagam Karnali watershed profile