Valley Conservation and Sustainable Development Plans
Central Karakorum National Park
2016-2026
Gilgit Baltistan
District Nagar

EvK2CNR PAKISTAN

CENTRAL KARAKORAM NATIONAL PARK CKNP

seed Social Economic Environmental Development

Valley Conservation And Sustainable Development Plans
2016-2026
Central Karakoram National Park
Gilgit Baltistan

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CONTENTS

List Of Exhibits

Abbreviations

°C	Celsius
ABG	Annual Biomass Growth
CAI	Current Annual Growth
CKNP	Central Karakoram National Park
CPEC	China Pakistan Economic Corridor
E	East
EIA	Environmental Impact Assessment
FGD	Focus Group Discussion
GB	Gilgit-Baltistan
GLOF	Glacier lake outburst flood
HH	Households
INGO	International Nongovernmental Organization
Kg	Kilograms
KIU	Karakorum International University
LSO	Local Support Organization
m a.s.l.	Meter above sea level
Mg	Mega grams
MP	Management Plan
N	North
N/A	Not Applicable
NGO	Non-governmental Organization
NTFP	Non-Timber Forest Product
OP	Operational Plan
S	Summer
SEED	Social Economic Environmental Development
UC	Union Council
VCC	Valley Conservation Committee
VCF	Valley Conservation Fund
VCSDP	Valley Conservation and Sustainable Development Plan
VCSP	Valley Conservation Sustainable Plan
VO	Village Organization
W	Winter
WO	Women organization
Yr	Year

1. OVERVIEW OF CKNP

1.1. Localization and access

The Central Karakoram National Park (CKNP), officially gazette as National Park in 1993, is situated within geographical limits of Gilgit-Baltistan. It is the largest national park in Pakistan, placed in category-II. This consists of two main zones, the Buffer Zone and the Core Zone, for a total of 10,557.73 Km^2. According to new administrative divisions, park spans on five of the ten districts of Gilgit-Baltistan[1]. These districts are Gilgit, Skardu, Nagar, Ghanche and Shigar.

CKNP is the largest national park of Pakistan CKNP having an area of 10,557.73 Km^2

CKNP presents variety of landscapes attitudinally ranging from 2000 - 8,000 m asl including world's second highest peak K2 (8,611 m asl), as its center piece and number of largest glaciers outside the polar regions. Land cover map of the area indicates that a major part (66.5%) is covered by snow and glaciers. Bare rocks and bare soils also represent a substantial part (15.4%) of CKNP whereas vegetation base classes represents about more than 14.7% of the area. Besides this, several other high altitude peaks and glaciers, provides world class tourism and mountaineering opportunities for tourists, trekkers and several others.

Exhibit 1: Landscapes of CKNP

1Khan, B. (2011).Field Guide to the Central Karakoram National Park, Pakistan. CESVI, Pakistan, Islamabad, pp. 45

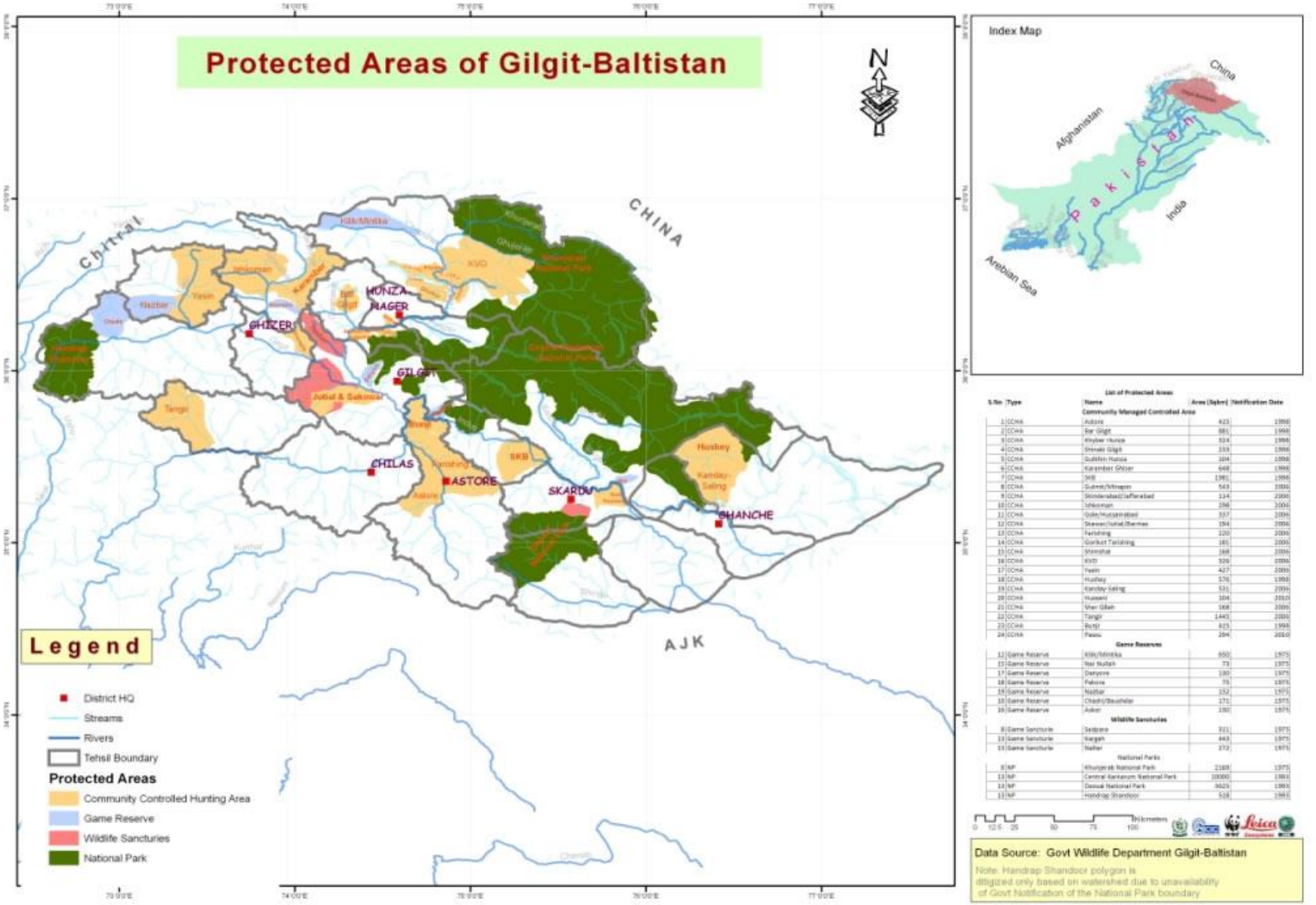


Exhibit 2: Protected areas of Gilgit-Baltistan

1.2. Local Climate

CKNP is part of the "transitional zone" between arid Central Asia and semi-humid subtropics of the South Asia. Local climate is characterized by greater precipitation in winter and spring and by the effects of arid continental climate in summer with sudden onsets of cold weather in early autumn. Average rainfall in the valleys is 100-300mm throughout the year[2].

Exhibit 3: K2, CKNP

1.3. Ecological Profile

Diversity and distribution of natural vegetation and associated fauna is closely linked to climatic and topographic conditions. It declines northwards of the park and increases in south-western regions of CKNP. Owing to the diverse micro-climatic, geographic and environmental conditions. The area is rich in biological diversity and a great source of freshwater and other services of highly aesthetic, ecological and socio-economic significance, for millions of people in Gilgit-Baltistan, as well as for those living downstream of the River Indus in Pakistan, and elsewhere in the world who like to venture through the rugged mountainous and glaciated landscape of Karakoram[3]. The dry alpine vegetation, comprising the species of Artemesia, Juniper, Polygonum and Wild Rose on slopes, whereas, Myricaria and sea buckthorn bushes along riverbanks and streambeds characterize most of the CKNP areas. Broadleaves mainly consist of scattered patches of *Betula utilis* and Salix spp., found in humid places. Conifers, comprising mainly of *Pinus wallichiana*, predominantly occur at lower altitudes in the western ends of the Park including Roundu Skardu, Haramosh, Bagrote and adjacent valleys of Gilgit

Exhibit 4: Vegetation of CKNP

2 Mari, F., Gallo, M.,Vuillermoz, E., Milanesi, D., Dece, L., Burashchi, E., Hassan, R., Central Karakoram National Park Management Plan. Ev-K2-CNR, Pakistan, Islamabad, pp. 323.

3 IUCN, Pakistan. (2009). Central Karakoram Conservation Complex. Draft Management Plan. Sub plan: Species Management, IUCN Pakistan, Karachi. Pages 24.

Exhibit 5: North East face of CKNP

and Hunza and Nagar[4]. Large mammals are a key resource and important conservation focus in CKNP (IUCN, 2009a). The Park is a refuge area not only for threatened species, such as markhor, musk deer, Ladakh urial, Marco Polo sheep (presence to be confirmed in CKNP) and snow leopard, but also for non-threatened but important "flagship" species, such as blue sheep, Siberian ibex, lynx and grey wolf.

2. MANAGEMENT OF CKNP

The management of national park has been governed by its management plan develop in 2014. CKNP is surrounded by 230 villages, inhabited by over 115,000 people living in about 13,000 households, which have access rights upon resources.

Majority of the local communities live an agro-pastoral life depending upon the Parks resources such as rangelands, forests, wildlife, medicinal flora, etc. Moreover, a considerable number of local people are also engaged in tourism and mining industry in and around CKNP. Thus, the local communities around CKNP are major stakeholders and systematic community involvement in Park management is highly desirable to foster a positive relationship between people's needs and Park ecology, which has been emphasized in Integrated Park Management Plan (IPMP) for CKNP[5] for the following major reasons:

One of the National Park's goals is to preserve and promote, in a sustainable way, local cultural heritage which is widely distributed in the valley adjoined CKNP; the CKNP management process is based on a "participatory development and implementation strategy". Considering the large extent of the park and the socio-economic and ecological diversity in the surrounding areas, the resources of the Park management office are limited and will have to rely on a large extent on communities living around CKNP for successful park management. For these reasons the park management office aims at committing community-based organizations to collaboration for management of the park[6]

4 Ferrari, E. (2014). Methodological issues in implementing a Sustainable Forest Management Plan in remote mountain areas: the Karakorum (Pakistan). Ph.D. Thesis. University of Padova, Italy.

5 Integrated Park Management Plan (IPMP) for Central Karakoram National Park. 2014. Developed by Ev-K2-CNR, Islamabad, Pakistan.

6 Flury, B. 2012. Livelihoods and natural resource management in Central Karakoram National Park Areas – Braldo and Basha valleys. Research Report Developed for SEED Project. 46 pp.

However, illegal activities (e.g. wood collection, grazing and tourism) are conducted inside the Park borders. The natural resources in CKNP are subjected to pressure due to traditional rights of the local inhabitants and tourism practices[7]. In addition, other activities not directly related with resource use could affect the Park integrity; and the local communities have some expectations from the Park as a relevant tool to improve their living standards and socio-economic conditions. In CKNP areas, community participation in co-management of natural resources starts from 1990's with establishment of Village and Valley Conservation Committees (VCCs) by INGOs such as IUCN and WWF. The initiative was based on Community-based Natural Resource Management (CBNRM) approach, which was first implemented in Africa and then adapted and applied in some areas of Gilgit-Baltistan, including an adjacent village of CKNP namely Hushey[8]. The initiative primarily aimed at development of community-based trophy hunting program. By 2013 more than 30 community-based organizations namely VCCs, LSOs and other local NGOs were formed by organizations like AKRSP, GBFWED, Ev-K2-CNR and WWF to facilitate CBNRM around CKNP with a view to have protect the Park resources.

Management plan for CKNP has already been developed by EVK2CNR and implemented by CKNP directorate; in response to which certain management gaps have ascended and create difficulty in the park management. To address this issue new and detailed operational plan on the basis of VCSDPS have to be developed for revised management plan of CKNP.

3. NEED OF REVISED OPERATION PLAN/SEED PHASE EXTENSION

The CKNP management plan has already been translated to an operational plan, making it easier for the park staff to understand and implement the plan. The operational plan is based on the data that was available through earlier surveys and reports on the socio-economic and environmental status of selected valleys, just 4 in numbers. Although most of the information, collected earlier were applicable to rest of the park valleys, but there were some obvious gaps that were identified through subsequent evaluation with some as follows:

a) Assessment of Customary Practices
b) Assessment of Climate Change impact on natural resources
c) Valley specific action plan

Besides, this was realized that since the implementation of the CKNP management plan is the basic objective that has been made easier through the formulation of an operational plan but since there were gaps in information from the valleys, reflecting in the management, and subsequently in the operational plan, the consequent implementation of the plan may not yield the desirable results.

7 Panzeri, D & M. Khan. 2009. Livelihoods in Central Karakoram National Park. Socioeconomic baseline data survey. HKKH Technical Report, 77 pp.

8 IPMP for CKNP. 2014. Developed by Ev-K2-CNR, Bergamao, Italy

4. SCOPE OF THE VCSDP

Villages surrounding the buffer area of CKNP have been defined into 15 distinct valleys. These valleys have been defined by same watersheds, considering some geographical analogies, district appurtenance and other proximity relations. For each valley around CKNP a specific Valley Conservation and Sustainable Development Plan (VCSDP) needs to be prepared and implemented to manage core, transition and buffer zone related conservation issues. CKNP VCSDP deals with the integrated conservation and sustainable development matters of its 15 valleys namely Danyore, Haramosh, Upper Braldu, Lower Braldu, Shigar, Astak, Tormik, Thalay, Ghulmat, Nagar, Bagrot, Basha, Hoper-Hispar, Nagar and Hushey that fall within CKNP buffer zone and depends upon park resources for subsistence. Integrated Park Management Plan (IPMP) for CKNP (2014)[9] emphasizes to strengthen the community-based organizations (VCCs and LSOs) around CKNP to make them integrated conservation and development bodies, with a view to:

a) Institutionalize an integrated conservation and development approach at the community level;
b) Increase effectiveness of project implementation
c) Empower women and strength representation of communities into the CKNP management process.

Valley Conservation planning process has been a valuable and important part of the CKNP management in engaging local communities. However, the CKNP Management Plan (2014) while evaluating the existing VCPs around CKNP has identified some gaps to improve this process. Those gaps include several factors such as lack of consistency between various components of the plans, lack of conceptual clarity, and lack of a monitoring mechanism, less clear role, responsibilities, and inappropriate information about resources required to undertake the desirable actions.

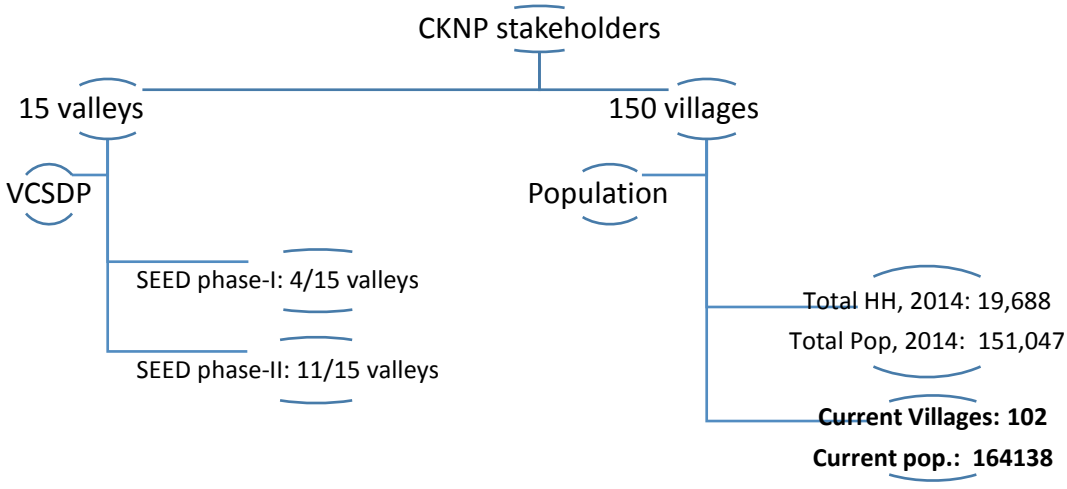
Based on this evaluation, the CKNP Management Plan (2014) has recommended to "revise and amend the VCPs according to a tested and universally acknowledged planning instrument, such as the logical framework approach, for example if they are to fulfill their functions as an instrument for grass-roots planning and implementation within the CKNP management process".

Development and approval of VCPs involve four steps including:

a) Resource Need Assessment (RNA)
b) Participatory Conservation Planning (PCP)
c) Approval of VCP from District Conservation Committees (DCCs)

9Integrated Park Management Plan (IPMP) for CKNP. 2014. Developed by Ev-K2-CNR, Country Office, Islamabad, Pakistan

d) Implementation of VCP through VCCs and other stakeholders.



4.1. Objectives of VCSDPS

One of the steps of CBNRM was to develop Conservation Plans at village or valley level, aimed to provide guidelines for participatory natural resource management. The revised VCPs, keeping in view the integration approach have been termed as Valley Conservation and Sustainable Development Plans (VCSDPs) aimed at the following specific objectives:

a) Promote participatory NRM in CKNP buffer zone villages and valleys to ameliorate environmental conservation of the park.
b) Create synergies among park stakeholder to promote community-based conservation in CKNP buffer zone.

4.2. Structure and Composition of the VCSDP Plan

The plan comprises of the following ten segments:

a) Socio-economic and Ecological profile of valley
b) Assessment of Customary Practices
c) Assessment of Climate Change impact on natural resources
d) Management issues and problems;
e) Proposed management interventions
f) Management actions
g) Indicators of process and progress
h) Implementation mechanisms/Available capacities for the implementation of the Valley Conservation Plans: Social organizations - CKNP Directorate - Facilitating NGOs/CBOs – Others
i) Expected outputs
j) Visible bottlenecks in realizing the expected outputs, and arrangements (available and potential both) to overcome the bottlenecks
k) Monitoring mechanism

4.3. Process of VCSDP Development

The VCSDP development process included following stages.

a) Designing of Questionnaire
b) Training of Enumerators
c) Pre-testing of Questionnaire and pilot survey
d) Sample Size and Interviewee classification
e) Compilation and Analysis of Data
f) Write up of VCSDP

4.3.1 Development procedure of Questionnaire

As a result of CKNP management and operational plan, it became essential to develop the VCSDP's to address the climate change adaptations and assessment of validity of statutory and customary laws in each valley for the conservation of ecosystem. To ensure the successful ecosystem planning community based approach was employed for which development of detailed questionnaire was recommended by the technical experts. Owing to the need of improvement in previously developed questionnaire (developed by WWF and Ev-K2-CNR) and VCSDP's of four valleys (namely Hooper-Hisper, Basha, Hushey, Bagrot) frequent sessions with technical experts from relevant departments, CKNP directorate and representative from local communities were held. The amended questionnaire was semi-structured and involves the research to analyze the attitudes and adaptation practices (customary/statutory) of the local community towards natural resources management in response to changing climate.

Exhibit 6: Meeting with community representatives before Questionnaire Development

4.3.2 Design of Questionnaire

The questionnaire consists of following sections

a. Basic facilities in the village
b. Statutory vs. Customary Laws/Practices
c. Climate Change Impacts on Natural Resources
d. Assessment of current customary practices in response to climate change
e. Management Issues/Problems

Design of all sections is based on analysis of past, current and future time scenarios, based on available projections and excavation of indigenous knowledge.

4.3.3 Pre-testing of Questionnaire and pilot survey

Enumerators have been trained by technical personnel about the interview methodology and information probing through relevant follow up questions from the community. Representatives of the target groups have been identified and a pilot survey was conducted to give the enumerators a real time experience along with the assessment of difficulties that can be encountered during the field survey.

Exhibit 7: Presentation about VCSDP Questionnaire to enumerators

4.3.4 Sample Size and Interviewee classification

The 10% of local community in each valley has been interviewed as sample population which responded with almost same type of answers. This repetition of responses shows that enough sample size has been taken. Interviewees were selected randomly but above the age of 40. The minimum scale for age of the interviewee was 40 years because of the enough acquaintance to the nature based on their life experiences as compared to young generation. To ensure accuracy and resolution of conflict in the information, individual interviews were supplemented with FGDs were conducted. The group comprised of 6-12 persons from local community for each focused discussion. Local community and professionals from relevant departments from both genders has been appointed to interview the semi-structured questionnaires.

Exhibit 8: Meeting with Enumerators

Information for socio-economic and ecological profile of the valley, management issues and problems and proposed interventions were obtained with the help of Focused Group Discussion (FGDs); and interviews with household heads.

4.3.5 Data collection, Compilation and Analysis

Both the quantitative and qualitative type of information has been obtained by the questionnaire. The quantitative data in terms of economic benefits has been expressed in relation to customary practices and climate change. The qualitative information will help to design local-level plans or policies may be important in shaping adaptive capacity of vulnerable households and individuals. Regional or district plans and/or sector strategies can give helpful information on priorities of local governments.

Exhibit 9: FGD session at Upper Braldo

By combining local knowledge with scientific data obtained via secondary resources including review articles, this document addresses the people's understanding about climate risks and adaptation strategies and validity of customary rules in consumption of natural resources.

Exhibit 10: Female Enumerator interviewing local representative of Danyore Valley

Best natural resource management practices from other PAs such as KNP in Gilgit-Baltistan and lessons of CBNRM from various valleys of GB were also reviewed for extracting proposed management interventions and actions. A meeting was conducted with CKNP management in Skardu to obtain their opinion on management issues, innervations and appropriate actions.

Exhibit 11: Training of Enumerators for Data Punching

CKNP Management Plan (2014) and SEED Project Technical Report were also consulted for relevant recommendations. Lessons learned by CKNP partners under SEED Project were reviewed from various documents available with WWF-Pakistan. Previously developed VCSDP of Basha, Bagrot and Hisper/Hoper were also reviewed to obtain useful information.

4.3.6 Ethical Consideration

As the interviews, being done was the research for VCSDPs development, therefore ethical issues were considered. Interviewee were informed about the purpose of the interview and the way this information will be used. Moreover, female interviewers were appointed to conduct the interviews from female representative of local communities to respect their culture and conflict resolution.

OVERVIEW OF CKNP VALLEYS

5. OVERVIEW OF CKNP VALLEYS

Indigenous communities are vulnerable to displacement face the difficult task of ensuring that their communities will be able to stay in place for as long as possible. Indigenous communities while interacting and surviving in nature have collected tremendous information on the ways of adaptability and sustainability. This traditional knowledge is complete resource of culture, experiences, natural resources, climate, and sustainable ways to thrive. These are accumulated through experience, relationships, and upheld responsibilities towards themselves and other living beings and places and are passed down generationally through oral histories, stories, ceremonies, and resource use practices. This traditional knowledge is a knack of local communities and come with certain responsibilities, such as determining when and with whom they should be shared.

Presented below is the assessment of customary practices and adaptation to climate change as a tool of sustainable management of CKNP.

Exhibit 12: Socio-Demographic Information of CKNP valleys

Name of Valley	No. of Villages	Total population		Distance to access road	No. of Schools	No. of Health centers	No. of Vet. centers
		Human	Livestock				
Nagar	7	28716	34250	Connected through link roads	16	6	4
Ghulmat	7	16896	19867	Lies along KKH	15	6	3
Danyore	5	41200	51530	-do-	5	4	2
Haramosh	7	9846	98763	Lies along KKH-Skardu road	6	5	2
Astak	16	6827	24808	45 min drive to main Skardu road.	10	3	1
Tormik	15	8533	16522	Located away from main road	11	3	1
Lower Braldo	8	5952	12263	-do-	7	1	1
Upper Braldo	9	3557	28440	-do-	10	4	0
Shigar	16	20295	15099	-do-	15	10	3
Thalay	10	9116	6220	-do-	8	7	2
Daghoni	2	13200	17600	-do-	2	2	0
Total	**102**	**164138**	**325362**	--	**89**	**45**	**15**

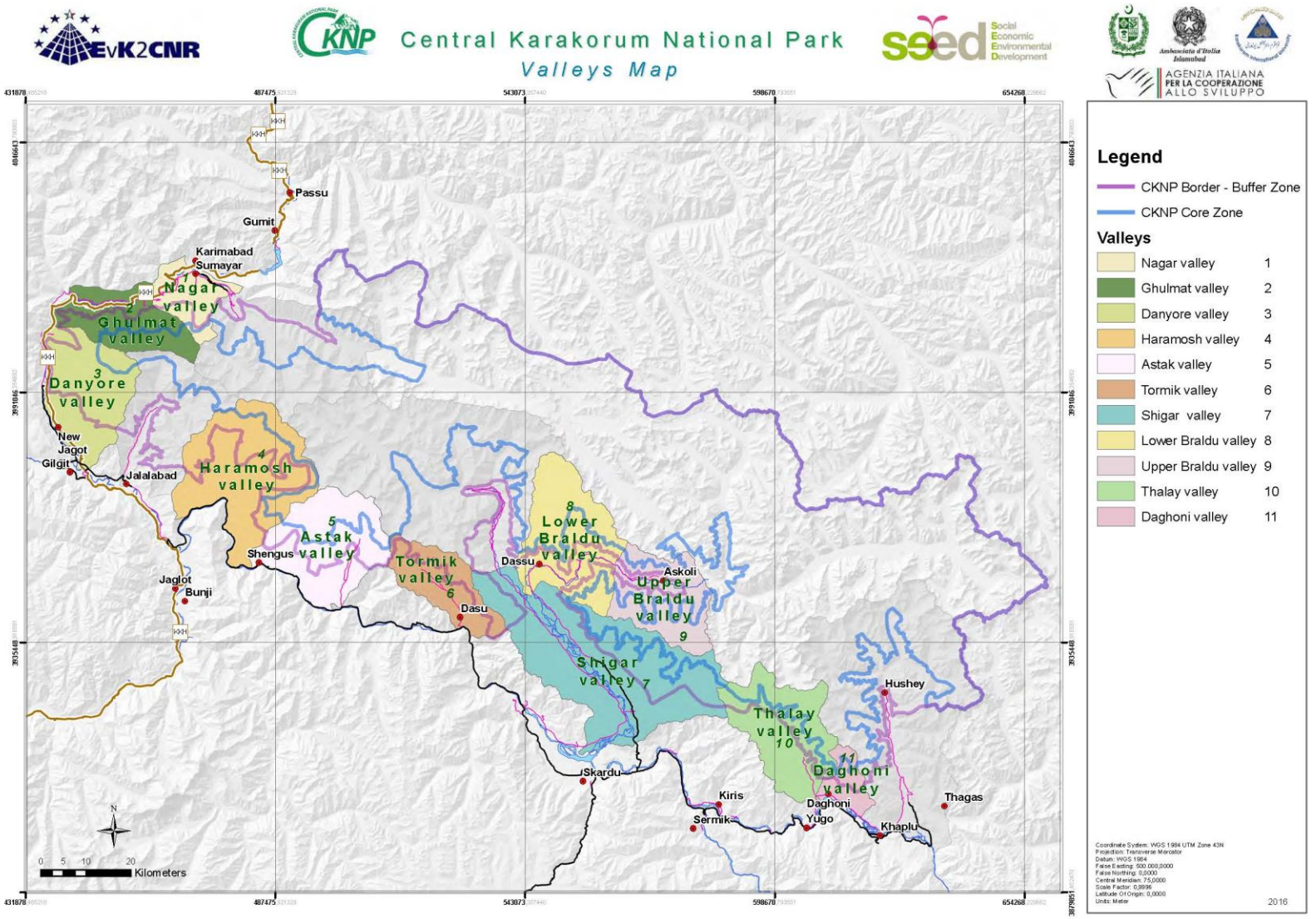


Exhibit 13: Valleys of CKNP

Exhibit 14: Status of Natural Resource Harvest in CKNP valleys

Name of Valley	Water				Forest				Pastures				Medicinal Plants				Wildlife Hunting			
	Sustainable	Unsustainable			Sustainable	Unsustainable			Sustainable	Unsustainable			Sustainable	Unsustainable			Sustainable	Unsustainable		
		L	M	H		L	M	H		L	M	H		L	M	H		L	M	H
Nagar	✓	-	-	-	-	✓	-	-	-	-	✓	-	✓	-	-	-	✓	-	-	-
Ghulmat	✓	-	-	-	-	-	-	✓	-	-	✓	-	✓	-	-	-	-	-	✓	-
Danyore	-	✓	-	-	-	-	✓	-	-	-	✓	-	✓	-	-	-	-	-	✓	-
Haramosh	-	✓	-	-	-	-	✓	-	-	-	✓	-		-	-	-	-	-	✓	-
Astak	✓	-	-	-	-	-	-	✓	-	-	-	✓	✓	-	-	-	-	✓	-	-
Tormik	✓	-	-	-	-	-	✓		-	-	-	✓	✓	-	-	-	-	-	✓	-
Lower Braldo	✓	-	-	-	-	-	-	✓	-	-	✓	-	✓	-	-	-	-	-	✓	-
Upper Braldo	✓	-	-	-	-	-	-	✓	-	-	-	✓	✓	-	-	-	-	-	✓	-
Shigar	✓	-	-	-	-	-	-	✓	-	-	-	✓	✓	-	-	-	-	✓	-	-
Thalay	✓	-	-	-	-	-	-	✓	-	-	-	✓	✓	-	-	-	-		✓	-
Daghoni	✓	-	-	-	-	✓	-	-	-	-	✓	-	✓	-	-	-	-	✓	-	-

- Nil, L=Low, M= Medium, H=High

Exhibit 15: Assessment of validity of customary and statutory rules in CKNP valleys for Park resources

S. No.	Consumptive uses of Park Resources.	Community practices	CKNP MP/OP rules	Recommendation
1.	Harvest of Forest and other natural vegetation	Juniper trees are cut and used as fuel wood and timber	Harvest of Juniper is banned; if harvest is necessary than only only braches should be removed instead of whole tree	Awareness of community is required
		Riparian vegetation e.g. Sea-buckthorn and Willows, community usually remove the whole plant/tree from soil	Cut single basal shoots from each plant to preserve in its root system. By doing so, new shoots can re-grow rapidly producing new biomass to be harvested	-do-
		Community harvests wood at unsustainable level both from buffer and core zone	Wood and shrub collection is allowed only in the buffer zone up to sustainable level	Afforestation, alternative fuel options and sustainable forest management areas are need to be designated. Along with this harvest rate compatible to annual growth of forest should be determined
2.	Medicinal Plants	Community harvests local medicinal herbs and aromatic plants from park for household purpose	Harvest is completely banned in core zone and allowed at sustainable level from buffer areas under license.	Community must be awarded the license and concerned department restrict the harvest without license.
3.	Livestock Grazing	Herd grazing is allowed only in buffer zone and tourism focused zones of the park.	Community graze their livestock in packs along with dogs inside core zone. Dogs and packs are not allowed inside parks	Improvement in watch and ward mechanism along with community awareness is necessary at urgency
		Equines (horses, mules, donkey) occasionally found in core zone of the park	Equines are allowed only in tourism focused zone	--

S. No.	Consumptive uses of Park Resources.	Community practices	CKNP MP/OP rules	Recommendation
		Yaks and its hybrids freely graze in the park	Grazing of traditional free roaming yaks and yak-cow breeds is buffer and core zone is acceptable	--
		Herders graze livestock in pasture and core zones dispose plastic bags, bottles in nearby streams and also use burn wood from forest	Use of plastic bottles, glass bottles, plastic bags and match box is not allowed inside parks.	Movement must be restricted for the grazers.
4.	Pastures	Community graze livestock in the pastures, which are located in and around buffer zones.	Grazing is allowed only in buffer zone	--
		Indigenous system of grazing was sustainable. During previous times herders ensured to take livestock into the pastures, when vegetation becomes knee-length. Currently, herders have abandoned this practice and take their livestock to pastures even before its sprouting.	Indigenous grazing system should be revived	Awareness and training of herders is important
5.	Wildlife hunting	Community take advantage of inaccurate population counts of wildlife and poach/ hunt wildlife at family gatherings, holy occasions and on other such events	Reliable wildlife count by DNA analysis is recommended and also to track poaching for core zone management. Hunting except for "trophy hunting" is banned both for buffer zone and core zone.	Community awareness can serve the purpose. Moreover genetic approach should be employed for accurate population counts and tracking of poaching

Exhibit 16: Impact of Climate Change on Local Community

Valley	Status	Visible Changes	Adaptations to CC by local community
Nagar	Changing	Recession of Glaciers	Dyke buildings of water channels
Ghulmat	-do-	Increased pest infection on crops	No adaptation
Danyore	-do-	Drought during late summer and early winter	-do-
Haramosh	-do-	Emerging Livestock diseases	-do-
Astak	-do-	Drying pastures	Dig creeks to hold snow and rain water in pastures
Tormik	-do-	Occurrence of medicinal herbs is declined	Community prefer allopathic ways
Lower Braldo	-do-	Extreme winter temperature	Harvest increaed quantity of fuel wood
Upper Braldo	-do-	Rapid Snow melt	No adaptation
Shigar	-do-	Increased Floods	-do-
Thalay	-do-	Landslides	-do-
Daghoni	-do-	Low agriculture productivity	Abandoning agriculture

CONSERVATION MANAGEMENT ISSUES & PROBLEMS OF CKNP VALLEY

6. MANAGEMENT ISSUES AND PROBLEMS

Current surveys of CKNP valleys for VCSDP development has reflected several conservation issues in customary practices halting their development and making them more vulnerable to climate change. Therefore, in order to develop an effective strategy for adaptation, it is necessary to identify issues and develop capacity of local community to develop in a way that reduces their dependency on natural resources. These adaptation approaches must then be disseminated to the communities and relevant laws up-gradation.

6.1. Agriculture

Arable lands are mostly small piece of land terraced by reclamation and cultivated by traditional methods. However, villages which lies close to road employ modern machinery for farming. Agriculture productivity is low and highlights food insecurity. Farmers usually accomplish required food from markets. Following issues are being reported by the local community. These issues although belongs to several sectors but all are aiding in decline of agriculture production.

1. **Land holding size:** Average land holding of farmers around CKNP valleys is 0.2 hectare per household seems to shrink further in size due to increasing population and conversion of arable land to more houses and settlements.
2. **Irrigation and Water Rights:** Water is frequently supplied by snow fed springs, river and its tributaries but supply is blocked during mid-summer and winter because of water shortage. Water become a problem in disaster prone areas, which damages the irrigation channels, and cause water blockage. Moreover, customary rights about water sharing between villages and among the households is not documented anywhere. This generates confusion and rivalry among the landholders for water during peak season.
3. **Traditional practices and non-certified seed varieties:** Local farmers rely upon the traditional farming and cultivation methods. Farmers prefer this practice due to several reasons, which includes certainty of quality, convenience, timeliness/availability, and cost. They also prefer this practice because farmers don't want to take risk on their productions. However, with the progress of time keeping though cultivar performance remained same but productivity declined which demands the practices of modern farming techniques and new seed varieties.
4. **Weeds and Pest:** Organic farming is an important aspect that is valued all over the world for healthy food. Local farmers are lucky enough to manage the crops and fruit production without using pesticides, insecticides and inorganic fertilizers. Animal manure and ash is used to enrich the soil with minerals. Despite of these, farmers are facing difficulties now a days due to several insect and pest species which feed on the grains, fruits and other such products. Indigenous people and their knowledge is blaming climate change for increasing pest infection on fresh as well as dry seeds and fruits.
5. **Climate Change:** Climate change is exacerbating the challenges faced by the agriculture sector, negatively affecting both crop and livestock systems in CKNP valleys. Intensity and

rapidly varied climatic events have added pressure on the local agriculture system – which is already struggling to thrive in rising pathogenic infections. The changing climate is also contributing to resource problems beyond food security, such as water scarcity, pollution and soil degradation. As resource scarcity and environmental quality problems emerge, so does the urgency of addressing these challenges. During FGDs farmers depicted inability to mitigate such issues and thinking to abandon the cultivation of cereal crops and altering them with cash crops.

6.2. Pasture

Majority of the pastures of CKNP valley are degrading at rapid rates. Pastures have pressure from excessive livestock, medicinal plants extraction, landslides and floods. Another prevailing issue since last ten years is infrequent and declined rate of snow fall leading to drying pastures.

1. **Baseline of flora and Phenological Shift:** There is no documented baseline data or inventory about the floral species of the pastures, their status and use. So it is the need of time to develop such basic dataset which prioritize the species for conservation actions to mitigate the socioeconomic and environmental pressures. Only medicinal plants are explored and listed but there is no information on the predicted impacts of climate change over these medicinal plants and their adaptations. It is therefore especially recommended on priority basis to monitor and conserve the floral species and medicinal plants affecting by climate change and showing phenological shifts.
2. **Gaps in customary practices:** Livestock grazing is an ecosystem service provided by the pastures**.** Pastures of CKNP valleys are showing decline in productivity due to unsustainable livestock grazing practices. There are no established rules about the maximum number of livestock heads in the customary rules. Carrying capacity of these pastures have never been estimated and that's why unsustainable pressures are fueling the degradation. Diseased animals are advised to keep away from the pastures but their water points are shared which can induce the infection in whole herds and there is a chance of disease transmissions.
3. **Grazing Timing:** Lasting pastures can be improved only when herders understand plants' recovery needs and practice good grazing land husbandry to maintain plant health. The local community around CKNP reported the problems like weed invasion, less productivity and weakened soil health. All these issues are indicators of impatient grazing by the herders i.e. they start to graze their animals before pastures are fully grown. Herders do so to provide animals with a high-quality diet but they are unaware that short plant growth reduces bite size and the nutrient intake. Moreover, it contributes to decline in pasture productivity, which is lose-lose situation only.
4. **Livestock insurance scheme:** Livestock insurance scheme is an incentive equal to the loss for the herders if their livestock get killed or attacked by the wildlife. The scheme was introduced in CKNP valley but currently it is non-functional. Though very few livestock kills by predators were reported during the survey and no retaliatory killing reported by the community, but in the absence of insurance scheme retaliatory killing of wildlife is expected.

5. **Lack of Zonation:** Pastures are degrading continuously but the customary laws don't have any hint of abandoning such pasture areas which hastens its decline. It is essential that grazing on pastures in the buffer area of CKNP should be controlled to maintain adequate vegetative cover that reduces erosion and permits adequate regrowth after each grazing period to ensure the health of grazed plants.
6. **Harvest of Medicinal plants:** CKNP valleys pastures and forest areas the rich sources of these medicinal herbs. Local community uses them for disease cure. These drugs have anti-pyretic, analgesic, anti-cancerous, anti-diabetic and several other uses. Local community is fully aware of their uses but they don't have any understanding of ways of its extraction without damaging the whole herb. Training of local community for collection, drying and usage is important.

6.3. Water

Water is the key ingredient and symbol of life. All the changes in climate pattern are directly and indirectly playing with water quantity and quality. Altered precipitation patterns, warm temperatures and frequent air currents actually disturbed the water quality and quantity both. The local community in CKNP valley depends directly upon the rain and indirectly upon annual snowfall. Due to delayed rain timings and less annual snowfall local community is frequently facing the drought and water shortage due to increasing glacier melting and flood causing blockage of irrigation system. Moreover, torrential rains are now more frequent which on one hand increases water quantity but also cause floods and landslides in disaster prone areas thereby creating socio-ecological stress. Water pollution is increasing due to lack of sanitation /drainage system and animal sheds nearby water channels and drinking water sources. Grey water from the local community is also getting mixed in to fresh water and degrading its quality.

1. **Drinking Water:** Local community depends on fresh water supplies from glaciers and springs for drinking purposes. Sediments are continuously increasing in the water supply due to weathering of rocks and mixing of soil and grit in the area. High mineral content can induce disease in local community and their livestock. The water testing facility already established at Karakoram International University provides the free testing but local community is not very interested in the procedure due to lack of awareness.
2. **Irrigation Deficit:** Local community reported poor structure of irrigation channels or insufficient irrigation channels is the prime reason for irrigation deficit. "Either lot of water or no water" in the water sources, the communities cannot fully utilize it for irrigation purpose. The communities in the villages have constructed irrigation channels but with increasing land fragmentation and demand for water those irrigation channels have proven insufficient. The communities cannot construction of more irrigation channels due to lack of financial resources.
3. **Water pollution mitigation:** To ensure the water quality local community should be compelled to make separate pathways for grey water ensuring that it do not mix into the fresh water streams. Hotel owners should be trained to dump the trash elsewhere instead of water while adopting ecosystem friendly approaches.

4. **Disaster Management:** Climate change is deeply reshaping the landscape of disaster risk. Weather extremes such as drought, flood and landslides cause the huge economic depressions in all sectors ranging from transport to land farms. No protocols are developed yet for the villages in the surrounding of CKNP. It is very necessary to take action because dependence of poor people on natural resources increases dramatically.

6.4. Forest and NTFP Issues

These sectors are as vulnerable from climate change as any other is and therefore, there is strong need to assess and enhance the adaptive capacity of the forest and biodiversity.

1. **Mortality:** Drought has increased tree mortality, resulted degradation, and reduced distribution of entire forest ecosystem. It increased the wood harvesting opportunity for the local community for subsistence purposes at the cost of degenerating forest.
2. **Harvest Pressure:** Heavy collection of timber and non-timber products from the forests allows the community to fulfill their needs. With continuously increasing population dependence of local community is also increasing on these natural resources. Fuel wood harvest of CKNP valleys has showed an unsustainable approach. This harvesting is not limited to here only but includes the removal of foliage, branches and plants cutting for livestock forage as well. Unsustainable practices and unguided approaches towards harvesting leads the ecosystem imbalance.
3. **Forest Regeneration:** Climate change has shown differential approaches for the propagation dependent upon the species ecology. Warmer temperatures and increased CO_2 increased the rate of photosynthesis and thus growth but increased the pest attack is seriously stressing the forest regeneration.

6.5. Eco-tourism

Ecotourism is nature based tourism that fosters environmental appreciation and awareness. Gilgit-Baltistan, which is considered as the hub of eco-tourism, incorporates a considerable number of tourists every year to generate the huge amount of revenues and alternative livelihood opportunities.

The local community is reporting following issues.

1. **Tourist Accommodation:** Limited accommodation facilities compel the tourists to opt for camping in open areas. This option become unsuitable during the adverse weather.
2. **Visitor facilities:** Site maps, information boards, sign board and other facilities are not available for tourists. However, open camping areas are the only option for the tourists stay in the valley due to lack of hotels.
3. **Climate Change:** Climate is a key resource for tourism and the sector is highly sensitive to the impacts of climate change and global warming, many elements of which are already being felt. Climate change is having adverse impacts on the number of tourists especially for the treks, which CKNP valleys offer.

6.6. Mining

In and around CKNP in the sedimentary rocks of the mountains, huge reservoirs of gemstones and precious rocks are deposited. Local level mining is being carried out in and around CKNP. Mining area can be identified by having the holes in its mountains just like bee web.

"About 30,000 people associated with the mining sector are carrying out activities inside the Central Karakoram National park territory, adding that the act may result in the loss of habitat for various species" (Express tribune: June 27th, 2012).

This mining provides some of the valleys around CKNP with a good opportunity to earn livelihood. In CKNP valleys, mining opportunities are available but a small portion of the entire population is associated with it. On other hand people associated with mining cannot get maximum benefit out of it due to the following reason.

"Lack of alternative livelihood opportunities for communities and uncontrolled mining in mountains are some of the issues that require attention" (Express tribune: June 27th, 2012).

1. **Lack of Modern tools and Practices:** Local miners are not trained for mining. They use iron rods for excavation and mostly end up in the damaging the stones. It leads to loss of revenue not only on personal level but also on the regional and ultimately at national level.
2. **Lack of training:** Local miners have learned the methods of mining by hit and trial approach and succeeded somewhat. Nevertheless, due to lack of training they are unable to extract pure and high quality rock. They accidently break these gemstones and thus lose the amount of profit.
3. **Value addition of Gemstones:** Gemstones are sold in raw form by the local community to the dealers on low cost due to improper cutting and polishing. Therefore, local miners lose their chance to earn huge revenues and only get a minor share.

6.7. Wildlife and Protected areas

Institutional structures to manage wildlife and protected areas experience lot of issues due to increasing urbanization, degrading forest and natural areas. The biodiversity of CKNP and its buffer zones has the species, which are of international and national importance. Wildlife plays an important role in both ecosystem sustainability and community economics. Although trophy hunting is a controversial subject, yet it enabled the community to earn millions of dollars since its start and contributed to conservation as well.

1. **Population trends:** The investigation of issues related to wildlife and protected areas normally consider the number of heads of animals irrespective of their health, annul recruitment. The overall trend of two trophy species; i.e. Markhor and Ibex seems to increase in their population according to the relevant government departments but there is no assessment on the reproductive output. There is chance of reproductive deficit in mountain ungulates such as Ibex and other species due to the history of population surge.

2. **Population Surge:** During the recent years of conservation, wild species has increased considerably. The sudden increase from small population are often culprits of inbreeding depression, which is most expected in the case of mountain ungulates and birds which are decreasing continuously.
3. **Unidentified Species:** GB hosts the diversity of wild fauna and flora most of which are unidentified and even un-discovered yet. The rapid environmental degradation is causing the extermination and extinction of the specialist species. It shows that biodiversity of the species is declining without recognizing their ecological and economic roles.
4. **Habitat degradation and Isolation:** Population is continuously increasing in CKNP and encroaching into the natural areas for settlements and agriculture. This land use change affected wildlife both positively and negatively depending upon the species ecology. Habitat degradation has also pushed the species to isolated and low quality habitats that caused additive stress on the wildlife heath, reproductive potential and genetic health and so on. There is no assessment for the impact of habitat degradation on genetic health of wildlife species.
5. **Genetic reserves of wildlife species:** Most wildlife surveys are based on the numerical assessment of the animals and do not account for their genetic viability. Designated areas such as national parks and sanctuaries are notified irrespective of the idea that particular area is either genetic bank of the particular species or not. Genetic reserves of forests and wild species are not identified and protected yet.

PROPOSED MANAGEMENT INTERVENTIONS FOR CKNP VALLEYS

7. PROPOSED MANAGEMENT INTERVENTIONS

7.1 Agriculture

In particular, there are different adaptation options in agriculture according to the involvement of different agents (producers, industries, governments); the intent, timing and duration of employment of the adaptation; the form and type of the adaptive measure; and the relationship to processes already in place to cope with risks associated with climate stresses finally the development of provincial climate change policy.

The adaptation options required for the local community needs four tiers. (i) Technological developments, (ii) government programs and insurance (iii) farm production practices, (iv) farm financial management.

1. **Population expansions:** Similar to other areas of GB, with increasing population construction is rapidly increasing and mostly houses, cattle shed and other required constructions are being built around the settlement and agriculture area, which is continuously shrinking arable land. To avoid these issue new settlements must be built on barren or abandoned parts of the land. This will keep the arable land available for cultivation.
2. **Certified seed varieties and crop insurance:** Certified seed is the only input that can get farmer more than just higher yields. Such varieties are resistant to climate related and pesticide issues. To introduce the concept and usage of certified seed varieties, relevant stakeholders must provide them on subsidized rates and premium insurance packages. Along with this one time, training of farmers of each village around CKNP is recommended to increase the agriculture production per unit area.
3. **Integrated farming and agriculture products:** Farmers are traditionally inclined to mono-cropping systems and earn the revenues from raw products. In CKNP valleys the farmers do not sale both fresh and dried fruits due lack of awareness on post harvesting techniques, processing techniques and proper storage facilities. The little economic innovation lies in the sale of potato only, while million rupees worth of fruit is being wasted annually due to lack of awareness, and skill for value addition and facilities for storage. Many end-users require specifically processed products such as Marmalades, Jams, Vinegar and Honey. Farmers need guidance on the value addition of products in order to be economically stable.
4. **Soil Analysis:** It was unanimously reported by all the communities that land they are cultivating is never tested in the laboratory and scientifically they don't know which crop and fruit varieties are best for their soil type. Each crop is sensitive to soil type and productivity heavily depends upon the suitable soil. Practically there is requirement of soil testing facility within each agriculture information cell. This facility will provide information about several structures especially addressing the common question of farmers such as suitable seed varieties, microbiota of soil and it's capacity of crop growth and several others.

5. **Secure water availability:** Water is central to agriculture productivity. Adaptation of climate-smart inputs and shifting to irrigation that is more efficient methods will help local farmers to maintain productivity levels. Water tanks for the storage purpose of agriculture are required to reduce the drought effects at some village.
6. **Training on climate friendly agriculture practices:** Farmers should be trained with the emphasis on targeted ingenuities such as outcome-based farmer incentives and knowledge transfer systems – that enhance farmer capacity to achieve sustainable productivity growth through mitigating and adaptive practices keeping the pace with climate change. These climate friendly and climate proof practices particular to each valley must be incorporated into the operational plan. As there are no previously approved practices so, they are needed to be designed by methodically modelling the practices with climate change models.
7. **Introduction of climate resistant seed varieties:** Farm decision-making is seen as an on-going process, whereby producers/farmers are continually making short-term and long-term decisions to manage risks emanating from a variety of climatic and non-climatic sources. In this sense, adaptation is the result of individual decisions influenced by forces internal to the farm household (i.e. risk of income loss, environmental perception) will become reasonable and let them earn revenue to decrease pressure of local community on natural resources. To resist or at least minimize the pressure of ever changing climate patterns and issues in relation to climate change, there is a need to develop an agriculture information cell for the farmers in each village. This information cell will raise the job opportunities for local community and will guide them about the climate resistant breeds, ways of cultivation, harvesting in detail. This information cell must have the tested varieties of climate resistant seeds and seedlings. Seed storage for potato in the harsh climatic condition is a challenge in the CKNP area, therefore input store for seed must be provided at least among every three villages.
8. **Spread of infestation to the wildlife:** Buffer area of CKNP harbor 230 villages. All of these villages have agriculture crops and tress, which are getting infected manifolds since last decade. These pest species have the chance of transmission towards the wild medicinal herbs, forests, nests of birds and ultimately enter in fauna. This pathogenic transmission can induce infections in the flora and fauna and has a considerable potential to depress the specialist species. However, this issue has not yet been explored and needs a well prepared monitoring procedure to estimate the estimate the annual economic laws.
9. **Research Projects:** Without research, adaptation to climate change is generally problematic for agricultural production and for agricultural economies and communities; but with adaptation, vulnerability can be reduced and there are numerous opportunities to be realized. Adaptation must be supported by the research of relevant components. Productivity is declining at a rapid pace due to some known and unknown reasons. Apparently, climate change seems responsible for this decline aided with ever-increasing pest attacks during last 10 years. The recent changes in the climate are so unpredictable that it is becoming impossible for the farmers to work in agriculture farms for profit. Customary practices for agriculture sustainability are losing their functionality. These practices must be updated by designating specific studies of seed variety, soil analysis, crop suitability analysis,

bio-control of pests, projected impact of climate change on the crop's productivity and transport, optimum economic benefits from every suitable crop and several other inter-related components. As it is evident that the impacts of climate change on agriculture will vary depending on precipitation changes, soil conditions, and land use, therefore these impacts are required to be evaluated independently for each valley in the buffer zone of CKNP. This vast research is possible if included in the operational plan of the CKNP to provide support for updated management plan of CKNP.

10. **Key Policy Reforms:** Key policy reforms across three pillars are needed to strengthen farmer incentives to achieve productivity growth sustainably, and without sacrificing climate change mitigation and adaptation objectives. These three pillars are i) Farmer level, ii) Agriculture sector level, iii) Provincial level. The agriculture policy needs an up gradation to mitigate the effects of changing climate and devising the climate friendly strategies at an urgency to minimize the agriculture induced impacts on climate ultimately to protect the protected areas of GB, particularly its largest park the CKNP. The management plan, which is already established, has a huge gap about the laws of employing climate friendly approaches in villages residing in buffer areas for agriculture. Moreover, the climate is not only changing but it is also on stationary, which means old knowledge can't be the thing to rely upon. Therefore, gap of climate friendly approaches must be assessed via operation plan for CKNP and then addressed in to the revised version of CKNP management plan.

7.2 Pasture

1. **Upgradation of customary laws:** Customary practices should be amended in such a way that ensures sustainable use of pastures.
2. Diseased animals must be kept away from the pastures to avoid the zoonosis and must be vaccinated.
3. Extraction/cultivation of medicinal plants by the local community must account only for household purpose and should be cultivated in the amount equal to its removal.
4. Encourage stall feeding/minimize grazing till the improvement of pastures.
5. These strategies must be field tested and then included in the customary and statutory laws and CKNP revised management plan.
8. **Grazing Management:** To enhance pasture productivity timing of grazing and grazing sites in each pasture are need to be designated to develop holistic grazing strategies with farmers/herders that include rotational grazing or intensively managed grazing as a regular grazing routine.
9. **Fodder Cultivation:** Regionally adapted and high nutrition value fodder crops should be cultivated for fodder instead of traditional species. This will remove the stress of early grazing from the pastures and allow them to grow.
10. **Training of herders:** Herders have no information about the sustainable practices of livestock grazing. They just sent their livestock with guards to feed upon the pastures. Timing of grazing is integral for livestock. Several other factors need to be cared for the sustainable livestock grazing.

11. **Seeding of local flora and training of Farmers:** Local flora should be collected and cultivated on the barren patches among the pastures. This will increase the pasture areas and productivity. Research on cultivating these species is required. After it dissemination of knowledge through training sessions, manuals and brochures will convince the farmers about the re-seeding of pastures.
12. **Local botanical garden to ensure existence of local flora:** Adaptable plants should be identified among the plants. These plants should be kept in botanical gardens to provide backup in case of avalanches, landslides, floods and barren land cultivations.
13. **Encourage the pasture extension services by other line departments:** Many forestry and livestock enterprises run by private farmers and the government depend on efficient, economical, and environmentally beneficial pasture use. Farmers need technically competent advisors to help them accomplish their objectives. Unfortunately, no advisory services for the pastures exist in the villages because of lack of pasture specialist technical advisor. Therefore, there is strong need to train the forest relevant personnel from each village or valley as a pasture specialist. CKNP biodiversity directorate staff can be a potential candidate for this training as they are both aware of natural resource use in and around CKNP.
14. **Cultivation and marketing of medicinal herbs:** Cultivation of these herbs should be promoted as an alternative economic resource with appropriate site assessment and training on its cultivation, harvesting marketing and utilization. Economic uplift of the community will actually decrease their dependence on CKNP resources and allow them to grow.
15. **Ethno-botanical Database:** Development of consumer linked ethno-botanical databases of each village will not only enhance the market for the local farmer but also fosters the direct link to the consumer.
16. **Pasture awareness programs:** Hands-on training and field experience are two of the best, most rapid ways to increase farmer's/shepherd's awareness and local university students about the optimum pasture use for healthy livestock. Outcomes will be best when technically competent professionals who can accurately answer questions and help solve problems guide this training. This training will allow the local community to employ sustainable practices and secure these resources for their future generations.
17. **Research Problems:** Phenological shift of floral species and their impact on biodiversity must be assessed on priority basis so that extirpations can be avoided. Ecological baseline of the pastures to keep the biodiversity of the area must be developed. Similarly, potential farming sites for each medicinal plant should be identified. The predicted impacts of climate change on the pasture productivity are not known and need to be evaluated due to their high valued ecosystem services. Most utilizable and ecologically resilient entry points are needed to be identified and designated.

7.3 Water

People living in CKNP buffer zone afflict with different kinds of water contagious diseases because of the scarce access to clean drinking water. Even though glacier water is present in many areas however easy, access to clean water is very difficult for most of the population.

1. **Quality of drinking water:** The water testing facility already established at Karakoram International University provides the free testing but local community is not very interested in the procedure due to lack of awareness.
2. **Construction of small and medium sized reservoirs**: Construction of small or medium-sized reservoirs in the foothills and plains are quite necessary, so that water from streams can be harvested for use during the dry season and the winter, both for farming and domestic purposes.
3. **Common drinking water storage tank:** Shared water storage tanks should be built upon among the households to help them adapting drought conditions.
4. **Water pollution mitigation:** To ensure the water quality local community should be compelled to make separate pathways for grey water ensuring that it do not mix into the fresh water streams. Hotel owners should be trained to dump the trash elsewhere instead of water while adopting ecosystem friendly approaches.
5. **Early warning system:** But to give relief to the local community of CKNP valleys there must be system to give them timely alerts about their crops and livestock protection. This will accentuate the economic resilience of the community and natural resilience of the buffer area.

7.4 Forest and NTFP

1. **Up gradation and regulation of Forest laws:** Customary laws allow the fuel wood collection, timber and non-timber forest products unlike statutory laws, which increase their favor towards the customary laws. These customary laws don't address the conservation needs and allow harvesting at an unknown level. If this practice is continued, then community will shortly run out of their forest reserves. To ensure sustainability, an up-gradation of customary rules is recommended. Otherwise, implementation of statutory laws is integral.
2. **Promotion of farm forestry:** Local farmers should be trained to have small-scale farm forests, which along with revenue generation allow them to be independent of forests. This practice exists in a valley but very limited. Training will allow the farmers to take self-initiatives and entrepreneurship in forestry sector.
3. **Climate Change and Conservation Friendly Forestry projects:** To generate credible forestry and conservation offsets, projects must be additional to what would have occurred without the incentive supplied by the carbon market; they must be verifiable (i.e., measurable and enforceable); they must control or adjust for leakage; and they must address the issue of permanence. Forward crediting is proposed by some to accommodate the long period of carbon accumulation in forests, but others are concerned about assuring payments only for actual carbon sequestration.

4. **Restoration cum conservation:** Several sustainability practices are being carried out in CKNP but any of them hardly meet the conservation targets. Keeping in view the present environment sustainability changes, restoration is required along with conservation. Therefore, the upcoming forestry projects must come up with the forward crediting instead of required crediting.
5. **Research Projects:** Projected annual greenhouse gas emission counts provide baseline to identify required CO_2 sequestration offset. On the basis of this, it will be identified that which species is required and in how much amount to keep climate stable for each valley in the buffer zone of CKNP and its surrounding areas. Remote sensing to monitor the land use changes is very essential because of the location of valley around CKNP. In future due to CPEC, land use is expected to be altered and its environmental consequences seem negative. To neutralize these expected issues baseline data about land use will quantify the environmental impacts and truly determine the required type of actions with high accuracy.

7.5 Eco-tourism

Following interventions are recommended on the basis of the survey conducted for VCSDPs development.

1. **Interpretation of Resources:** In order to increase the revenues by tourism there is need to provide interpretation programs that are relevant to the public, further information is required. This information can be obtained through visitor surveys.
2. **Destination vulnerability hotspots:** The integrated effects of climate change will have far-reaching consequences for tourism businesses and destinations. Importantly, climate change will generate both negative and positive impacts in the tourism sector and these impacts will vary substantially by market segment and geographic region. There are disaster prone areas in and around CKNP, which are not mapped and disseminated to the tour operators. This inventory should be developed along with measured risks and challenges that tourist can face.
3. **Infrastructure:** Surge in tourist flow has been reported recently but related infrastructure such as accommodation, ecotourism facilities, are very short and needed to be developed to ensure the provision of facilities for tourist influx by public and private department.

7.6 Mining

Following interventions are recommended on the basis of the survey conducted for VCSDPs development.

1. **Training of Miners:** It is important for the miners to have hand on training on modern tools and techniques for quality mining. It is especially important for the valleys, which lie near mining deposits of Gemstones and other minerals.
2. **Entrepreneurship opportunities:** Small-scale business related to gemstones and its products will provide the local community an opportunity to earn good profit.

7.7 Wildlife and Protected areas

1. **Population assessment:** Database should be established to keep the systematic annual population assessment of all the near threatened and endangered animals. The protocols for population assessment of each species should be determined on ecological basis and kept same every year.
2. **Wildlife health:** There is some baseline data about the health of animals. Nevertheless, all such studies are either short term or based on only few components. Moreover, genetic health of the species have never been accounted which can be the culminating factor in the reproduction of the animals in addition to other stresses.
3. **Species Recovery Plan:** There is a growing consensus that habitat fragmentation has caused wildlife decline. However, what is the impact of this fragmentation is still unknown. There is need to study to study how the urbanization, habitat isolation, decline in vegetation has stressed the wildlife. How these impacts can be mitigated, which habitat areas need priority conservation actions such as habitat connectivity? All this information is possible from the properly designed studies unique to each class of wildlife based on which species recovery plan will be designed.
4. **Genetic Reserves:** Genetic reserves inside the protected areas of the threatened and endangered species are needed to be identified for their restoration. If the designated protected areas do not have by chance these genetically healthy populations then their boundaries should be adjusted according to these reserves.
5. **Climate change Indicators:** Several fungi and amphibian species are considered as an indicator of climate change. These species are experiencing decline in the population such as Deosai toad, which was once abundant in clean waters of the area. This species is now hard to find because of water pollution. These indicators are needed to be identified and used as climate change detection for the areas. This research will provide the real assessment unlike models, which sometimes fails to give real estimate.

LIST OF VCSDPS

Volume A: Gilgit region

1. Conservation and Sustainable Development Plan 2016-2026 Nagar valley Central Karakoram National Park Gilgit-Baltistan
2. Conservation and Sustainable Development Plan 2016-2026 Ghulmat valley Central Karakoram National Park Gilgit-Baltistan
3. Conservation and Sustainable Development Plan 2016-2026 Danyore valley Central Karakoram National Park Gilgit-Baltistan
4. Conservation and Sustainable Development Plan 2016-2026 Haramosh valley Central Karakoram National Park Gilgit-Baltistan

Volume B: Baltistan Region

1. Conservation and Sustainable Development Plan 2016-2026 Astak valley Central Karakoram National Park Gilgit-Baltistan
2. Conservation and Sustainable Development Plan 2016-2026 Tormik valley Central Karakoram National Park Gilgit-Baltistan
3. Conservation and Sustainable Development Plan 2016-2026 Shigar valley Central Karakoram National Park Gilgit-Baltistan
4. Conservation and Sustainable Development Plan 2016-2026 Lower Braldo valley Central Karakoram National Park Gilgit-Baltistan
5. Conservation and Sustainable Development Plan 2016-2026 Upper Braldo valley Central Karakoram National Park Gilgit-Baltistan
6. Conservation and Sustainable Development Plan 2016-2026 Daghoni valley Central Karakoram National Park Gilgit-Baltistan
7. Conservation and Sustainable Development Plan 2016-2026 Thalay valley Central Karakoram National Park Gilgit-Baltistan

Conservation and Sustainable Development Plan 2016 – 2026
Nagar Valley
Central Karakorum National Park
Gilgit Baltistan

CONSERVATION AND SUSTAINABLE DEVELOPMENT PLAN 2016-2026

NAGAR VALLEY

CENTRAL KARAKORAM NATIONAL PARK

GILGIT-BALTISTAN

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PLAN EDORSEMENT

Signed by President LSO Nagar .....

Endorsed Director CKNP .....

Approved by Deputy Commissioner/ .....
Chairman District Conservation Committee
For Nagar in ..... meeting of DCC Nagar
Held .....

Dated.....

CONTENTS

LIST OF EXHIBITS

ABBREVIATIONS

°C	**Celsius**
ABG	Annual Biomass Growth
CAI	Current Annual Growth
CKNP	Central Karakoram National Park
CPEC	China Pakistan Economic Corridor
E	East
EIA	Environmental Impact Assessment
FGD	Focus Group Discussion
GB	Gilgit-Baltistan
GLOF	Glacier lake outburst flood
HH	Households
INGO	International Nongovernmental Organization
Kg	Kilograms
KIU	Karakorum International University
LSO	Local Support Organization
m a.s.l.	Meter above sea level
Mg	Mega grams
MP	Management Plan
N	North
N/A	Not Applicable
NGO	Non-governmental Organization
NTFP	Non Timber Forest Product
OP	Operational Plan
S	Summer
SEED	Social Economic Environmental Development
UC	Union Council
VCC	Valley Conservation Committee
VCF	Valley Conservation Fund
VCSDP	Valley Conservation and Sustainable Development Plan

VCSP	Valley Conservation Sustainable Plan
VO	Village Organization
W	Winter
WO	Women organization
Yr	Year

1 INTRODUCTION OF NAGAR VALLEY

1.1 Locality of Nagar Valley

Nagar valley is situated in the middle part of the Nagar district; consist of seven villages below the watershed of the mighty Golden peak. Moving up the KKH toward Upper Hunza from central Hunza the confluence of the Hispar-Gilgit rivers and the settlement of Ganish mark the entrance to the main Nagar valley where the same road also connects both Nagar valley and Hoper-Hisper valley. In the Proper Nagar village, the road bifurcates the track going south leads to the Hopar/Hisper Valley, whereas the one going to the east lead to other villages of Nagar, such as Sumayar, Askurdas, Hakuchar, Phakar, Shayar and Miacher. The valley covers two Union Councils, Proper Nagar and Sumayar, whereas, Proper Nagar valley falls in Union council proper Nagar while the rest of villages are covered under Union Council Sumayar. Miacher and Phakar are situated on the hilly area also connected through a narrow jeep-able road with its entrance from Minapin village which passes through both villages at connects with main central villages of Nagar at Askurdas village. The villages are scattered on a vast area, some villages' boundaries are connected with each other and some are situated on larger distances laying on average 2300m high above the sea level.

Exhibit 1: Village locations of Nagar Valley, 2016

Villages	Coordinates		Elevation (m asl)
	N	E	
Askurdas	36°17'58.6''	074°38'18.8''	2188
Miacher	36° 14'44.9''	074° 34'12.6''	2507
Shayar	36° 17'40.3''	074°37'040.9''	2182
Sumayar	36° 18'20.6''	074° 39'16.8''	2214
Phakar	36° 15'49.4''	074° 35'57.2''	2485
Hakuchar	36° 16'15.3''	074° 36'51.5''	2292
Proper Nagar	36° 16'00.9''	074° 44'29.2''	2395

1.2 Ecological Profile of Nagar Valley

Nagar is an adorable valley with lovely terraced fields developing a wide range of yields. It shapes the passage to the considerable mountain pinnacles of the Karakoram. The valley has an amazingly beautiful scene, and possesses large amounts of natural product, for example, grapes, peaches, pears, walnuts and apricots. The valley offers a stunningly contrasting landscape – rocky, barren cliffs, cultivated terraces, and orchards all around.

The biodiversity of Nagar valley is adapted to harsh and varied climatic conditions and topography. Besides this, there is a rich diversity of habitats e.g., Lakes, springs, small rivers and streams, sub alpine and alpine meadows, steep mountain slopes, cultivated fields, roadsides and permanent glaciers etc., Which supports a rich and equally diverse floristic wealth.

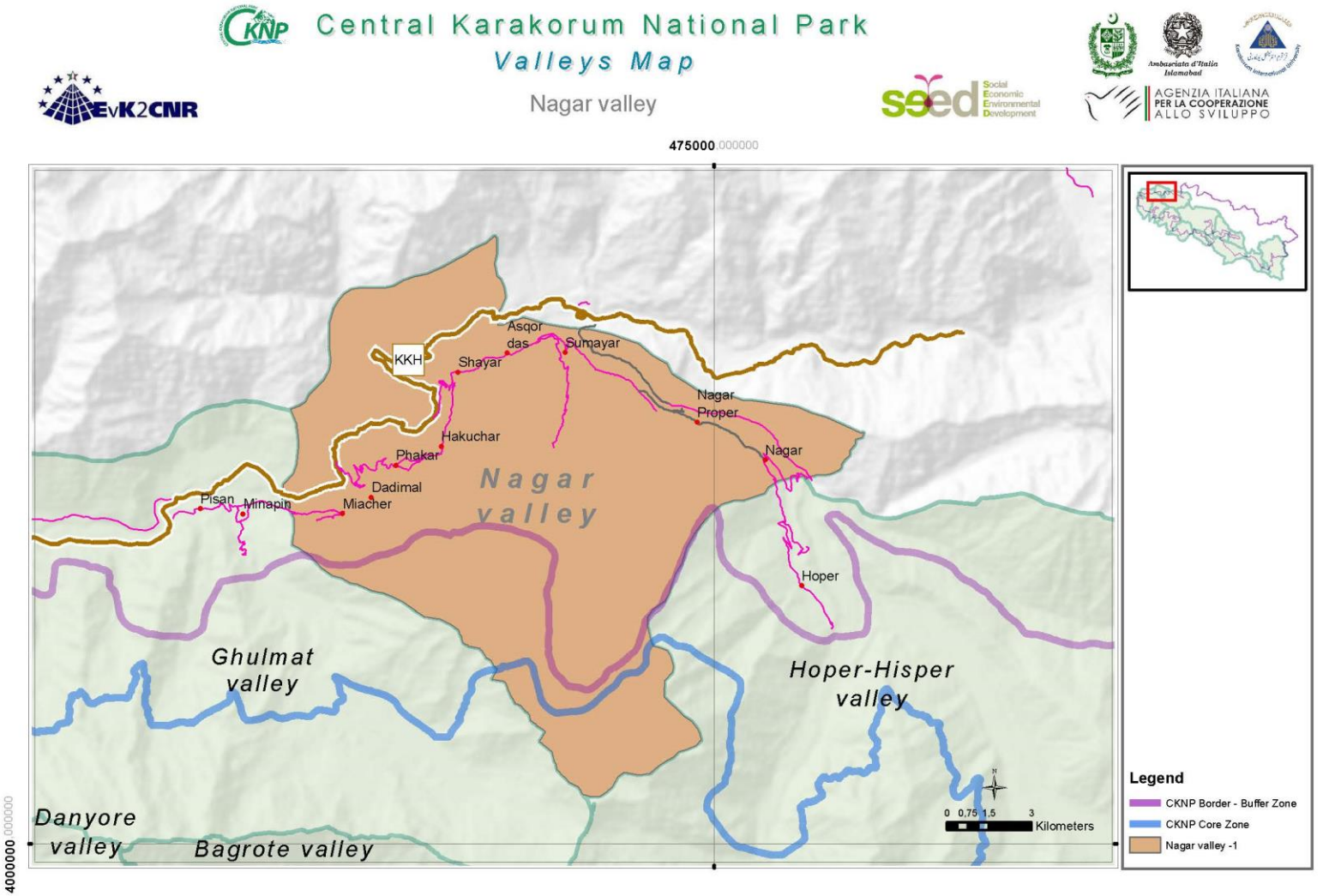


Exhibit 2: Map of Nagar Valley

The biodiversity of Nagar valley is adapted to harsh and varied climatic conditions and topography. Besides this, there is a rich diversity of habitats e.g., Lakes, springs, small rivers and streams, sub alpine and alpine meadows, steep mountain slopes, cultivated fields, roadsides and permanent glaciers etc., Which supports a rich and equally diverse floristic wealth. Wildlife species such as Ibex is still in abundance. Moreover, *Picea smithiana* mixed with *Pinus wallichiana* is still present in some lateral valleys of Nagar like Nilt and Minapin. Nagar valley is representative of 16.8 % broad-leaved, 11.9% coniferous forest and 71.3% juniper trees (Ferrari, 2014). These forests are the sources of consumptive and non-consumptive uses as reported by the local community. Unlike other communities these forests are co-managed between the villages.

1.3 Socio-economic Profile of Nagar Valley

1.3.1 Demography of Nagar Valley

According to the survey conducted for VCSDPs development, there is some increase in population. The total population of the valley is 28716 of which 16530 are females and 12186 males. All these villages are based around the buffer area of CKNP which spans 2757.88 m^2 and serves as reserves of natural resources for the local people and transitional area between the park and local communities. This local community depends heavily upon natural resources, both for subsistence and income.

Exhibit 3: Demographic profile of villages of Nagar Valley, 2016

Village	HH	Av. HH size	Population	Male	Female	Male: Female
Askurdas	450	8	3,600	1,440	2,160	0.66667:1.5
Miacher	250	8	2000	900	1100	0.81818:1.222
Shayar	120	8	960	384	576	0.66667:1.5
Sumayar	820	8	6,560	2,624	3,936	0.66667:1.5
Phakar	512	8	4096	1638	2458	0.66656:1.500
Hakuchar	80	6.25	500	200	300	0.66667:1.5
Proper Nagar	1200	9.166	11000	5000	6000	0.83333:1.2
Total	**3432**	**7.916**	**28716**	**12186**	**16530**	**0.71211:1.4175**

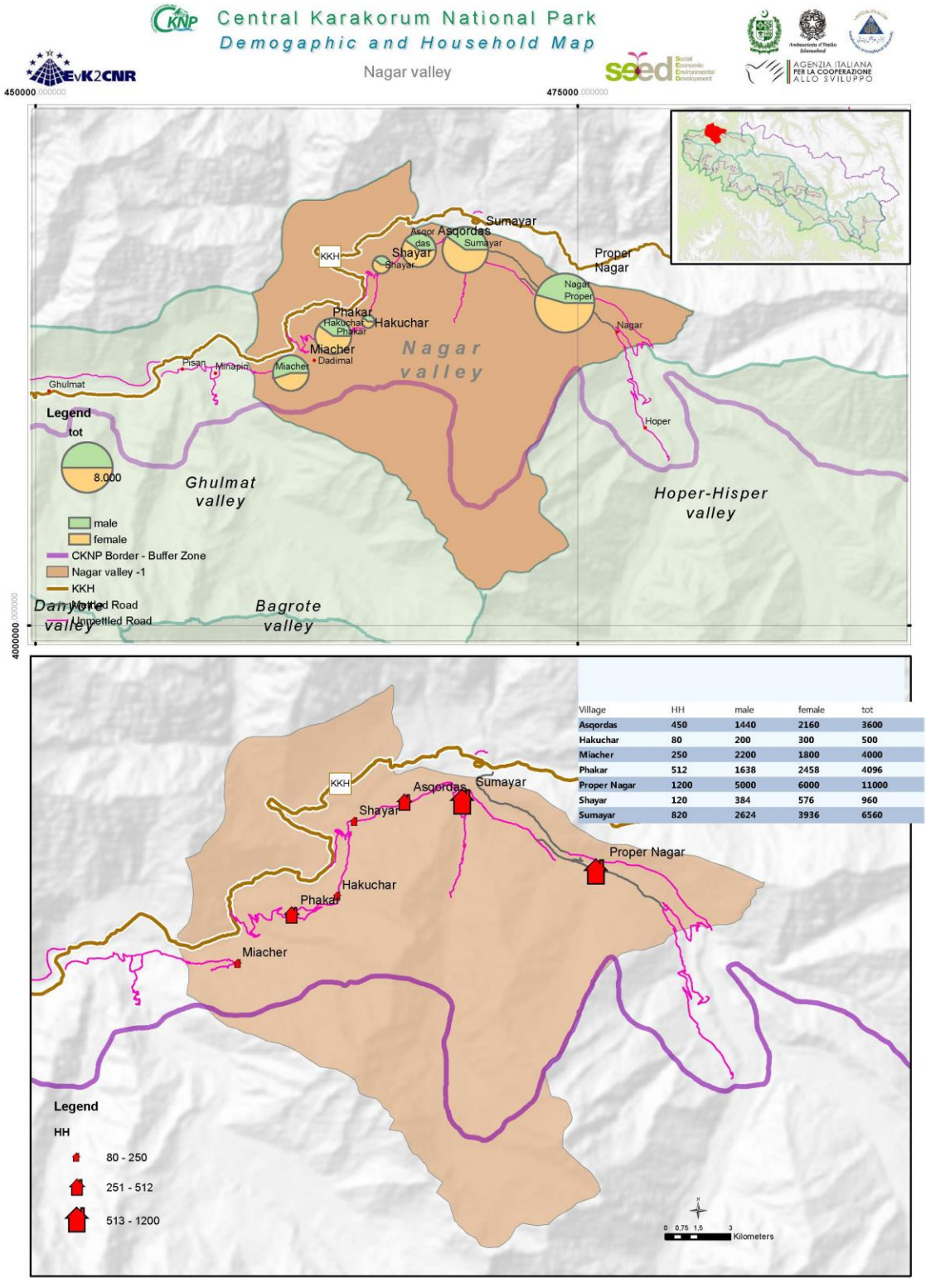
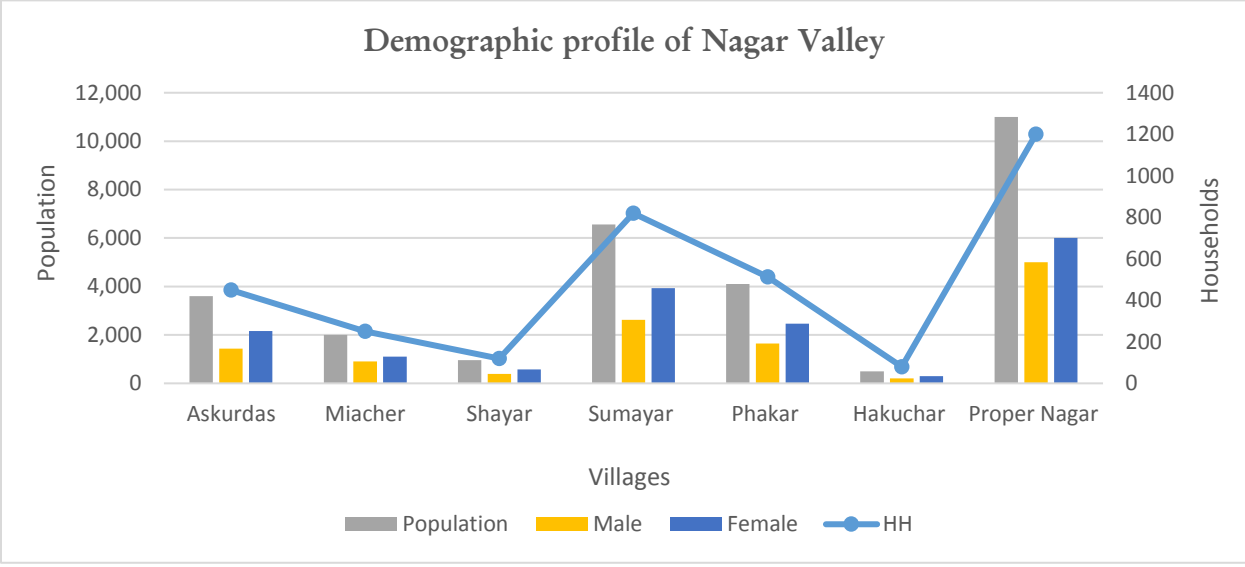


Exhibit 4: Demographic map of Nagar Valley

Exhibit 5: Demographics of Nagar Valley, 2016



1.3.2 Road Access

Nagar valley is connected through three link roads to the KKH at different locations. The first three villages Miacher, Phakar and Hakuchar are primarily connected through an unpaved road in Minapin and, another bridge near Murtaza Abad; Hunza connects the middle villages (Askurdas and Shayar) and the main roads leads to the valley junctions at Ganish Village of Hunza. Though all villages of Nagar are connected through road, but the roads are narrow on turnings, prone to landslide and floods. Road blockage is a common phenomenon at Miacher and Phakar villages which halts transportation and blocks the village.

1.3.3 Education Facilities

Education facility marvelously improved in the valley over the last decade. Almost all villages of Nagar have schools up to the middle level and easy access to high school. High school is not within every village, but easily accessible at neighboring villages within shorter distance. Similar to other CKNP valleys government schools are operating conventional education system with meager facilities available inside the schools but this gape is considerably filled by presence of Uswa School System in the valley, which is emphasizing on quality education with proper training of teachers in modern education system. The education system is noticeably good, but still quality education is a key challenge in the area, which can be achieved through providing qualified and well-trained teachers, required teaching gear and providing sophisticated physical environment. Govt. The education department and Uswa School System can play lead role in partnership to achieve the milestone.

Exhibit 6: Socio-economic profile of Nagar Valley

Villages	Education Facilities				Health Facilities		Veterinary Facilities	Electricity
	Category/ Level	Ownership	Geographic Location	Gender	Facility	Geographic Location		
Askurdas	Primary	Govt.	N 36°17'57.9'' E 074°38'09.0'' 2182m	Girls	Dispensary	N 36°18'05.6'' E 074°38'40.0'' 2193m	Yes	Yes
			N 36°17'59.9'' E 074°38'20.4'' 2189m	Boys				
		Private	N 36°18'04.7'' E 074°38'25.3'' 2182m	Both				
	Middle	Govt.	N 36°17'57.9'' E 074°38'09.0'' 2182m	Girls				
			N 36°17'59.9'' E 074°38'20.4'' 2189m	Boys				
		Private	N 36°18'04.7'' E 074°38'25.3'' 2182m	Both				
	High	Govt.	N 36°18'03.0'' E 074°38'07.4'' 2178m	Girls				
			N 36°18'04.6'' E 074°38'36.8'' 2179m	Boys				
		Private	N 36°18'04.7'' E 074°38'25.3'' 2182m	Both				
Miacher	–	--	--	--	–	--	Yes	Yes
Shayar	Primary	Govt.	N 36°17'41.7'' E 074°17'20.4'' 2173m	Both	Dispensary	N 36°17'40.5'' E 074°37'05.7'' 2183m	Yes	Yes
		Private	N 36°17'38.1'' E 074°37'12.2'' 2174m	Girls				
			N 36°17'38.0'' E 074°37'10.7'' 2187m	Boys				

Villages	Education Facilities				Health Facilities		Veterinary Facilities	Electricity
	Category/ Level	Ownership	Geographic Location	Gender	Facility	Geographic Location		
	Middle	Govt.	N 36°17'41.7'' E 074°17'20.4'' 2173m	Both				
		Private	N 36°17'41.2'' E 074°37'10.9'' 2187m	Both				
	High	Private	N 36°17'41.2'' E 074°37'10.9'' 2187m	Both				
Sumayar	Primary	Govt.	N 36°13'25.3'' E 074°38'55.8'' 2170m	Both	Dispensary	N 36°18'22.9'' E 074°39'18.3'' 2208m	Yes	Yes
		Private	N 36°18'21.5'' E 074°39'09.4'' 2198m	Both				
	Middle	Govt.	N 36°18'17.4'' E 074°39'12.5'' 2210m	Girls				
			N 36°18'20.6'' E 074°39'16.8'' 2214m	Boys				
		Private	N 36°18'21.5'' E 074°39'09.4'' 2198m	Both				
	High	Govt.	N 36°18'17.4'' E 074°39'12.5'' 2210m	Girls				
			N 36°18'20.6'' E 074°39'16.8'' 2214m	Boys				
Phakar	Primary	Govt.	N 36°15'52.1'' E 074°35'47.0'' 2464m	Girls	Dispensary	N 36°15'58.2'' E 074°35'21.6'' 2400m	No	Yes
			N 36°15'56.1'' E 074°35'18.6'' 2388m	Boys				
		Private	N 36°15'53.8'' E 074°35'37.9'' 2448m	Both				

Villages	Education Facilities				Health Facilities		Veterinary Facilities	Electricity
	Category/ Level	Ownership	Geographic Location	Gender	Facility	Geographic Location		
	Middle	Govt.	N 36°15'52.1'' E 074°35'47.0'' 2464m	Girls				
			N 36°15'56.1'' E 074°35'18.6'' 2388m	Boys				
		Private	N 36°15'53.8'' E 074°35'37.9'' 2448m	Both				
	High	Govt.	N 36°15'52.1'' E 074°35'47.0'' 2464m	Girls				
			N 36°15'56.1'' E 074°35'18.6'' 2388m	Boys				
		Private	N 36°15'53.8'' E 074°35'37.9'' 2448m	Both				
Hakuchar	Primary	Govt.	N 36°16'18.6'' E 074°36'42.3'' 2220m	Both	No	--	No	Yes
		Private	N 36°16'15.6'' E 074°35'51.9'' 2301m	Both				
Proper Nagar	Primary	Govt.	N 36°15'07.6'' E 074°32'10.5'' 2029m	Girls	Dispensary	--	Yes	Yes
			N 36°15'14.8'' E 074°31'46.9'' 2021m	Boys				
	Middle	Govt.	N 36°15'07.6'' E 074°32'10.5'' 2029m	Girls				

Villages	Education Facilities				Health Facilities		Veterinary Facilities	Electricity
	Category/ Level	Ownership	Geographic Location	Gender	Facility	Geographic Location		
			N 36°15'14.8'' E 074°31'46.9'' 2021m	Boys				
	High	Govt.	N 36°15'07.6'' E 074°32'10.5'' 2029m	Girls				
			N 36°15'14.8'' E 074°31'46.9'' 2021m	Boys				

1.3.4 Health Facilities

The basic health facility is almost available in every village except Hakuchar village, where the community access basic health facility by going to Phakar or Askurdas. A ten-bed hospital exists in Proper Nagar which is not easily accessible to all villages and most locals of the villages go to Hunza Aliabad where a secondary health unit of Aga Khan Health service is available. The access to health facility is relatively easy for those of people from Shayar, Askurdas and Sumayar to Hunza, which are connected through a bridge near Murtaza Abad, however, people of Miacher, and Phakar are facing difficulty due to large distances and poor condition of the road. Though both government and private health facilities exist in the valley, but not sufficient to meet the needs of community properly. Since 2015 Nagar has been declared as a separate district, development in health facilities of valley by establishing a district Hospital and improved status of government dispensary.

1.3.5 Veterinary Facilities

Though veterinary facilities are available in all villages except Phakar and Hakuchar but do not properly serves the need of the community and access to vaccination campaigns is relatively easier in the adjacent District Hunza. The government veterinary department casually carries out vaccination, but most of the times community purchase medicines and vaccines by taking services of any trained individual/veterinarian nearby available for common livestock disease. Goat pox, Interotoxemia (Goat, sheep and cattle), Black quarter, Mange (Large animal's cattle, yak, zozomo)

Community demands the need for improved veterinary facilities as well training for the local communities on vaccination so that the community members they could carry out proper vaccination in the absence of vaccinator.

1.3.6 Electricity

All the villages in Nagar valley have the access to electricity facility provided and managed by Water and Power Department, GB. The sources of electricity are small hydro stations of various capacities in Nagar valley. Supply-demand lapse is managed by load shedding. The frequency of load shedding increases in winter with increase in demand to maintain the indoor temperature. Local community residing around CKNP manages this electricity shortage by harvesting wood as a fuel source from the National Park.

1.3.7 Traditional Governance System

Traditional Governance system unfolds two tiers; within the households and within the village. Within the ambit of the social structure at household level, the basic residential/economic unit is the joint family. Typically, this unit includes an elder's household with his married sons' families. Married sons generally live in their father's household, with the latter or the eldest brother exercising authority over the extended family. The authoritative head of the household has the responsibility and authority to make decisions on behalf of the entire household members. It is within the joint family that the primary solidarities lie for daily economic activities.

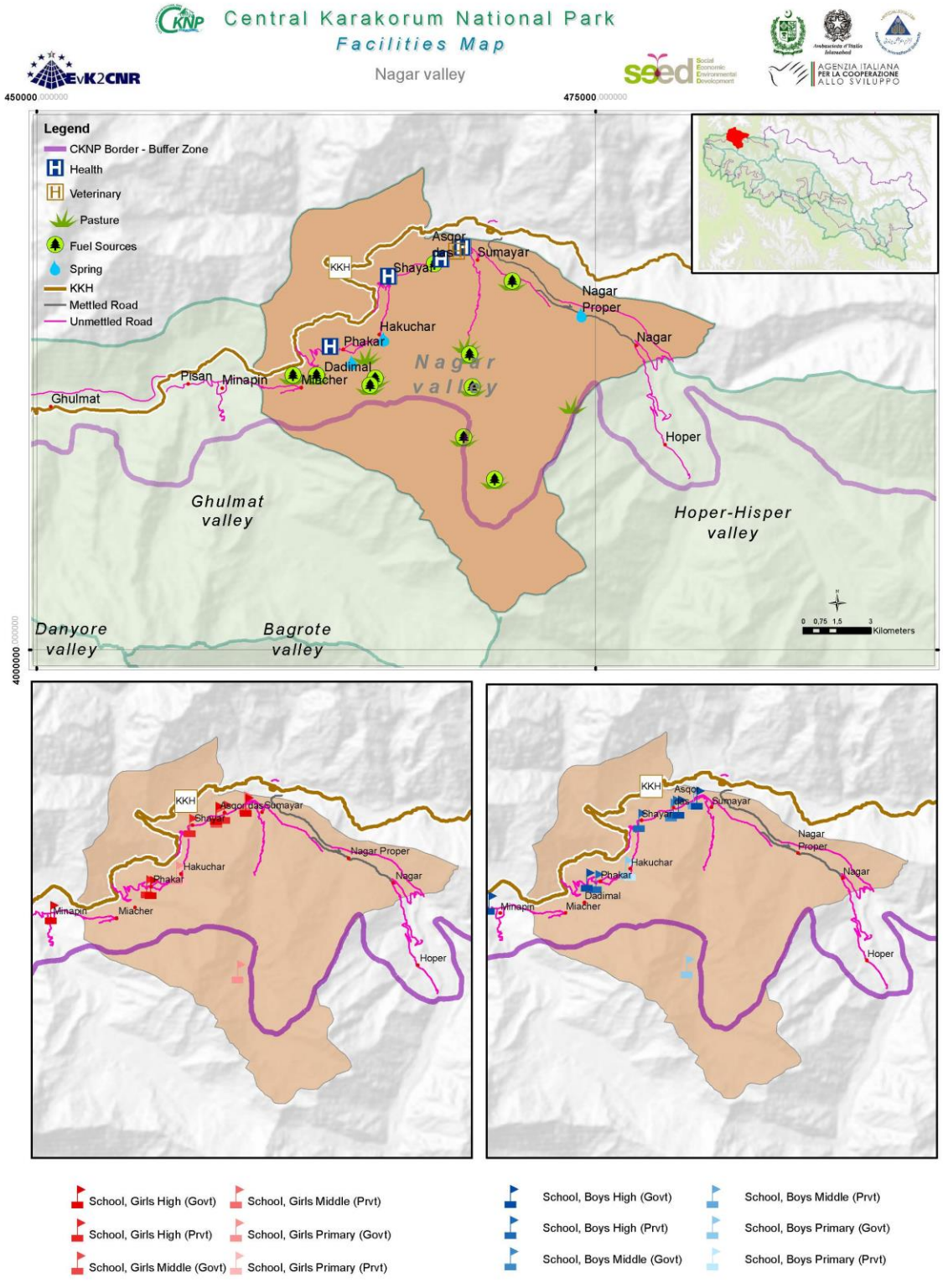


Exhibit 7: Facilities of Nagar Valley

This customary practice of joint family system fairly justifies the lower average increase in households and higher average increase in population.

The whole buffer zone of CKNP is full of villages having rugged topography, jagged mountains, harsh climate and disaster-prone areas. In this situation, local community helped themselves by establishing and maintaining the local support organization in order to explore and enhance the developmental opportunities for the areas. They were established back in 1980 under the awareness and efforts of working NGO's and INGO's at the time, but maintained and managed by the local communities as an integral social component. It serves as an umbrella for VCCs, VOs, and WOs. This organization contains the members from all the regional organizations and jurisdiction spans upon the watersheds at the village/valley level. Their function is equivalent sharing and support of the development opportunities in the area.

The social organization systemm is sturdily practiced in the valley. LSO V/WOs, religious organization and youth organizations are actively working for the prosperity of the area, but the available resources are scarce and member of the organizations is having insufficient technical capacity. Community rates the performance of these organizations satisfactory while acknowledging the meager financial and technical resources available for the organizations. The survey result reveals that there is a need of thorough work on capacity building and resource mobilization with the social organizations.

Exhibit 8: Women working at field and giving interview for VCSDP

1.3.8 Gender Impact

In Nagar valley gender roles are very similar to other CKNP valleys in the neighboring where a household usually comprises of two gender authorities, the oldest male member of a household is head of the household and the oldest women can be said as subordinate to the head. The division of labor is basically gender-based, the male members of the family, including the head of the family are responsible for both external and internal matters such as representing the household in the village as well as ensuring income earning and its management, such as decision making related to agriculture and livestock production, use and distribution of tasks. The woman's head of the house is responsible for defining and organizing the tasks and handling household economic affairs, including managing storerooms, kitchen and handling/use the agricultural and livestock production.

Primarily women are engaged in agricultural activities and other reproductive roles due to lack of income earning opportunity within the village and rare mobility opportunities outside the village. The primary reason for women's current role is lack of education and skill in women. A few women who earn cash income are either primary or secondary level teachers in the school or midwives in health facilities. Currently increasing enrollment of women in the schools is expected to increase the number of educated women in few years, which will ultimately become a reason for changing women's role.

ASSESSMENT OF CUSTOMARY PRACTICES FOR SUSTAINABLE USE OF NATURAL RESOURCES IN CONTEXT OF INDIDENOUS KNOWLEDGE

2 ASSESSMENT OF CUSTOMARY PRACTICES FOR SUSTAINABLE USE OF NATURAL RESOURCES

Local community inhabited this land since forefathers and practices their own set of rules known as customary/custodian rules/practices which were formed before the statutory laws even before the creation of Pakistan. These laws passed from generation to generation by words and hardly been written anywhere.

Local communities have long histories of interaction with the natural environment. With the passage of time the land use priorities changed and resulted in differential dependence upon natural resources by each community and even varied personally. Allied with many of these communities is a collective organization of knowledge, expertise, practices and emblematic depiction. These refined sets of understanding, elucidation and connotation are an integral component of a cultural complex that incorporates language, nomenclature, resource use practice, cultural and world view. This local and indigenous wisdom is a key resource for empowering communities to exploit natural resources in sustainable manners to ensure its continuation for next generations.

2.1 Requirement of Revitalization of Indigenous Knowledge

Indigenous people are the custodian of customary systems. These people are well informed about their own circumstances, their resources, what works and what does not work. They are also aware of the possible impact of a change in one factor on the other parts of the environment, but the issue highlighted by the local community during the interviews is that they are unable to assess and adapt to environmental changes as fast as it happening. This provokes the need of awareness raising and revitalizing the indigenous knowledge in a way that allows these people to adapt to their environment and let them able to reciprocate the disastrous changes steadily.

2.2 Water

Condition of water resource is better in the valley as compared to other CKNP valleys. Small water streams flowing from the watersheds above the valley are major sources of irrigation and drinking water facilities. The drinking water facility through pipe is available in all villages, but reported untested for physico-chemical factors. In some villages such as Proper Nagar irrigation channels are constructed through dangerous mountain terrain having huge seepage due to poor structure and need to be improved. Though water is available for irrigation, but to control wastage of water the irrigation channels need to be improved. Regarding water distribution, customary laws are being practiced regularly, whereas, area wise distribution takes place and one area is provided with water on a weekly basis. Water availability needs to be improved through improving conditions of irrigation channels and updating customary practices.

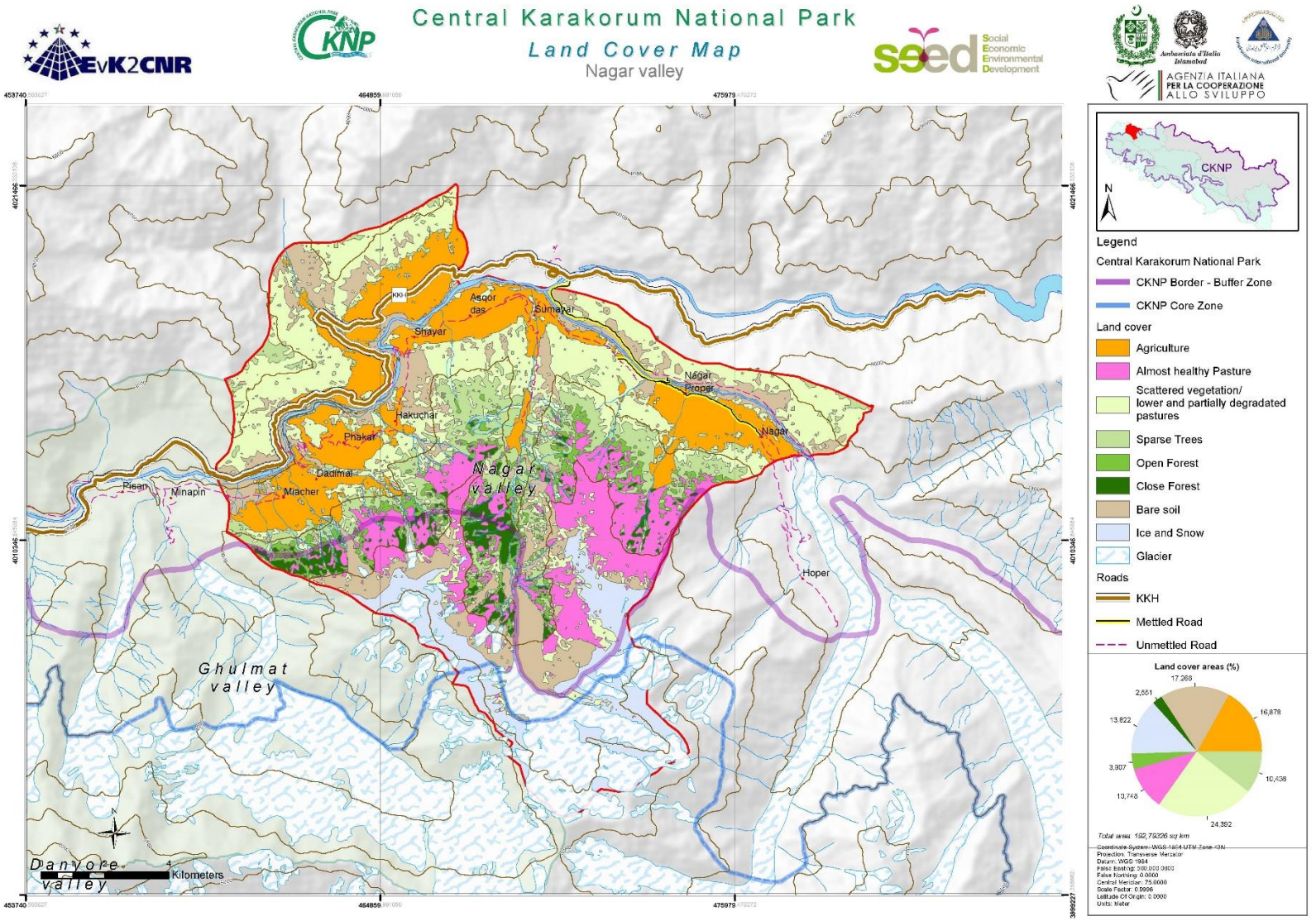


Exhibit 9: Land cover map of Nagar Valley

2.3 Agriculture

The population is primarily dependent on agriculture and livestock like other CKNP valleys. The entire valley falls in double cropping zone where Wheat, Potato and Barley are the main crop and Maize is used to be cultivated as secondary crop. Major cash crop is potato while the other crops are being consumed for domestic purpose.

Exhibit 10: Fruit tree in backyard of house

Both genders work parallel part in the fields and division of labor exist. The communal work such as a combined repair work of common irrigation channels and other water supply system and channelizing water from the source is performed by men and women join men in the field during cultivation and harvesting season and take care of livestock for stall feeding and grazing in nearer areas.

Male workforces in the valley are primarily responsible for earning supplementary income from off-farm income sources such as government & private sector employment, small scale business and tourism etc. Therefore, watering the crops are mostly carried out by women. Potato is the main cash crop, whereas some on average 85% potato is marketed to earn cash income and fruit is a secondary source of cash income from agriculture source.

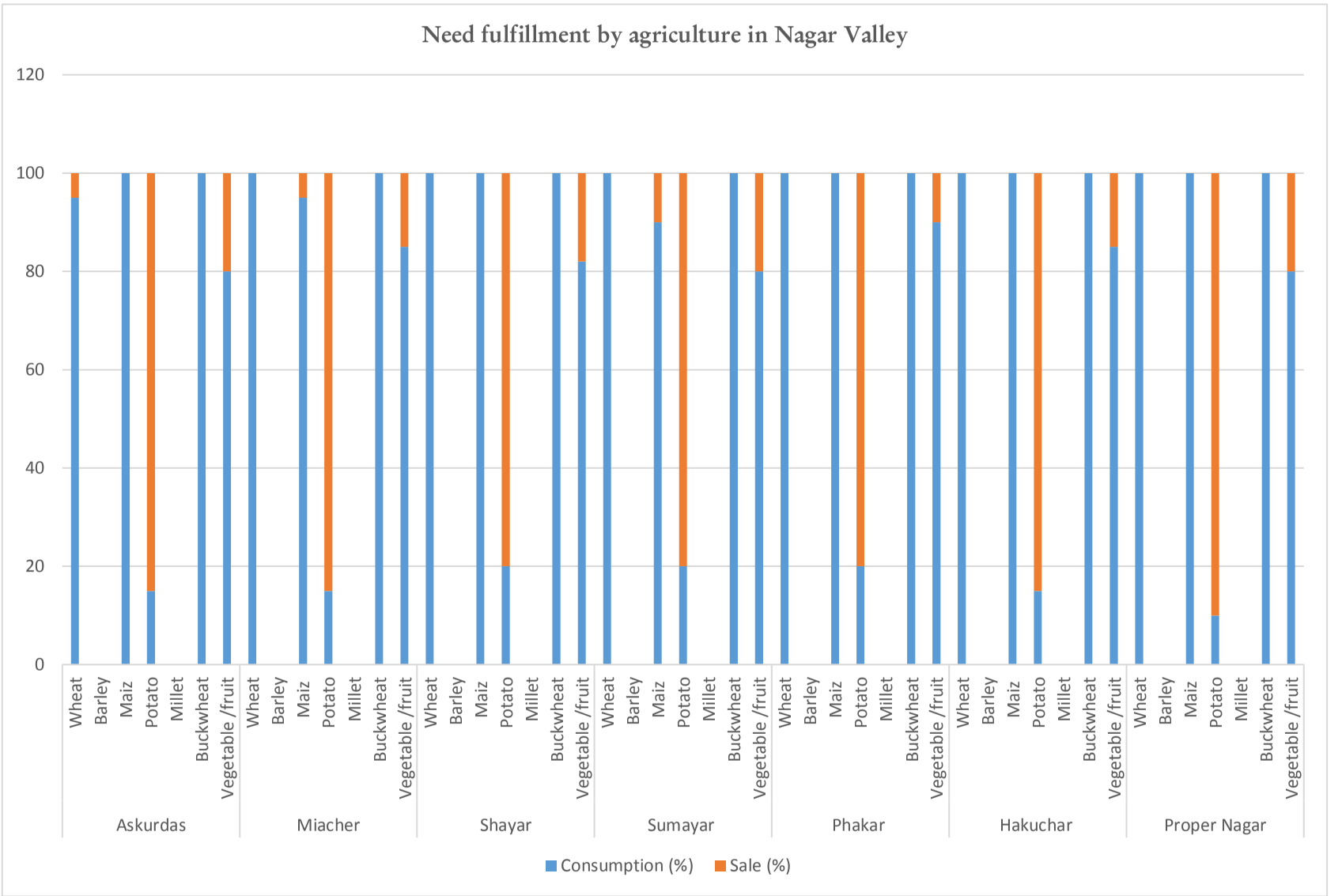
Exhibit 11: Forest at Nagar Valley

Land holding per household in the valley is shrinking with increasing population. To increase production from agriculture, there is need of technological transformation or change of traditional methods in order to get more production out of the existing cultivable land, the community-based organization can mobilize resources from different relevant agencies to meet the goal.

Exhibit 12: Economic benefits of agriculture production in Nagar Valley

Village	Kind of crops	Consumption (%)	Sale (%)	Av. Income/HH/yr	Av. Value/HH/yr
Askurdas	Wheat	95	5	70000	105000
	Barley	0	0		
	Maize	100	0		
	Potato	15	85		
	Millet	0	0		
	Buckwheat	100	0		
	Vegetable /Fruit	80	20		
Miacher	Wheat	100	0	55000	85000
	Barley	0	0		
	Maize	95	5		
	Potato	15	85		
	Millet	0	0		
	Buckwheat	100	0		
	Vegetable /Fruit	85	15		
Shayar	Wheat	100	0	65000	93000
	Barley	0	0		
	Maize	100	0		
	Potato	20	80		
	Millet	0	0		
	Buckwheat	100	0		
	Vegetable /Fruit	82	18		
Sumayar	Wheat	100	0	50000	84500
	Barley	0	0		
	Maize	90	10		
	Potato	20	80		
	Millet	0	0		
	Buckwheat	100	0		
	Vegetable /Fruit	80	20		
Phakar	Wheat	100	0	70000	100000
	Barley	0	0		
	Maize	100	0		
	Potato	20	80		
	Millet	0	0		
	Buckwheat	100	0		
	Vegetable /Fruit	90	10		
Hakuchar	Wheat	100	0	72000	100000
	Barley	0	0		
	Maize	100	0		
	Potato	15	85		
	Millet	0	0		
	Buckwheat	100	0		
	Vegetable /Fruit	85	15		
Proper Nagar	Wheat	100	0	750000	100000
	Barley	0	0		
	Maize	100	0		
	Potato	10	90		
	Millet	0	0		
	Buckwheat	100	0		
	Vegetable /Fruit	80	20		

Exhibit 13: Need fulfillment by agriculture in Nagar Valley



2.4 Livestock

Animal rearing serves as a "living bank" in terms of food and cash. Investment in livestock herding has a wide portfolio of animals: cattle, goats, sheep, donkeys, mules and poultry. This is supplemented in some areas with domestication of yak and hybrid yak. Livestock mobility, dispersion, shifting of households, utilization of pastures is adaptation strategies for livestock herding. However, the livestock population highly depends on alpine & subalpine pastures, and rangeland due to insufficient fodder from the agriculture fields. Moreover, the pastorals also collect fodder from pastures during spring, summer season and store it for the over-wintering.

Livestock rearing trend decreased considerably during last ten years owing to less economic return for the following reasons.

Most working class of today has grown up and been educated. Many of them never return, but stay in town and join alternative livelihood options.

Livestock diseases over the last 10 years, reportedly increased and the livestock loss ratio has increased over the past years. Lack of sufficient vet facilities and medicines in the valley has added more to the challenges of the farmers and herders to overcome the increasing loss of animals.

Pastorals know about the changing climate, but they are neither adapted to it, nor do they know how to adapt and mitigate the effects of climate change for sustainability. New veterinary diseases are befalling in the valleys due to climate change. Pastorals have almost no or very little information about the precautionary measures and vaccines and faces economic loss ultimately.

There is a huge dependence of livestock in the pastures for fodder. With the increase in human population and ultimately livestock population the pressures have been increased, the subsequently health of pastures is decreasing. There is no assessment about the carrying capacity of pastures and therefore no rules exist about the maximum number of livestock in the pastures neither in customary rules nor statutory laws. It is mandatory to carry out a research / assessment on carrying capacities of different pastures and include the findings in statuary law to control over grazing.

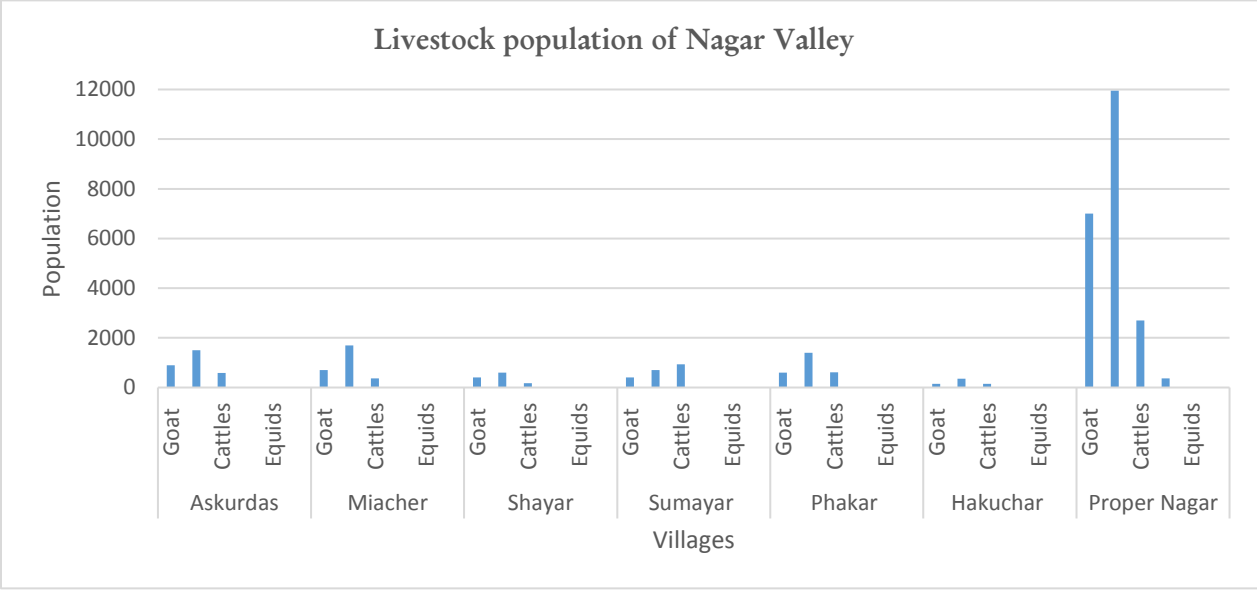
The observed decree in the livestock rearing has both positive and negative impacts. The need is to assess the direction of adaptations towards the actions that are more suitable for natural resources and its components. On one hand, decreasing trend in livestock rearing is useful as it reduces the pressure on the pastures, by leaving space and food for the wild herbivores such as Ibex, and several small rodent species and ultimately increasing prey density for wild carnivores, on the other hand, decreased economic incentives by livestock in annual income per household increases the dependence of the local community on the wood and non-wood products. This dependence of the local community on natural resources needs to be evaluated in terms of monetary benefits during each season and their economic value in the area to do research-based decisions for ecosystem sustainability. No previous research addresses the comparison of the monetary share of natural resources for household and its own economic value in terms of sustainable ecosystem services has been explored. Therefore, it is the need of time to strengthen

the management plan by such research and specifically its implementation in the operational plan to ensure sustainable use of land and its products.

Exhibit 14: Contribution of livestock in economics of Nagar Valley

Villages	Kind of livestock	Population per village	Av. Income/HH/yr	Rearing trend
Askurdas	Goat	1700	30000	Decrease
	Sheep	1000		
	Cattles	405		
	Yaks	200		
	Equids	_		
	Donkey	_		
Miacher	Goat	1400	25000	Decrease
	Sheep	550		
	Cattles	70		
	Yaks	82		
	Equids	0		
	Donkey	0		
Shayar	Goat	360	32000	Decrease
	Sheep	300		
	Cattles	300		
	Yaks	0		
	Equids	0		
	Donkey	0		
Sumayar	Goat	1000	33000	Decrease
	Sheep	1000		
	Cattles	170		
	Yaks	0		
	Equids	0		
	Donkey	0		
Phakar	Goat	1100	35000	Decrease
	Sheep	1200		
	Cattles	800		
	Yaks	50		
	Equids	0		
	Donkey	0		
Hakuchar	Goat	250	32000	Decrease
	Sheep	150		
	Cattles	40		
	Yaks	10		
	Equids	0		
	Donkey	0		
Proper Nagar	Goat	7000	30000	Decrease
	Sheep	6000		
	Cattles	1700		
	Yaks	200		
	Equids	0		
	Donkey	10		

Exhibit 15: Livestock population of Nagar Valley



2.5 Pastures

Alpine Meadows and extended grasslands (high pastures) above or near tree line are accessible only for a short time period which is the peak summer season. Traditional rights of communities in these pastures are usually well defined, and they establish seasonal summer pastures in these areas and some of them are shared between two or more bordering villages. Rights to the utilization of pastures are collectively conferred on entire villages and are not confined to kinship groups. Nomadic economy and labor activities are predominantly based on animal husbandry. Mixed herds are composed of sheep and goats, cattle/yaks for livestock production and camels, horses and donkeys mainly for the transport of tents, household goods and utensils. Nomads utilize pastures to which they claim rights of access based on customary law.

Local pastorals at Nagar valley exhibit vertical transhumance patterns with seasonal movements from top mountain pastures to the downside. The pasture settlements have sheds for the animals as well and they are fenced as well to avoid attacks of snow leopard and wolves. The FGD interview indicates that 74% pastures of Nagar valley are degrading gradually

Community reported that pastures are drying up, less vegetation as compared to past and decrease in wild medicinal plants. Decline in health of pastures is a direct indicator of unsustainable harvesting practices due to increasing local population fueled by climate change. Uncontrolled grazing and other consumable products irrespective of decreasing productivity, allow them to earn handsome amount for subsistence. Indirectly it also indicates the less snow and shift of rainy seasons, which contributes to its low productivity. Barren patches among the pastures are notable features indicating the removal of top soil as a result of flooding and landslides. Collecting all the facts mentioned by local community and commonly reported in literature provokes the need of managing zones of rotational grazing in the pastures and

determining the maximum number of each kind of livestock according to carrying capacity of pastures while keeping pace for wild herbivores reptiles and rodents to thrive.

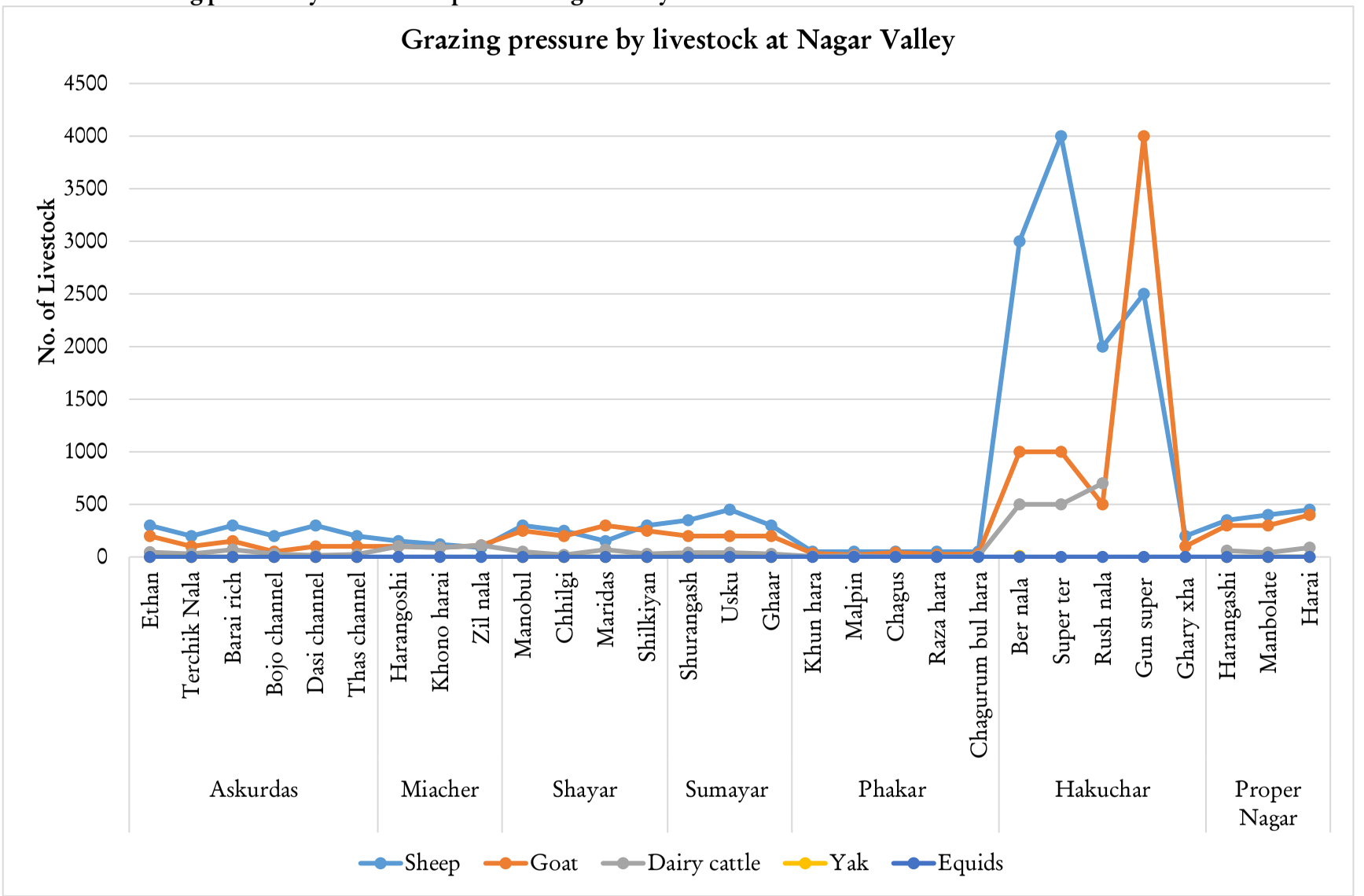
Exhibit 16 : Assessment of grazing pressure from each livestock classes on pastures of Nagar Valley

Pasture / Village	Status	Other uses	Grazing period	Kind of livestock			
				Sheep	Goat	Dairy Cattle	Donkeys
Asqurdas							
Harangashi	PD	Wood and herbal collection	May-September	350	200	60	_
Manbolate				300	100	40	_
Harai				250	100	60	_
Manobul				200	100	70	_
Chhilgi				150	200	65	_
Maridas				200	150	50	_
Shilkiyan				250	150	60	_
Miacher							
Ethan	PD	Wood and herbal collection	Mar-November	180	50	14	_
Terchik Nala				150	40	7	_
Barai Rich				170	120	7	_
Bojo channel				120	60	8	_
Dasi channel				250	100	7	_
Thas channel				130	50	9	_
Shahbaran Eethan				150	70	12	_
Shahbaran				250	60	6	_
Shayar							
Manobul	PD	Wood and herbal collection	May-October	20	45	3	_
.Chhilgi				40	40	5	_
Maridas				40	35	3	_
Shilkiyan				30	50	3	_
Rung				25	40	4	_
Harangoshi				30	30	3	
khono Harai				24	40	5	

Pasture / Village	Status	Other uses	Grazing period	Kind of livestock			
				Sheep	Goat	Dairy Cattle	Donkeys
Zil Nala				45	70	4	
Sumayar							
Manobul	PD	Wood and herbal collection	May-October	300	250	50	_
Chhilgi				250	200	20	_
Maridas				150	300	70	_
Shilkiyan				300	250	30	_
Rung				_	_	_	_
Chumarbacore				_	_	_	_
Phakar							
Shurangash	PD	Wood and herbal collection	June-September	350	350	300	_
Usku				450	400	300	_
Ghaar				300	450	200	_
Hakuchar							
Shurangash	PD	Wood and herbal collection	March-Dec	30	15	7	_
Usku				20	20	5	_
Ghaar				25	10	6	_
Khun Hara				25	10	6	--
Malpin				30	25	6	--
Chagus				20	15	4	--
Raza Hara				50	25	3	--
Chagurum Bul Hara				50	30	3	--
Proper Nagar							

Pasture / Village	Status	Other uses	Grazing period	Kind of livestock			
				Sheep	Goat	Dairy Cattle	Donkeys
Ber Nala	PD	Wood and herbal collection	May-Sep	1795	909	500	10
Super Ter				2393	909	500	--
Rush NALA				1197	455	700	--
Gun Super				1496	3636	--	--
Ghary Xha				120	91	--	--
Nagar Ter				--	--	--	--

Exhibit 17: Grazing pressure by livestock on pastures Nagar Valley



2.6 Fuel Wood Collection/ Timber Harvesting

Nagar valley has comparatively fragmented and sparse forest with approximately 34.1km^2 vegetation cover and its average ABG is 3029.7MgKm^{-2} and CAI of 1577.6 Mg/year (Ferrari, 2014). Vegetation cover of Nagar valley comprised of 10.6% grasslands, 5% close forest, 5.7% open forests and 20 % for both scattered and sparse vegetation. High density of timber trees is found in south-western valleys of CKNP than North eastern valleys.

As a consequence of increasing population; expansion of villages is a common phenomenon in Nagar valley like other valleys and thus construction of settlements/houses is also on the rise. The timber for construction purposes is either purchased from Proper Nagar, Hunza or Gilgit timber market or from natural/artificial plantations (Exhibit No. 11). In Nagar valley it is important, noting that use rights are maintained even by households now residing in nearby villages/cities. The usual amount harvestable is around 100-200 logs per household per year in Nagar valley. From a large tree, locals usually obtain around 50 logs. The trees harvested for timber in each village of Nagar valley are listed in Exhibit No. 18. Household fuel sources in Nagar valley are Artemisia, Sea buckthorn, Dung, pruning from plantations and wood from forests. Area under vegetation in the whole Nagar valley is only 77.3 km^2 comprises of 71.3 % Junipers, 11.9% coniferous and 16.1% broad leaves and also the artificial plantation sites of *Populus* spp. Along with Artemisia shrub-land, and sea buckthorn. The community reported a decrease in vegetation on mountain slopes.

Exhibit 18: Timber harvesting and use at Nagar valley

Village	Houses constructed in last 5 years (2010-2015)	Number of trees used	Tree species used
Askurdas	200	50	White Poplar, Juniper
Miacher	55	30	White Poplar, Mulberry, Juniper
Shayar	25	40	White Poplar
Sumayar	100	250	White Poplar, Walnut
Phakar	150	220	White Poplar
Hakuchar	15	80	White Poplar
Proper Nagar	250	475	White Tree, Mulberry, Juniper, Walnut

Poplar varieties are common plantations aided significantly to alleviate stress on natural forests. They are preferred due to high annual biomass, higher pest resistance, site adaptability, and easy vegetative propagation. Due to Artemisia's regular presence, this valley is also called as Artemisia Shrub land. Apart from being component of the fuel sources, it is also used by livestock during winter. A juniper tree is found in isolation at inaccessible locations on steep mountain slopes and grows well where water availability is up to the requirement of the tree. Junipers are preferred species for fuel because of its dryness and aroma. Our data collected during the survey reports that approximately 1875 households living in Nagar valley harvests

about 436 Mg/year/valley of the natural resources (Artemisia, Sea buck thorn, Juniper, Forest, Riparian vegetation, Shrub and grasses) and 1.23.2 Mg/year from junipers as fuel.

Exhibit 19: Summary of Fuel Wood harvest and Consumption in Nagar Valley

Village	HH	Consumption Per Household (Mg yr^{-1})			Consumption Per Village (Mg yr^{-1})		
		Winter	Summer	Total	Winter	Summer	Total
Askurdas	450	1.29	0.65	1.94	580.5	292.5	873
Miacher	250	1.2	0.8	2	300	200	500
Shayar	120	1.6	0.6	2.2	192	72	264
Sumayar	820	1.4	0.8	2.2	1148	656	1804
Phakar	512	1.2	0.8	2	614.4	409.6	1024
Hakuchar	80	1.2	0.8	2	96	64	160
Proper Nagar	1200	1.25	0.77	2.02	1500	924	2424

The dependency on the forest is very low in Nagar valley because of strict regulations by the community itself. Major dependency is on animal dang and fruit trees. Among the alternative fuel wood resources electricity, gas cylinders and kerosene oil are usually employed. Plantations by local communities on private lands have help alleviate strains on natural flora considerably. Even sustainable and productive forest systems may experience pervasive and severe levels of small-scale chronic disturbance.

In Nagar valley households are primarily dependent on far-forest sources for timber and fuel wood and partially use natural gas and electric devices. With fast increasing population settlements are expanding and houses are also on the rise and there is a shortage of timber for construction purposes so people are still fetching timber and fuel wood from natural forest in spite of the strict ban on deforestation by the community itself. However, in comparison to past the community has reduced dependency on natural forest and preferring plantation and purchase from the market. Alternative to fuel wood is cylinder gas and electricity, but electricity is not widely available for heating and cooking in some houses. By improving the availability of alternatives in the area fuel wood can be conserved.

Exhibit 20: Annual fuel wood harvest, Nagar valley

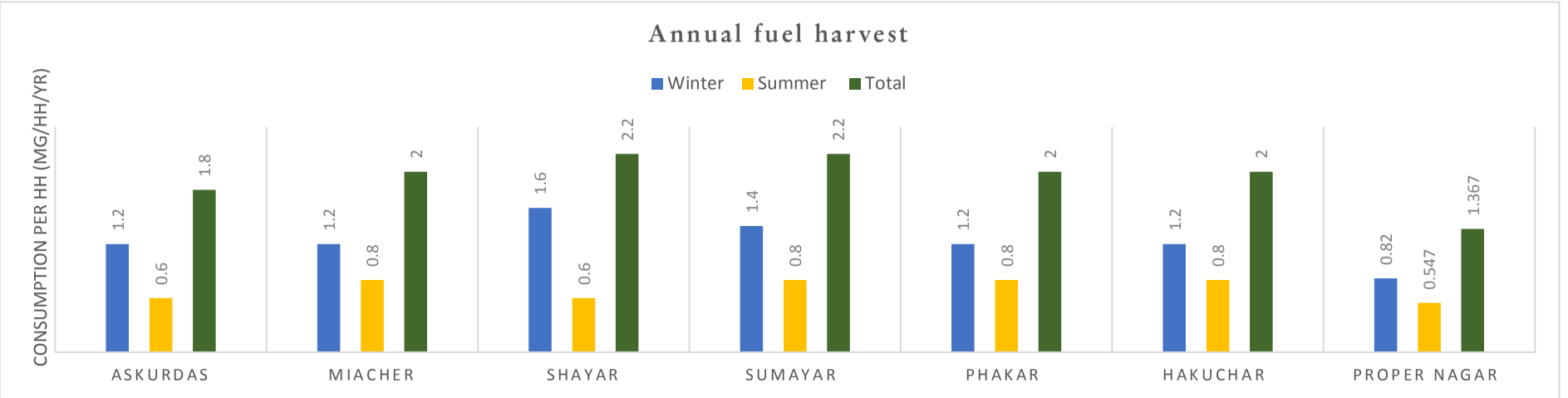


Exhibit 21: Details of fuel wood harvested per household from several sources (Mg/HH/Yr)

Villages/Source	Artemisia		Sea buckthorn		Juniper		Shrubs		Dung		Riverbank		Natural Forest		Fruit Trees		Plantation		Other Riparian trees	
	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W
Askurdas	0.6	1	0	0	0	0	0.01	0.04	0	0	0	0	0	0	0.3	0.2	0.05	0.2	0.004	0.01
Miacher	0	0	0	0	0	0	0.05	0.15	0	0	0	0	0	0	0.52	0.2	0.3	0.45	0.008	0.015
Shayar	0	0	0	0	0	0	0	0	0.28	0.28	0	0	0	0	0.56	0.16	0.28	0.41	0.007	0.009
Sumayar	0	0	0	0	0	0	0.05	0.1	0.15	0.15	0	0	0	0	0.4	0.2	0.4	0.4	0.004	0.011
Phakar	0	0	0	0	0	0	0	0	0.12	0.12	0	0	0	0	0.6	0.2	0.28	0.45	0.003	0.008
Hakuchar	0	0	0	0	0.05	0.15	0	0	0.25	0.25	0	0	0	0	0.56	0.12	0.29	0.43	0.006	0.009
Proper Nagar	0	0	0.027	0.054	0	0	0.055	0.082	0.041	0.041	0	0	0	0	0.8	0.41	0.27	0.34	0.008	0.01

2.7 Mining

Nagar valley is rich in precious gemstone. The main mining area is Chumar bakor. This mine is the largest gemstone mining sources in Nagar valley, which is owned a few households/villages lying along the watershed of Chumarbakor. Main gemstone being mined in the area are aquamarine, sapphire, tourmaline, quartz, topaz. Though communities of all villages are not engaged in mining, but on average 25 groups from three villages are reported being engaged in mining activities earning on average PKR 250,000/- annually. Due to lack of required equipment and technical capacities a part of a gemstone is wasted and optimal earning income cannot be obtained. It is therefore important to train the miners on safe extraction of the gemstone.

Exhibit 22: Economic revenue from mining in Nagar Valley, 2016

Village	Since	No of Mining Groups	Mining Products	Revenue/Yr/ Village (PKR)	Revenue/Yr /Group (PKR)
Asqurdas	--	--	--	--	--
Miacher	--	--	--	--	--
Shayar	--	--	--	--	--
Sumayar	1967	1988	Aquamarine, Tourmaline, Topaz, Ruby, Fluorite, Beroj, Quartz, Morganite	300000	21000000
Phekar	1949	1990	Aquamarine, Tourmaline, Topaz, Ruby, Fluorite, Beroj, Quartz, Morganite	25000	2250000
Hakuchar	--	--	--	--	--
Proper Nager	1950	20000	Aquamarine, Tourmaline, Topaz, Ruby, Fluorite, Beroj, Quartz, Morganite	200000	5000000

2.8 Tourism

Tourism in the valley does not exist and therefore people from the valley are not engaged in tourism related activities. However, some people from Proper Nagar village are reported partially engaged in tourism as cook, porter and Guides going to other areas, such as Hisper and Hoper to earn from tourism and annually an estimated on average PKR.10, 00000/- comes in the village. In proper Nagar the Historical Fort of Mir of Nagar exist but the tourist does not visit the fort due to lack of its interpretation and poor structure. The community of proper Nagar believes that renovation of the fort and its publicity can attract domestic tourism in the area and create a handsome earning source for them.

ASSESSMENT OF CLIMATE CHANGE IMPACT FOR SUSTAINABLE USE OF NATURAL RESOURCES IN CONTEXT OF INDIGENOUS KNOWLEDGE

3 ASSESSMENT OF CLIMATE CHANGE IMPACT ON NATURAL RESOURCES

Climate change is projected to have a significant effect upon the future rate of biodiversity loss. There is a growing global consensus that the rate of climate change has already exceeded the capacity of some species and ecosystems to adapt naturally, and is close to exceeding that of many more. There is therefore an urgent need to identify the key mechanisms underpinning climate change impacts on natural resources in order to best select climate change adaptation strategies. It is also essential that the scale of these changes is clearly communicated to policy and decision-makers. Furthermore, it is recognized that climate change will have increasingly significant direct impacts on local communities, biodiversity and that increased rates of species extirpations are likely. The growth of many crops and weeds is being stimulated. Migration of plant and animal species is changing the composition and structure of the local ecosystem. This will have negative consequences in terms of services provided by these species and ecosystems provide, especially in areas where the majority of the human population are the rural poor and dependent on direct exploitation of these ecosystem services.

3.1 Climate Change in the Perspective of Indigenous Knowledge

People in Nagar valley were well aware of the changes that are happening in their climate and responded all the questions effectively. The main concern of local community discussed during the FGD's was the adaptation strategies that are required to mitigate the effect of climate changing. Data obtained shows that the local climate is changing, but these changes are not very pronounced and can be reversed if we do proper and timely actions. Change in length of season has been reported by the local community with increased temperatures and prolonged summer. The local community has also reported an increase in the frequency of disastrous activities. According to scientific investigations these higher temperatures are degrading the permafrost layers, causing slope instability, rock falls, landslides and avalanches.

Although climate change has both positive and negative impacts, the issue is that the negative consequences may be more pronounced in the mountains, both for the communities and for their environments, requiring more awareness, more attention and quicker reaction than elsewhere. Equally, the consequences of negative impacts may go beyond the boundaries of the mountains and affect people and ecosystems in the surrounding lowlands.

3.2 Temperature Variability and Seasonal Shifts

The climate of Nagar valley can be categorized as dry continental Mediterranean. Gradual increase in temperature has been reported by the local community during last 30 years. Community reported a rapid increase of temperature during the last 10 years. Community reported approximately 16% increase in temperature as compared to last 10 years. Regarding decrease in winter season, the community members responded that temperature in winter has increased and occasional snowfall. The most visible evidence of temperature increase is the earlier melt out of snow cover and glaciers across the region, which has become more rapid over last one decade. This increasing temperature is responsible for disastrous activities and glacier

recession, which is getting frequent day by day according to the local community. Warming temperatures have led to effects as diverse as altered timing of bird migrations, increased evaporation, and longer growing seasons for wild and domestic plant species. Increased temperatures often lead to a complex mix of effects. Warmer summer temperatures have led to longer forest growing seasons, but have also increased summer drought stress, vulnerable to insect pests.

3.3 Precipitation

In addition, changes in climate, such as reduced snowfall and increased rainfall, are reported across the area by the local community, but solid evidence of the impact is difficult to ascertain. Changes in precipitation level and the size of storms affect plant-available moisture, snowpack and snowmelt, stream flow, flood hazard, and water quality. Rainfall variability and periodicity has changed since last 30 years with the most profound effect since last ten years. High speed and late rains have been observed by the local community which accelerates the crop diseases and infections. It shows that pests are getting adaptable to seasonal shift and variability more than other organisms and contribute to increased economic loss of crops and fruit trees.

According to the local community snow season has also showed significant delay and is getting more delayed year by year in different valleys. Community reported a 60 % decline in the amount of snow fall over the last 10 years is reported. Some community members reported an increase in precipitation, but once confirmed from PMD Gilgit that there is no increase in rainfall in fact, there is increase in extreme event like a cloud burst etc. As a result of this sharp decline in frequency and magnitude of snowfall locals are facing shortage of alpine pasture productivity, which affects negatively both to natural resources sustainability and economy of the valley.

3.4 Drought

The drought is considered as the most damaging and costliest type of natural disaster, especially in mountainous regions where water quality and quantity is regulated solely by the precipitation with a far-reaching economic, environmental and social impact leading to food and water insecurity, reduced agricultural productivity, damage to forests, pastures, wildlife, livestock, fish and food price hikes. However, unlike other valleys, drought is not reported here.

3.5 Flood

Changes in the climate have had an influence on the magnitude and frequency of flooding in rivers in Gilgit-Baltistan. With respect to snow and glacier melt, the magnitude of temperature-changes during the spring and summer are sufficient to have caused a major change in the flood-potential of catchments. Changes in winter temperatures have influenced the amount and altitudinal distribution of snow available for melt in the subsequent season and this has increased the magnitude of the flood by 22% since last 30 years. However, the flood frequency was also reported to be increased by 21% since last 30 years. Since a change in flood pattern is being observed over the last three decades, but over the last half a decade, a sharp increase in both frequency and magnitude of flood is observed.

3.6 Landslides

Floods are the regulating factors of the landslides. With an increase in the temperature and rain intensified, the soil patches lose their compactness. The increased Aeolian movements remove the top layer of soil and rain washes this layer from the mountains and moves it to the nearby rivers and ultimately it becomes the part of the Indus basin.

According to the survey conducted to gather information about the driving factors of climate events by the local community, it is assessed that landslides have increased considerably (28%) since last 30 years. In the discussion with the community, it was reported that nearby mountain to Nagar village had developed cracks and sometimes it starts sliding as well. The local residents demand for an immediate survey by experts to avoid any potential disaster. These landslides wither soil from the mountains, pastures and less vegetated areas and make the land barren. It destroys the infrastructure facilities such as roads, bridge, and sometimes buildings along the edges. Agriculture is the most negatively impacted sectors of land sliding, because the irrigation systems are mostly built along rough mountain ranges and are more prone to landslide. As a result of broken and disconnected irrigation channel community face water shortage sometimes even for months and subsequently decreased agriculture production.

Exhibit 23: Climate change at Nagar Valley in the perspective **of indigenous knowledge**

Factors	Status	Change (days/ %age)	Trends		
			30 yr ago (1985)	**10 yr ago (2006)**	**Future prediction**
Rain	Increase	29	Rain pattern was normal	Frequency increased but magnitude has become abnormal.	Decrease in the frequency of rain is expected
Snow	Decrease	60	Normal with slight decrease	Decreased drastically year by year.	Decreasing trend of snow is expected
Temperature	Increase	14	Increasing	Increasing	Temperature will increase
Summer season duration	Increase	16	Summer was slightly increasing	Increase	Crops reap some 10-15 days earlier then its normal time and this trend is increase, which indicates early start and late end of summer
Winter season duration	Decrease	16	It was slightly decreasing but no considerable change seen	Decrease	Length of winter season is decreasing but magnitude of cold increasing
Glacier recession	Increase	13% recession in glacier observed	No visible change observed	Increase	Based on the indigenous knowledge of locals over last few years most of glaciers have receded or changed their place and this trend will keep increasing in the future as well in response to increasing temperature
Land slides	Increase	28	Normal	Increase	Land sliding in almost all villages are increasing and expected to be increased in the upcoming years

Flood frequency	Increase	21.7	Normal	Increase	The frequency of flood is increasing every year and supposed to be increasing in the future
Flood magnitude	Increase	22	Increasing	Increase	The local people confirmed that magnitude and devastation of flood is becoming powerful which indicates a high increase in the future
Drought	NA	--	--	--	--
GLOF Frequency	NA	--	--	--	--
GLOF Magnitude	NA	--	--	--	--

3.7 Pastures

A regional climate scenario for CKNP valleys shows prolonged growing seasons and shifts in temperature and precipitation as currently happening in the Nagar valley. Despite the better and prolonged growth seasons range lands that serve as pastures and grazing lands are degrading annually. In the alpine and sub alpine areas 13% degradation has been observed. Mid and low land grazing areas have declined 16%. According to community the pastures are drying up; medicinal plants in pastures are decreasing due to less precipitation both in snow and rainfall. This resulting drying up of grasses, less germination, less greenery on mountains which badly affected the availability of fodder for livestock.

It can be assumed that many plant species are migrating vertically for lower temperature increasing the plant diversity of higher alpine regions and growing competition by highly productive species at low lands. The local community reported probable causes for pasture degradation as vertical shifts in plant growth and unsustainable livestock management. On the other hand, warmer temperatures and increased microbial activity are likely to contribute to the loss of carbon from alpine soils. Since a higher amount of carbon is stored in soils than in the aboveground biomass above tree line. This indicates that alpine ecosystems may turn into carbon sources rather than sinks.

Exhibit 24: Impact of climate change on pastures of Nagar Valley

Pastures	Status	Change (days/ %age)	Trend			Adaptation Measures by local community
			30 yr ago (1985)	10 yr ago (2006)	Future prediction	
Alpine and sub-alpine pastures	Degrading	13	Less degraded as compared to present	Degrading	More degradation is expected	Nil
Mid and low land grazing	Degrading	16	Less degraded as compared to present	Degrading	More degradation	Nil

3.8 Biodiversity

3.8.1 Agriculture and Fruits

Climatic factors such as temperature, precipitation, CO_2 concentrations, and water availability directly impacts the health and well-being of fruit trees and agricultural crops. With increased temperature and CO_2, crops such as wheat, maize, barley, buckwheat, fodder etc. and fruit trees are likely to grow more rapidly due to increased photosynthesis. It is also influencing insects, disease, and weeds, which in turn decreases agricultural production as currently happening in Nagar valley. Aided to these additional stresses is offered by variable precipitation and irrigation water. Early and rapid snow melting accompanied by irregular rainfall followed by drought declines the productivity.

Some farmers reported that despite of using high yielding seed varieties and inorganic fertilizers, the average crop productivity is less as compared to past years. Farmers reported rapid increase in weeds and pests during the last 10 years, which shows a positive correlation with the increase in temperature. Thriving chances increases for the pests in warm climates. Disease pressure on crops is continuously at increase with earlier and prolonged summers and warmer winters, which allowed proliferation and higher survival rates of pathogens and parasites. The marketable yield of many commercial crops e.g., Potatoes, walnut, apricot, mulberry, almonds etc. is declined for Nagar valley and become more sensitive to climate change than agriculture crops.

Local farmers observed the productivity and economic decline which shows that they are aware of climate change impacts but at the same time these people have no idea about the climate resistant seed varieties. To keep the tinge of organic farming and pristine local ecosystem the community must be trained about the natural and biological removal of pest and weed species.

3.8.2 Forest

Climate change directly and indirectly affects the growth and productivity of forests. Direct effect embraces the change in atmospheric carbon dioxide due to increased temperature and change in precipitation. The indirect effects account for the complex interactions in forest ecosystems. Climate also affects the frequency and severity of many forest disturbances such as

cutting, removal of fruits etc. Natural forest stands of Nagar valley represents a mix of woody and non woody vegetation. Major floral species are Cheer pine, Junipers, Willow, Sea-buckthorn, Artemisia, Mulberry and medicinal plants include Tumoro, Siah and Phialo.

Juniper and blue pine species are found in Nagar valley, but highly degraded. Over the last few years, the conservation process in the area got swifts progress, the indigenous knowledge shared during FGD sessions reveals that condition of forest has started improving in the valley due to strict conservation practices by local communities. It is pertinent to note that VCCs have considerably followed conservation practices and put on a ban on deforestation of natural forest tree over last five years. As a result, over last five-year status of forest regeneration is on improved.

Since the community itself is effectively dealing with the climate change issues from the platform of the VCCS but still the practices are not enough to scuffle the situation. The VCCs/local committees still facing technical and financial capacity and NGOs working on climate changes related programs or projects in the area can play a vital role to assist the LSO management in filling the gaps.

The local community has reported the following impacts of climate change on the forest:

Rising temperature and Co2 as a consequence of climate change has impacted the local forest ecosystem of Nagar by providing a prolonged growth season which seems to enhance its productivity apparently. But this rising temperature can lead to phonological shifts of the alpine species and they will become locally or regionally extinct since they are unable to shift to higher altitudes. The increased Co2 is becoming useless with increased temperature because of water unavailability throughout the season due to early and rapid melt out of snow and shift in rain season.

The Nullah branching out from glaciers and springs are the major irrigating channels for the agriculture crops and the forest species. With increasing temperatures these channels dry out and cause water stress augmenting the forest degradation in Nagar valley.

Along with this, warmer springs has the chance to extend the range and lifetime of many pests that stress trees and crops and at the same time it decreases the available water quantity throughout the year.

Considering all these facts, it can be concluded that the local community knows about the impact of climate change on the forest but don't know about the mitigation strategies. These strategies are needed to be designed by thorough research and impact. Long term impact of the small-scale forest disturbances which cannot be observed via satellite systems must be assessed and countermeasures should be adopted. With the increasing temperature and drought, it is obvious that some species will not be able to adapt and flourish in the ecosystem so there is a need to assess that how long the present floral species will survive and which species should be planted to continue the forest sustainability. This entire question needs research-based answers and capacity building of the community accordingly to ensure the ecosystem viability.

3.8.3 Wildlife and Associated Biodiversity

The multiple components of climate change are anticipated to affect all the levels of biodiversity, from organism to biome levels. The impact of Climate change is projected to become a progressively more significant threat in the coming decades. In addition to warming temperatures, more frequent extreme weather events and changing patterns of rainfall and drought can be expected to have significant impacts on biodiversity.

In Nagar valley, faunal biodiversity is in good shape, during FGD sessions the participants reported a 36 % increase in Ibex population over the last 30 years that refers to the good conservation initiatives and mainly because of trophy hunting efforts. In either case comprehensive study is required to assess the breeding potential and adaptability of the species in a changing climate.

Considering the birds like wild pigeon, sparrow, Monal pheasant, crows, vultures, eagle, falcons and butterflies have been reported by the local community that these species had been coming a long time ago, but now several of them are not common and experiencing a decline. The community also reported that the arrival of migratory birds decreased and even their arrival time has been changed. The apparent reasons are the absence of a favorable climate for the prey species, decline in seed crops, removal of forests and floral species. No assessment has yet been done, which provides the complete biodiversity information about the Nagar valley. Therefore, it is difficult to prioritize the species for conservation actions and to monitor the effect of climate change on the small and large animals.

Exhibit 25: Impact of climate change on biodiversity of Nagar Valley

Biodiversity	Status	Altitudinal Shift	Trend			Adaptation Measures by local community
			10 yr ago	30 yr ago	Future prediction	
Agriculture crops and fruit trees	Degrading	N/A	Degrading as diseases increase and production is decreasing	No considerable change observed	Irregular water availability due to increased flood, diseases and irregular precipitation patterns will lead to productivity decline.	Nil
Natural Forest	Degrading	Increasing	Increasing	Forest patches were dense and healthy	More degradation is expected	Harvest from plantations and fruit trees residual
Wildlife						
Ibex	Increasing	Increasing	The Ibex population almost depleted	Population was relatively good in number but illegal	Population will be increasing if conservation practices adapted strictly, otherwise	Nil

				poaching proved a disaster	complete depletion is expected. Astor Markhor was existing in the area some decade earlier but now the existence has finished in the area	
Birds	Decreasing	N/A	Bird population is increasing	Population and diversity were good	Declining Natural resource and hunting can cause decrease in birds' population	Nil
Butterflies	Decreasing	--	Diversity of species has declined	Butterflies of several types were common	The trend seems to be decreasing in the future because some of the species are disappearing	Nil
Fishery	N/A					

3.9 Water

Nagar valley community unanimously reported an extreme decline in precipitation level. Snow fall has declined up to 35% and no significant changes in annual rainfall. According to the perception of local community. At present, snowfall happens 2-3 times in winter in the valley; however, mountains do get a considerable amount of snow. Community members also reported reduction in the size of glaciers and increase in the frequency of GLOF events. The altered precipitation pattern has caused the differential availability of water during different seasons. During end summer and winter season water become scarce and leads to unsustainable water management, however, during the start of the summer flood season in the streams increase and irrigation channels and creates water unavailability/scarcity coupled with poor water quality.

3.10 Tourism

Huge domestic tourism in GB over a couple of years has provided income earning opportunities for many remote communities and it is a valuable opportunity for people of Nagar valley to advertise their touristic points and manage proper facilities and services for tourist, which can help them in earning income from tourism.

Lower earnings in winter tourism are reinforcing economic disparities between the dependent communities and compel them to depend upon the natural resources of the area as a mean of their livelihood. Nagar valley is a tourism dependent valley, but lack of tourist and visibility facilities and poor accessibility hampering tourism sector.

CONSERVATION MANAGEMENT ISSUES & PROBLEM OF NAGAR VALLEY

4 MANAGEMENT ISSUES AND PROBLEMS

Present scenario of Nagar valley has reflected several issues in customary practices and adaptation to climate change. These issues directly or indirectly affect the economic situation of each household and increase their dependence on natural resources which are free of cost and in vicinity to the community as compared to market. Therefore, in order to develop an effective strategy for adaptation, it is necessary to develop capacity of local community to adapt to the changes in a way that reduces their dependency on natural resources. These adaptation approaches must then be disseminated to the communities and relevant laws up-gradation. In Nagar valley customary laws are being practiced in all villages, but these laws are unable to sustain and address the suitable practices and continuously generating issues, therefore needs an up-gradation.

4.1 Agriculture

A smaller area of arable land is cultivated in Nagar valley by traditional varieties of fodder, crops, fruit trees and commercial trees. The following issues are being reported by the local community. These issues, although belongs to several sectors, but all are aiding in decline of agriculture production.

1. **Small land pieces for agriculture:** With increasing population and emerging nuclear family system in Nagar valley, arable land fragmentation is taking place and area of land holding per household is shirking year by year.
2. **Irrigation and water rights:** Customary a right about water sharing between villages and among the households is not documented anywhere. This generates confusion and rivalry among the land holders for water needed for irrigation. Situations become worse during the spring and autumn season, which foster the low availability of water in streams.
3. **Low productivity:** Farmers, technical personnel, and interviewee from relevant fields unanimously reported low productivity per unit area. The common issues underlying this fact are small land, thin soil cover due to erosion, increasing pest prevalence over the crops, low fertility, water unavailability, erratic and unpredictable precipitation times, warm temperature, disasters such as landslides, floods and several other. The most important among them is the use of traditional methods and seeds for cultivation.
4. **Weeds and pest:** Organic farming is an important aspect that is valued all over the world for nutrition. Local farmers are lucky enough to manage the crops and fruit production without using pesticides, insecticides and inorganic fertilizers. Animal manure and ash to be used to enrich the soil with minerals. Moreover, water in the streams also provides sufficient quantities of mineral to sustain agriculture practices. Despite of these, farmers are facing difficulties now days due to several insect and flies' pest species which feed on the grains, fruits and other such products. Indigenous people and their knowledge are blaming climate change for increasing pest infection on fresh as well as dry seeds and fruits.

5. **Traditional practices and non-certified seed varieties:** Local farmers rely upon the traditional farming and cultivation methods. Growing crops from farm saved seed is common practice around the world and same in Nagar Valley. Farmers prefer this practice due to several reasons which includes certainty of quality, convenience, timeliness/availability, and cost. They also prefer this practice because farmers don't want to take a risk on their productions. But with the progress of time keeping though cultivar performance remained same, but productivity declined, which demands the practices of modern farming techniques and new seed varieties.
6. **Climate change:** Climate change is exacerbating the challenges faced by the agriculture sector, negatively affecting both crop and livestock systems in Nagar Valley. Climate change induced increases in temperatures, rainfall variation and the frequency and intensity of extreme weather events are adding to pressure on the local agriculture system – which is already struggling to respond to rising pathogenic infections. The changing climate is also contributing to resource problems beyond food security, such as water scarcity, pollution and soil degradation. As resource scarcity and environmental quality problems emerge, so does the urgency of addressing these challenges. The farmers are really feeling helpless against the inconsistent weather even they are thinking to abandon growing maize and wheat, and cultivate cash crops like potato because that are short-duration.

4.2 Pastures

The majority of the pastures in Nagar valley are declining at rapid rates. The pasture sustainability is also facing a lot of pressures from livestock more than carrying capacity, medicinal plant extraction, landslides and floods. The most common factor over the last ten years is an infrequent snow fall, which causes declining growth of natural vegetation in alpine & sub-alpine pastures and rangeland, and largely contributing to declining livestock raring trend in the valley.

1. **Baseline of flora and phenological shift:** There is no documented baseline data or inventory about the floral species of the pastures, their status and use. So it is the need of time to develop such basic dataset which prioritize the species for conservation actions to mitigate the socioeconomic and environmental pressures. It is especially recommended on priority basis to monitor and conserve the floral species and medicinal plants affecting by climate change and showing phenological shifts. Only medicinal plants are explored and listed, but there is no information on the predicted impacts of climate change over these medicinal plants and their adaptations.
2. **Gaps in customary practices:** Livestock grazing is an ecosystem service provided by the pastures. 100% pastures of Nagar valley are showing decline in productivity due to unsustainable livestock grazing practices. There are no established rules about the maximum number of livestock heads in the customary rules. The carrying capacities of these pastures have never been estimated and that's why unsustainable pressures are fueling the degradation. Diseased animals are advised to keep away from the pastures, but their water

points are shared which can induce the infection in whole herds and also there is a chance of disease transmissions.

3. **Grazing timing:** Lasting pastures can be improved only when herders understand plants' recovery needs and practice good grazing land husbandry to maintain plant health. The local community of Nagar reported the problems like weed invasion, less productivity and weakened soil health. All these issues are indicators of impatient grazing by the herders i.e. they start to graze their animals before pastures are fully grown. Herders do so to provide animals with a high-quality diet, but they are unaware that short plant growth reduces the bite size and the nutrient intake. Moreover, it contributes to decline in pasture productivity, which is lose-lose situation only.
4. **Livestock insurance scheme:** Livestock insurance scheme is an incentive equal to the loss for the herders if their livestock gets killed or attacked by the wildlife. The scheme was introduced in Nagar valley, but currently it is non-functional. Though very few livestock kill by predators were reported during the survey and no retaliatory killing reported by the community, but in the absence of insurance scheme retaliatory killing of wildlife is expected.
5. **Lack of zonation:** Pastures are degrading continuously, but the customary laws don't have any hint of abandoning such pasture areas which hastens its decline. It is essential that grazing on pastures in the buffer area of CKNP should be controlled to maintain adequate vegetative cover that reduces erosion and permits adequate regrowth after each grazing period to ensure the health of grazed plants.
6. **Harvest of medicinal plants:** Nagar pastures and forest areas the rich sources of these medicinal herbs. Local community uses them for disease cure. These drugs have anti-pyretic, analgesic, anti-cancerous, anti-diabetic and several other uses. Local community is fully aware of their uses, but they don't have any understanding of the ways of its extraction without damaging the whole herb. Training of the local community for the collection, drying and usage is important.

4.3 Water

Water is the key ingredient and a symbol of life. All the changes in climate pattern are directly and indirectly playing with water quantity. Altered precipitation patterns, warm temperatures and frequent air currents actually disturbed the water quality and quantity both. The local community in Nagar valley depends directly upon the rain and indirectly upon annual snowfall. Due to delayed rain timings and less annual snowfall local community has frequently faced the drought and water shortage due to increasing glacier melting and flood causing blockage of irrigation system. Moreover, torrential rains are now more frequent which on one hand increases water quantity but also cause floods and landslides in disaster prone areas thereby creating socio-ecological stress. Water pollution is increasing due to lack of sanitation /drainage system and animal sheds nearby water channels and drinking water sources. Gray water from the local community is also getting mixed into fresh water and degrading its quality.

1. **Drinking water:** Local community depends on fresh water supplies from glaciers and springs for drinking purposes. Sediments are continuously increasing the water supply due

to weathering of rocks and mixing of soil and grit in the area. High mineral content can induce disease in local communities and their livestock. The water testing facility already established at the Karakoram International University provides the free testing, but local community is not very interested in the procedure due to lack of awareness.

2. **Irrigation deficit:** Local community reported poor structure of irrigation channels or insufficient irrigation channels is the prime reason for irrigation deficit. "Either a lot of water or no water" in the water sources, the communities cannot fully utilize it for irrigation purpose. The communities in the villages have constructed irrigation channels, but with increasing land fragmentation and demand for water those irrigation channels have proven insufficient. The communities cannot construction of more irrigation channels due to lack of financial resources.
3. **Water pollution mitigation:** To ensure the water quality local community should be compelled to make separate pathways for gray water, ensuring that it do not mix into the freshwater streams. Hotel owners should be trained to dump the trash elsewhere instead of water while adopting ecosystem friendly approaches.
4. **Disaster management:** Climate change is deeply reshaping the landscape of disaster risk. Weather extremes such as drought, flood and landslides cause the huge economic depressions in all sectors ranging from transport to land farms. No protocols are developed, yet for the villages in the surrounding of CKNP. It is very necessary to take action because the dependence of poor people on natural resources increases dramatically.

4.4 Forest and NTFP

These sectors are as vulnerable from climate change as any other and therefore, there is a strong need to assess and enhance the adaptive capacity of the forest and biodiversity.

1. **Mortality:** Drought has increased tree mortality and resulted degradation and reduced distribution of the entire forest ecosystem. It increased the wood harvesting opportunity for the local community from Nagar valley for subsistence purposes at the cost of degenerating forest.
2. **Harvest pressure:** Heavy collections of timber and non-timber products from the forests allow the community to fulfill their needs. With the continuously increasing population dependence of local communities is also increasing on these natural resources. Fuel wood harvest of Nagar valley has showed an unsustainable approach. This harvesting is not limited to here only but includes the removal of foliage, branches and plants cutting for livestock forage as well. Unsustainable practices and unguided approaches towards harvesting lead the ecosystem imbalance.
3. **Forest regeneration:** Climate change has shown differential approaches for the propagation dependent upon the species ecology. Warmer temperatures and increased CO_2 increased the rate of photosynthesis and thus growth but increased the pest attack is seriously stressing the forest regeneration.

4.5 Ecotourism

Ecotourism is nature-based tourism that fosters environmental appreciation and awareness. Gilgit-Baltistan which is considered as the hub of eco-tourism incorporates a considerable

number of tourists every year to generate the huge amount of revenues and alternative livelihood opportunities.

The following issues are being reported by the local community.

1 **Tourist accommodation:** Limited accommodation facilities compel the tourists to opt for camping in open areas. This option becomes unsuitable during the adverse weather.
2 **Visitor facilities:** Site maps, information boards, sign board and other facilities are not available for tourists. However, open camping areas are the only option for the tourists stay in the valley due to the lack of hotels.
3 **Climate change:** Climate is a key resource for tourism and the sector is highly sensitive to the impacts of climate change and global warming, many elements of which are already being felt. Climate change is having adverse impacts on the number of tourists, especially for the treks which Nagar valley offers.

4.6 Mining

In and around CKNP in the sedimentary rocks of the mountains, huge reservoirs of gemstones and precious rocks are deposited. Local level mining is being carried out in and around CKNP. Mining area can be identified by having the holes in its mountains just like bee web.

"About 30,000 people associated with the mining sector are carrying out activities inside the Central Karakoram National park territory, adding that the act may result in the loss of habitat for various species" (Express tribune: June 27th, 2012).

This mining provides some of the valleys around CKNP with a good opportunity to earn a livelihood. In Nagar valley, mining opportunities are available, but a small portion of the entire population is associated with it. On the other hand, people associated with mining cannot get maximum benefit out of it due to the following reason!

"Lack of alternative livelihood opportunities for communities and uncontrolled mining in mountains are some of the issues that require attention" (Express tribune: June 27th, 2012).

1. Lack of modern tools and practices: Local miners are not trained for mining. They use iron rods for excavation and mostly end up in the damaging the stones. It leads to loss of revenue not only on a personal level, but also on the regional and ultimately at national level.
2. Lack of training: Local miners have learned the methods of mining by hit and trial approach and succeeded somewhat. Nevertheless, due to lack of training they are unable to extract pure and high-quality rock. They accidently break these gemstones and thus lose the amount of profit.
3. Value addition of gemstones: Gemstones are sold in raw form by the local community to the dealers on low cost due to improper cutting and polishing. Therefore, local miners lose their chance to earn huge revenues and only get a minor share.

4.7 Wildlife and Protected Areas

Institutional structures to manage wildlife and protected areas experience lot of issues due to increasing urbanization, degrading forest and natural areas. The biodiversity of CKNP and its buffer zones has the species, which are of international and national importance. Wildlife plays an important role in both ecosystem sustainability and community economics. Although trophy hunting is a controversial subject, yet it enabled the community to earn millions of dollars since its start and contributed to conservation as well.

1 **Population trends:** The investigation of issues related to wildlife and protected areas normally consider the number of heads of animals irrespective of their health, annul recruitment. The overall trend of two trophy species; i.e. Markhor and Ibex seem to increase in their population according to the relevant government departments but there is no assessment on the reproductive output. There is chance of reproductive deficit in mountain ungulates such as Ibex and other species due to the history of population surge.
2 **Population surge:** During the recent years of conservation, wild species has increased considerably. The sudden increase of small population are often culprits of inbreeding depression, which is most expected in the case of mountain ungulates and birds which are decreasing continuously.
3 **Unidentified species:** GB hosts the diversity of wild fauna and flora most of which are unidentified and even un-discovered yet. The rapid environmental degradation is causing the extermination and extinction of the specialist species. It shows that biodiversity of the species is declining without recognizing their ecological and economic roles.
4 **Habitat degradation and isolation:** In Nagar population is continuously increasing and encroaching into the natural areas for settlements and agriculture. This land use changes affected wildlife both positively and negatively depending upon the species ecology. Habitat degradation has also pushed the species to isolated and low-quality habitats that caused additive stress on the wildlife heath, reproductive potential and genetic health and so on. There is no assessment of the impact of habitat degradation on the genetic health of wildlife species.
5 **Genetic reserves of wildlife species:** Most wildlife surveys are based on the numerical assessment of the animals and do not account for their genetic viability. Designated areas such as national parks and sanctuaries are notified irrespective of the idea that particular area is either genetic bank of the particular species or not. Genetic reserves of forests and wild species are not identified and protected yet.

PROPOSED MANAGEMENT INTERVENTION FOR NAGAR VALLEY

5 PROPOSED MANAGEMENT INTERVENTIONS

5.1 Agriculture

In particular, there are different adaptation options in agriculture, according to the involvement of different agents (producers, industries, governments); the intent, timing and duration of employment of the adaptation; the form and type of the adaptive measure; and the relationship to processes already in place to cope with risks associated with climate stresses finally the development of provincial climate change policy.

The adaptation options required for the local community need four tiers. (i) Technological developments, (ii) government programs and insurance (iii) farm production practices, and (iv) farm financial management.

1 **Population expansions:** Similar to other areas of GB, with increasing population construction are rapidly increasing and mostly houses, cattle shed and other required constructions are being built around the settlement and agriculture area, which is continuously shrinking arable land. To avoid this issue new settlement must be built on barren or abandoned parts of the land. This will keep the arable land available for cultivation.

2 **Certified seed varieties and crop insurance:** Certified seed is the only input that can get farmer more than just higher yields. Such varieties are resistant to climate related and pesticide issues. To introduce the concept and usage of certified seed varieties, relevant stakeholders must provide them on subsidized rates and premium insurance packages. Along with this one-time training of farmers of each village around CKNP is recommended to increase the agricultural production per unit area.

3 **Integrated farming and agriculture products:** Farmers are traditionally inclined to mono-cropping systems and earn the revenues from raw products. In Nagar valley the farmers do not sale both fresh and dried fruits due lack of awareness of post harvesting techniques, processing techniques and proper storage facilities. The little economic innovation lies in the sale of potato only, while million rupees worth of fruit is being wasted annually due to lack of awareness, and skill for value addition and facilities for storage. Many end-users require specifically processed products such as Marmalades, Jams, Vinegar and Honey. Farmers need guidance on the value addition of products in order to be economically stable.

4 **Soil analysis:** It was unanimously reported by all the communities that land they are cultivating is never tested in the laboratory and scientifically they don't know which crop and fruit varieties are best for their soil type. Each crop is sensitive to soil type and productivity heavily depends upon the suitable soil. Practically there is requirement of soil testing facility within each agriculture information cell. This facility will provide information about several structures, especially addressing the common question of farmers

such as suitable seed varieties, microbiota of soil and its capacity of crop growth and several others.

5 **Secure water availability:** Water is central to agricultural productivity. Adaptation of climate-smart inputs and shifting to more efficient irrigation methods will help local farmers maintain productivity levels. Water tanks for the storage purpose of agriculture are required to reduce the drought effects at some village.

6 **Training on climate friendly agriculture practices:** Farmers should be trained with the emphasis on target ingenuities such as outcome-based farmer incentives and knowledge transfer systems – that enhance farmer capacity to achieve sustainable productivity growth through mitigating and adaptive practices keeping the pace with climate change. These climate friendly and climate proof practices particular to each valley must be incorporated into the operational plan. As there are no previously approved practices so they are needed to be designed by methodically modelling the practices with climate change models.

7 **Introduction of climate resistant seed varieties:** Farm decision-making is seen as an on-going process, whereby producers/farmers are continually making short-term and long-term decisions to manage risks emanating from a variety of climatic and non-climatic sources. In this sense, adaptation is the result of individual decisions influenced by forces internal to the farm household (i.e. Risk of income loss, environmental perception) will become reasonable and let them earn revenue to decrease the pressure of the local community on natural resources. To resist or at least minimize the pressure of ever-changing climate patterns and issues in relation to climate change, there is a need to develop an agriculture information cell for the farmers in each village. This information cell will raise the job opportunities for local community and will guide them about the climate resistant breeds, ways of cultivation, harvesting in detail. This information cell must have the tested varieties of climate resistant seeds and seedlings. Seed storage for potato in the harsh climatic condition is a challenge in the CKNP area, therefore input store for seed must be provided at least among every three villages.

8 **Spread of infestation to the wildlife:** Buffer area of CKNP harbor 230 villages. All of these villages have agriculture crops and trees which are getting infected manifolds since last decade. These pest species have the chance of transmission towards the wild medicinal herbs, forests, nests of birds and ultimately enter in fauna. This pathogenic transmission can induce infections in the flora and fauna and has a considerable potential to depress the specialist species. However, this issue has not yet been explored and needs a well-prepared monitoring procedure to estimate the estimate the annual economic laws.

9 **Research projects:** Without research, adaptation to climate change are generally problematic for agricultural production and for agricultural economies and communities; but with adaptation, vulnerability can be reduced and there are numerous opportunities to be realized. Adaptation must be supported by the research of relevant components. Productivity is declining at a rapid pace due to some known and unknown reasons.

Apparently, climate change seems responsible for this decline aided by ever increasing pest attacks during the last 10 years. The recent changes in the climate are so unpredictable that it is becoming impossible for the farmers to work in agriculture farms for profit. Customary practices for agriculture, sustainable are losing their functionality. These practices must be updated by designating specific studies of seed variety, soil analysis, crop suitability analysis, bio-control of pests, the projected impact of climate change on the crop's productivity and transport, optimum economic benefits from every suitable crop and several other interrelated components. As it is evident that the impacts of climate change on agriculture will vary depending on precipitation changes, soil conditions, and land use, therefore these impacts are required to be evaluated independently for each valley in the buffer zone of CKNP. This vast research is possible if included in the operational plan of the CKNP to provide support for an updated management plan of CKNP.

10 **Key policy reforms:** Key policy reforms across three pillars are needed to strengthen farmer incentives to achieve productivity growth sustainable, and without sacrificing climate change mitigation and adaptation objectives. These three pillars are i) Farmer level, ii) Agriculture sector level, iii) Provincial level. The agriculture policy needs an up gradation to mitigate the effects of changing climate and devising the climate friendly strategies at an urgency to minimize the agriculture induced impacts on climate ultimately to protect the protected areas of GB, particularly its largest park the CKNP. The management plan which is already established has a huge gap about the laws of employing climate friendly approaches in villages residing in buffer areas for agriculture. Moreover, the climate is not only changing, but it is also a stationary which means old knowledge can't be the thing to rely upon. So, a gap of climate friendly approaches must be assessed via operation plan for CKNP and then addressed in the revised version of the CKNP management plan.

5.2 Pastures

Upgradation of customary laws: Customary practices should be amended in such a way that ensures the sustainable use of pastures. Diseased animals must be kept away from the pastures to avoid the zoonosis and must be vaccinated. Extraction/cultivation of medicinal plants by the local community must account only for household purpose and should be cultivated in the amount equal to its removal. Encourage stall feeding/minimize grazing till the improvement of pastures. These strategies must be field tested and then included in the customary and statutory laws and CKNP revised management plan.

1 **Grazing management:** To enhance pasture productivity timing of grazing and grazing sites in each pasture are need to be designated to develop holistic grazing strategies with farmers/herders that include rotational grazing or intensively managed grazing as a regular grazing routine.

2 **Fodder cultivation:** Regionally adapted and high nutrition value fodder crops should be cultivated for fodder instead of traditional species. This will remove the stress of early grazing from the pastures and allow them to grow.

3 **Training of herders:** Herders have no information about the sustainable practices of livestock grazing. They just sent their livestock with guards to feed upon the pastures. Timing of grazing is integral for livestock. There are several other factors that need to be cared for the sustainable livestock grazing.

4 **Seeding of local flora and training of farmers:** Local flora should be collected and cultivated in the barren patches among the pastures. This will increase the pasture areas and productivity. Research on cultivating these species is required. After its dissemination of knowledge through training sessions, manuals and brochures will convince the farmers about the re-seeding of pastures.

5 **Local botanical garden to ensure the existence of local flora:** Adaptable plants should be identified among the plants. These plants should be kept in the botanical gardens to provide backup in case of avalanches, landslides, floods and barren land cultivations.

6 **Encourage the pasture extension services by other line departments:** Many forestry and livestock enterprises run by private farmers and the government depend on efficient, economical, and environmentally beneficial pasture use. Farmers need technically competent advisors to help them accomplish their objectives. Unfortunately, no advisory services for the pastures exist in the villages because of lack of pasture specialist technical advisor. Therefore, there is a strong need to train the forest relevant personnel from each village or valley as a pasture specialist. CKNP biodiversity directorate staff can be a potential candidate for this training as they are both aware of natural resource use in and around CKNP.

7 **Cultivation and marketing of medicinal herbs:** Cultivation of these herbs should be promoted as an alternative economic resource with appropriate site assessment and training on its cultivation, harvesting, marketing and utilization. Economic uplift of the community will actually decrease their dependence on CKNP resources and allow them to grow.

8 **Ethno-botanical database:** Development of consumer linked ethno-botanical databases of each village will not only enhance the market for the local farmer but also fosters the direct link to the consumer.

9 **Pasture awareness programs:** Hands-on training and field experience are two of the best, most rapid ways to increase farmer's/shepherd's awareness and local university students about the optimum pasture use of healthy livestock. Final outcomes will be better when this training is guided by technically competent professionals who can accurately answer questions and help solve problems. This training will allow the local community to employ sustainable practices and secure these resources for their future generations.

10 **Research problems:** Phenological shift of floral species and their impact on biodiversity must be assessed on a priority basis so that extirpations can be avoided. The ecological baseline of the pastures to keep the biodiversity of the area must be developed. Similarly, potential farming sites for each medicinal plant should be identified. The predicted impacts of climate change on the pasture productivity are not known and need to be evaluated due

to their high valued ecosystem services. Most utilizable and ecologically resilient entry points are needed to be identified and designated.

5.3 Water

People living in CKNP buffer zone afflict with different kinds of water, contagious diseases because of the scarce access to clean drinking water. Even though glacier water is present in many areas, however easy access to clean water is very difficult for most of the population.

1 **Quality of drinking water:** The water testing facility already established at the Karakoram International University provides the free testing, but local community is not very interested in the procedure due to lack of awareness.
2 **Construction of small and medium sized reservoirs**: Construction of small or medium-sized reservoirs in the foothills and plains are quite necessary, so that water from streams can be harvested for use during the dry season and the winter, both for farming and domestic purposes.
3 **Common drinking water storage tank:** Shared water storage tanks should be built upon among the households to help them adapting drought conditions.
4 **Water pollution mitigation:** To ensure the water quality local community should be compelled to make separate pathways for gray water, ensuring that it do not mix into the freshwater streams. Hotel owners should be trained to dump the trash elsewhere instead of water while adopting ecosystem friendly approaches.
5 **Early warning system:** But to give relief to the local community of Nagar valley, there must be system to give them timely alerts about their crops and livestock protection. This will accentuate the economic resilience of the community and natural resilience of the buffer area.

5.4 Forest

1 **Up gradation and regulation of Forest laws:** Customary laws allow the fuel wood collection, timber and non-timber forest products unlike statutory laws, which increase their favor towards the customary laws. These customary laws don't address the conservation needs and allow harvesting at an unknown level. If this practice is continued, then the community will shortly run out of their forest reserves. To ensure sustainability, an up-gradation of customary rules is recommended. Otherwise, implementation of statutory laws is integral.
2 **Promotion of farm forestry:** Local farmers should be trained to have small-scale farm forests, which, along with revenue generation allow them to be independent of forests. This practice exists in a valley but very limited. The training will allow the farmers to take self-initiatives and entrepreneurship in the forestry sector.
3 **Climate change and conservation friendly forestry projects:** To generate credible forestry and conservation offsets, projects must be additional to what would have occurred without the incentive supplied by the carbon market; they must be verifiable (i.e., measurable and enforceable); they must control or adjust for leakage; and they must address the issue of permanence. Forward crediting is proposed by some to accommodate the long

period of carbon accumulation in forests, but others are concerned about assuring payments only for actual carbon sequestration.

4 **Restoration cum conservation:** Several sustainability practices are being carried out in Nagar but any of them hardly meet the conservation targets. Keeping in view the present environment sustainability changes, restoration is required along with conservation. Therefore, the upcoming forestry projects must come up with the forward crediting instead of required credits.

5 **Research projects:** Projected annual greenhouse gas emission counts provide a baseline to identify required Co_2 sequestration offset. On the basis of this, it will be identified that which species is required and on how much amount to keep the climate stable for each valley in the buffer zone of CKNP and its surrounding areas. Remote sensing to monitor the land use changes is very essential because of the location of valley around CKNP. In future due to CPEC, land use is expected to be altered and its environmental consequences seem negative. To neutralize these expected issues, baseline data about land use will quantify the environmental impacts and truly determine the required type of actions with high accuracy.

5.5 Eco-tourism

Following interventions are recommended on the basis of the survey conducted for VCSDPs development.

1 **Interpretation of resources:** In order to increase the revenues by tourism there is a need to provide interpretive programs that are relevant to the public, further information is required. This information can be obtained through visitor surveys.

2 **Destination vulnerability hotspots:** The integrated effects of climate change will have far-reaching consequences for tourism businesses and destinations. Importantly, climate change will generate both negative and positive impacts in the tourism sector and these impacts will vary substantially by market segment and geographic region. There are disaster prone areas in and around CKNP which are not mapped and disseminated to the tour operators. This inventory should be developed along with measured risks and challenges that tourist can face.

3 **Infrastructure:** Surge in tourist flow has been reported recently, but related infrastructure such as accommodation, ecotourism facilities, are very short and needed to be developed to ensure the provision of facilities for tourist influx by public and private department.

5.6 Mining

Following interventions are recommended on the basis of the survey conducted for VCSDPs development.

1 **Training of miners:** It is important for the miners to have hands on training on modern tools and techniques for quality mining. It is especially important for the valleys, which lie near mining deposits of Gemstones and other minerals.

4 **Entrepreneurship opportunities:** Small-scale business related to gemstones and its products will provide the local community an opportunity to earn good profit.

5.7 Wildlife and Protected Areas

1 **Population assessment:** Database should be established to keep the systematic annual population assessment of all the near threatened and endangered animals. The protocols for population assessment of each species should be determined on ecological basis and kept same every year.

2 **Wildlife health: There** is some baseline data about the health of animals. Nevertheless, all such studies are either short term or based on only few components. Moreover, the genetic health of the species has never been accounted which can be the culminating factor in the reproduction of the animals in addition to other stresses.

3 **Species recovery plan:** There is a growing consensus that habitat fragmentation has caused wildlife decline. However, what is the impact of this fragmentation is still unknown. There is a need to study to study how the urban, habitat isolation, decline in vegetation has stressed the wildlife. How these impacts can be mitigated, which habitat areas need priority conservation actions such as habitat connectivity? All this information is possible from the properly designed studies unique to each class of wildlife based on which species recovery plan will be designed.

4 **Genetic reserves:** Genetic reserves inside the protected areas of the threatened and endangered species are needed to be identified for their restoration. If the designated protected areas do not have by chance these genetically healthy populations, then their boundaries should be adjusted according to these reserves.

5 **Climate change indicators:** Several fungi and amphibian species are considered as an indicator of climate change. These species are experiencing decline in the population such as Deosai toad, which was once abundant in clean waters of the area. This species is now hard to find because of water pollution. These indicators are needed to be identified and used as climate change detection for the areas. This research will provide the real assessment unlike models, which sometimes fails to give real estimate.

6 STATUARY VS CUSTOMARY PRACTICES IN NAGAR VALLEY

S. No.	Consumptive Uses of Park Resources.	Community Practices	CKNP MP/OP Rules	Recommendation
1.	Harvest of Forest and other natural vegetation	Juniper trees are cut and used as fuel wood and timber	Harvest of Juniper is banned; if harvest is necessary than only only branches should be removed instead of whole tree	Awareness of community is required
		Riparian vegetation e.g. Sea-buckthorn and Willows, community usually remove the whole plant/tree from soil	Cut single basal shoots from each plant to preserve in its root system. By doing so, new shoots can re-grow rapidly producing new biomass to be harvested	-do-
		Community harvests wood at unsustainable level both from buffer and core zone	Wood and shrub collection is allowed only in the buffer zone up to sustainable level	Afforestation, alternative fuel options and sustainable forest management areas are need to be designated. Along with this harvest rate compatible to annual growth of forest should be determined
2.	Medicinal Plants	Community harvests local medicinal herbs and aromatic plants from park for household purpose	Harvest is completely banned in core zone and allowed at sustainable level from buffer areas under license.	Community must be awarded the license and concerned department restrict the harvest without license.
3.	Livestock Grazing	Herd grazing is allowed only in buffer zone and tourism focused zones of the park.	Community graze their livestock in packs along with dogs inside core zone. Dogs and packs are not allowed inside parks	Improvement in watch and ward mechanism along with community awareness is necessary at urgency
		Equines (horses, mules, donkey) occasionally found in core zone of the park	Equines are allowed only in tourism focused zone	--
		Yaks and its hybrids freely graze in the park	Grazing of traditional free roaming yaks and yak-cow breeds is buffer and core zone is acceptable	--
		Herders graze livestock in pasture and core zones dispose plastic bags, bottles in nearby	Use of plastic bottles, glass bottles, plastic bags and match box is not allowed inside parks.	Movement must be restricted for the grazers.

		streams and also use burn wood from forest		
4.	Pastures	Community graze livestock in the pastures which are located in and around buffer zones.	Grazing is allowed only in buffer zone	--
		Indigenous system of grazing was sustainable. During previous times herders ensured to take livestock into the pastures, when vegetation becomes knee-length. Currently, herders have abandoned this practice and take their livestock to pastures even before its sprouting.	Indigenous grazing system should be revived	Awareness and training of herders is important
5.	Wildlife hunting	Community take advantage of inaccurate population counts of wildlife and poach/ hunt wildlife at family gatherings, holy occasions and on other such events	Reliable wildlife count by DNA analysis is recommended and also to track poaching for core zone management. Hunting except for "trophy hunting" is banned both for buffer zone and core zone.	Community awareness can serve the purpose. Moreover, genetic approach should be employed for accurate population counts and tracking of poaching

7 RECOMMENDED ACTION PLAN FOR NAGAR VALLEY

S. No.	Sector	Management Objectives	Conservation/ Development Issues/Gaps	Root Cause(s)	Proposed Management Action	Ref. to MP/OP	Village/s	Priority	Time Scale (Short, Medium, Long term)
1.	CKNP Directorate	1.1. Improve CKNP functionality	Lack of enough support of local community for CKNP	Conflicts over the use of park resources	1.1.1 Manage the conflicting issues ensuring park conservation	Suggested for inclusion in revised MP/OP activities	All	Urgent	Short term
				Community awareness is insufficient due to deprivation meetings, and awareness campaigns by CKNP Directorate	1.1.2. Awareness campaigns /training of local community about the significance, rules and regulations of the park and sustainable use of natural resources.	Suggested for inclusion in revised MP/OP activities	All	Urgent	Short term
2.	Local Social Organizations	2.1. Develop Structural/ Institutional framework of social organizations	Insufficient support of LSO to CKNP directorate	Weak communication linkages Lack of effective conflict management mechanisms	2.1.1. Develop appropriate networking for existing social organizations under the umbrella of concerned LSO/CKNP	Suggested for inclusion in revised MP/OP activities	All	Urgent	Short term
		2.2. Develop capacity for Financial sustainability of	Poor implementation of conservation interventions implementations	Lack of awareness about sustainability avenues	2.2.1. Preview the existing capacity of relevant LSOs for the identification of gaps	Suggested for inclusion in revised MP/OP activities	All	Urgent	Short term

		local social originations	and subsequent sustainability		2.2.2. Capacity building of Social organizations to ensure conservation of park resources and sustainable resource used	Activity 5.2.1	All	Urgent	Short term
					2.2.3. Capacity building of LSO to generate funding for their sustainability	Suggested for inclusion in revised MP/OP activities	All	Urgent	Short term
3.	Health	3.1. Promote health facilities	Prevalence of Diseases	Lack of basic health facilities in existing dispensaries Lack of sufficient dispensaries	3.1.1. Capacity building of existing staff 3.1.2. Provision of Medicines 3.1.3. Provision of new diagnosis equipment	Suggested for inclusion in community developmen t plans	Nagar proper Nagar proper Nagar proper	Urgent Urgent Urgent	Long term Short term Medium term
			Lack of access community health facilities		1. 2. 3. 3.1. 3.1.4. Establishmen t of new dispensaries	-do-	Hakuchar, Miachar	Urgent	Long term
			Unhygienic practices by locals		3.1.5. Awareness conferences about hygienic practices 3.1.6. Dissemination of brochures and pamphlets to educate community about prevention from sporadic	-do-	All	Urgent	Short term
						Suggested for inclusion in revised MP/OP activities	All	Urgent	Short term

					diseases Promotion of healthy and hygienic practices by women and children through workshops, campaign and social organizations	Suggested for inclusion in revised MP/OP activities			
4.	Energy	4.1. To meet energy demand	Depletion of natural resources	Preference of fuel wood from forest by the local community due to free commodity Lack of alternative fuel options	4.1.1. Promotion of fuel-efficient stoves at high altitudes 4.1.2. Develop and Motivate usage of alternative sources	Activity 14.2.1.	All	Urgent	Short term
5.	Education	5.1. Curb illetracy	Prevalence of unsustainable practices	Lack of needful development infrastructure and human resource	5.1.1. Increase the capacity of existing schools	Suggested for inclusion in revised MP/OP activities	All	Medium	Long term
					5.1.2. Creation of new educational facilities	Suggested for inclusion in community developmen t plans	Miachar, Phekar	Medium	Long term
			Poor acceptability of messages/solutio n of conservation	Lack of awareness	5.1.3. Awareness of school staff and children about sustainable use of resources, respect of statutory laws and changing climate scenarios	Suggested for inclusion in community developmen t plans	All	Urgent	Short term
6.	Agriculture	6.1. Lack of sufficient food and	Out-migration Malnutrition and related disease	Lack of financial and technical	6.1.1. Introduction of Improved seed varieties for agriculture and other	Suggested for inclusion in revised	All	Medium	Medium term

		future food security		capacity to enhance agri-productivity	related crops adaptable to local climatic conditions 6.1.2. Capacity building of farmers about modern techniques to enhance productivity.	MP/OP activities Activity No. 17.1.	All	Medium	Medium term
				Water Scarcity	6.1.3. Construction and repair of water channels and for barren lands	Suggested for inclusion in revised MP/OP activities	All	High	Medium Term
				Pests and diseases	6.1.4. Integrated pest management techniques	Suggested for inclusion in revised MP/OP activities	All	High	Medium Term
				Improper crop storage	6.1.5. Promotion of small-scale solar driers	Suggested for inclusion in revised MP/OP activities	All	Medium	Medium Term
				Lack of jobs and economic opportunities in agriculture and related crops	6.1.6. Improvement of existing economic opportunities 6.1.7. Creation of new job to enhance economic capacity of the local community 6.1.8. Provision and Installation of fruit processing unit	Suggested for inclusion in revised MP/OP activities -do- -do-	All All Askurdas, Proper Nagar	Medium Medium Urgent	Medium Term Medium Term Long term
				Less arable land per household	6.1.9. Development of barren land patches	Suggested for inclusion	All	Medium	Medium Term

						in revised MP/OP activities			
7.	Livestock	7.1. To enhance income opportunities for locals from livestock	Livestock mortality due to diseases	Disease spread Poor breeds with lesser dairy productivity Lack of proper grazing management regeneration with lesser productivity	7.1.1. Improvement of existing vet facilities	Suggested for inclusion in community development planning	Phakar and Hakuchar	Medium	Medium Term
					7.1.2. Establishment of new vet facilities	Suggested for inclusion in revised MP/OP activities	Miachar and Phekar	Medium	Medium Term
			Depredation of livestock by wildlife		7.1.3. Livestock insurance scheme	Activity No. 9.4.2	All	Medium	Medium Term
			Poor breeds with lesser productivity		7.1.4. Training regarding animal husbandry	Suggested for inclusion in revised MP/OP activities	All	Medium	Medium Term
			Disease out break		7.1.5. Training of herders to restrict zoonosis	Suggested for inclusion in revised MP/OP activities	All	Urgent	Medium Term
8.	Pastures and Rangelands	7. 8. 8.1. To maintain	Loss of floral diversity Loss of pollinators	Water scarcity	8.1.1. New snow fed channels for pastures irrigation	Suggested for inclusion in revised MP/OP activities	Nagar Proper, Askhordas , Miacher	Urgent	Short term

		ecologically healthy ecosystem	Over grazing Degraded pastures resulting in loss of food for Wildlife	Uncontrolled number of livestock Insufficient growth time for pastures	8.1.2. Promotion of supplementation with stall feeding	Suggested for inclusion in revised MP/OP activities	All	High	Medium
				Poor and dangerous accessibility to pastures	8.1.3. Promotion of fodder cultivation on suitable land patches	-do-	All	Moderate	Medium term
					8.1.4. Awareness of herders/professional shepherd about sustainable herding practices	-do	All	High	Short term
					8.1.5. Revive the use of indigenous grazing system	-do-	All	Urgent	Short term
			Unknown Carrying capacity	Lack of Research studies	8.1.6. Research studies about the carrying capacity and adaptability of Pasture to climate change	Activity No. 9.2.	All	Urgent	Long Term
					8.1.7. Establishment of enclosure to measure productivity with surrounding pastures	-do-	One healthy/least degraded pature in whole valley	Urgent	Long Term

9.	Forest	9.1. To maintain appropriate forest cover	Run-off and landslides Less biodiversity Less fuel wood availability for local community	Lack of alternative fuel resources Lack of capacity to use fuel resources Lack of awareness on values and function of forests	9.1.1. Enhance productivity through Reforestation and afforestation 9.1.2. Promotion of farm forestry 9.1.3. Develop restricted forest zones to ensure regeneration and a total ban on Juniper harvest 9.1.4. Training of farmers for farm forestry 9.1.5. Up gradation and regulation of customary practices 9.1.6. Improved Watch & ward (Capacity building and induction of more game watchers or community guards) to minimize illegal harvest	Suggested for inclusion in revised MP/OP activities -do- -do- -do- -do- Activity No. 9.1 -do-	All All All All All All	Urgent -do- -do- -do- -do -do-	Long Term Long Term Long Term Long Term Long Term Long Term
10.	Wildlife	10.1. To improve and maintain healthy wildlife population	Unsustainable hunting Habitat degradation Diseases from livestock	Habitat fragmentation and degradation Poaching Lack of awareness	1.1. Dedicated zones for wildlife, restrict grazing in those areas	Suggested for inclusion in revised MP/OP activities -do-	All All	High High	Long term

			resulting in un-natural mortality	about significance of biodiversity of area Lack of eco-tourism opportunities	10.1.2. Improve habitat connectivity in existing fragmented habitats 10.1.3. Habitat modelling for near threatened wildlife species 10.1.4. Identification of healthy population of endangered species reintroduction 10.1.5. Establishment of water point 10.1.6. Improve watch and ward mechanism with inclusion of local SOs 10.1.7. Awareness raising through seminars, and wildlife clubs in schools 10.1.8. Dedicated research projects	-do- -do- -do- Activity No. 6.1. -do- -do-	All All All All All	High High High High Moderate	Long term Medium term Medium term Short term Long term Medium term Long term
11.	Tourism	11.1. Promotion of tourism as a sustainable economic avenue	Loss of economic opportunities Loss of support for conservation and development opportunities	Poor structure of road Insufficient facilities of road and stay Lack of interpretation	11.1.1. Maintenance of road throughout the touristic season 11.1.2. Development and dissemination of	Suggested for inclusion in revised MP/OP activities -do-	All Nagar, Minapin	High High	Short term Short term

				of resources i.e. Hot springs Lack of mechanism to attract tourist/visitor	brochures for interpretation of tourist opportunities 11.1.3. Water supply, waste disposal and improvement in washroom condition 11.1.4. Community based residence and restaurants 11.1.5. Establishment of bath rooms and rest area	-do- -do- -do-	All All All	Urgent Medium Medium	Medium term Medium term Medium term
12.	Water	12.1. To maintain quality and quantity of water	Pollution Water shortage at source and point of end-user	Climate change Waste disposal into water channels	12.1.1. Water quality testing from all water channels 12.1.2. Awareness of local community with focus to keep water resources clean and its minimal usage	Suggested for inclusion in revised MP/OP activities	All	High	Long term
13.	Gem stone Mining	13.1. 11.1. To aware the local miners with true practices and value of mining with ultimate aim to increase livelihood	Low economic revenues from mining products	Lack of training Lack of Contemporary practices and tools Lack of Value addition service units	13.1.1. Training sessions for local miners under framework of local organization established. 13.1.2. Enhance the direct linkages between local miners and market 13.1.3. Establishment of local service units for gem cutting and polishing	Suggested for inclusion in revised MP/OP activities -do- -do-	All All All	Medium Medium Medium	Short term Short Term Long Term

8 IMPLEMENTATION AND MONITORING MECHANISM

8.1 Implementation Mechanism

The whole process needs to be facilitated by Conservator- Gilgit in collaboration with CKNP Directorate and NGOs such as AKRSP, AKPBS, EvK2CNR, WWF etc. Following steps are important in this regard:

The first step should be the restructuring of the community organizations in the form of Community-based conservation and sustainable development organization's (CBCSDOs). Agreements should be signed with CBCSDOs for their proactive participation in conservation and sustainable use of natural resources. The local communities are now well mobilized in support of CKNP and the restructuring should not be a problem.

The second step is participatory conservation planning in which the draft CSDP should be shared with the respective communities (involving VCCs, UC members, President of VOs and WOs (where possible)): line departments at district level (Agriculture, LS&DD, Forest, Wildlife and Park, Tourism) and concerned NGOs such as AKRSP, AKPBS, EvK2CNR) to solicit their technical opinion and possible support during implementation of the plan.

The third step is approval of VCSDP from DCC Nagar, and facilitation of subsequent DCC meetings to facilitate and monitor implementation on VCSDP.

There are two cross-cutting themes. First is capacity-building involving awareness raising, trainings and exchange programmes. The second is financial sustainability which comes from various sources, primarily from government allocations and subsequently at community level from various sustainable use initiatives such as trophy hunting, ecotourism, CKNP entry fee etc. Community based organizations can also initiate small projects for that the capacity of the CBCSDOs can be enhanced so to conceive, develop, hunt and implement small initiative on their own. However, this kind of the implementation will be done in consultation with the CKNP directorate to avoid any duplication in the activities.

8.2 Monitoring Mechanism

8.2.1 CKNP Directorate

The major responsibility of monitoring all action of a CBCSDO carried out under the framework of VCSDP should be jointly with DFO Nagar and CKNP Directorate. The DFO Nagar and CKNP Directorate can monitor their progress in the following steps:

- Visiting individual CBCSDOs and checking their records and verifying physical progress on activities
- Attending dcc meetings and reviewing progress of CBCSDOs annual plans
- Monitoring CBCDSOs performance against their annual plans in the meetings of the CKNP management committee
- CKNP can call in meetings of the representatives CBCSDOS at the directorate on a periodic or need basis to review the progress against the tasks

8.2.2 District Conservation Committee Meetings

The VCSDP should be presented in DCC Nagar and endorsed by the chairman of DCC with recommendations from CKNP Director and DFO Nagar. The DCC Nagar in its bi-annual meeting should review the progress of implementation on VCSDP. Each village should have an annual plan to be presented and subsequently reviewed in DCC.

8.2.3 Community Agreements

DFO Nagar, CKNP Directorate or any supporting agency intending to initiate any activity with a CBCSDO should sign a letter of agreement explaining the roles and responsibilities of all parties involved in undertaking the activity. A copy of such an agreement should be made available in CBCSDOs office records.

8.2.4 CBCSDOs Audit and Record Keeping

DFO Nagar, CKNP Directorate or any supporting organizations should emphasize on proper record keeping of all activities undertaken by CBCSDOs. This can be done by checking monthly minutes' sheet, proceedings of the special meetings and financial records of CBCSDOs. It should be mandatory for every CBCSDO to have their annual audit report. Any financial support to a CBCSDO should be linked to availability of annual audit report. The community must have a separate file for all major activities to be undertaken as part of the VCSDP.

For all major initiatives the CBCSDO should constitute two committees: a) project execution committee and b) project audit committee. Most of the local communities are familiar of this system due to the projects of several organizations.

8.2.5 CBCSDO Visitor Diary

CBCSDO should maintain a visitor diary for noting comments, feedback and observations of all visitors coming to a village in connection with conservation and sustainable development initiatives. The CKNP Directorate, DFO Nagar and supporting agencies or organizations should clearly instruct their employees visiting any village/ valley to write down their notes in CBCSDO visitor diary. This way the supporting agencies can avoid duplicate of efforts and it will be helpful in carrying out the activities systematically and logically.

8.2.6 Relevance in Assignments

The CBCSDOs should find the relevant person for carrying out tasks including the finance and record keep, meeting minutes etc. The relevant persons will thus be able to keep a proper record that is a prerequisite for the sustainability of the community organizations. Channels should be found out, wherever possible for the capacity building of the technical persons closely coordinating with the government and private organizations.

8.2.7 Network of CBCSDOs

In order to learn from each other's best practices, it is worthwhile to develop a network of CBCSDOs. They may opt to meet led by some representatives facilitated by CKNP to discuss the successes and failures. The learning can be shared that can help in avoiding failures, adopting models that lead to successes considering the relevancy.

Visitors Diary

Name of CBCSDO.....

Name of Visitor .....

Organization/institution .....

Date of visit .....

Purpose of visit .....

Venue of meeting .....

Meeting participants.....

Key discussions or decision points

.....
.....
.....
.....
.....
.....

Required follow up actions

.....
.....
.....
.....
.....

Signature of the visitor.....

CONSERVATION AND SUSTAINABLE DEVELOPMENT PLAN 2016-2026

GHULMAT VALLEY

CENTRAL KARAKORAM NATIONAL PARK

GILGIT-BALTISTAN

Citation: Naureen Mustafa, Muhammad Aurang Zaib, Ghulam Musa Shimshali, Ashiq Ahmad Khan, Maurizio Gallo, Arif Hussain, Riaz Ul Hassan, Elisa Vuillermoz, Luca Listo, Muhammad Raza, Nadeem Nazar, Yasir Abbas, Aman Ullah Khan, Ruby Pyara, Raja Abid and Yasir Abbas Rizvi. (2016). Conservation and Sustainable Development Plan for Ghulmat valley of CKNP. Ev-K2-CNR Pakistan.

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PLAN EDORSEMENT

Signed by President LSO Ghulmat .....

Endorsed Director CKNP .....

Approved by Deputy Commissioner/ .....

Chairman District Conservation Committee

For Nagar in ..... meeting

Held .....

Dated.....

CONTENTS

LIST OF EXHIBITS

Abbreviations

°C	**Celsius**
ABG	Annual Biomass Growth
CAI	Current Annual Growth
CKNP	Central Karakoram National Park
CPEC	China Pakistan Economic Corridor
E	East
EIA	Environmental Impact Assessment
FGD	Focus Group Discussion
GB	Gilgit-Baltistan
GLOF	Glacier lake outburst flood
HH	Households
INGO	International Nongovernmental Organization
Kg	Kilograms
KIU	Karakorum International University
LSO	Local Support Organization
m a.s.l.	Meter above sea level
Mg	Mega grams
MP	Management Plan
N	North
N/A	Not Applicable
NGO	Non-governmental Organization
NTFP	Non-Timber Forest Product
OP	Operational Plan
S	Summer
SEED	Social Economic Environmental Development
UC	Union Council
VCC	Valley Conservation Committee
VCF	Valley Conservation Fund
VCSDP	Valley Conservation and Sustainable Development Plan
VCSP	Valley Conservation Sustainable Plan
VO	Village Organization
W	Winter
WO	Women organization
Yr	Year

1. INTRODUCTION OF GHULMAT VALLEY

1.1. Location of Ghulmat Valley

Ghulmat Valley is part of UC Ghulmat and District Nagar, situated in Nagar -II at a distance of approximately 100 km towards north of Gilgit city. Ghulmat valley is situated 60Km North East from Gilgit city, in lower Nagar part of newly established district Nagar. There are seven (07) main villages in the valley: Jaffar Abad, Sikandar Abad, Nilt, Ghulmat, Minapin, Pisan and Thole.

Exhibit 1: A view of Ghulmat valley

This valley may be easily accessed via public transport from Gilgit and Aliabad or jeeps can be hired from Gilgit. Ghulmat is a popular tourist attraction and hot spot in Nagar because of its scenic beauty of the surrounding mountains like Rakaposhi peak (7788m), Diran peak and some other peaks. Rakaposhi view point Ghulmat attracts almost the entire local, domestic as well as the foreign tourist to stop here to enjoy the spectacular view with a cup of tea at the Rakaposhi view point hotel and the others. It is also a good point to capture and save the view from your camera eyes. Rakaposhi means "shining wall" in local language is also known as Dumani ("Mother of Mist"). Ghulmat is also known for of Astana (holy shrine) of Syed Shah Wali- a spiritual preacher of Islam in Gilgit-Baltistan. Mostly the local people visit Ghulmat for Ziarat of the holy shrine. Minapin is known for its tourist attractions like Diran peak and Glacier, Rakaposhi Base camp and other hot spots like "Kachaili" and "Taga Fari" where a considerable number of trekkers visit annually for trekking and recreational activities.

Exhibit 2: Village locations of Ghulmat Valley, 2016

Villages	Coordinates		Elevation (m asl)
	N	E	
Jaffar Abad	36°14'13.8''	74°24'04.8''	1923
Sikandar Abad	36°14'42.0''	74°21'46.6''	1848
Nilt	36°13'53.4''	74°24'56.4''	1969
Ghulmat	36°14'22.1''	74°29'18.5''	1989
Minapin	36°15'08.3"	74°32'22.5"	2045
Pisan	36°15'02.6''	74°31'01.6''	2069
Thole	36°14'17.8''	74°26'36.2''	1959

1.2. Ecological Profile of Ghulmat Valley

Ghulmat is an adorable valley in Nagar district is with lovely terraced fields developing a wide range of yields. It shapes the passage to the considerable mountain pinnacles of the Karakoram. The valley has an amazingly beautiful scene, and possesses large amounts of natural product, for example, grapes, peaches, pears, walnuts and apricots. The valley offers a stunningly contrasting landscape – rocky barren cliffs, cultivated terraces, and orchards all around.

The biodiversity of Ghulmat valley is adapted to harsh and varied climatic conditions and topography. Besides this, there is a rich diversity of habitats e.g., lakes, springs, small rivers and streams, sub alpine and alpine meadows, steep mountain slopes, cultivated fields, roadsides and permanent glaciers etc., which supports a rich and equally diverse floristic wealth. Wildlife species such as Ibex is still in abundance. Moreover, *Picea smithiana* mixed with *Pinus wallichiana* is still present in some lateral valleys of Nagar like Nilt and Minapin. Ghulmat valley is representative of 16.8 % broad-leaved, 11.9% coniferous forest and 71.3% juniper trees (Ferrari, 2014). These forests are the sources of consumptive and non-consumptive uses as reported by the local community. Unlike other communities these forests are co-managed between the villages.

1.3. Socio-economic Profile of Ghulmat Valley

1.3.1. Demography of Ghulmat Valley

According to the survey conducted for VCSDPs development, there is some increase in population. The total population of the valley is 16896 of which 9837 are females and 7059 males. All these villages are based around the buffer area of CKNP which spans 2757.88 m^2 and serves as reserves of natural resources for the local people and transitional area between the park and local communities. This local community depends heavily upon natural resources, both for subsistence and income.

Exhibit 3: Demographic profile of villages of Ghulmat Valley, 2016

Village	HH	Av. HH size	Population	Male	Female	Male: Female
Jaffar Abad	300	9	2600	1040	1560	0.666:1.5
Sikandar Abad	400	10	3800	1600	2200	0.727:1.375
Nilt	250	9	2200	1000	1200	0.833:1.2
Ghulmat	265	9	2296	919	1377	0.667:1.498
Minapin	220	7	1600	700	900	0.777:1.285
Pisan	170	8	1400	600	800	0.75:1.333
Thole	270	11	3000	1200	1800	0.666:1.5
Total	1875	9	16896	7059	9837	0.727:1.384

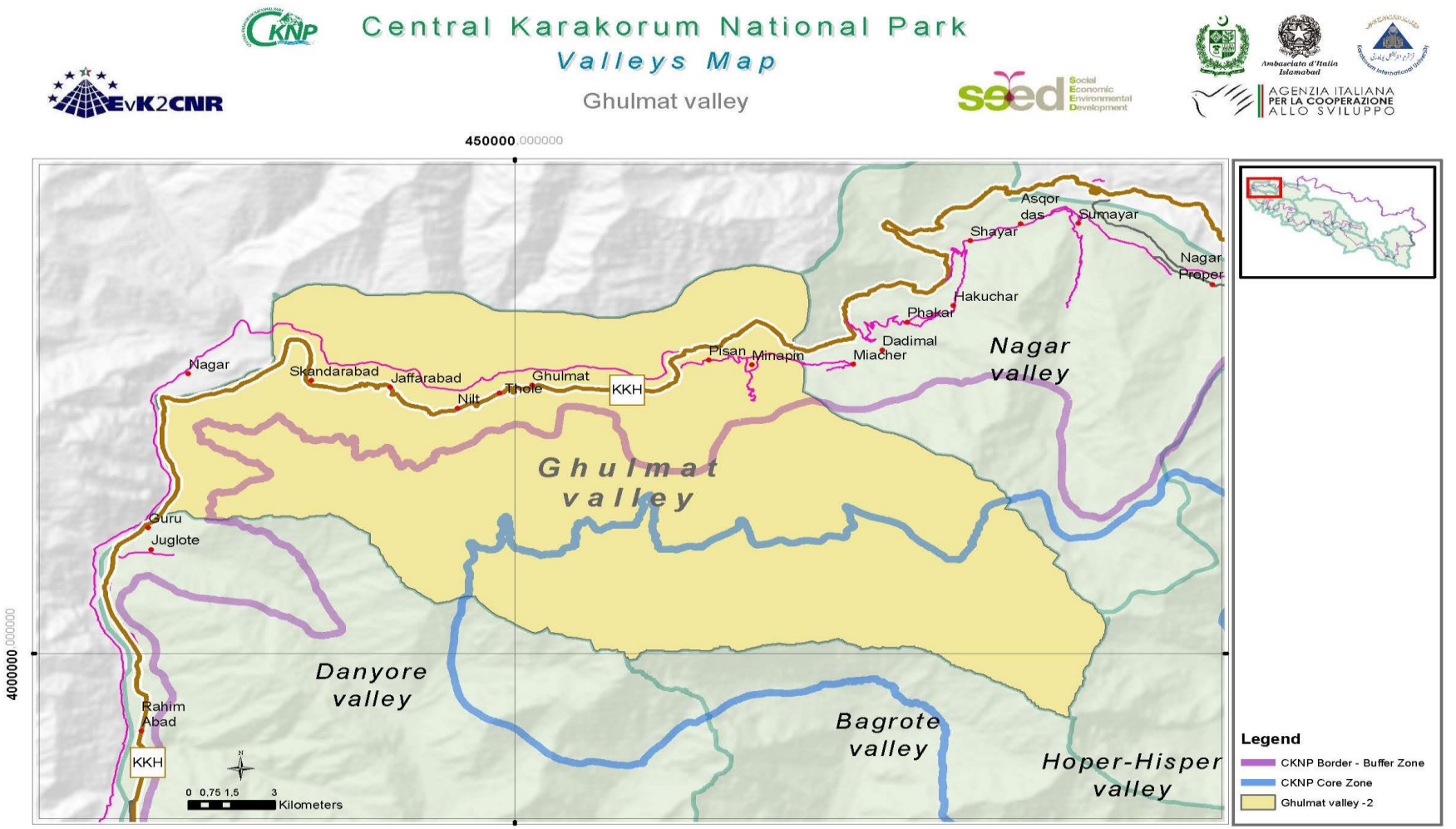


Exhibit 4: Map of Ghulmat Valley

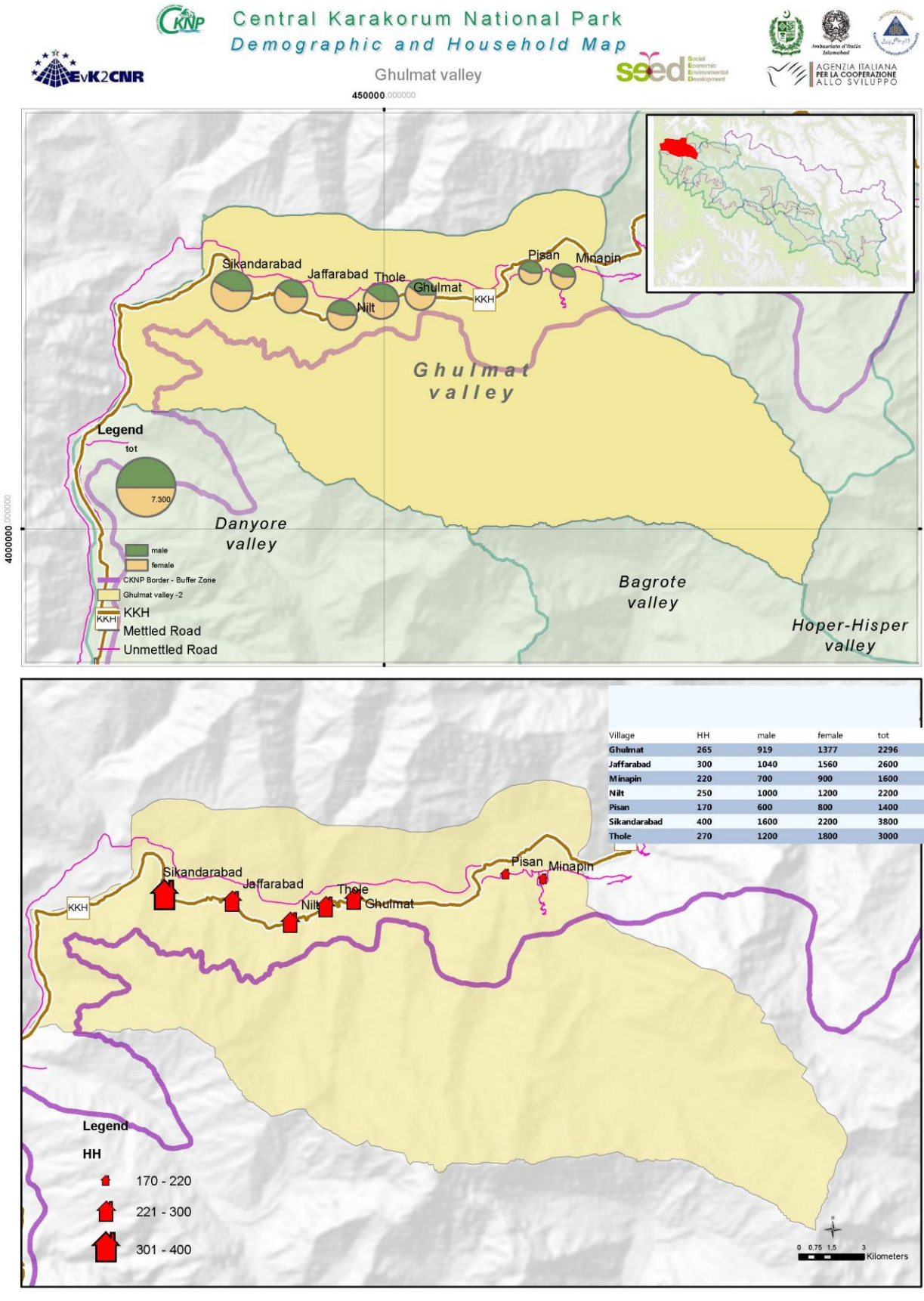
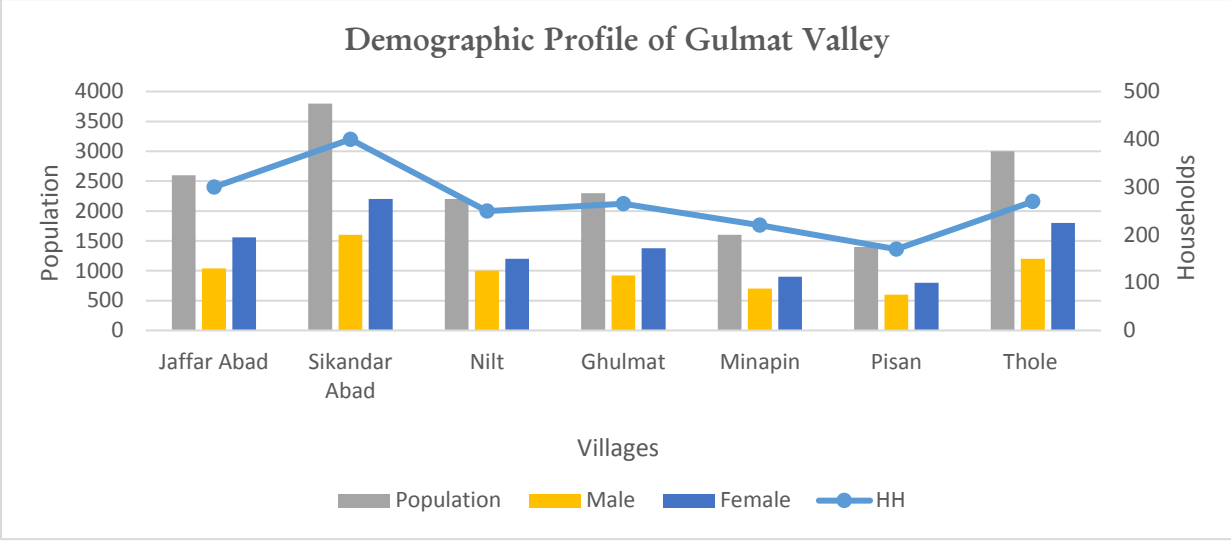


Exhibit 5:Demographic map of Ghulmat Valley

Exhibit 6: Demographic graph of villages of Ghulmat Valley, 2016



1.3.2. Road Access

Accessibility is a key issue in mountain landscapes and goes far beyond access to basic infrastructures such as health services, schools, roads, transport, markets and communication with the outside world. This lack can be attributed to difficult topography and low population densities relative to lowland areas, factors that increase investment and maintenance costs. Ghulmat valley is connected to Gilgit through KKH. Three major villages Ghulmat, Pisan and Minapin lie along the main Karakuram Highway. The link roads inside the valley are narrow and unpaved.

Exhibit 7: Girls school in Ghulmat valley

1.3.3. Education Facilities

All the villages have primary school education facilities being operated by both public and private sector. All the valleys have education facilities up to high school both for girls and boys Thole and in Nilt there is no high school for girls. Majority of population visit Gilgit for college and university level education.

1.3.4. Health Facilities

In Ghulmat valley health care facilities are severely limited; lack of basic infrastructure, medicines and lack of staff are the major issues. There is no basic health facility in Minapin

village, either the community visits health facility in Ghulmat villages or to Hunza, Danyore or Gilgit city. All the health facilities are being operated by GB health department except Pisan village health facilities that is being operated by

Agha Khan Health Services. The people of Ghulmat valley are facing health care issues as the hospital in Ghulmat often remain without any doctor. It has also been reported by the community that all the health facilities in Ghulmat valley lacks medicines, forcing the people to travel to Gilgit for the treatment of diseases and to buy medicines.

Exhibit 8: Dispensary at Ghulmat Valley

1.3.5. Veterinary Facilities

Veterinary facilities are lacking in Ghulmat valley. There are veterinary facilities in five villages except Nilt, and Pissan villages, which are without any such facility. The villagers often visit Ghulmat and Skindar Abad. The infrastructures of the veterinary facilities are really poor, lacking trained staff and medicines.

1.3.6. Electricity

All the villages in Ghulmat valley have the access to electricity facility provided and managed by Water and Power Department, GB. The sources of electricity are small hydro stations of various capacities in Nagar valley. Supply-demand lapse is managed by load shedding. The frequency of load shedding increases in winter with increase in demand to maintain the indoor temperature. Local community residing around CKNP manages this electricity shortage by harvesting wood as a fuel source from the National Park.

Exhibit 9:Socio-economic profile of Ghulmat Valley

Villages	Education Facilities				Health Facilities		Veterinary Facilities	Electricity
	Category / Level	Ownership	Geographic Location	Gender	Facility	Geographic Location		
Jaffar Abad	High	Govt.	N 36°14'41.1'' E 74°22'20.9'' 1844 m asl	Girls	Dispensary	N 36°14'08.6'' E 74°24'00.5'' 1993 m asl	Yes	Yes
	High	Govt.	N 36°14'26.6'' E 74°22'08.8'' 1891 m asl	Boys				
Sikandar Abad	High	Govt.	N 36°14'13.8'' E 74°24'04.8'' 1923 m asl	Girls	-do-	N 36°14'41.3'' E 74°22'08.9'' 1856 m asl	-do-	-do-
	High	Govt.	N 36°14'05.1'' E 74°24'16.7'' 1956 m asl	Boys				
Nilt	Middle	Private	N 36°13'57.2'' E 74°28'22.4'' 2212 m asl	Girls	-do-	N 36°14'06.3'' E 74°25'08.9'' 1889 m asl	No	-do-
	Primary	Govt.	N 36°13'15.1'' E 74°26'14.9'' 2238 m asl	Boys				
Ghulmat	High	Govt.	N 36°14'30.4'' E 74°28'52.6'' 1970 m asl	Girls	-do-	N 36°14'25.0'' E 74°29'00.2'' 1974 m asl	Yes	-do-
	High	Govt.	N 36°14'24.0'' E 74°29'03.2'' 1987 m asl	Boys				
Minapin	High	Govt.	N 36°15'07.6'' E 74°32'10.5'' 2029 m asl	Girls	Nil	--	-do-	-do-

Villages	Education Facilities				Health Facilities		Veterinary Facilities	Electricity
	Category / Level	Ownership	Geographic Location	Gender	Facility	Geographic Location		
	High	Govt.	N 36°15'14.8'' E 074°31'46.9'' 2021 m asl	Boys				
Pisan	High	Govt.	N 36°15'02.7'' E 74°31'25.9'' 2048 m asl	Girls	Aga Khan Health Service	N 36°15'02.6'' E 74°31'07.6'' 2065 m asl	No	-do-
	High	Govt.	N 36°14'57.7'' E 74°30'59.6'' 2047 m asl	Boys				
Thole	Middle	Private	N 36°13'57.2'' E 74°28'22.4'' 2212 m asl	Girls	Dispensary	N 36°13'57.2'' E 74°28'22.4'' 2212 m asl	Yes	-do-
	High	Govt.	N 36°14'30.4'' E 74°28'52.6'' 1970 m asl	Girls				
	High	Govt.	N 36°14'24.0'' E 74°29'03.2'' 1987 m asl	Boys				

1.3.7. Traditional Governance System

Traditional Governance system unfolds two tiers; within the households and within the village. Within the ambit of social structure at household level, the basic residential/economic unit is the joint family. Typically, this unit includes an elder's household with his married sons' families. Married sons generally live in their father's household with the latter or the eldest brother exercising authority over the extended family. The authoritative head of the household has the responsibility and authority to make decisions on behalf of the entire household members. It is within the joint family that the primary solidarities lie for daily economic activities. This customary practice of joint family system fairly justifies the lower average increase in households and higher average increase in population.

The whole buffer zone of CKNP is full of villages having rugged topography, jagged mountains, harsh climate and disaster-prone areas. In this situation, local community helped themselves by establishing and maintaining the local support organization in order to explore and enhance the developmental opportunities for the areas. They were established back in 1980 under the awareness and efforts of working NGO's and INGO's at time but maintained and managed by the local communities as an integral social component. It serves as umbrella for VCCs, VOs, and WOs. This organization contains the members from all the regional organizations and jurisdiction spans upon the water sheds at the village/valley level. Their function is equivalent sharing and support of the developmental opportunities in the area.

Several social organizations like LSO, VOs, WOs and conservation committees are working in Ghulmat valley. All the social organizations are working properly according to the community but these organizations are suffering from lack of financial resources so their performance is being hampered and as well as low visibility. There are also some VOs having political and religious backgrounds. In the context of natural resource management these organizations facilitate the meetings, execution of activities, monitoring and decisions related to community resources and resolve conflicts.

ASSESSMENT OF CUSTOMARY PRACTICES FOR SUSTAINABLE USE OF NATURAL RESOURCES IN CONTEXT OF INDIDENOUS KNOWLEDGE

2. ASSESSMENT OF CUSTOMARY PRACTICES FOR SUSTAINABLE USE OF NATURAL RESOURCES

Local community inhabited this land since forefathers and practices their own set of rules known as customary/custodian rules/practices which were formed before the statutory laws even before the creation of Pakistan. These laws passed from generation to generation by words and hardly been written anywhere.

Local communities have long histories of interaction with the natural environment. With the passage of time the land use priorities changed and resulted in differential dependence upon natural resources by each community and even varied personally. Allied with many of these communities is a collective organization of knowledge, expertise, practices and emblematic depiction. These refined sets of understanding, elucidation and connotation are integral component of a cultural complex that incorporates language, nomenclature, resource use practice, cultural and worldview. This local and indigenous wisdom is a key resource for empowering communities to exploit natural resources in sustainable manners to ensure its continuation for next generations.

2.1. Requirement of Revitalization of Indigenous Knowledge

Indigenous people are the custodian of customary systems. These people are well informed about their own circumstances, their resources, what works and what does not work. They are also aware of the possible impact of a change in one factor on the other parts of the environment, but the issue highlighted by the local community during the interviews is that they are unable to assess and adapt to environmental changes as fast as its happening. This provokes the need of awareness raising and revitalizing the indigenous knowledge in a way that allows these people to adapt to their environment and let them able to reciprocate the disastrous changes steadily.

Exhibit 10: Water channel

2.2. Water

Inhabitants of Ghulmat valley have established complex irrigation mechanism or water system frameworks and agricultural fields in a long process of water channel.

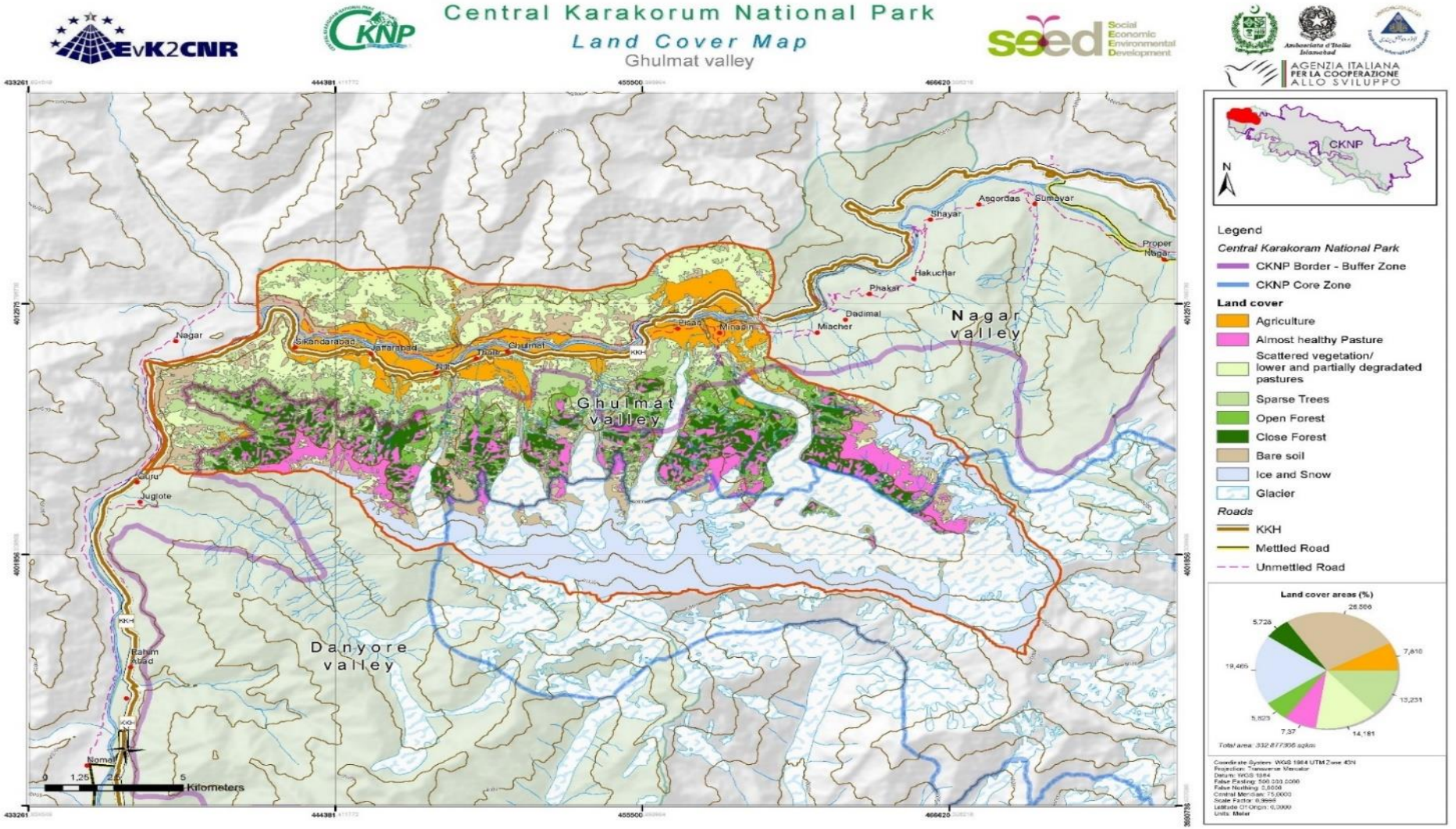


Exhibit 11:Land cover map of Ghulmat Valley

2.3. Agriculture

Ghulmat valley has agro based economy, majority of Ghulmat habitants depend their living on farming. The land use in Ghulmat valley is dominated by agriculture, fruit gardens and livestock farming and farm forestry. There is subsistence agriculture in Ghulmat valley, the most important crops are wheat, buckwheat, barley, millet, vegetables (peas) and fruits (apricots) are grown in several different local and adopted varieties. The Ghulmat valley is a single cropping zone because of the short growing season due to harsh climate which does not allow another cropping cycle. Agriculture in Ghulmat valley is both irrigated and rain fed. Indigenous cultivars and even the wild relatives of numerous crops are grown with the possibility of "Food for own" but the yield is very low. In average each house hold has 12 Kanals of cultivated land. In the cultivated land most of the people grow wheat and vegetables. In Ghulmat valley local farmers have developed terraced patches of agriculture fields through land reclamation at different altitudes around their settlements which is often highly fragmented landscapes. Besides protecting and improving the existing cropping system, terraces provide new planting niches with favorable conditions for specialty crops or for establishing valuable trees. For example, farmers plant fruit and nut trees along the edges of terrace rises and thereby allow the successful establishment of tree crops to manage scarce plain area. The size for the agriculture fields decides the limits for mechanization such as manual tilling or mechanized tilling. To maximize agriculture production conservation tillage in addition to animal manure has also been practiced by local farmers in Ghulmat valley to avoid erosion and increase in fertility. Being unable to deal with erratic weather patterns, lack of capacity in acquiring farm inputs including quality seed and absence of extension services; vulnerable farming communities

Exhibit 12: Agriculture field in Ghulmat valley

Exhibit 13: Fruit trees in Ghulmat valley

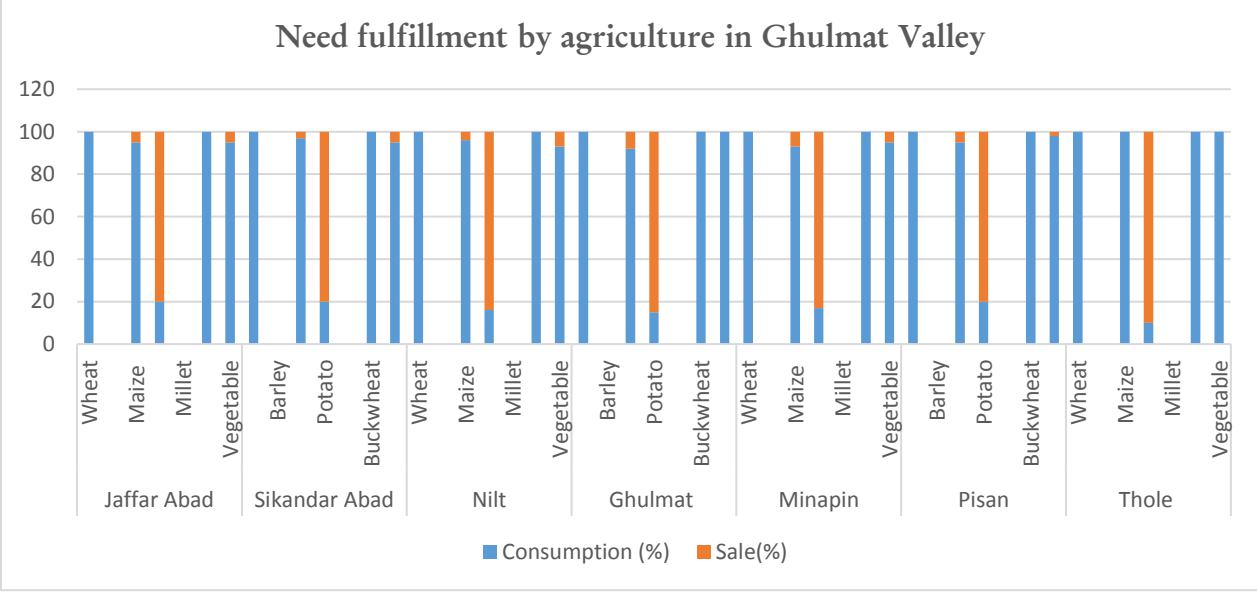
remain at the mercy of divine rescue because, they lack institutional and technical and financial support.

Exhibit 14: Economic benefits of agriculture production in Ghulmat Valley

Village	Kind of Crops	Consumption (%)	Sale (%)	Av. Income per Household	Av. Value/HH/ Yr
Jaffar Abad	Wheat	100	0	150000	45000000
	Barley	0	0		
	Maize	95	5		
	Potato	20	80		
	Millet	0	0		
	Buckwheat	100	0		
	Vegetable	95	5		
Sikandar Abad	Wheat	100	0	100000	40000000
	Barley	0	0		
	Maize	97	3		
	Potato	20	80		
	Millet	NA	0		
	Buckwheat	100	0		
	Vegetable	95	5		
Nilt	Wheat	100	0	70000	17500000
	Barley	NA	0		
	Maize	96	4		
	Potato	16	84		
	Millet	0	0		
	Buckwheat	100	0		
	Vegetable	93	7		
Ghulmat	Wheat	100	0	110000	29150000
	Barley	0	0		
	Maize	92	8		
	Potato	15	85		
	Millet	0	0		
	Buckwheat	100	0		
	Vegetable	100	0		
Minapin	Wheat	100	0	80000	17600000
	Barley	0	0		
	Maize	93	7		
	Potato	17	83		
	Millet	0	0		
	Buckwheat	100	0		
	Vegetable	95	5		
Pisan	Wheat	100	0	70000	11900000
	Barley	0	0		
	Maize	95	5		
	Potato	20	80		
	Millet	0	0		
	Buckwheat	100	0		

Village	Kind of Crops	Consumption (%)	Sale (%)	Av. Income per Household	Av. Value/HH/ Yr
	Vegetable	98	2		
Thole	Wheat	100	0	110000	29700000
	Barley	0	0		
	Maize	100	0		
	Potato	10	90		
	Millet	0	0		
	Buckwheat	100	0		
	Vegetable	100	0		

Exhibit 15: Need fulfillment by agriculture in Ghulmat Valley



2.4. Livestock

Livestock herding is one of the major sources of livelihood in the CKNP buffer zone. CKNP buffer zone livestock constitutes 20% of the total head of livestock in Gilgit Baltistan, which according to current VCSDP survey are 19,617 animals in seven (07) villages of Ghulmat valley.

The general population of Ghulmat Valley makes their earnings from subsistence agricultural farming and animal domestication. They keep diverse sort of animals including diverse sort of sheep, goat, bull, zo, zomo, yak, yakmo and poultry breeds. The majorities of the cattle in Ghulmat are local, however a portion of the general population likewise raise Jersey dairy cattle and for breeding purpose yaks and bulls are being used. Artificial insemination is just an exception. Wheat straw, grasses and leaves are stored and fed to animals in winter. The regular diseases of the domesticated animals are pleura pneumonia, FMD and mastitis. The primary driver of year-round mortality are illnesses, predation, winter starvation and losses (falls, Avalanches). The people of Ghulmat Valley mainly drive their livelihoods from subsistence farming and livestock. According to survey the animals rearing trend is still increasing in

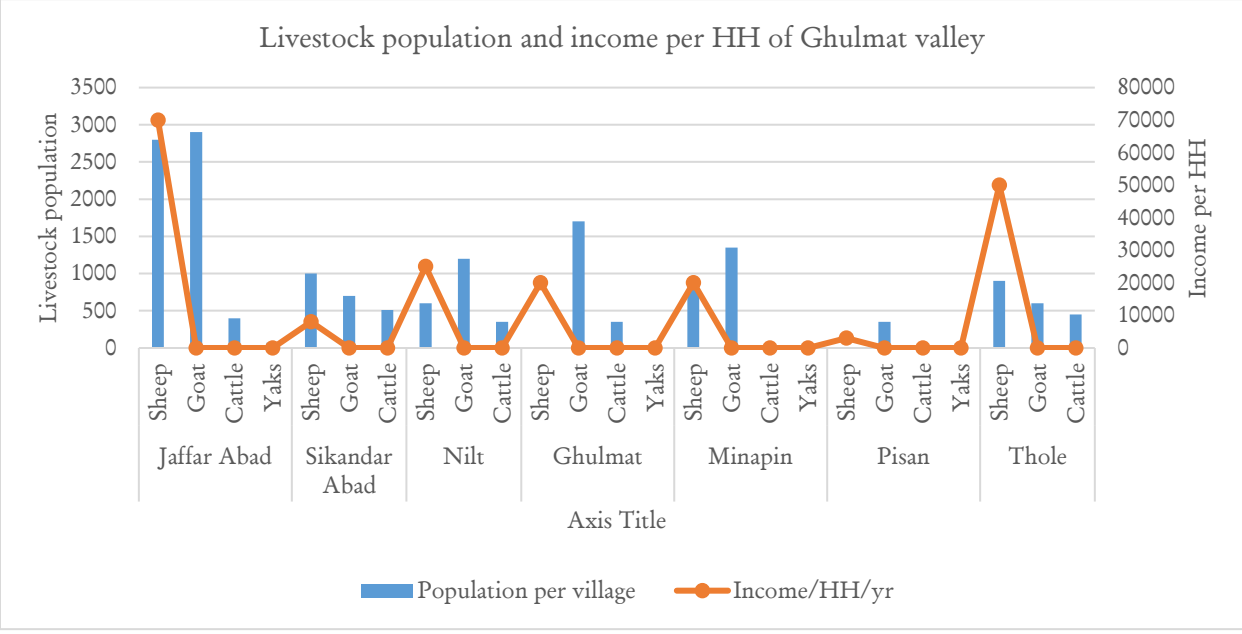
Ghulmat. In March and April, stockholders take their herds on daily movements to the transitional pastures but not sufficient for the livestock all villages of Ghulmat. All animals are collected and given to a few men who take them up to high elevated pastures. On daily movements the flocks are driven to high elevated meadows following the receding snowline as 4000 m. The timing of herding in different parts of the alpine pastures may vary, reflecting perceptions of the value of grass in different places.

The newly born calves, lambs and kids and as well as one or two lactating animals per household for daily milk supply are retained at villages during the whole summer. They are fed with fresh grass and weeds removed from the fields by women. The village community or in some cases the village elderly select a village guardian who protects the crops to ensure that no animal enter any field until the fields are harvested. The guarding usually serves for one year and receives 5kgs of wheat per household as payment for his duty. In addition, if he catches grazing animals in the fields, he receives fines from the owner of a specific animal in autumn, when the livestock are driven down from the high pastures, they are turned on to the fields to graze on the stubble. Dried apricots of lower quality are given to them in evening as kind of reward so that they return to stables. Kind of fodder to the livestock during the winter depends not only its availability but also on many beliefs about the appropriate forms and amount of fodder to be given to particular types of animals. Cattles and cross bred are fed straw, and sometimes a little grain. Pregnant cattle are given supplementary fodder, hay, some flour, apricot nuts and sometimes eggs. Generally, all livestock lose weight during the winter. Since the traction power of zo is needed for plowing, they are fed barley and sometimes even apricot oil as supplement three weeks before plowing starts in early spring. Goats and sheep are fed leaves of fruit and other trees during October and November. Women or children tear leaves off the trees or beat the branches with long stick so that the leaves fall down and can be eaten by the stock. During the winter goats are fed hay, dried leaves, and herbs from weeding, sometimes apricot kernel of low quality and also millet straw, when available.

Exhibit 16:Contribution of livestock in economics of Ghulmat Valley

Villages	Kind of Livestock	Population per village	Av. Income/HH/yr	Rearing Trend
Jaffar Abad	Sheep	2800	70000	Decrease
	Goat	2900		
	Cattle	400		
	Yaks	70		
Sikandar Abad	Sheep	1000	8000	Decrease
	Goat	700		
	Cattle	510		
Nilt	Sheep	600	25000	Decrease
	Goat	1200		
	Cattle	350		
Ghulmat	Sheep	--	20000	Decrease
	Goat	1700		
	Cattle	350		
	Yaks	55		
Minapin	Sheep	900	20000	Decrease
	Goat	1350		
	Cattle	50		
	Yaks	65		
Pisan	Sheep	--	3000	Decrease
	Goat	350		
	Cattle	50		
	Yaks	67		
Thole	Sheep	900	50000	Decrease
	Goat	600		
	Cattle	450		

Exhibit 17: Livestock population and income per HH of Ghulmat valley



2.5. Pastures

Alpine Meadows and extended grasslands (high pastures) above or near tree line are accessible only for short time period which is peak summer season. Traditional rights of communities in these pastures are usually well defined, and they establish seasonal summer pastures in these areas and some of them are shared between two or more bordering villages. Rights to the utilization of pastures are collectively conferred on entire villages and are not confined to kinship groups. Nomadic economy and labor activities are predominantly based on animal husbandry. Mixed herds are composed of sheep and goats, cattle/yaks for livestock production and camels, horses and donkeys mainly for transport of tents, household goods and utensils. Nomads utilize pastures to which they claim rights of access based on customary law.

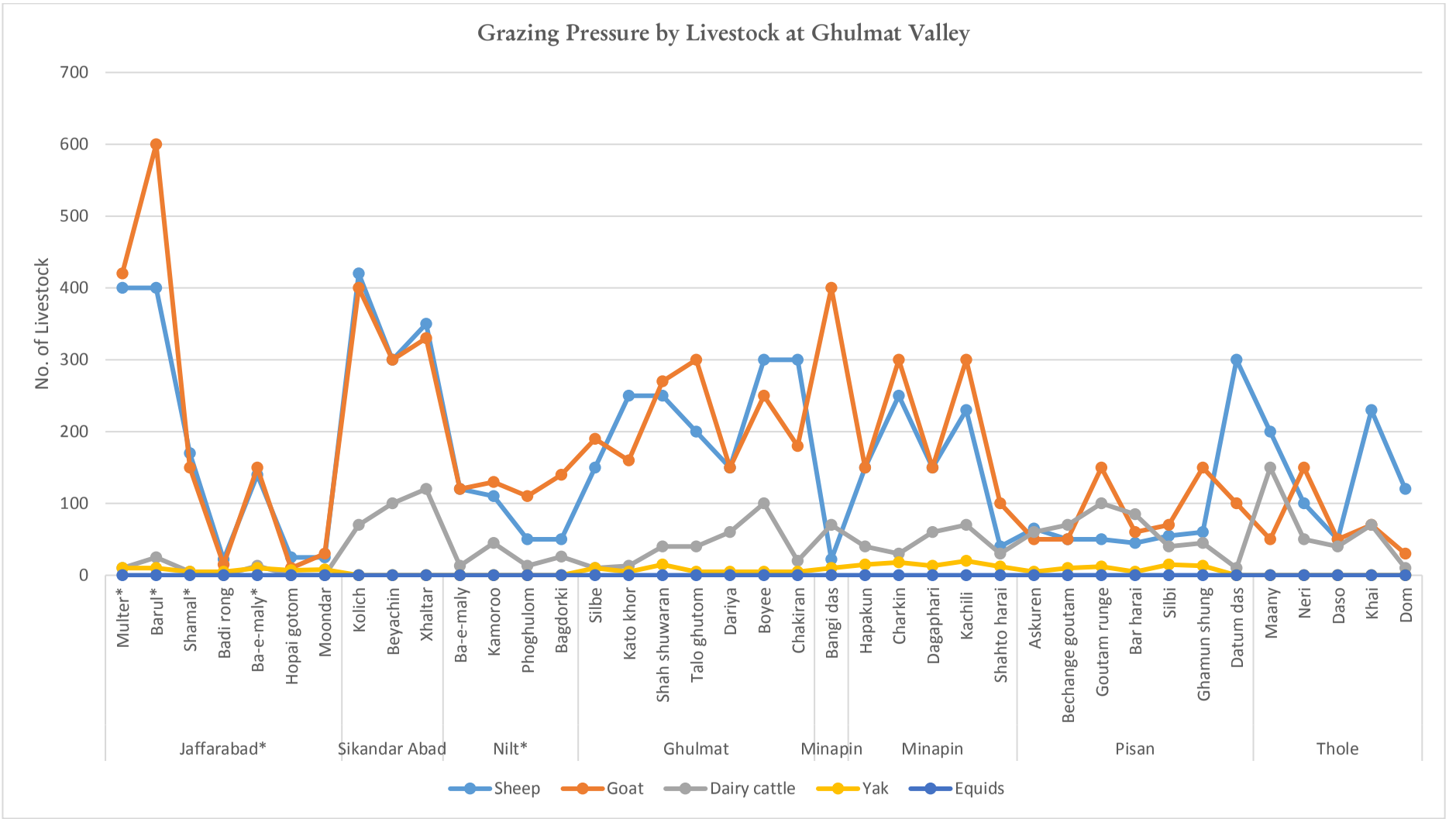
Local pastorals at Ghulmat valley exhibit vertical transhumance patterns with seasonal movements from top mountain pastures to downside. The pasture settlements have sheds for the animals as well and they are fenced as well to avoid attacks of snow leopard and wolves. The FGD interview indicates that 85% pastures of Ghulmat valley are degrading gradually Community reported that pastures are drying up, less vegetation as compared to past and decrease in wild medicinal plants. Decline in health of pastures is direct indicator of unsustainable harvesting practices due to increasing local population fueled by climate change. Uncontrolled grazing and other consumable products irrespective of decreasing productivity allow them to earn handsome amount for subsistence. Indirectly it also indicates the less snow and shift of rainy seasons which contributes to its low productivity. Barren patches among the pastures are notable features indicating the removal of top soil as a result of flooding and landslides. Collecting all the facts mentioned by local community and commonly reported in literature provokes the need of managing zones of rotational grazing in the pastures and determining the maximum number of each kind of livestock according to carrying capacity of pastures while keeping pace for wild herbivores reptiles and rodents to thrive.

Exhibit 18:Contribution of livestock in economics of Ghulmat Valley

Pastures	Village	Other uses	Status	Grazing period	Livestock class					
					Sheep	Goat	Dairy cattle	Yak	Equids	Tot
Multer	Jaffar Abad	Medicinal plants	PD	May-Nov	400	420	10	10	_	790
Barul		-do-	-do-	May-Nov	400	600	25	10	_	1035
Shamal		-do-	-do-	May-Nov	170	150	05	05	_	330
Badi rong		-do-	-do-	May-Nov	22	15	_	5	_	42
Ba-e-maly		-do-	-do-	May-Nov	140	150	13	10	_	313
Hopai gotom		-do-	-do-	May-Nov	25	10	_	7	_	42
Moondar		-do-	-do-	May-Nov	25	30	_	8	_	63
Daching	Sikandar Abad	-do-	PD	May-Nov	Abandoned for grazing					
Fulatohara		-do-	-do-	May-Nov	Abandoned for grazing					
Tropho		-do-	-do-	May-Nov	Abandoned for grazing					
Sho hara		-do-	-do-	May-Nov	Abandoned for grazing					
Kolich		-do-	-do-	May-Nov	420	400	70	_	_	890
Batalyhur		-do-	-do-	May-Nov	Abandoned for grazing					
Beyachin		-do-	-do-	May-Nov	300	300	100	_	_	700
Xhaltar		-do-	-do-	May-Nov	350	330	120	_	_	800
Kamoroo	Nilt	-do-	-do-	May-Nov	110	130	45	_	_	285
Phoghulom		-do-	-do-	May-Nov	50	110	13	_	_	173
Bagdorki		-do-	-do-	May-Nov	50	140	26	_	_	216
Silbe	Ghulmat	-do-	-do-	May-Nov	150	190	10	10		360
Kato khor		-do-	-do-	May-Nov	250	160	13	5		428
Shah shuwaran		-do-	-do-	May-Nov	250	270	40	15		575
Talo ghutom		-do-	-do-	May-Nov	200	300	40	5		545
Dariya		-do-	-do-	May-Nov	150	150	60	5		365
Boyee		-do-	-do-	May-Nov	300	250	100	5		655
Chakiran		-do-	-do-	May-Nov	300	180	20	5		505
Rakaposhi base camp pasture	Minapin	-do-	-do-	May-Nov	Abandoned for grazing					

Pastures	Village	Other uses	Status	Grazing period	Livestock class					
					Sheep	Goat	Dairy cattle	Yak	Equids	Tot
Bangi das		-do-	-do-	May-Nov	22	400	70	10	_	502
Hapakun		-do-	-do-	May-Nov	150	150	40	15	_	355
Teltotote		-do-	-do-	May-Nov	Abandoned for grazing					
Tamaray		-do-	-do-	May-Nov	Abandoned for grazing					
Charkin		-do-	-do-	May-Nov	250	300	30	18	_	598
Dagaphari		-do-	-do-	May-Nov	150	150	60	13	_	373
Kachili		-do-	-do-	May-Nov	230	300	70	20	_	620
Shahto harai	Pisan	-do-	-do-	May-Nov	40	100	30	12	_	182
Askuren		-do-	-do-	May-Nov	65	50	60	5	_	180
Bechange goutam		-do-	-do-	May-Nov	50	50	70	10	_	180
Badad hara		-do-	-do-	May-Nov	Abandoned for grazing					
Goutam runge		-do-	-do-	May-Nov	50	150	100	12	_	312
Bar harai		-do-	-do-	May-Nov	45	60	85	5	_	195
Silbi		-do-	-do-	May-Nov	55	70	40	15	_	180
Ghamun shung		-do-	-do-	May-Nov	60	150	45	13	_	268
Datum das	Thole	-do-	-do-	May-Nov	300	100	10	_	_	410
Maany		-do-	-do-	May-Nov	200	50	150	_	_	400
Neri		-do-	-do-	May-Nov	100	150	50	_	_	300
Daso		-do-	-do-	May-Nov	50	50	40	_	_	140
Khai		-do-	-do-	May-Nov	230	70	70	_	_	370
Dom		-do-	-do-	May-Nov	120	30	10	_	_	160

Exhibit 19:Grazing pressure by livestock on pastures Ghulmat Valley (Jaffarabad – Thole)



2.6. Fuel Wood Collection/ Timber Harvesting

Ghulmat valley has comparatively fragmented and spares forest with approximately 34.1km^2 vegetation cover and its average ABG is 3029.7MgKm^{-2} and CAI of 1577.6 Mg/year (Ferrari, 2014). Vegetation cover of Ghulmat valley comprised of 10.6% grasslands, 5% close forest, 5.7% open forests and 20 % for both scattered and sparse vegetation. High density of timber trees are found in south-western valleys of CKNP than North eastern valleys.

As a consequence of increasing population; expansion of villages is common phenomenon in Ghulmat valley like other valleys and thus construction of settlements/houses is also on rise. The timber for construction purposes is either purchased from Proper Nagar, Hunza or Gilgit timber market or from natural/artificial plantations (Exhibit No. 21). In Ghulmat valley it is important noting that use rights are maintained even by households now residing in nearby villages/cities. The usual amount harvestable is around 100-200 logs per household per year in Ghulmat valley. From a large tree, locals usually obtain around 50 logs. The trees harvested for timber in each village of Ghulmat valley are listed in Exhibit No. 11. Household fuel sources in Ghulmat valley are Artemisia, Sea buckthorn, Dung, pruning from plantations and wood from forests. Area under vegetation in whole Ghulmat valley is only 77.3 km^2 comprises of 71.3 % Junipers, 11.9% coniferous and 16.1% broad leaves and also the artificial plantation sites of *Populus* spp. along with Artemisia shrub-land, and sea buckthorn. The community reported a decrease in vegetation on mountain slopes.

Exhibit 20: Poplar plantation at Ghulmat valley

Poplar varieties are common plantations aided significantly to alleviate stress on natural forests. They are preferred due to high annual biomass, higher pest resistance, site adaptability, and easy vegetative propagation. Due to Artemisia's regular presence, this valley is also called as Artemisia Shrub land. Apart from being component of the fuel sources, it is also used by livestock during winter. Juniper trees are found in isolation at inaccessible locations on steep mountain slopes and grow well where water availability is up to the requirement of the tree. Junipers are preferred species for fuel because of its dryness and aroma. Our data collected during the survey reports that approximately 1875 households living in Ghulmat valley harvests

about 436 Mg/year/valley of the natural resources (Artemisia, Sea buck thorn, Juniper, Forest, Riparian vegetation, Shrub and grasses) and 1.23.2 Mg/year from junipers as fuel. The dependency on forests in very low in Ghulmat valley because of strict regulations by community itself. Major dependency is on animal dang and fruit trees. Among the alternative fuel wood resources electricity, gas cylinders and kerosene oil are usually employed. Plantations by local community on private lands have help alleviate strains on natural flora considerably. Even sustainable and productive forest systems may experience pervasive and severe levels of small-scale chronic disturbance by harvesting.

Majority of the fuel sources are common to the community and within community; there is no restriction on fuel wood collection but selling of wood is not encouraged socially. These regulations do not apply to private resources and plantations. Community restricts over exploitation from common resources. Bushes, mainly Artemisia which is quite common in CKNP is frequently used as fuel for ignition purpose in Ghulmat valley.

Customary laws are being followed in the valley for exploitation of natural resources. Community is allowed to collect only dead and fallen trees for fuel wood and timber up to need basis only. In Ghulmat which has scarce forest reserves, timber and fuel harvest is usually unchecked and unmonitored, evidently contributes significant share in total household livelihood revenues. Customary laws although allow the use up to need basis and don't allow sale of wood extracted from natural forests but this is hardly practiced and locals decide by themselves where and how much to cut (FGD interview, 2016). Although these practices do not allow sale of timber neither address the maximum amount of wood harvest from the buffer area. There are several other gaps in customary laws which provoke the need of revitalization of customary practices/laws in addition to reinforcement of statutory laws essential for natural resources conservation and restoration. There is strong need to quantify the magnitude of the chronic small-scale disturbances as well as large scale disturbance as a key component of landscape quality and incorporate the findings into laws to ensure sustainable and healthy environment in order to mitigate the haphazard changes of climate.

Exhibit 21:Timber harvesting and use at Ghulmat valley

Village	Houses constructed in last 5 years (2010-2015)	Number of trees used	Tree species used
Jaffar Abad	25	05	Poplar, Mulberry, Willow
Sikandar Abad	225	05	Poplar, Mulberry, Willow
Nilt	25	05	Poplar, Mulberry, Willow
Ghulmet	25	03	Poplar, Walnut
Minapin	20	04	Poplar
Pisan	30	04	Poplar, Walnut
Thole	30	04	Poplar

Exhibit 22:Summary of Fuel Wood harvest and Consumption in Ghulmat Valley

Village	HH	Consumption Per Household (Mg)			Consumption Per Village (Mg)		
		W	**S**	**Total**	**W**	**S**	**Total**
Jaffar Abad	300	2.16	1.09	3.25	648	327	975
Sikandar Abad	400	1.93	1.02	2.95	772	408	1180
Nilt	250	2.13	1.08	3.21	532.5	270	802.5
Ghulmat	265	1.805	0.92	2.725	478.325	243.8	722.125
Minapin	220	1.95	0.95	2.9	429	209	638
Pisan	170	1.975	0.965	2.94	335.75	164.05	499.8
Thole	270	1.9	0.985	2.885	513	265.95	778.95

Exhibit 23:Annual fuel wood harvest, Ghulmat valley

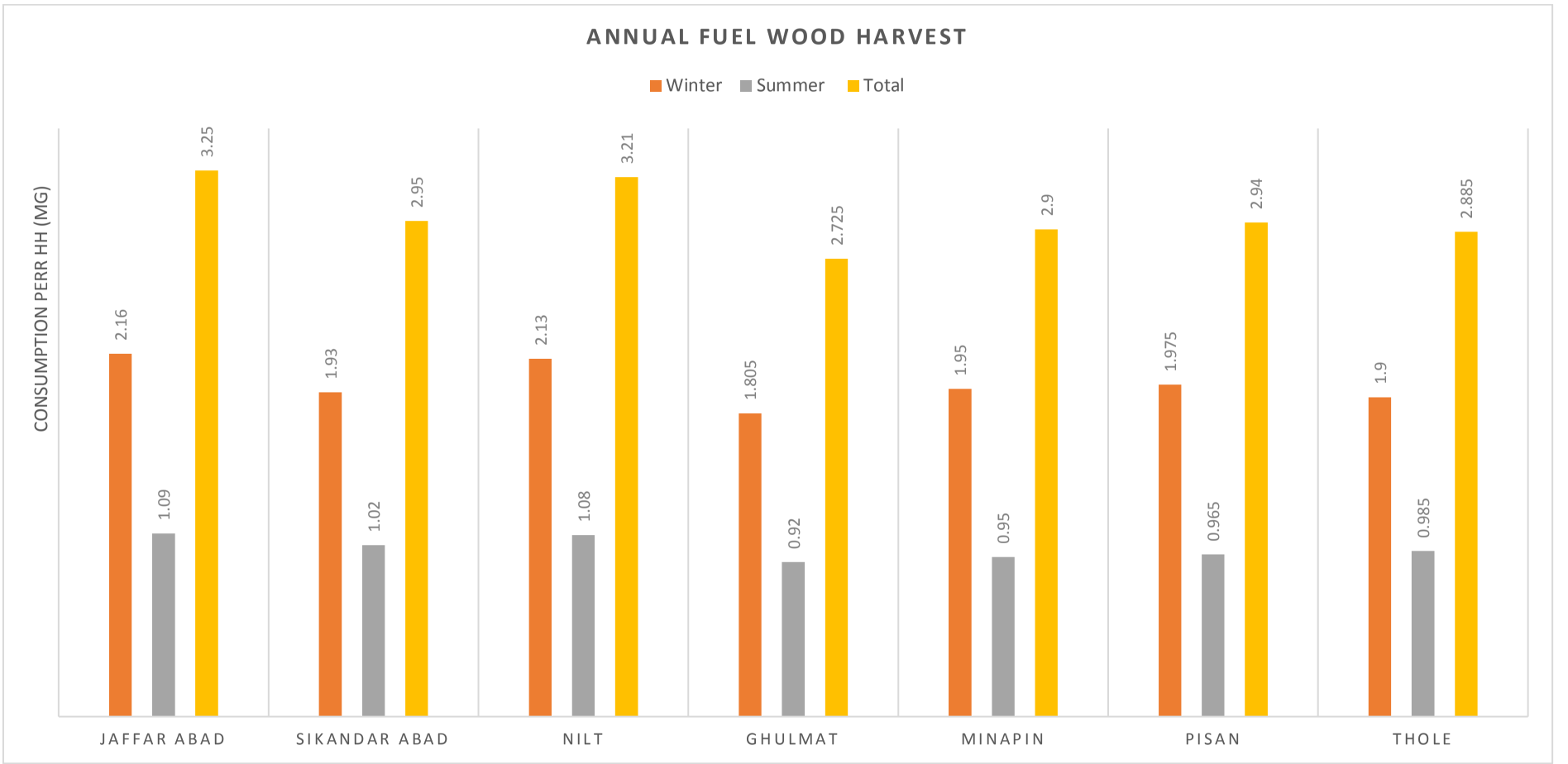


Exhibit 24:Details of fuel wood harvested per household from several sources (Mg/HH/yr)

Villages/Sources	Jaffar Abad		Sikandar Abad		Nilt		Ghulmat		Minapin		Pisan		Thole	
	W	S	W	S	W	S	W	S	W	S	W	S	W	S
Artemisia	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sea buckthorn	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.2	0.1
Junipers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1
Shrubs/Grasses	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.1	0.0	0.0	0.0	0.0
Dung	0.4	0.2	0.2	0.1	0.3	0.1	0.3	0.2	0.1	0.1	0.0	0.0	0.3	0.2
Natural forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fruit trees	0.5	0.2	0.5	0.21	0.5	0.3	0.6	0.3	0.6	0.3	0.7	0.3	0.6	0.3
Other riparian vegetation	0.0	0.0	0.2	0.2	0.3	0.2	0.2	0.1	0.0	0.0	0.3	0.2	0.0	0.0
Plantation	0.5	0.2	0.4	0.2	0.6	0.3	0.2	0.1	0.6	0.3	0.3	0.2	0.2	0.1
Market	0.6	0.3	0.4	0.2	0.4	0.2	0.4	0.2	0.4	0.2	0.4	0.2	0.4	0.2

Exhibit 25: Assessment of required reforestation to compensate fuel needs in Ghulmat Valley

Valley	Average Fuel consumption from Natural Forest (Mg/yr/valley)	Annual CAI (Mg/yr/valley) *	Required credit to sustain fuel needs	Harvest Pressure
Ghulmat	3196.875	1577.6	-1619.28	**Unsustainable**

2.7. Tourism

Ghulmat is a popular tourist attraction and hot spot in Nagar because of its scenic beauty of surrounding mountains like Rakaposhi peak (7788m) and Diran peak and some other peaks. Rakaposhi view point Ghulmat attracts almost the entire local, domestic as well as the foreign tourist to stop here to enjoy the spectacular view with a cup of tea at Rakaposhi view point hotel and the others. It is also a good point to capture and save the view from your camera eyes. Rakaposhi means "shining wall" in local language is also known as Dumani ("Mother of Mist"). It is ranked 27th highest in the world and 12th highest in Pakistan, but it is more popular for its beauty than its rank. Ghulmat is also known for of Astana (holy shrine) of Syed Shah Wali- a spiritual preacher of Islam in Gilgit-Baltistan. Mostly the local people visit Ghulmat for Ziarat of the holy shrine. Minapin is known for its tourist attractions like Diran peak and Glacier, Rakaposhi Base camp and other hot spots like "Kachaili" and "Taga Fari" where a considerable number of trekkers visit annually for trekking and recreational activities, particularly students from different universities of Pakistan during summers. Taga Fari; a well-known tourist spot in the valley at a distance of 10 km from Minapin Guest House provides an awesome camping site and offers Annual Donkey Polo Festival from 25th July to 5th August every year.

Residence facilities in Rakaposhi valley include Diran Guest House, Diran Guest House-II (Oosho thaang), Rakaposhi view point hotel, Rakaposhi paradise hotel, small cafe, and small shops of handicrafts, antiques, gems and jewelry. Professional tourist guides cooks, high porters and guides are available in the valley.

ASSESSMENT OF CLIMATE CHANGE IMPACT FOR SUSTAINABLE USE OF NATURAL RESOURCES IN CONTEXT OF INDIGENOUS KNOWLEDGE

3. ASSESSMENT OF CLIMATE CHANGE IMPACT ON NATURAL RESOURCES

Climate change is projected to have a significant effect upon the future rate of biodiversity loss. There is a growing global consensus that the rate of climate change has already exceeded the capacity of some species and ecosystems to adapt naturally, and is close to exceeding that of many more. There is therefore an urgent need to identify the key mechanisms underpinning climate change impacts on natural resources in order to best select climate change adaptation strategies. It is also essential that the scale of these changes is clearly communicated to policy and decision-makers. Furthermore, it is recognized that climate change will have increasingly significant direct impacts on local communities, biodiversity and that increased rates of species extirpations are likely. The growth of many crops and weeds is being stimulated. Migration of plant and animal species is changing the composition and structure of local ecosystem. This will have negative consequences in terms of services provided by these species and ecosystems provide, especially in areas where the majority of the human population are the rural poor and dependent on direct exploitation of these ecosystem services.

Exhibit 26: Impact of climate change on local community

3.1. Climate Change in the Perspective of Indigenous Knowledge

People at Ghulmat valley were well aware of changes that are happening in their climate and responded all the questions effectively. The main concern of local community discussed during the FGD's was the adaptations strategies that are required to mitigate the effect of climate changing. Data obtained shows that local climate is changing but these changes are not very pronounced and can be reversed if we do proper and timely actions. Change in length of season has been reported by the local community with increased temperatures and prolonged summer. Local community has also reported an increase in the frequency of disastrous activities. According to scientific investigations these higher temperatures are degrading the permafrost layers, causing slope instability, rock falls, landslides and avalanches.

Although climate change has both positive and negative impacts, the issue is that the negative consequences may be more pronounced in mountains, both for the communities and for their environments, requiring more awareness, more attention and quicker reaction than elsewhere. Equally, the consequences of negative impacts may go beyond the boundaries of mountains and affect people and ecosystems in the surrounding lowlands.

3.2. Temperature Variability and Seasonal Shifts

The climate of Ghulmat valley can be categorized as dry continental Mediterranean. Gradual increase in temperature has been reported by local community during last 30 years. Community reported a rapid increase of temperature during last 10 years. According to the community approximately 10% increases in temperature as compared to last 10 years. Regarding decrease in winter season, the community members responded that temperature in winter has increased and occasional snowfall. The most visible evidence of temperature increase is the earlier melt out of snow cover and glaciers across the region which has become more rapid over last one decade. This increasing temperature is responsible for disastrous activities and glacier recession which is getting frequent day by day according to the local community. Warming temperatures have led to effects as diverse as altered timing of bird migrations, increased evaporation, and longer growing seasons for wild and domestic plant species. Increased temperatures often lead to a complex mix of effects. Warmer summer temperatures have led to longer forest growing seasons but have also increased summer drought stress, vulnerability to insect pests.

3.3. Precipitation

In addition, changes in climate, such as reduced snowfall and increased rainfall, are reported across the area by local community, but solid evidence of the impact is difficult to ascertain. Changes in precipitation level and the size of storms affect plant-available moisture, snowpack and snowmelt, stream flow, flood hazard, and water quality. Rainfall variability and periodicity has changed since last 30 years with most profound effect since last ten years. High speed and late rains have been observed by the local community which accelerates the crop diseases and infections. It shows that pests are getting adaptable to seasonal shift and variability more than other organisms and contribute to increased economic loss of crops and fruit trees.

According to local community snow season has also showed significant delay and is getting more delayed year by year in different valleys. Community reported 35% decline in amount of snow fall over last 10 years is reported. Some community members reported increase in precipitation but once confirmed from PMD Gilgit that there is no increase in rainfall in fact there is increase in extreme event like cloud burst etc. As result of this sharp decline in frequency and magnitude of snowfall locals are facing shortage of alpine pastures productivity which affects negatively both to natural resources sustainability and economy of valley.

3.4. Drought

Drought is considered as the most damaging and costliest type of natural disaster, especially in mountainous regions where water quality and quantity is regulated solely by the precipitation with a far-reaching economic, environmental and social impact leading to food and water

insecurity, reduced agricultural productivity, damage to forests, pastures, wildlife, livestock, fish and food price hikes.

Exhibit 27: Water storage tank at village in Ghulmat valley

As a consequences of climate shift drought is at continuous increase from regional climate scenario as reported by local community. Due to warmer temperature the snow deposits are melting before time and increased speed. Altered timing of rain is presenting a cumulative effect on drought which results into the huge quantity of water by the start of summer. This quantity decreases and ultimately dries out as the season proceeds. The irregular availability of water halts not only the agricultural productivity but also natural regeneration of forest and pastures. It is difficult to mitigate the issue by water uplifting from rivers due to the required capital. According to community perspective the snow fall has declined up to 35 and in consequence drought has increased 9%.

The local community so-far is unable to assess the intensity of drought and to adapt it accordingly. Therefore, to enhance the resilience of local community and ecosystem it is necessary to incorporate the following actions for CKNP operational plan.

a) Devise the research to determine natural indicators to measure the intensity of drought for local community.
b) Evaluate the proper management actions/ interventions to improve preparedness of community for drought.

3.5. Flood

Changes in the climate have had an influence on the magnitude and frequency of flooding in rivers in Gilgit-Baltistan. With respect to snow and glacier melt, the magnitude of temperature-changes during the spring and summer are sufficient to have caused a major change in the flood-potential of catchments. Changes in winter temperatures have influenced the amount and altitudinal distribution of snow available for melt in the subsequent season and this has increased the magnitude of the flood by 25% since last 30 years. However, the flood frequency was also reported to be increased by 20% since last 30 years. Since change in flood

pattern is being observed over last three decades but over last half a decade, a sharp increase in both frequency and magnitude of flood is observed.

3.6. Landslides

Floods are the regulating factors of the land slides. With increase in the temperature and rain intensity, the soil patches lose their compactness. The increased Aeolian movements remove the top layer of soil and rain washes this layer from the mountains and move it to the nearby rivers and ultimately it becomes the part of Indus basin.

According to the survey conducted to gather information about the driving factors of climate events by local community, it is assessed that landslides have increased considerably (24%) since last 30 years. In the discussion with community, it was reported that nearby mountain of Ghulmat village had developed cracks and sometimes it starts sliding as well. Approximately 3000 people could lose their homes and land. The local residents' demand for an immediate survey by experts to avoid any potential disaster. These landslides wither soil from mountains, pastures and less vegetated areas and make the land barren. It destroys the infrastructure facilities such as roads, bridge, and sometimes buildings along the edges. Agriculture is the most negatively impacted sector by land sliding, because the irrigation systems are mostly built along rough mountain ranges and are more prone to landslide. As a result of broken and disconnected irrigation channels community face water shortage sometimes even for months and subsequently decreased agriculture production.

Exhibit 28: Climate Change at Ghulmat Valley in the Perspective of Indigenous Knowledge

Factors	Status	Change (days/ %age)	Trends		
			30 yr. Ago (1985)	10 yr. Ago (2006)	Future Prediction
Rain	Increase	36	Rain pattern was normal	Frequency increased but magnitude has become abnormal.	Decrease in the frequency of rain is expected
Snow	Decrease	35	Normal with slight decrease	Decreased drastically year by year.	Decreasing trend of snow is expected
Temperature	Increase	10	Increasing	Increasing	Temperature will increase
Summer season duration	Increase	12	Summer was slightly increasing	Increase	Crops reap some 10-15 days earlier then its normal time and this trend is increase, which indicates early start and late end of summer
Winter season duration	Decrease	12	It was slightly decreasing but	Decrease	Length of winter season is decreasing

Factors	Status	Change (days/ %age)	Trends		
			30 yr. Ago (1985)	10 yr. Ago (2006)	Future Prediction
			no considerable change seen		but magnitude of cold increasing
Glacier recession	Increase	10	No visible change observed	Increase	Based on the indigenous knowledge of locals over last few years most of glaciers have receded or changed their place and this trend will keep increasing in the future as well in response to increasing temperature
Land slides	Increase	24	Normal	Increase	Land sliding in almost all villages are increasing and expected to be increased in the upcoming years
Flood frequency	Increase	21	Normal	Increase	The frequency of flood is increasing every year and supposed to be increasing in the future
Flood magnitude	Increase	25	Increasing	Increase	The local people confirmed that magnitude and devastation of flood is becoming powerful which indicates a high increase in the future
Drought	Increase	09	Normal but slight increase observed	Increase	In most of the villages in the valley drought is frequently observed. The Indigenous observation of locals show expected increase in drought in the future.
GLOF Frequency	increase	06	Normal	Increase	A very small frequency of change

Factors	Status	Change (days/ %age)	Trends		
			30 yr. Ago (1985)	10 yr. Ago (2006)	Future Prediction
					is being seen but compare to the past it is increasing and the trend shows increase in the future too.
GLOF Magnitude	Increase	25	Normal	Increase	The magnitude of GLOF is observed increasing as more damage to infrastructure and agriculture land is happening, based on which it can be foreseen as increasing

3.7. Pastures

Regional climate scenarios for CKNP valleys shows prolonged growing seasons and shifts in temperature and precipitation as currently happening in the Ghulmat valley. Despite the better and prolonged growth seasons range lands that serve as pastures and grazing lands are degrading annually. In the alpine and sub alpine areas 24% degradation has been observed. Mid and low land grazing areas have declined 31%. According to community the pastures are drying up; medicinal plants on pastures are decreasing due to less precipitation both in snow and rainfall. This resulting drying up of grasses, less germination, less greenery on mountains which badly affected the availability of fodder for livestock.

It can be assumed that many plant species are migrating vertically for lower temperature increasing the plant diversity at higher alpine regions and growing competition by highly productive species at low lands. The local community reported probable causes for pasture degradation as vertical shifts in plant growth and unsustainable livestock management. On the other hand, warmer temperatures and increased microbial activity are likely to contribute in the loss of carbon from alpine soils. Since a higher amount of carbon is stored in soils than in the aboveground biomass above tree line. This indicates that alpine ecosystems may turn into carbon sources rather than sinks.

Exhibit 29: Impact of climate change on Pastures of Ghulmat Valley

Pastures	Status	Change (days/ %age)	Trend			Adaptation Measures by Local Community
			30 yr. Ago (1985)	10 yr. Ago (2006)	Future Prediction	
Alpine and sub-alpine pastures	Degrading	24	Less degraded as compared to present	Degrading	More degradation is expected	Nil
Mid and low land grazing	Degrading	31	Less degraded as compared to present	Degrading	More degradation	Nil

3.8. Biodiversity

3.8.1. Agriculture and Fruits

Climate factors such as temperature, precipitation, CO_2 concentrations, and water availability directly impact the health and well-being of fruit trees and agriculture crops. With increased temperature and CO_2, crops such as wheat, maize, barley, buckwheat, fodder etc. and fruit trees are likely to grow more rapidly due to increased photosynthesis. It is also influencing insects, disease, and weeds, which in turn decreases agricultural production as currently happening in Ghulmat valley. Aided to these additional stresses is offered by variable precipitation and irrigation water. Early and rapid snow melting accompanied by irregular rainfall followed by drought declines the productivity.

Some farmers reported that despite of using high yielding seed varieties and inorganic fertilizers, the average crop productivity is less as compared to past years. Farmers reported rapid increase in weeds and pests during last 10 years which shows positive correlation with the increase in temperature. Thriving chances increases for the pests in warm climate. Disease pressure on crops is continuously at increase with earlier and prolonged summers and warmer winters, which allowed proliferation and higher survival rates of pathogens and parasites. The marketable yield of many commercial crops e.g., potatoes, walnut, apricot, mulberry, almonds etc. is declined for Ghulmat valley and become more sensitive to climate change than agriculture crops.

Local farmers observed the productivity and economic decline which shows that they are aware of climate change impacts but at the same time these people have no idea about the climate resistant seed varieties. To keep the tinge of organic farming and pristine local ecosystem the community must be trained about the natural and biological removal of pest and weed species.

3.8.2. Forest

Climate change directly and indirectly affects the growth and productivity of forests. Direct effect embraces the change in atmospheric carbon dioxide due to increased temperature and change in precipitation. The indirect effects account for the complex interactions in forest ecosystems. Climate also affects the frequency and severity of many forest disturbances such as

cutting, removal of fruits etc. Natural forest stand of Ghulmat valley represents a mix of woody and non woody vegetation. Major floral species are cheer, pine, junipers, willow, sea buckthorn, artemisia, mulberry and medicinal plants include tumoro, siah and Phialo.

Local community has reported the following impacts of climate change on the forest:

a) Rising temperature and CO_2 as a consequence of climate change has impacted the local forest ecosystem of Ghulmat by providing prolonged growth season which seems to enhance its productivity apparently. But this rising temperature can lead to phonological shifts of the alpine species and they will become locally or regionally extinct since they are unable to shift to higher altitudes. The increased CO_2 is becoming useless with increased temperature because of water unavailability throughout the season due to early and rapid melt out of snow and shift in rain season.
b) The Nullah branching out from glaciers and springs are the major irrigating channels for the agriculture crops and the forest species. With increasing temperatures these channels dry out and cause water stress augmenting the forest degradation in Ghulmat valley.
c) Along with this, warmer springs has the chance to extend the range and lifetime of many pests that stress trees and crops and at the same time it decreases the available water quantity throughout the year.

Considering all these facts it can be concluded that local community knows about the impact of climate change on the forest but don't know about the mitigation strategies. These strategies are needed to be designed by thorough research and impact. Long term impact of the small-scale forest disturbances which cannot be observed via satellite systems must be assessed and counter measures should be adopted. With the increasing temperature and drought, it is obvious that some species will not be able to adopt and flourish in the ecosystem so there is need to assess that how long the present floral species will survive and which species should be planted to continue the forest sustainability. All these questions need research-based answer and capacity building of the community accordingly to ensure the ecosystem viability.

3.8.3. Wildlife and Associated Biodiversity

The multiple components of climate change are anticipated to affect all the levels of biodiversity, from organism to biome levels. Impact of Climate change is projected to become a progressively more significant threat in the coming decades. In addition to warming temperatures, more frequent extreme weather events and changing patterns of rainfall and drought can be expected to have significant impacts on biodiversity.

In Ghulmat valley, faunal biodiversity is in good shape, during FGD sessions the participants reported 36% increase in Ibex population over last 30 years that refers to the good conservation initiatives and mainly because of trophy hunting efforts. In either case comprehensive study is required to assess the breeding potential and adaptability of the species in changing climate.

Considering the birds like wild pigeon, sparrow, Monal pheasant, crows, vultures, eagle and falcon and butterflies have been reported by the local community that these species were common a long time ago, but now several of them are not common and experiencing decline.

The community also reported that the arrival of migratory birds decreased and even their arrival time has been changed. The apparent reasons are the absence of favorable climate for prey species, decline in seed crops, removal of forests and floral species. No assessment has yet been done which provides the complete biodiversity information about the Ghulmat valley. Therefore, it is difficult to prioritize the species for conservation actions and to monitor the effect of climate change on the small and large animals.

Exhibit 30: Impact of climate change on biodiversity of Ghulmat Valley

Biodiversity	Status	Altitudinal Shift	Trend			Adaptation Measures by Local Community
			10 yr. Ago	30 yr. Ago	Future Prediction	
Agriculture crops and fruit trees	Degrading	N/A	Degrading as diseases increase and production is decreasing	No considerable change observed	Irregular water availability due to increased flood, diseases and irregular precipitation patterns will lead to productivity decline.	Nil
Natural Forest	Degrading	Increasing	Increasing	Forest patches were dense and healthy	More degradation is expected	Harvest from plantations and fruit trees residual
Wildlife						
Ibex	Increasing	Increasing	The Ibex population almost depleted	Population was relatively good in number but illegal poaching proved a disaster	Populations will increasing if conservation practices adapted strictly, otherwise complete depletion is expected. Astor Markhor was existing in the area some decade earlier but now the existence has finished in the area	Nil
Birds	Decreasing	N/A	Bird population is increasing	Population and diversity was good	Declining Natural resource and hunting can cause decrease in birds population	Nil
Butterflies	Decreasing	--	Diversity of species has declined	Butterflies of several types were common	The trend seems to be decreasing in the future because some of the species are disappearing	Nil
Fishery	N/A					

3.9. Water

Ghulmat valley community unanimously reported an extreme decline in precipitation level. Snow fall has declined up to 35% and no significant changes in annual rainfall. According to the perception of local community. At present, snowfall happens 2-3 times in winter in the valley; however mountains do get a considerable amount of snow. Community members also reported reduction in the size of glaciers and increase in the frequency of GLOF events. The altered precipitation pattern has caused the differential availability of water during different seasons. During end summer and winter season water become scarce and leads to unsustainable water management, however during the start of summer season flood in the streams increase and irrigation channels and creates water unavailability/scarcity coupled with poor water quality.

3.10. Tourism

Huge domestic tourism in GB over a couple of year has provided income earning opportunity opportunities for many remote communities and it is a valuable opportunity for people of Ghulmat valley to advertise their touristic points and manage proper facilities and services for tourist, which can help them in earning income from tourism.

Lower earnings in winter tourism are reinforcing economic disparities between the dependent communities and compel them to depend upon the natural resources of area as a mean of their livelihood. Ghulmat valley is a tourism dependent valley but lack of tourist and visibility facilities and poor accessibility hampering tourism sector.

CONSERVATION MANAGEMENT ISSUES & PROBLEM OF GHULMAT VALLEY

4. MANAGEMENT ISSUES AND PROBLEMS

Present scenario of Ghulmat valley has reflected several issues in customary practices and adaptation to climate change. These issues directly or indirectly affect the economic situation of each household and increase their dependence on natural resources which are free of cost and in vicinity to the community as compared to market. Therefore, in order to develop an effective strategy for adaptation, it is necessary to develop capacity of local community to adapt to the changes in a way that reduces their dependency on natural resources. These adaptation approaches must then be disseminated to the communities and relevant laws up-gradation. In Ghulmat valley customary laws are being practiced in all villages but these laws are unable to sustain and address the suitable practices and continuously generating issues, therefore needs an up-gradation.

4.1. Agriculture

A smaller area of arable land is cultivated in Ghulmat valley by traditional varieties of fodder, crops, fruit trees and commercial trees. Following issues are being reported by the local community. These issues although belongs to several sectors but all are aiding in decline of agriculture production.

1. **Small land pieces for agriculture:** With increasing population and emerging nuclear family system in Ghulmat valley, arable land fragmentation is taking place and area of land holding per household is shirking year by year.
2. **Irrigation and water rights:** Customary rights about water sharing between villages and among the households are not documented anywhere. This generates confusion and rivalry among the land holders for water needed for irrigation. Situations become worse during the spring and autumn season which foster low availability of water in streams.
3. **Low productivity:** Farmers, technical personnel, and interviewee from relevant fields unanimously reported low productivity per unit area. The common issues underlying this fact is small land, thin soil cover due to erosion, increasing pest prevalence over the crops, low fertility, water unavailability, erratic and unpredictable precipitation times, warm temperature, disasters such as landslides, floods and several other. The most important among them is use of traditional methods and seeds for cultivation.
4. **Weeds and pest:** Organic farming is an important aspect that is valued all over the world for nutrition. Local farmers are lucky enough to manage the crops and fruit production without using pesticides, insecticides and inorganic fertilizers. Animal manure and ash to be used to enrich the soil with minerals. Moreover, water in the streams also provide sufficient quantity of mineral to sustain agriculture practices. Despite of these, farmers are facing difficulties now a days due to several insect and flies' pest species which feed on the grains, fruits and other such products. Indigenous people and their knowledge is blaming climate change for increasing pest infection on fresh as well as dry seeds and fruits.
5. **Traditional practices and non-certified seed varieties:** Local farmers rely upon the traditional farming and cultivation methods. Growing crops from farm saved seed is common practice around the world and same in Ghulmat Valley. Farmers prefer this

practice due to several reasons which includes certainty of quality, convenience, timeliness/availability, and cost. They also prefer this practice because farmers don't want to take risk on their productions. But with the progress of time keeping though cultivar performance remained same but productivity declined which demands the practices of modern farming techniques and new seed varieties.

6. **Climate change:** Climate change is exacerbating the challenges faced by the agriculture sector, negatively affecting both crop and livestock systems in Ghulmat Valley. Climate change induced increases in temperatures, rainfall variation and the frequency and intensity of extreme weather events are adding to pressure on the local agriculture system – which is already struggling to respond to rising pathogenic infections. The changing climate is also contributing to resource problems beyond food security, such as water scarcity, pollution and soil degradation. As resource scarcity and environmental quality problems emerge, so does the urgency of addressing these challenges. Farmers are really feel helpless against the inconsistent weather even they are thinking to abandon growing maize and wheat, and cultivate cash crops like potato because that are short-duration.

4.2. Pasture

Majority of the pastures in Ghulmat valley is declining at rapid rates. The pasture sustainability is also facing lot of pressures from livestock more than carrying capacity, medicinal plants extraction, landslides and floods. The most common factor over last ten years is infrequent snow fall which causes declining growth of natural vegetation in alpine and sub-alpine pastures and rangeland, and largely contributing to declining livestock raring trend in the valley.

1. **Baseline of flora and phenological shift:** There is no documented baseline data or inventory about the floral species of the pastures, their status and use. So it is the need of time to develop such basic dataset which prioritize the species for conservation actions to mitigate the socioeconomic and environmental pressures. It is especially recommended on priority basis to monitor and conserve the floral species and medicinal plants affecting by climate change and showing phenological shifts. Only medicinal plants are explored and listed but there is no information on the predicted impacts of climate change over these medicinal plants and their adaptations.
2. **Gaps in customary practices:** Livestock grazing is an ecosystem service provided by the pastures. 100% pastures of Ghulmat valley are showing decline in productivity due to unsustainable livestock grazing practices. There are no established rules about the maximum number of livestock heads in the customary rules. Carrying capacities of these pastures have never been estimated and that's why unsustainable pressures are fueling the degradation. Diseased animals are advised to keep away from the pastures but their water points are shared which can induce the infection in whole herds and also there is a chance of disease transmissions.
3. **Grazing timing:** Lasting pastures can be improved only when herders understand plants' recovery needs and practice good grazing land husbandry to maintain plant health. The local

community of Ghulmat reported the problems like weed invasion, less productivity and weakened soil health. All these issues are indicators of impatient grazing by the herders i.e. they start to graze their animals before pastures are fully grown. Herders do so to provide animals with a high-quality diet but they are unaware that short plant growth reduces bite size and the nutrient intake. Moreover, it contributes to decline in pasture productivity which is lose-lose situation only.

4. **Livestock insurance scheme:** Livestock insurance scheme is an incentive equal to the loss for the herders if their livestock get killed or attacked by the wildlife. The scheme was introduced in Ghulmat valley but currently it is non-functional. Though very few livestock kills by predators were reported during the survey and no retaliatory killing reported by the community, but in the absence of insurance scheme retaliatory killing of wildlife is expected.
5. **Lack of zonation:** Pastures are degrading continuously but the customary laws don't have any hint of abandoning such pasture areas which hastens its decline. It is essential that grazing on pastures in the buffer area of CKNP should be controlled to maintain adequate vegetative cover that reduces erosion and permits adequate regrowth after each grazing period to ensure the health of grazed plants.
6. **Harvest of medicinal plants:** Ghulmat pastures and forest areas the rich sources of these medicinal herbs. Local community uses them for disease cure. These drugs have anti-pyretic, analgesic, anti-cancerous, anti-diabetic and several other uses. Local community is fully aware of their uses but they don't have any understanding of ways of its extraction without damaging the whole herb. Training of local community for collection, drying and usage is important.

4.3. Water

Water is the key ingredient and symbol of life. All the changes in climate pattern are directly and indirectly playing with water quantity. Altered precipitation patterns, warm temperatures and frequent air currents actually disturbed the water quality and quantity both. The local community in Ghulmat valley depends directly upon the rain and indirectly upon annual snowfall. Due to delayed rain timings and less annual snowfall local community is frequently facing the drought and water shortage due to increasing glacier melting and flood causing blockage of irrigation system. Moreover, torrential rains are now more frequent which on one hand increases water quantity but also cause floods and landslides in disaster prone areas thereby creating socio-ecological stress. Water pollution is increasing due to lack of sanitation /drainage system and animal sheds nearby water channels and drinking water sources. Grey water from the local community is also getting mixed in to fresh water and degrading its quality.

1. **Drinking water:** Local community depends on fresh water supplies from glaciers and springs for drinking purposes. Sediments are continuously increasing in the water supply due to weathering of rocks and mixing of soil and grit in the area. High mineral content can induce disease in local community and their livestock. The water testing facility already established at Karakoram International University provides the free testing but local community is not very interested in the procedure due to lack of awareness.

2. **Irrigation deficit:** Local community reported poor structure of irrigation channels or insufficient irrigation channels is the prime reason for irrigation deficit. "Either lot of water or no water" in the water sources, the communities cannot fully utilize it for irrigation purpose. The communities in the villages have constructed irrigation channels but with increasing land fragmentation and demand for water those irrigation channels have proven insufficient. The communities cannot construction of more irrigation channels due to lack of financial resources.
3. **Water pollution mitigation:** To ensure the water quality local community should be compelled to make separate pathways for grey water ensuring that it do not mix into the fresh water streams. Hotel owners should be trained to dump the trash elsewhere instead of water while adopting ecosystem friendly approaches.
4. **Disaster management:** Climate change is deeply reshaping the landscape of disaster risk. Weather extremes such as drought, flood and landslides cause the huge economic depressions in all sectors ranging from transport to land farms. No protocols are developed yet for the villages in the surrounding of CKNP. It is very necessary to take action because dependence of poor people on natural resources increases dramatically.

4.4. Forest and NTFP Issues

These sectors are as vulnerable from climate change as any other and therefore, there is strong need to assess and enhance the adaptive capacity of the forest and biodiversity.

1. **Mortality:** Drought has increased tree mortality and resulted degradation and reduced distribution of entire forest ecosystem. It increased the wood harvesting opportunity for the local community from Ghulmat valley for subsistence purposes at the cost of degenerating forest.
2. **Harvest pressure:** Heavy collection of timber and non-timber products from the forests allows the community to fulfill their needs. With continuously increasing population dependence of local community is also increasing on these natural resources. Fuel wood harvest of Ghulmat valley has showed an unsustainable approach. This harvesting is not limited to here only but includes the removal of foliage, branches and plants cutting for livestock forage as well. Unsustainable practices and unguided approaches towards harvesting leads the ecosystem imbalance.
3. **Forest regeneration:** Climate change has shown differential approaches for the propagation dependent upon the species ecology. Warmer temperatures and increased CO_2 increased the rate of photosynthesis and thus growth but increased the pest attack is seriously stressing the forest regeneration.

4.5. Eco-tourism

Ecotourism is nature based tourism that fosters environmental appreciation and awareness. Gilgit-Baltistan which is considered as the hub of eco-tourism incorporates a considerable number of tourists every year to generate the huge amount of revenues and alternative livelihood opportunities.

Following issues are being reported by the local community.

1. **Tourist accommodation:** Limited accommodation facilities compel the tourists to opt for camping in open areas. This option become unsuitable during the adverse weather.
2. **Visitor facilities:** Site maps, information boards, sign board and other facilities are not available for tourists. However, open camping areas are the only option for the tourists stay in the valley due to lack of hotels.
3. **Climate Change:** Climate is a key resource for tourism and the sector is highly sensitive to the impacts of climate change and global warming, many elements of which are already being felt. Climate change is having adverse impacts on the number of tourists especially for the treks which Ghulmat valley offers.

4.6. Mining

In and around CKNP in the sedimentary rocks of the mountains, huge reservoirs of gemstones and precious rocks are deposited. Local level mining is being carried out in and around CKNP. Mining area can be identified by having the holes in its mountains just like bee web.

"About 30,000 people associated with the mining sector are carrying out activities inside the Central Karakoram National park territory, adding that the act may result in the loss of habitat for various species" (Express tribune: June 27th, 2012).

This mining provides some of the valleys around CKNP with a good opportunity to earn livelihood. In Ghulmat valley, mining opportunities are available but a small portion of the entire population is associated with it. On other hand people associated with mining cannot get maximum benefit out of it due to the following reason!

"Lack of alternative livelihood opportunities for communities and uncontrolled mining in mountains are some of the issues that require attention" (Express tribune: June 27th, 2012).

1. **Lack of modern tools and practices:** Local miners are not trained for mining. They use iron rods for excavation and mostly end up in the damaging the stones. It leads to loss of revenue not only on personal level but also on the regional and ultimately at national level.
2. **Lack of training:** Local miners have learned the methods of mining by hit and trial approach and succeeded somewhat. Nevertheless, due to lack of training they are unable to extract pure and high quality rock. They accidently break these gemstones and thus lose the amount of profit.

3. **Value addition of gemstones:** Gemstones are sold in raw form by the local community to the dealers on low cost due to improper cutting and polishing. Therefore, local miners lose their chance to earn huge revenues and only get a minor share.

4.7. Wildlife and Protected Areas

Institutional structures to manage wildlife and protected areas experience lot of issues due to increasing urbanization, degrading forest and natural areas. The biodiversity of CKNP and its buffer zones has the species, which are of international and national importance. Wildlife plays an important role in both ecosystem sustainability and community economics. Although trophy hunting is a controversial subject, yet it enabled the community to earn millions of dollars since its start and contributed to conservation as well.

1. **Population trends:** The investigation of issues related to wildlife and protected areas normally consider the number of heads of animals irrespective of their health, annul recruitment. The overall trend of two trophy species; i.e. Markhor and Ibex seems to increase in their population according to the relevant government departments but there is no assessment on the reproductive output. There is chance of reproductive deficit in mountain ungulates such as Ibex and other species due to the history of population surge.
2. **Population surge:** During the recent years of conservation, wild species has increased considerably. The sudden increase from small population are often culprits of inbreeding depression, which is most expected in the case of mountain ungulates and birds which are decreasing continuously.
3. **Unidentified species:** GB hosts the diversity of wild fauna and flora most of which are unidentified and even un-discovered yet. The rapid environmental degradation is causing the extermination and extinction of the specialist species. It shows that biodiversity of the species is declining without recognizing their ecological and economic roles.
4. **Habitat degradation and isolation:** Population is continuously increasing In Ghulmat is increasing and encroaching into the natural areas for settlements and agriculture. This land use change affected wildlife both positively and negatively depending upon the species ecology. Habitat degradation has also pushed the species to isolated and low quality habitats that caused additive stress on the wildlife heath, reproductive potential and genetic health and so on. There is no assessment for the impact of habitat degradation on genetic health of wildlife species.
5. **Genetic reserves of wildlife species:** Most wildlife surveys are based on the numerical assessment of the animals and do not account for their genetic viability. Designated areas such as national parks and sanctuaries are notified irrespective of the idea that particular area is either genetic bank of the particular species or not. Genetic reserves of forests and wild species are not identified and protected yet.

PROPOSED MANAGEMENT INTERVENTION FOR GHULMAT VALLEY

6. PROPOSED MANAGEMENT INTERVENTIONS

6.1. Agriculture

In particular, there are different adaptation options in agriculture according to the involvement of different agents (producers, industries, governments); the intent, timing and duration of employment of the adaptation; the form and type of the adaptive measure; and the relationship to processes already in place to cope with risks associated with climate stresses finally the development of provincial climate change policy.

The adaptation options required for the local community needs four tiers. (i) Technological developments, (ii) government programs and insurance (iii) farm production practices, and (iv) farm financial management.

1. **Population expansions:** Similar to other areas of GB, with increasing population construction is rapidly increasing and mostly houses, cattle shed and other required constructions are being built around the settlement and agriculture area, which is continuously shrinking arable land. To avoid this issue new settlement must be built on barren or abandoned parts of the land. This will keep the arable land available for cultivation.
2. **Certified seed varieties and crop insurance:** Certified seed is the only input that can get farmer more than just higher yields. Such varieties are resistant to climate related and pesticide issues. To introduce the concept and usage of certified seed varieties, relevant stakeholders must provide them on subsidized rates and premium insurance packages. Along with this one time training of farmers of each village around CKNP is recommended to increase the agriculture production per unit area.
3. **Integrated farming and agriculture products:** Farmers are traditionally inclined to mono-cropping systems and earn the revenues from raw products. In Ghulmat valley the farmers do not sale both fresh and dried fruits due lack of awareness on post harvesting techniques, processing techniques and proper storage facilities. The little economic innovation lies in the sale of potato only, while million rupees worth of fruit is being wasted annually due to lack of awareness, and skill for value addition and facilities for storage. Many end-users require specifically processed products such as Marmalades, Jams, Vinegar and Honey. Farmers need guidance on the value addition of products in order to be economically stable.
4. **Soil analysis:** It was unanimously reported by all the communities that land they are cultivating is never tested in the laboratory and scientifically they don't know which crop and fruit varieties are best for their soil type. Each crop is sensitive to soil type and productivity heavily depends upon the suitable soil. Practically there is requirement of soil testing facility within each agriculture information cell. This facility will provide information about several structures especially addressing the common question of farmers such as suitable seed varieties, microbiota of soil and its capacity of crop growth and several others.
5. **Secure water availability:** Water is central to agriculture productivity. Adaptation of climate-smart inputs and shifting to more efficient irrigation methods will help local farmers

to maintain productivity levels. Water tanks for the storage purpose of agriculture are required to reduce the drought effects at some village.

6. **Training on climate friendly agriculture practices:** Farmers should be trained with the emphasis on targeted ingenuities such as outcome-based farmer incentives and knowledge transfer systems – that enhance farmer capacity to achieve sustainable productivity growth through mitigating and adaptive practices keeping the pace with climate change. These climate friendly and climate proof practices particular to each valley must be incorporated into the operational plan. As there are no previously approved practices so they are needed to be designed by methodically modelling the practices with climate change models.
7. **Introduction of climate resistant seed varieties:** Farm decision-making is seen as an on-going process, whereby producers/farmers are continually making short-term and long-term decisions to manage risks emanating from a variety of climatic and non-climatic sources. In this sense, adaptation is the result of individual decisions influenced by forces internal to the farm household (i.e. risk of income loss, environmental perception) will become reasonable and let them earn revenue to decrease pressure of local community on natural resources. To resist or at least minimize the pressure of ever changing climate patterns and issues in relation to climate change, there is a need to develop an agriculture information cell for the farmers in each village. This information cell will raise the job opportunities for local community and will guide them about the climate resistant breeds, ways of cultivation, harvesting in detail. This information cell must have the tested varieties of climate resistant seeds and seedlings. Seed storage for potato in the harsh climatic condition is a challenge in the CKNP area, therefore input store for seed must be provided at least among every three villages.
8. **Spread of infestation to the wildlife:** Buffer area of CKNP harbor 230 villages. All of these villages have agriculture crops and tress which are getting infected manifolds since last decade. These pest species have the chance of transmission towards the wild medicinal herbs, forests, nests of birds and ultimately enter in fauna. This pathogenic transmission can induce infections in the flora and fauna and has a considerable potential to depress the specialist species. However, this issue has not yet been explored and needs a well prepared monitoring procedure to estimate the estimate the annual economic laws.
9. **Research projects:** Without research adaptation to climate change is generally problematic for agricultural production and for agricultural economies and communities; but with adaptation, vulnerability can be reduced and there are numerous opportunities to be realized. Adaptation must be supported by the research of relevant components. Productivity is declining at a rapid pace due to some known and unknown reasons. Apparently climate change seems responsible for this decline aided with ever increasing pest attacks during last 10 years. The recent changes in the climate are so unpredictable that it is becoming impossible for the farmers to work in agriculture farms for profit. Customary practices for agriculture sustainability are losing their functionality. These practices must be updated by designating specific studies of seed variety, soil analysis, crop suitability analysis, bio-control of pests, projected impact of climate change on the crops productivity and transport, optimum economic benefits from every suitable crops and several other inter-

related components. As it is evident that the impacts of climate change on agriculture will vary depending on precipitation changes, soil conditions, and land use, therefore these impacts are required to be evaluated independently for each valley in the buffer zone of CKNP. This vast research is possible if included in the operational plan of the CKNP to provide support for updated management plan of CKNP.

10. **Key policy reforms:** Key policy reforms across three pillars are needed to strengthen farmer incentives to achieve productivity growth sustainably, and without sacrificing climate change mitigation and adaptation objectives. These three pillars are i) Farmer level, ii) Agriculture sector level, iii) Provincial level. The agriculture policy needs an up gradation to mitigate the effects of changing climate and devising the climate friendly strategies at an urgency to minimize the agriculture induced impacts on climate ultimately to protect the protected areas of GB, particularly its largest park the CKNP. The management plan which is already established has a huge gap about the laws of employing climate friendly approaches in villages residing in buffer areas for agriculture. Moreover, the climate is not only changing but it is also on stationary which means old knowledge can't be the thing to rely upon. So gap of climate friendly approaches must be assessed via operation plan for CKNP and then addressed in to the revised version of CKNP management plan.

6.2. Pasture

Upgradation of customary laws: Customary practices should be amended in such a way that ensures sustainable use of pastures. Diseased animals must be kept away from the pastures to avoid the zoonosis and must be vaccinated. Extraction/cultivation of medicinal plants by the local community must account only for household purpose and should be cultivated in the amount equal to its removal. Encourage stall feeding/minimize grazing till the improvement of pastures. These strategies must be field tested and then included in the customary and statutory laws and CKNP revised management plan.

1. **Grazing management:** To enhance pasture productivity timing of grazing and grazing sites in each pasture are need to be designated to develop holistic grazing strategies with farmers/herders that include rotational grazing or intensively managed grazing as a regular grazing routine.
2. **Fodder cultivation:** Regionally adapted and high nutrition value fodder crops should be cultivated for fodder instead of traditional species. This will remove the stress of early grazing from the pastures and allow them to grow.
3. **Training of herders:** Herders have no information about the sustainable practices of livestock grazing. They just sent their livestock with guards to feed upon the pastures. Timing of grazing is integral for livestock. There are several other factors that need to be cared for the sustainable livestock grazing.
4. **Seeding of local flora and training of farmers:** Local flora should be collected and cultivated on the barren patches among the pastures. This will increase the pasture areas and productivity. Research on cultivating these species is required. After it dissemination of

knowledge through training sessions, manuals and brochures will convince the farmers about the re-seeding of pastures.

5. **Local botanical garden to ensure existence of local flora:** Adaptable plants should be identified among the plants. These plants should be kept in botanical gardens to provide backup in case of avalanches, landslides, floods and barren land cultivations.
6. **Encourage the pasture extension services by other line departments:** Many forestry and livestock enterprises run by private farmers and the government depend on efficient, economical, and environmentally beneficial pasture use. Farmers need technically competent advisors to help them accomplish their objectives. Unfortunately, no advisory services for the pastures exist in the villages because of lack of pasture specialist technical advisor. Therefore, there is strong need to train the forest relevant personnel from each village or valley as a pasture specialist. CKNP biodiversity directorate staff can be a potential candidate for this training as they are both aware of natural resource use in and around CKNP.
7. **Cultivation and marketing of medicinal herbs:** Cultivation of these herbs should be promoted as an alternative economic resource with appropriate site assessment and training on its cultivation, harvesting marketing and utilization. Economic uplift of the community will actually decrease their dependence on CKNP resources and allow them to grow.
8. **Ethno-botanical data base:** Development of consumer linked ethno-botanical databases of each village will not only enhance the market for the local farmer but also fosters the direct link to the consumer.
9. **Pasture awareness programs:** Hands-on training and field experience are two of the best, most rapid ways to increase farmer's/shepherd's awareness and local university students about the optimum pasture use for healthy livestock. Final outcomes will be best when this training is guided by technically competent professionals who can accurately answer questions and help solve problems. This training will allow the local community to employ sustainable practices and secure these resources for their future generations.
10. **Research problems:** Phenological shift of floral species and their impact on biodiversity must be assessed on priority basis so that extirpations can be avoided. Ecological baseline of the pastures to keep the biodiversity of the area must be developed. Similarly, potential farming sites for each medicinal plant should be identified. The predicted impacts of climate change on the pasture productivity are not known and need to be evaluated due to their high valued ecosystem services. Most utilizable and ecologically resilient entry points are needed to be identified and designated.

6.3. Water

People living in CKNP buffer zone afflict with different kinds of water contagious diseases because of the scarce access to clean drinking water. Even though glacier water is present in many areas however easy access to clean water is very difficult for most of the population.

1. **Quality of drinking water:** The water testing facility already established at Karakoram International University provides the free testing but local community is not very interested in the procedure due to lack of awareness.
2. **Construction of small and medium sized reservoirs**: Construction of small or medium-sized reservoirs in the foothills and plains are quite necessary, so that water from streams can be harvested for use during the dry season and the winter, both for farming and domestic purposes.
3. **Common drinking water storage tank:** Shared water storage tanks should be built upon among the households to help them adapting drought conditions.
4. **Water pollution mitigation:** To ensure the water quality local community should be compelled to make separate pathways for grey water ensuring that it do not mix into the fresh water streams. Hotel owners should be trained to dump the trash elsewhere instead of water while adopting ecosystem friendly approaches.
5. **Early warning system:** But to give relief to the local community of Ghulmat valley, there must be system to give them timely alerts about their crops and livestock protection. This will accentuate the economic resilience of the community and natural resilience of the buffer area.

6.4. Forest and NTFP

Up gradation and regulation of forest laws: Customary laws allow the fuel wood collection, timber and non-timber forest products unlike statutory laws, which increase their favor towards the customary laws. These customary laws don't address the conservation needs and allow harvesting at an unknown level. If this practice is continued, then community will shortly run out of their forest reserves. To ensure sustainability, an up-gradation of customary rules is recommended. Otherwise, implementation of statutory laws is integral.

1. **Promotion of farm forestry:** Local farmers should be trained to have small-scale farm forests, which along with revenue generation allow them to be independent of forests. This practice exists in a valley but very limited. Training will allow the farmers to take self-initiatives and entrepreneurship in forestry sector.
2. **Climate change and conservation friendly forestry projects:** To generate credible forestry and conservation offsets, projects must be additional to what would have occurred without the incentive supplied by the carbon market; they must be verifiable (i.e., measurable and enforceable); they must control or adjust for leakage; and they must address the issue of permanence. Forward crediting is proposed by some to accommodate the long period of carbon accumulation in forests, but others are concerned about assuring payments only for actual carbon sequestration.
3. **Restoration cum conservation:** Several sustainability practices are being carried out in Ghulmat but any of them hardly meet the conservation targets. Keeping in view the present environment sustainability changes, restoration is required along with conservation. Therefore, the upcoming forestry projects must come up with the forward crediting instead of required crediting.

4. **Research projects:** Projected annual greenhouse gas emission counts provide baseline to identify required CO_2 sequestration offset. On the basis of this, it will be identified that which species is required and in how much amount to keep climate stable for each valley in the buffer zone of CKNP and its surrounding areas. Remote sensing to monitor the land use changes is very essential because of the location of valley around CKNP. In future due to CPEC, land use is expected to be altered and its environmental consequences seem negative. To neutralize these expected issues baseline data about land use will quantify the environmental impacts and truly determine the required type of actions with high accuracy.

6.5. Eco-tourism

Following interventions are recommended on the basis of the survey conducted for VCSDPs development.

1. **Interpretation of resources:** In order to increase the revenues by tourism there is need to provide interpretation programs that are relevant to the public, further information is required. This information can be obtained through visitor surveys.
2. **Destination vulnerability hotspots:** The integrated effects of climate change will have far-reaching consequences for tourism businesses and destinations. Importantly, climate change will generate both negative and positive impacts in the tourism sector and these impacts will vary substantially by market segment and geographic region. There are disaster prone areas in and around CKNP which are not mapped and disseminated to the tour operators. This inventory should be developed along with measured risks and challenges that tourist can face.
3. **Infrastructure:** Surge in tourist flow has been reported recently but related infrastructure such as accommodation, ecotourism facilities, are very short and needed to be developed to ensure the provision of facilities for tourist influx by public and private department.

6.6. Mining

Following interventions are recommended on the basis of the survey conducted for VCSDPs development.

1. **Training of miners:** It is important for the miners to have hand on training on modern tools and techniques for quality mining. It is especially important for the valleys, which lie near mining deposits of Gemstones and other minerals.
2. **Entrepreneurship opportunities:** Small-scale business related to gemstones and its products will provide the local community an opportunity to earn good profit.

6.7. Wildlife and Protected Areas

1. **Population assessment:** Database should be established to keep the systematic annual population assessment of all the near threatened and endangered animals. The protocols for population assessment of each species should be determined on ecological basis and kept same every year.

2. **Wildlife health:** There is some baseline data about the health of animals. Nevertheless, all such studies are either short term or based on only few components. Moreover, genetic health of the species have never been accounted which can be the culminating factor in the reproduction of the animals in addition to other stresses.
3. **Species recovery plan:** There is a growing consensus that habitat fragmentation has caused wildlife decline. However, what is the impact of this fragmentation is still unknown. There is need to study to study how the urbanization, habitat isolation, decline in vegetation has stressed the wildlife. How these impacts can be mitigated, which habitat areas need priority conservation actions such as habitat connectivity. All this information is possible from the properly designed studies unique to each class of wildlife based on which species recovery plan will be designed.
4. **Genetic reserves:** Genetic reserves inside the protected areas of the threatened and endangered species are needed to be identified for their restoration. If the designated protected areas do not have by chance these genetically healthy populations then their boundaries should be adjusted according to these reserves.
5. **Climate change indicators:** Several fungi and amphibian species are considered as an indicator of climate change. These species are experiencing decline in the population such as Deosai toad, which was once abundant in clean waters of the area. This species is now hard to find because of water pollution. These indicators are needed to be identified and used as climate change detection for the areas. This research will provide the real assessment unlike models, which sometimes fails to give real estimate.

7. STATUARY VS CUSTOMARY PRACTICES IN GHULMAT VALLEY

S. No.	Consumptive Uses of Park Resources.	Community Practices	CKNP MP/OP Rules	Recommendation
1.	Harvest of Forest and other natural vegetation	Juniper trees are cut and used as fuel wood and timber	Harvest of Juniper is banned; if harvest is necessary than only only branches should be removed instead of whole tree	Awareness of community is required
		Riparian vegetation e.g. Sea-buckthorn and Willows, community usually remove the whole plant/tree from soil	Cut single basal shoots from each plant to preserve in its root system. By doing so, new shoots can re-grow rapidly producing new biomass to be harvested	-do-
		Community harvests wood at unsustainable level both from buffer and core zone	Wood and shrub collection is allowed only in the buffer zone up to sustainable level	Afforestation, alternative fuel options and sustainable forest management areas are need to be designated. Along with this harvest rate compatible to annual growth of forest should be determined
2.	Medicinal Plants	Community harvests local medicinal herbs and aromatic plants from park for household purpose	Harvest is completely banned in core zone and allowed at sustainable level from buffer areas under license.	Community must be awarded the license and concerned department restrict the harvest without license.
3.	Livestock Grazing	Herd grazing is allowed only in buffer zone and tourism focused zones of the park.	Community graze their livestock in packs along with dogs inside core zone. Dogs and packs are not allowed inside parks	Improvement in watch and ward mechanism along with community awareness is necessary at urgency
		Equines (horses, mules, donkey) occasionally found in core zone of the park	Equines are allowed only in tourism focused zone	–
		Yaks and its hybrids freely graze in the park	Grazing of traditional free roaming yaks and yak-cow breeds is buffer and core zone is acceptable	–
		Herders graze livestock in pasture and core zones dispose plastic bags, bottles in nearby streams and also use burn wood from forest	Use of plastic bottles, glass bottles, plastic bags and match box is not allowed inside parks.	Movement must be restricted for the grazers.

S. No.	Consumptive Uses of Park Resources.	Community Practices	CKNP MP/OP Rules	Recommendation
4.	Pastures	Community graze livestock in the pastures which are located in and around buffer zones.	Grazing is allowed only in buffer zone	–
		Indigenous system of grazing was sustainable. During previous times herders ensured to take livestock into the pastures, when vegetation becomes knee-length. Currently, herders have abandoned this practice and take their livestock to pastures even before its sprouting.	Indigenous grazing system should be revived	Awareness and training of herders is important
5.	Wildlife hunting	Community take advantage of inaccurate population counts of wildlife and poach/ hunt wildlife at family gatherings, holy occasions and on other such events	Reliable wildlife count by DNA analysis is recommended and also to track poaching for core zone management. Hunting except for "trophy hunting" is banned both for buffer zone and core zone.	Community awareness can serve the purpose. Moreover genetic approach should be employed for accurate population counts and tracking of poaching

8. RECOMMENDED ACTION PLAN FOR GHULMAT VALLEY

S. No.	Sector	Management Objectives	Conservation/ Development Issues/Gaps	Root Cause(s)	Proposed Management Action	Ref. to MP/OP	Village/s	Priority	Time Scale (Short, Medium, Long term)
1.	CKNP Directorate	1.1. Improve CKNP functionality	Lack of enough support of local community for CKNP	Conflicts over the use of park resources	1.1.1 Manage the conflicting issues ensuring park conservation	Suggested for inclusion in revised MP/OP activities	All	Urgent	Short term
				Community awareness is insufficient due to deprivation meetings, and awareness campaigns by CKNP Directorate	1.1.2. Awareness campaigns /training of local community about the significance, rules and regulations of the park and sustainable use of natural resources.	Suggested for inclusion in revised MP/OP activities	All	Urgent	Short term
2.	Local Social Organizations	2.1. Develop Structural/ Institutional framework of social organizations	Insufficient support of LSO to CKNP directorate	Weak communication linkages Lack of effective conflict management mechanisms	2.1.1. Develop appropriate networking for existing social organizations under the umbrella of concerned LSO/CKNP	Suggested for inclusion in revised MP/OP activities	All	Urgent	Short term

S. No.	Sector	Management Objectives	Conservation/ Development Issues/Gaps	Root Cause(s)	Proposed Management Action	Ref. to MP/OP	Village/s	Priority	Time Scale (Short, Medium, Long term)
		2.2. Develop capacity for Financial sustainability of local social originations	Poor implementation of conservation interventions implementations and subsequent sustainability	Lack of awareness about sustainability avenues	2.2.1. Preview the existing capacity of relevant LSOs for the identification of gaps	Suggested for inclusion in community development plan	All	Urgent	Short term
					2.2.2. Capacity building of Social organizations to ensure conservation of park resources and sustainable resource used	Activity 5.2.1	All	Urgent	Short term
					2.2.3. Capacity building of LSO to generate funding for their sustainability	Suggested for inclusion in community development plan	All	Urgent	Short term
3.	Health	3.1. Promote health facilities	Prevalence of Diseases	Lack of basic health facilities in existing dispensaries Lack of sufficient dispensaries	3.1.1. Capacity building of existing staff 3.1.2. Provision of Medicines 3.1.3. Provision of new diagnosis equipment	Suggested for inclusion in community development plan	Ghulmat Ghulmat Ghulmat Nilt	Urgent Urgent Urgent Urgent	Long term Medium term Medium term Long term

S. No.	Sector	Management Objectives	Conservation/ Development Issues/Gaps	Root Cause(s)	Proposed Management Action	Ref. to MP/OP	Village/s	Priority	Time Scale (Short, Medium, Long term)
					3.1.4. Establishment of new health facilities				
			Unhygienic practices by locals		3.1.5. Awareness conferences about hygienic practices	Suggested for inclusion in revised MP/OP activities	All	Urgent	Short term
					3.1.6. Dissemination of brochures and pamphlets to educate community about prevention from sporadic diseases Promotion of healthy and hygienic practices by women and children through workshops, campaign and social organizations	Suggested for inclusion in revised MP/OP activities	All	Urgent	Short term
4.	Energy	4.1. To meet energy demand	Depletion of natural resources	Preference of fuel wood from forest by the local community due to free commodity	4.1.1. Promotion of fuel efficient stoves at high altitudes 4.1.2. Develop and Motivate usage of alternative sources	Activity No. 14.2	All Minapin, Sikandarabad, Ghulmat, Jaffarabad	Urgent Urgent	Short term Medium term

S. No.	Sector	Management Objectives	Conservation/ Development Issues/Gaps	Root Cause(s)	Proposed Management Action	Ref. to MP/OP	Village/s	Priority	Time Scale (Short, Medium, Long term)
				Lack of alternative fuel options					
5.	Education	5.1. Curb illiteracy	Prevalence of unsustainable practices	Lack of needful development infrastructure and human resource	5.1.1. Increase the capacity of existing schools	Suggested for inclusion in revised MP/OP activities	All	Medium	Long term
					5.1.2. Creation of new educational facilities	Suggested for inclusion in revised MP/OP activities	Nilt, Thole	Medium	Long term
			Poor acceptability of messages/solution of conservation	Lack of awareness	5.1.3. Awareness of school staff and children about sustainable use of resources, respect of statutory laws and changing climate scenarios	Suggested for inclusion in revised MP/OP activities	All	Urgent	Short term
6.	Agriculture	6.1. Lack of sufficient food and future food security	Out-migration Malnutrition and related disease	Lack of financial and technical capacity to enhance agri-productivity	6.1.1. Introduction of Improved seed varieties for agriculture and other related crops adaptable to local climatic conditions 6.1.2. Capacity building of farmers about modern techniques to enhance productivity.	Suggested for inclusion in revised MP/OP activities	All	Medium	Medium term

S. No.	Sector	Management Objectives	Conservation/ Development Issues/Gaps	Root Cause(s)	Proposed Management Action	Ref. to MP/OP	Village/s	Priority	Time Scale (Short, Medium, Long term)
					6.1.3. Fruit Processing unit	Activity No. 17.1.1.			
				Water Scarcity	6.1.4. Construction and repair of water channels and for barren lands	Suggested for inclusion in revised MP/OP activities	All	High	Medium term
				Pests and diseases	6.1.5. Integrated pest management techniques	Suggested for inclusion in revised MP/OP activities	All	High	Medium term
				Improper crop storage	6.1.6. Promotion of small scale solar driers	Suggested for inclusion in revised MP/OP activities	All	Medium	Medium term
				Lack of jobs and economic opportunities in agriculture and related crops	6.1.7. Improvement of existing economic opportunities	Suggested for inclusion in revised MP/OP activities	All	Medium	Medium term
					6.1.8. Creation of new job to enhance economic capacity of the local community	Suggested for inclusion in revised	All	Urgent	Long term

S. No.	Sector	Management Objectives	Conservation/ Development Issues/Gaps	Root Cause(s)	Proposed Management Action	Ref. to MP/OP	Village/s	Priority	Time Scale (Short, Medium, Long term)
					6.1.9. Provision and Installation of fruit processing unit	MP/OP activities	Sikandarabad	Medium	Long term
				Less arable land per household	6.1.10. Development of barren land patches	Suggested for inclusion in revised MP/OP activities	All	Medium	Medium term
7.	Livestock	7.1. To enhance income opportunities for locals from livestock	Livestock mortality due to diseases	Disease spread	7.1.1. Improvement of existing vet facilities	Suggested for inclusion in community development plan	All	Urgent	Long term
					7.1.2. Establishment of new vet facilities		Any main village	Medium	Medium term
			Depredation of livestock by wildlife	Lack of proper grazing management regeneration with lesser productivity	7.1.3. Livestock insurance scheme	Activity No. 9.4	All	Medium	Medium term
			Poor breeds with lesser productivity		7.1.4. Training regarding animal husbandry	Suggested for inclusion in revised MP/OP activities	All	Medium	Medium term
			Disease out break	Poor breeds with lesser dairy productivity	7.1.5. Training of herders to restrict zoonosis	Suggested for inclusion in revised	All	Urgent	Medium term

S. No.	Sector	Management Objectives	Conservation/ Development Issues/Gaps	Root Cause(s)	Proposed Management Action	Ref. to MP/OP	Village/s	Priority	Time Scale (Short, Medium, Long term)
						MP/OP activities			
8.	Pastures and Rangelands	8.1. To maintain ecologically healthy ecosystem	Loss of floral diversity Loss of pollinators	Water scarcity	8.1.1. New snow fed channels for pastures irrigation	Suggested for inclusion in revised MP/OP activities	All	Urgent	Short term
			Over grazing Degraded pastures resulting in loss of food for Wildlife	Uncontrolled number of livestock Insufficient growth time for pastures Poor and dangerous accessibility to pastures	8.1.2. Promotion of supplementation with stall feeding	Suggested for inclusion in revised MP/OP activities	All	High	Medium term
					8.1.3. Promotion of fodder cultivation on suitable land patches	Suggested for inclusion in revised MP/OP activities -do-	All	Moderate	Medium term
					8.1.4. Awareness of herders/professional shepherd about sustainable herding practices	-do-	All	High	Short term
					8.1.5. Revive the use of indigenous grazing system		All	Urgent	Short term

S. No.	Sector	Management Objectives	Conservation/ Development Issues/Gaps	Root Cause(s)	Proposed Management Action	Ref. to MP/OP	Village/s	Priority	Time Scale (Short, Medium, Long term)
			Unknown Carrying capacity	Lack of Research studies	8.1.6. Research studies about the carrying capacity and adaptability of Pasture to climate change	Activity No. 9.2.1.	All	Urgent	Long term
					8.1.7. Establishment of enclosure to measure productivity with surrounding pastures	Suggested for inclusion in revised MP/OP activities	One healthy/least degraded pature in whole valley	Urgent	Long term
9.	Forest	9.1. To maintain appropriate forest cover	Run-off and landslides Less biodiversity Less fuel wood availability for local community	Lack of alternative fuel resources Lack of capacity to use fuel resources Lack of awareness on values and function of forests	9.1.1. Enhance productivity through Reforestation and afforestation	Suggested for inclusion in revised MP/OP activities	All	Urgent	Long term
					9.1.2. Promotion of farm forestry	Activity 9.1	All	Urgent	Long term
					9.1.3. Develop restricted forest zones to ensure regeneration and a total ban on Juniper harvest	-do-	Jaffarbad, Minapin	Urgent	-do-
					9.1.4. Training of farmers for farm forestry	-do-	All	Urgent	Short term
					9.1.5. Up gradation and regulation of customary practices	-do-	All	Urgent	-do-

S. No.	Sector	Management Objectives	Conservation/ Development Issues/Gaps	Root Cause(s)	Proposed Management Action	Ref. to MP/OP	Village/s	Priority	Time Scale (Short, Medium, Long term)
					9.1.6. Improved Watch & ward (Capacity building and induction of more game watchers or community guards) to minimize illegal harvest	do-	All	Urgent	-do-
10.	Wildlife	10.1. To improve and maintain healthy wildlife population	Unsustainable hunting Habitat degradation Diseases from livestock resulting in un-natural mortality	Habitat fragmentation and degradation Poaching Lack of awareness about significance of biodiversity of area Lack of eco-tourism opportunities	10.1.1. Dedicated zones for wildlife, restrict grazing in those areas	Suggested for inclusion in revised MP/OP activities	All	High	Long term
					10.1.2. Improve habitat connectivity in existing fragmented habitats	-do-	All	High	Long term
					10.1.3. Habitat modelling for near threatened wildlife species	-do-	All	High	Medium term
					10.1.4. Identification of healthy population of endangered species reintroduction	-do-	All	High	Medium term
					10.1.5. Establishment of water point	-do-	All	High	Short term
					10.1.6. Improve watch and ward mechanism		All	High	Long term

S. No.	Sector	Management Objectives	Conservation/ Development Issues/Gaps	Root Cause(s)	Proposed Management Action	Ref. to MP/OP	Village/s	Priority	Time Scale (Short, Medium, Long term)
					with inclusion of local SOs	Activity No. 6.1			
					10.1.7. Awareness raising through seminars, and wildlife clubs in schools	-do-	All	High	Medium term
					10.1.8. Dedicated research projects	-do-	All	Moderate	Long term

S. No.	Sector	Management Objectives	Conservation/ Development Issues/Gaps	Root Cause(s)	Proposed Management Action	Ref. to MP/OP	Village/s	Priority	Time Scale (Short, Medium, Long term)
11.	Tourism	11.1. Promotion of tourism as a sustainable economic avenue	Loss of economic opportunities Loss of support for conservation and development opportunities	Insufficient facilities of road and stay Lack of interpretation of resources i.e. Hot springs Lack of mechanism to attract tourist/visitor	11.1.1. Maintenance of road throughout the touristic season 11.1.2. Development and dissemination of brochures for interpretation of tourist opportunities 11.1.3. Water supply, waste disposal and improvement in washroom condition 11.1.4. Community based residence and restaurants	Suggested for inclusion in revised MP/OP activities -do- -do- -do-	All All All All	High High Urgent Medium	Short term Short term Medium term Medium term
12.	Water	12.1. To maintain quality and quantity of water	Pollution Water shortage at source and point of end-user	Climate change Waste disposal into water channels	12.1.1. Water quality testing from all water channels 12.1.2. Awareness of local community with focus to keep water resources clean and its minimal usage	Suggested for inclusion in revised MP/OP activities	All	High	Long term

9. IMPLEMENTATION AND MONITORING MECHANISM

9.1. Implementation Mechanism

The whole process needs to be facilitated by Conservator- Gilgit in collaboration with CKNP Directorate and NGOs such as AKRSP, AKPBS, EvK2CNR, WWF etc. Following steps are important in this regard:

The first step should be the restructuring of the community organizations in the form of Community-based conservation and sustainable development organization's (CBCSDOs). Agreements should be signed with CBCSDOs for their proactive participation in conservation and sustainable use of natural resources. The local communities are now well mobilized in support of CKNP and the restructuring should not be a problem.

The second step is participatory conservation planning in which the draft CSDP should be shared with the respective communities (involving VCCs, UC members, President of VOs and WOs (where possible)): line departments at district level (Agriculture, LS&DD, Forest, Wildlife and Park, Tourism) and concerned NGOs such as AKRSP, AKPBS, EvK2CNR) to solicit their technical opinion and possible support during implementation of the plan.

The third step is approval of VCSDP from DCC Nagar, and facilitation of subsequent DCC meetings to facilitate and monitor implementation on VCSDP.

There are two cross-cutting themes. First is capacity-building involving awareness raising, trainings and exchange programmes. The second is financial sustainability which comes from various sources, primarily from government allocations and subsequently at community level from various sustainable use initiatives such as trophy hunting, ecotourism, CKNP entry fee etc. Community based organizations can also initiate small projects for that the capacity of the CBCSDOs can be enhanced so to conceive, develop, hunt and implement small initiative on their own. However, this kind of the implementation will be done in consultation with the CKNP directorate to avoid any duplication in the activities.

9.2. Monitoring Mechanism

9.2.1. CKNP Directorate

The major responsibility of monitoring all action of a CBCSDO carried out under the framework of VCSDP should be jointly with DFO Nagar and CKNP Directorate. The DFO Nagar and CKNP Directorate can monitor their progress in the following steps:

- Visiting individual CBCSDOs and checking their records and verifying physical progress on activities
- Attending DCC meetings and reviewing progress of CBCSDOs annual plans
- Monitoring CBCDSOs performance against their annual plans in the meetings of the CKNP Management Committee
- CKNP can call in meetings of the representatives CBCSDOs at the directorate on a periodic or need basis to review the progress against the tasks

9.2.2. District Conservation Committee Meetings

The VCSDP should be presented in DCC Nagar and endorsed by the chairman of DCC with recommendations from CKNP Director and DFO Nagar. The DCC Nagar in its bi-annual meeting should review the progress of implementation on VCSDP. Each village should have an annual plan to be presented and subsequently reviewed in DCC.

9.2.3. Community Agreements

DFO Nagar, CKNP Directorate or any supporting agency intending to initiate any activity with a CBCSDO should sign a letter of agreement explaining the roles and responsibilities of all parties involved in undertaking the activity. A copy of such an agreement should be made available in CBCSDOs office records.

9.2.4. CBCSDOs Audit and Record Keeping

DFO Nagar, CKNP Directorate or any supporting organizations should emphasize on proper record keeping of all activities undertaken by CBCSDOs. This can be done by checking monthly minutes' sheet, proceedings of the special meetings and financial records of CBCSDOs. It should be mandatory for every CBCSDO to have their annual audit report. Any financial support to a CBCSDO should be linked to availability of annual audit report. The community must have a separate file for all major activities to be undertaken as part of the VCSDP.

For all major initiatives the CBCSDO should constitute two committees: a) project execution committee and b) project audit committee. Most of the local communities are familiar of this system due to the projects of several organizations.

9.2.5. CBCSDO Visitor Diary

CBCSDO should maintain a visitor diary for noting comments, feedback and observations of all visitors coming to a village in connection with conservation and sustainable development initiatives. The CKNP Directorate, DFO Nagar and supporting agencies or organizations should clearly instruct their employees visiting any village/ valley to write down their notes in CBCSDO visitor diary. This way the supporting agencies can avoid duplicate of efforts and it will be helpful in carrying out the activities systematically and logically.

9.2.6. Relevance in Assignments

The CBCSDOs should find the relevant person for carrying out tasks including the finance and record keep, meeting minutes etc. The relevant persons will thus be able to keep a proper record that is a prerequisite for the sustainability of the community organizations. Channels should be found out, wherever possible for the capacity building of the technical persons closely coordinating with the government and private organizations.

9.2.7. Network of CBCSDOs

In order to learn from each other's best practices, it is worthwhile to develop a network of CBCSDOs. They may opt to meet led by some representatives facilitated by CKNP to discuss the successes and failures. The learning can be shared that can help in avoiding failures, adopting models that lead to successes considering the relevancy.

Visitors Diary

Name of CBCSDO.....

Name of Visitor .....

Organization/institution .....

Date of visit .....

Purpose of visit .....

Venue of meeting .....

Meeting participants.....

Key discussions or decision points

.....
.....
.....
.....
...

Required follow up actions

.....
.....
.....
.....

Signature of the visitor.....

Conservation and Sustainable Development Plan

for Hoper-Hisper Valley of

Central Karakoram National Park (CKNP)

Gilgit-Baltistan

(2016-2026)

Developed by WWF-Pakistan, Gilgit-Baltistan in consultation with CKNP partners

With financial support of Ev-K2-CNR under the framework of SEED Project for CKNP

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www.cknp.org.pk

PLAN EDORSEMENT

Signed by President HCDO Hoper ……

Signed by President CBCSDO Hisper ……

Endorsed Director CKNP ……

Approved by Deputy Commissioner/ ……
Chairman District Conservation Committee
for Hunza-Nagar in …… meeting of DCC
held on ……..

Dated……

TABLE OF CONTENTS

ABBREVIATIONS

AHMP.	Asia High Mountain Project (of WWF)
AKPBS	Aga Khan Planning & Building Services
AKRSP	Aga Khan Rural Support Programme
BWCDO	Baltistan Wildlife Conservation and Development Organization
CBCSDO	Community-based Conservation and Sustainable Development Organization
CCHA..	Community-controlled Hunting Area
CFT	Cubic feet
CI	Confidence Interval
CKNP	Central Karakoram National Park
CL	Confidence Level
CMCA	Community-managed Conservation Areas
CO	Community Organization
CSDF	Conservation and Sustainable Development Fund
CSDP	Conservation and Sustainable Development Plan
DCC	District Conservation Committee
GB	Gilgit-Baltistan
GoGB	Government of Gilgit-Baltistan
HCDO	Hoper Conservation and Development Organization
HH	Households
IUCN	International Union for Conservation of Nature
IPMP	Integrated Park Management Plan
KIU	Karakoram International University
KNP	Khunjerab National Park
KVO	Khunjerab Villagers Organization
LIF	Livestock Insurance Fund
LIMC	Livestock Insurance Management Committee
LIS	Livestock Insurance Scheme

LS&DD	Livestock and Dairy Development Department
LSO	Local Support Organization
MAPs	Medicinal and Aromatic Plants
MH	Micrco-hydel
M	metre
N	North
SKB	Skoyo-Karabathang-Basingo
SLF	Snow Leopard Foundation
SUI	Sustainable Use Initiatives
VCC	Valley Conservation Committee
VCF	Valley Conservation Fund
WWF	World Wide Fund for Nature

ABOUT THE PLAN

Background and objectives

The Central Karakoram National Park (CKNP), officially gazette as national park in 1993, is situated in northern Pakistan (**Figure 1**), within geographical limits of Gilgit-Baltistan. It is the largest protected area in Pakistan, spanning over 10,000 km^2, attitudinally ranging from 2000 m asl to 8,000 m asl and partly covering four of the seven districts of Gilgit-Baltistan[1]. With K2 (8,611 m asl.), the word's second highest peak as its centerpiece, CKNP holds greatest concentration of high altitude peaks and glaciers, providing world class tourism and mountaineering opportunities.

Establishment of this park by the Government of Gilgit-Baltistan was primarily to conserve the unique

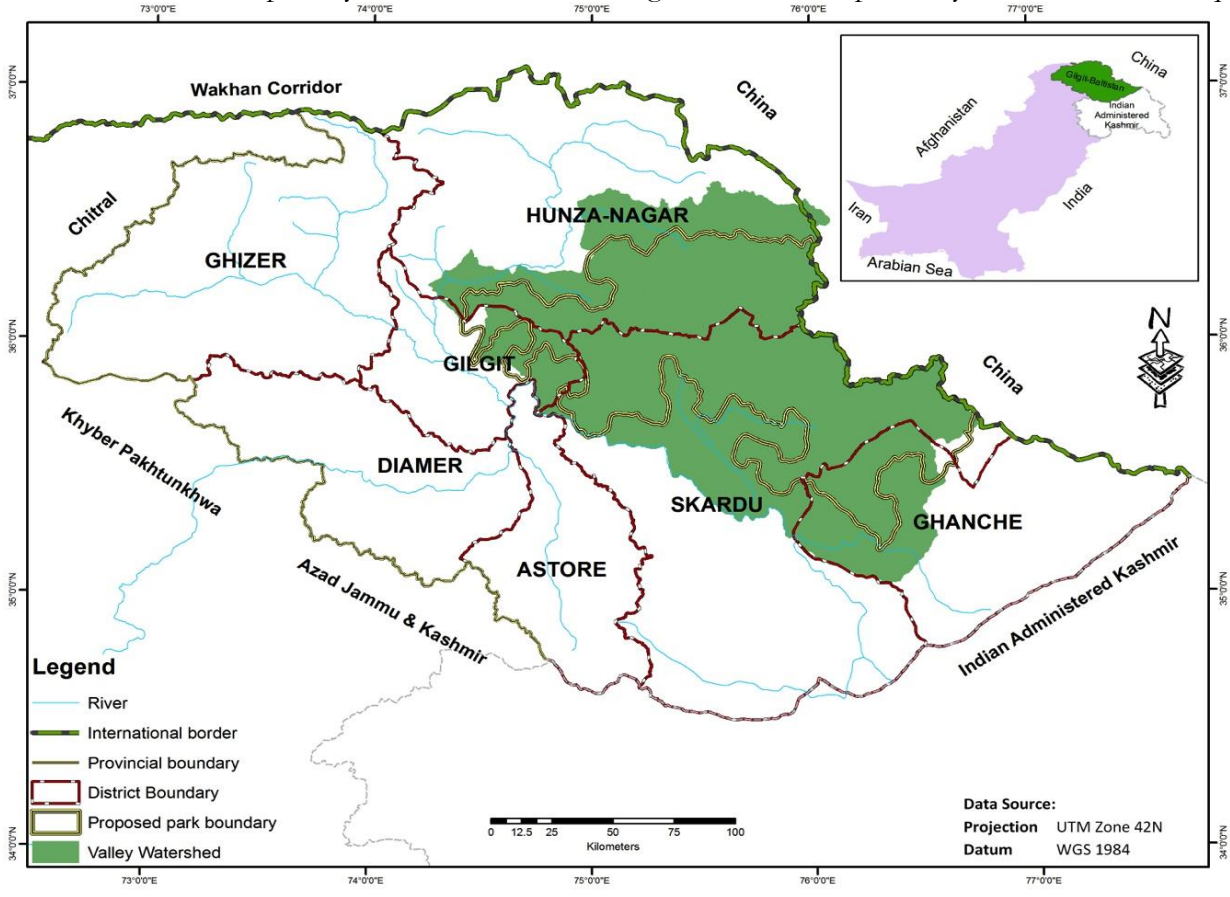

Figure 1 Location map of CKNP

geographic and ecological features in the central portion of Karakoram Mountains[2]. Owing to the diverse micro-climatic, geographic and environmental conditions, the area is rich in biological diversity and a great source of freshwater and other services of highly aesthetic, ecological and socioeconomic significance, for million of people in Gilgit-Baltistan as well as living downstream the River Indus in

[1]Khan, B. 2011. Field Guide to the Central Karakoram National Park, Pakistan. CESVI, Pakistan, Islamabad, pp. 45

[2]Hagler Bailly Pakistan (2005a). Central Karakoram Protected Area. Volume I: Studies and Recommendations for Preparation of a Management Plan. IUCN Pakistan, Karachi, HBP Ref.: D5MP2CKP.

Pakistan, and elsewhere in the world who like to venture through the rugged mountainous and glaciated landscape of Karakoram[3].

Most of the CKNP areas are characterized by the dry alpine vegetation, comprising species of *Artemesia, Juniperus, Polygoum* and Rosa on slopes, whereas *Myricaria* and Sea buckthorn bushes along river banks and streambeds. Broadleaves mainly consist of scattered patches of *Betula utilis* and *Salix species*, found in humid places. Conifers, comprising mainly of *Pinus wallichiana*, predominantly occur at lower altitudes in the western ends of the Park including Roundu Skardu, Haramosh, Bagrote and adjacent valleys of Gilgit and Hunza-Nagar [4],[5]. Large mammals are a key resource and important conservation focus in CKNP (IUCN, 2009a). The Park is a refuge area not only for threatened species, such as markhor, musk deer, Ladakh urial, Marco Polo sheep (presence to be confirmed in CKNP) and snow leopard, but also for not threatened but important "flagship" species, such as blue sheep, Siberian ibex, lynx and grey wolf [6].

Around 230 villages, inhabited by over 115,000 people living in about 13,000 households, surround CKNP. Majority of the local communities live an agro-pastoral life depending upon the Parks resources such as rangelands, forests, wildlife, medicinal flora, *etc.* Moreover, a considerable number of local people are also engaged in tourism and mining industry in and around CKNP. Thus the local communities around CKNP are major stakeholders and systematic community involvement in Park management is highly desirable to foster a positive relationship between people's needs and Park ecology, which has been emphasised in Integrated Park Management Plan (IPMP) for CKNP[7] for the following major reasons:

i. One of the National Park's goals is to preserve and promote, in a sustainable way, local cultural heritage which is which is widely distributed in the valley adjoined CKNP;
ii. The CKNP management process is based on a "participatory development and implementation strategy". Considering the large extent of the park and the socio-economic and ecological diversity in the surrounding areas, the resources of the Park management office are limited and will have to rely on a large extent on communities living around CKNP for successful park management. For these reasons the park management office aims at committing community-based organizations to collaboration for management of the park[8];

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[3] IUCN, Pakistan. (2009). Central Karakoram Conservation Complex. Draft Management Plan. Sub plan: Species Management, IUCN Pakistan, Karachi. Pages 24.

[4]WWF-Pakistan, 2008a. Land Cover Mapping of the Central Karakoram National Park, WWF – Pakistan, Lahore. Pages 39.

[5]Ferrari, E.(2014). Methodological issues in implementing a Sustainable Forest Management Plan in remote mountain areas: the Karakorum (Pakistan). Ph.D. Thesis. University of Padova, Italy.

[6]Lovari, S. & Bocci, A. 2009. An evaluation of large mammal distribution on the CKNP. (pp126-144) Integrated case study of a selected valley in the Central Karakoram National Park. The Bargot valley (HKKH Partnership Project) Ev-K2-CNR, Italy.

[7] Integrated Park Management Plan (IPMP) for Central Karakoram National Park. 2014. Developed by Ev- K2-CNR, Islamabad, Pakistan

[8]Flury, B. 2012. Livelihoods and natural resource management in Central Karakoram National Park Areas – Braldo and Basha valleys. Research Report Developed for SEED Project. 46 pp.

iii. However, difficult activities (e.g., wood collection, grazing, tourism) are conducted inside the Park borders. The natural resources in CKNP are subjected to pressure due to traditional rights of the local inhabitants and tourism practices9. Also other activities not directly related with resource use could affect the Park integrity; and
iv. The local communities have some expectations for the Park as a relevant tool to improve their living standards and socio-economic conditions

In CKNP areas, community participation in co-management of natural resources starts from 1990s with establishment of Village and Valley Conservation Committees (VCCs) by INGOs such as IUCN and WWF. The initiative was based on Community-based Natural Resource Management (CBNRM) approach, which was first implemented in Africa and then adapted and applied in some areas of Gilgit-Baltistan, including an adjacent village of CKNP namely Hushey[10]. The initiative primarily aimed at development of community-based trophy hunting programme. By 2013 more than 30 community-based organizations namely VCCs, LSOs and other local NGOs were formed by organizations like AKRSP, GBFWED, Ev-K2-CNR and WWF to facilitate CBNRM around CKNP with a view to have protect the Park resources. One of the steps of CBNRM was to develop Conservation Plans at village or valley level, aimed to provide guidelines for participatory natural resource management. Development and approval of VCPs involve four steps including: Resource Need Assessment (RNA) Participatory Conservation Planning (PCP) Approval of VCP from District Conservation Committees (DCCs) Implementation of VCP through VCCs and other stakeholders.

CKNP Management Plan (2014) emphasize to strengthen the community-based organizations (VCCs and LSOs) around CKNP to make them integrated conservation and development bodies, with a view to:

a) institutionalize an integrated conservation and development approach at the community level;
b) increase effectiveness of project implementation
c) empowering women and strengthening representation of communities into the CKNP management process.

Valley Conservation Planning process has been a valuable and important part of the CKNP management in engaging local communities, however, the CKNP Management Plan (2014) while evaluating the existing VCPs around CKNP, has identified some gaps to improve this process. Those gaps include various factors such as lack of consistency between various components of the plans, lack of conceptual clarity, lack of a monitoring mechanism, less clear role and responsibilities and inappropriate information about resources required to undertake the desirable actions.

Based on this evaluation the Integrated Park Management Plan for CKNP (2014) has recommended to "revise and amend the VCPs according to a tested and universally acknowledged planning instrument, such as the logical framework approach, for example if they are to fulfill their functions as a instrument for grass-roots planning and implementation within the CKNP management process".

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[9]Panzeri, D & M. Khan. 2009. Livelihoods in Central Karakoram National Park. Socioeconomic baseline data survey. HKKH Technical Report, 77 pp.

[10]IPMP for CKNP. 2014. Developed by Ev-K2-CNR

The revised VCPs, keeping in view the integration approach have been termed as Valley Conservation and Sustainable Development Plans (VCSDPs) aimed at the following specific objectives:

Promote participatory NRM in CKNP buffer zone villages and valleys to ameliorate environmental conservation of the park

- Create synergies among park stakeholder to promote community-based conservation in CKNP buffer zone

Scope of the Plan

This document, termed, as "Conservation and Sustainable Development Plan (CSDP) for Hoper-Hisper valley" will deal with participatory conservation and sustainable development matters of all villages within the geographical limits of Hoper and Hisper communities/villages in District, Hunza-Nagar. The area comprising the north-eastern part of CKNP has unique geographic features like Spantic/Golden Peak (7,020m), Rash Lake, Snow Lake and glaciers like Hisper, Miar, Hoper etc. The valley is important habitat of Siberian ibex (*Capra sibirica*) and the endangered snow leopard (*Panthera uncia*).

Structure and Composition of the Plan

The plan comprises of the following ten segments:

i) Socio-economic and ecological profile of Hoper-Hisper valley
ii) Management issues and problems;
iii) Proposed management interventions;
iv) Management actions
v) Indicators of process and progress
vi) Implementation mechanisms/Available capacities for the implementation of the Valley Conservation Plans: Social organizations - CKNP Directorate - Facilitating NGOs/CBOs – Others
vii) Expected outputs
viii) Visible bottlenecks in realizing the expected outputs, and arrangements (available and potential both) to overcome the bottlenecks
ix) Monitoring mechanism
x) Proposed budget for implementation

Plan Development Process

Information for socio-economic and ecological profile of four villages of the valley, management issues and problems and proposed interventions was obtained with the help of eight Focused Group Discussion (FGDs); one in each village and interviews with household heads, covering 277 household out of 995 (28 % of the total households of the valley, calculated based on CI 5 and CL 95%). Sampling plan for household interviews and participants of FGD is given in the ***appendix-A***. List of participant of FGDs is given in ***appendix-B.*** Best natural resource management practices from other PAs such as KNP in Gilgit-Baltistan and lessons of CBNRM from various valleys of GB were also reviewed for extracting proposed management interventions and actions. A meeting was conducted with CKNP management in Skardu to obtain their opinion on management issues, innervations and appropriate actions. CKNP Management Plan (2014) was also consulted relevant recommendations. Lessons learned by CKNP partners under SEED Project were reviewed from various documents available with WWF-Pakistan. Previous VCPs of Hoper and Hisper were also reviewed to obtain useful information.

1. SOCIO-ECONOMIC AND ECOLOGICAL PROFILE OF HOPER-HISPER VALLEY

Hoper-Hisper valley comprises of two main villages namely Hoper and Hisper. Hoper village is some 26 km southeast of Aliabad town (district capital of Hunza-Nagar) and Hisper is about 70 km further east of Nagar (Tehsil headquarter of Nagar I) through a bumpy jeep able road, after crossing Ganish Bridge on Karakoram Highway and turning towards right while going upward along the Nagar River towards Golden Peak. From Nagar proper one has to cross six small and medium hanging wooden bridges to reach Hisper Village.

1.1. Geographic location of villages

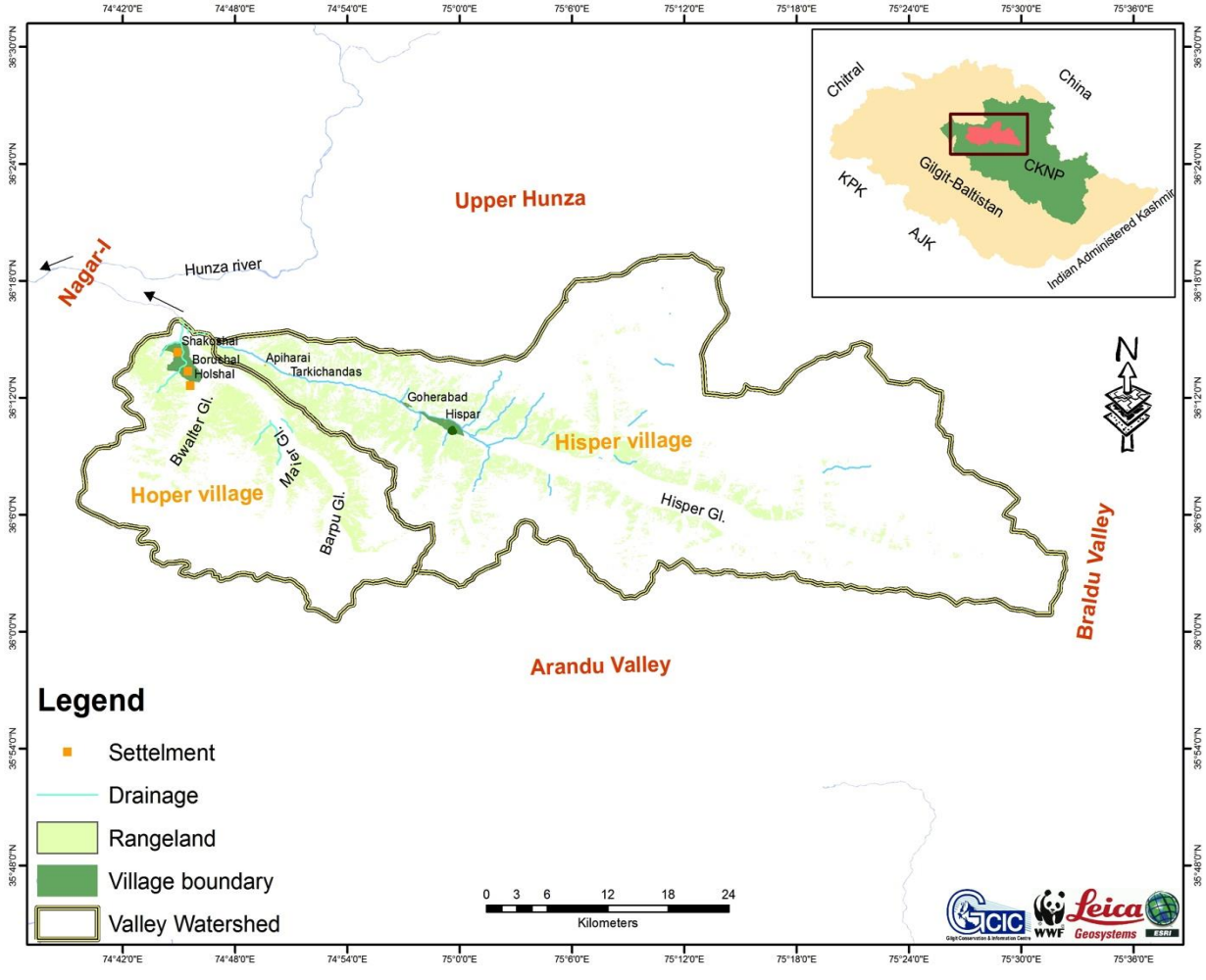


Figure 2 Location of villages (territory use)

Villages	Settlements	Coordinates (at village centre)		Elevation (m)
		E	N	
Hoper	Boroshal, Hakalshal, Ratal, Holshal, Goshoshal, Shiqamating and Shakoshal	74°46'55.6"E	36°12'05.96"N	2821
Hisper	Ethayum, Makuchim Gamuyum	74°59'38.41"E	36°10'17.13"	3150

Territory use (limit of private properties land and the limit of the village common use right land)

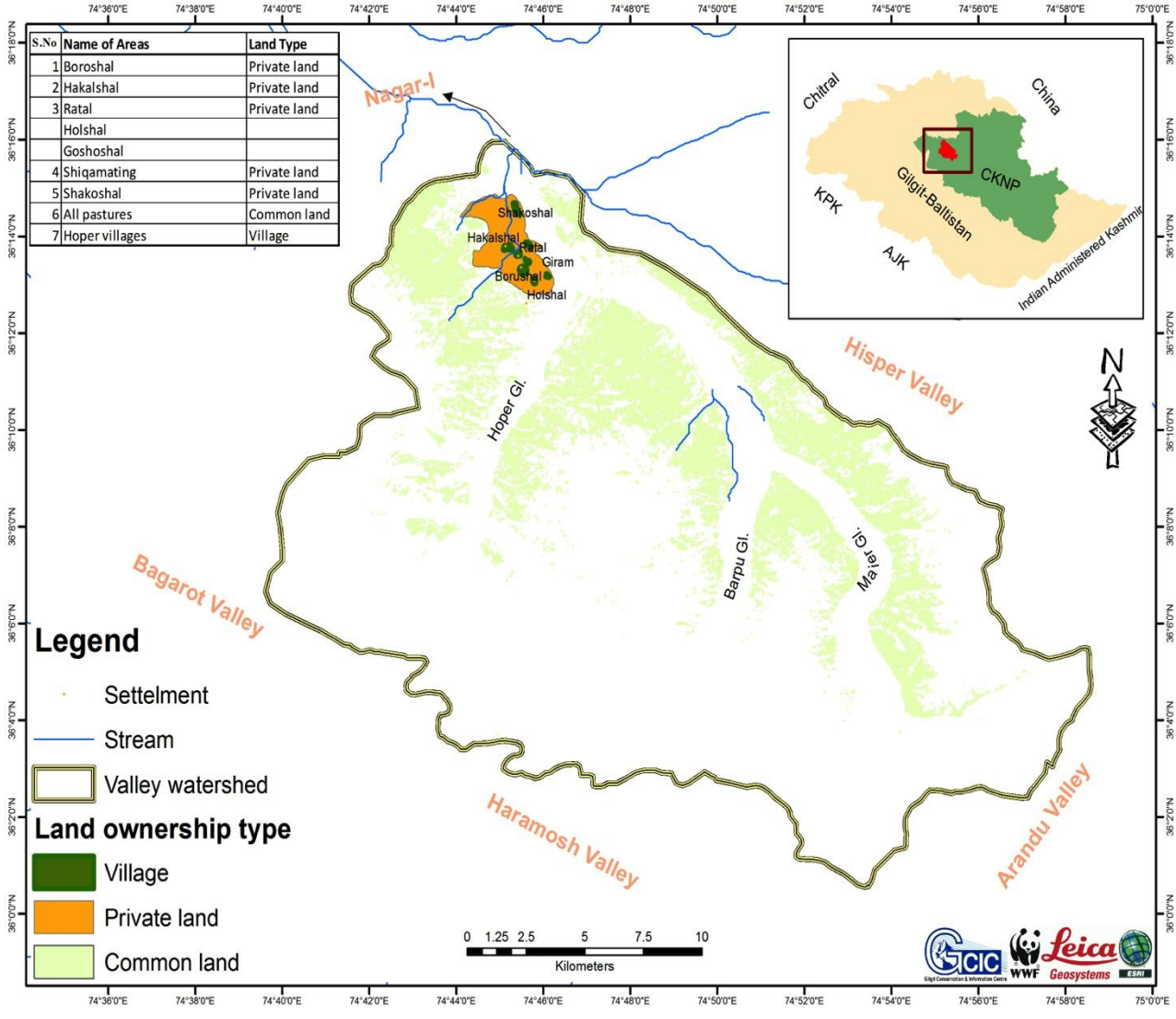


Figure 3 Territory use Hoper village

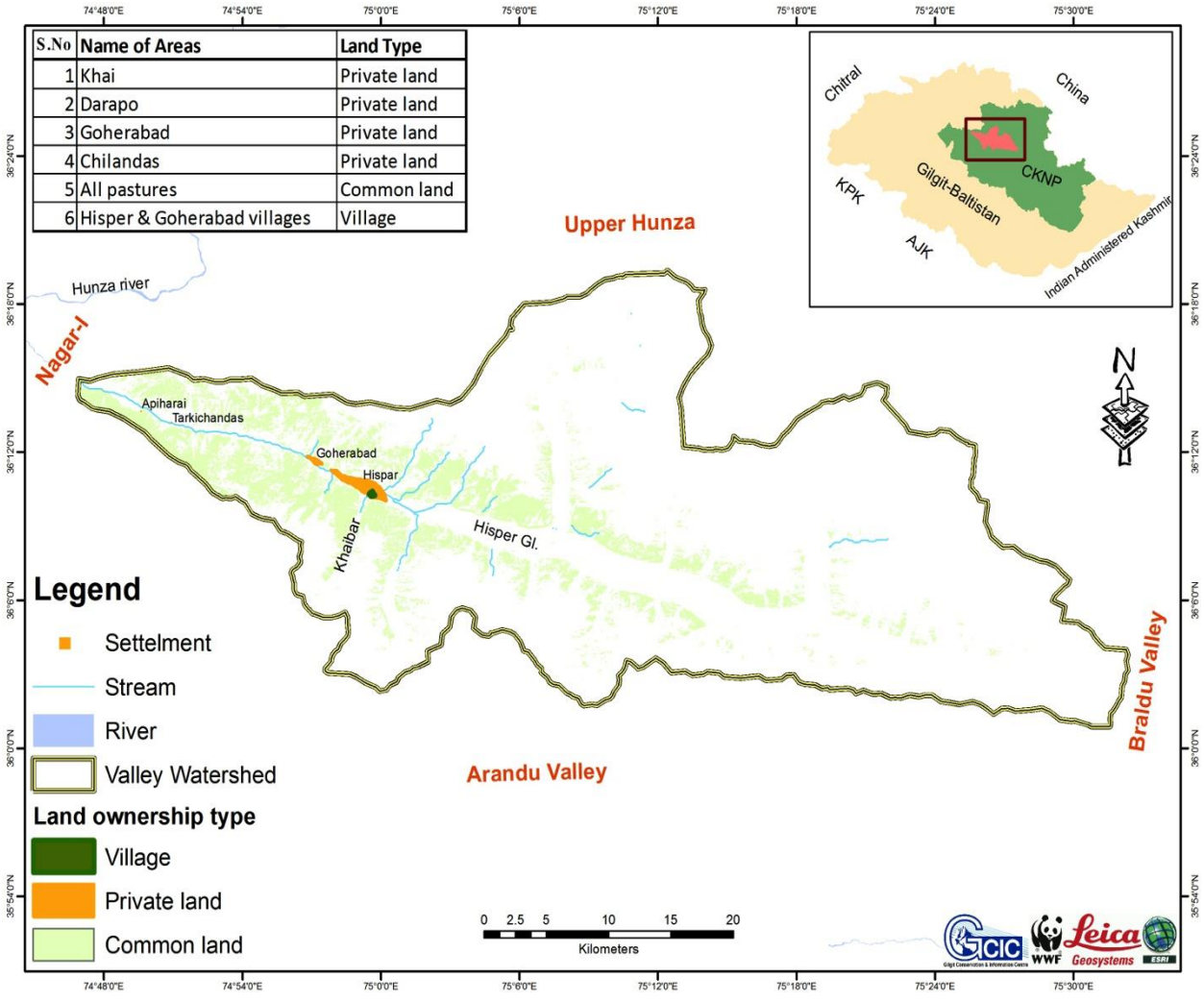


Figure 4 Territory use Hisper village

1.2. Demographic and socio-economic profile

Village	No of Households	Population	Average household size	Agricultural land per household (Ha)	Yearly Cash Income/household (PKR)
Hoper	740	6920	11	0.356	165,112
Hisper	200	2000	9	0.435	84,600

Major sources of Income in Hoper-Hisper Valley

Hoper: The major sources of income include agriculture (contributing 74.1%, n=58 of the total annual cash income), government jobs (22.4%), tourism (8.6%), labor (6.8%), , and private jobs (5.2%).

Hisper: The major sources of income in Hisper include Agriculture (contributing 69%, n=98 of the total annual cash income), labor (5%) and government jobs (29%, n=98).

1.3. Education

Hoper: Majority of the population (54.90%) is illiterate while rest of the 45.10% is literate to varying levels. A small proportion of the total population (4%) is graduate, while only 4.39% of the population has received post graduate level education. 15 percent of the total population appeared having primary and middle level education in the valley whereas 15% are having secondary level education. As a general perception, male populace is more literate than their female counterparts.

Hisper: Majority of the population (62%) is illiterate while rest of the 38% is literate to varying levels. A small proportion of the total population (4%) is graduate, while none of the population has received post graduate level education. 30 percent of the total population appeared having primary and middle level education in the valley whereas non are having secondary level education. 4% are having higher secondary education. As a general perception, male populace is more literate than their female counterparts.

Education facilities in Hoper-Hisper Valley

Village	Name of school	Level/ Grade	Target group (Boys, Girls/Mix	Government/ Private	If private, name of supporting Institution/ individual
Hoper	FG Boys High School Ratal	10th	Boys	Government	-
	FG Girls High School Hakalshal	8th	Girls	Government	-
	FG Primary School Goshoshal	5th	Mix	Government	-
	FG Boys Primary School Hakalshal	5th	Boys	Government	-
	Primary School Ratal	5th	Mix	Government	-
	Primary School Boroshal	5th	Mix	Government	-
	Primary School Shakoshal	5th	Mix	Government	Run in Imambargah (mosque), no building yet
	Primary School Shiqamating	5th	Mix	Government	Run in a private house
	Uswa Public School	8th	Mix	Private	Friends Trust
Hisper	Golden Mosque School Hisper	5th	Mix	Government	-
	Primary School for Girls	5th	Girls	NEFP	NEFP
	Biafo Academy of Modern Science (BAMS)	5TH	Boys	Private	-

1.4. Health

Hoper: Health facilities in Hoper include a Basic Health Unit (BHU) managed by Directorate of Health Gilgit through PPHI, containing a qualified doctor and 1-3 Lady health visitors (LHVs) in each village. Moreover, Aga Khan Health Centre (AKHC) is also operational in the village managed by Aga Khan Health Services, Pakistan. AKHC focuses on mother-child health care, in addition to providing basic treatment services.

Hisper: Only one First Aid Post is available which is managed by Government Health Department but there is no any dispenser or a Para medical staff. There is no any medical store in the village. The condition of the road is very bad therefore, the patients with serious ailments have to seek treatment in Aliabad government hospital or Aga Khan Health services or from Gilgit in government, military or private hospital, keeping in view their financial positions.it becomes impossible to transfer serious patients to the nearby town with health facilities (Aliabad). Most recently, a Karachi based welfare society has started establishing a small hospital in the village (per. comm. with Sheikh Fida Hussain, Chairman VCC Hisper; 26.03.2015).

Health related issues in the village are as under:

- No proper treatment for severe diseases and emergency cases
- Lack of suitable facility for mother and child health care including pregnancy and delivery cases
- Lack of medicine
- Poor and difficult road conditions for timely accessibility to main hospitals or health services in nearby towns

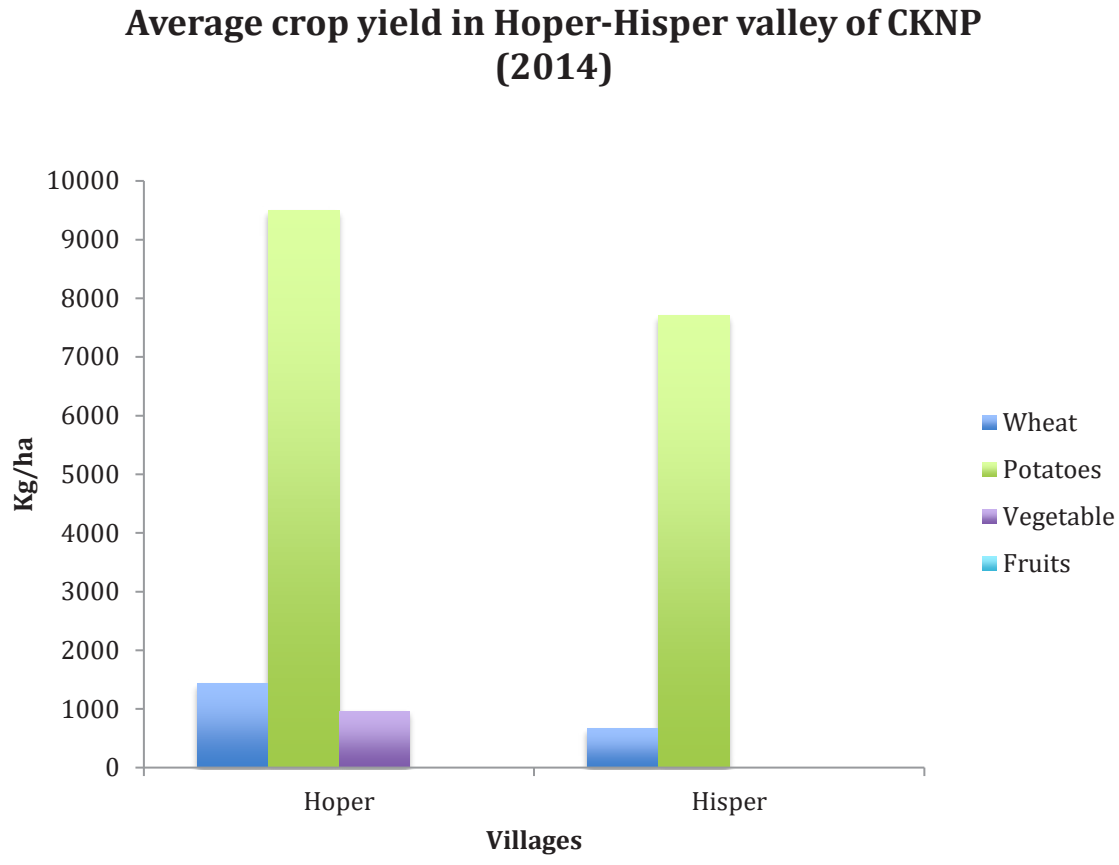
1.5. Agriculture

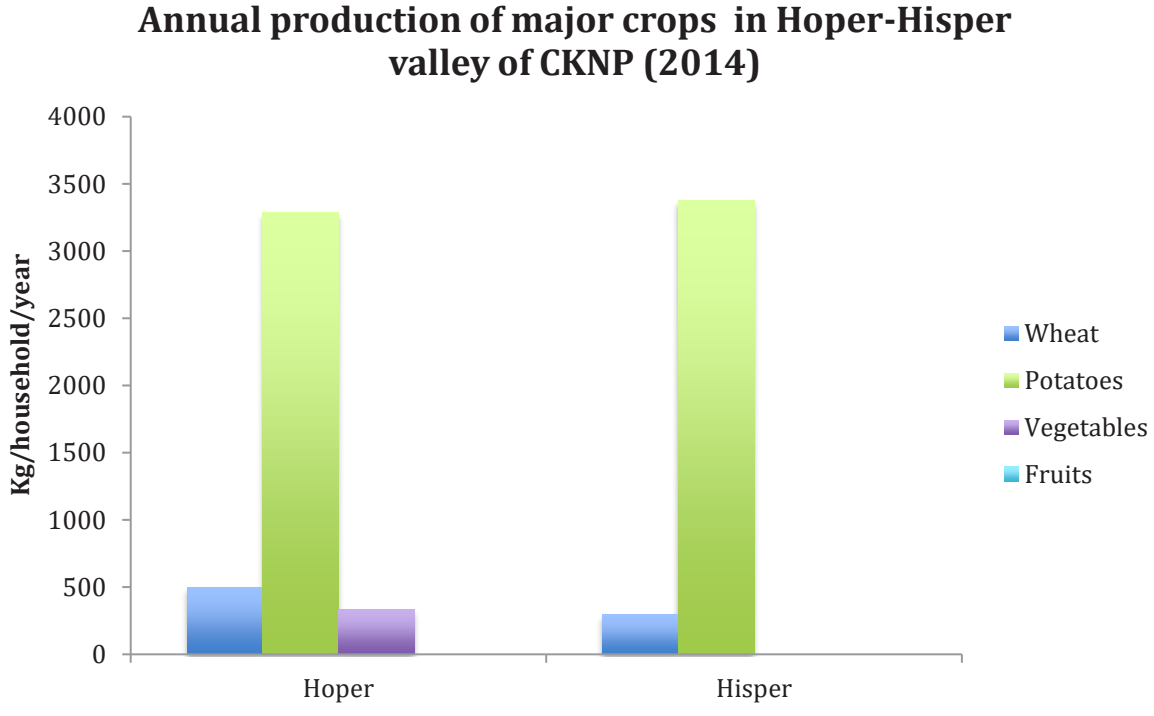
The area falls under single cropping zone with wheat as major cereal crop, followed by barley while potatoes is main cash crop. Having a short and specific growing season, both the cereal (wheat) and vegetables (potato, peas and turnip, and some other vegetables) are grown at the same time (April-May), and harvested before inception of winter season (September-October). Potatoes are major cash crop and on average each household in Hoper and Hisper sell about 3000 Kg of potatoes annually. In Hoper, fruits (primarily apricots) also contribute significantly in household agricultural production accounting for about 300 Kg per household per year while in Hisper this category is not significant (only 2 kg per household per year).

A statistical overview of agricultural production and consumption in Hoper-Hisper valley is given in the following table:

Village	Average size of Land holding (Ha)	Major crops	Average Yield (kg/ha)	Average production per household (Kg/year)	Consumption (%)	
					Domestic	Sale
Hoper	0.346	Wheat	1434	496	100	0
		Potatoes	9500	3287	20	79.81 @ Rs. 35/kg (2014)
		Vegetables	87	30	65	43
		Fruits	966	333	47	53
Hisper	0.438	Wheat	669	293	100	0
		Potatoes	7703	3374	22	76.16 @ Rs. 35/kg (2014)
		Vegetables	156	69	88	10
		Fruits	4	1.7	100	0

Average crop yield and annual production per household is given in the following figures.





1.6. Water resources and irrigation infrastructure in Hoper-Hisper valley

The drinking water supply to the villages is from natural springs, while irrigation water is mostly from streams flowing down from the mountains. Water resource in the various villages of the valley are indicated in the following tables and figures

Source/Facilities	Name of Location	GPS Coordinate (UTM WGS84)	Elevation (m a.s.l.)	No of households benefited	Type of water source	Water condition
Spring	Jachirkish	74°44'42.28"E, 36°13'33.21"N	3154	15	spring	Clear
Pipe line		74°45'18.83"E,36°13'34.37"N	2810		spring	Clear
Water tap		74°46'5.03"E, 36°13'12.22"N	2795		spring	Clear
Reservoir (Holshal) Reservoir (Ghoshoshal) Reservoir (Boroshal) Reservoir (Ratal) Reservoir (Hakalshal)		74°46'7.12"E, 36°12'52.83"N 74°45'42.71"E, 36°13'5.12"N 74°45'16.52"E,36°13'32.47"N 74°45'18.83"E,36°13'34.37"N 74°45'6.57"E, 36°13'43.82"N	2826 2838 2845 2810 2870		spring	Clear

Hoper:

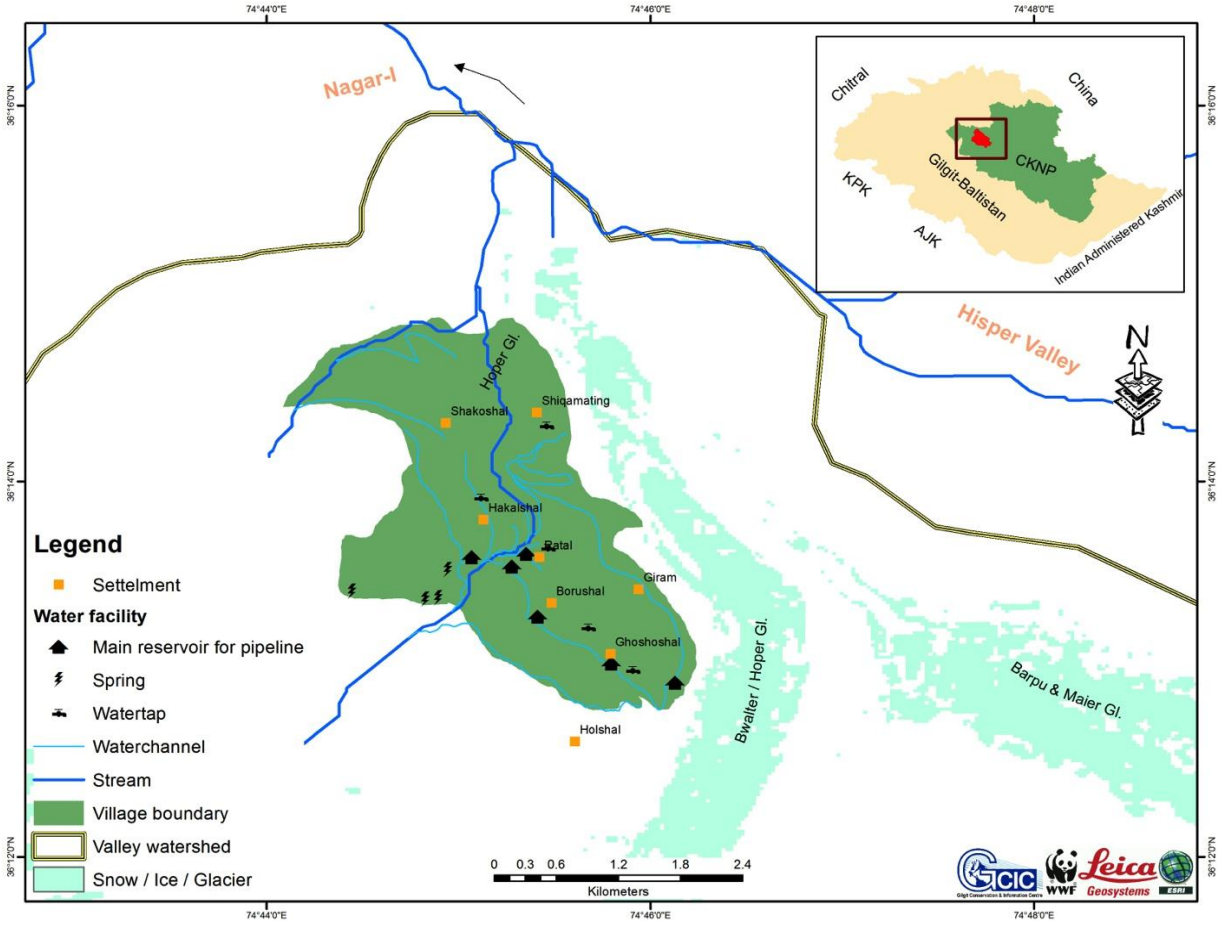


Figure 5 Water resources and facilities in Hoper village

Hisper

Source/Facilities	Name of Location	GPS Coordinate (UTM WGS84)	Elevation (m asl)	Used by No households	Water condition
Spring	Khaibar near Khai Glacier	74°59'7.70"E, 36° 9'30.17"N	3498	160	Clear
Pipe line	Khai	74°59'29.05"E, 36°10'16.41"N	3143		Clear
Water tap	Khai/ Hisper settelments	74°59'40.32"E, 36°10'18.00"N	3121		Clear
Reservoir	Khai	74°59'29.05"E, 36°10'16.41"N	3144		Clear
Reservoir micro hydel	Darapo rung	74°59'16.60"E, 36°10'12.81"N	3198		Clear

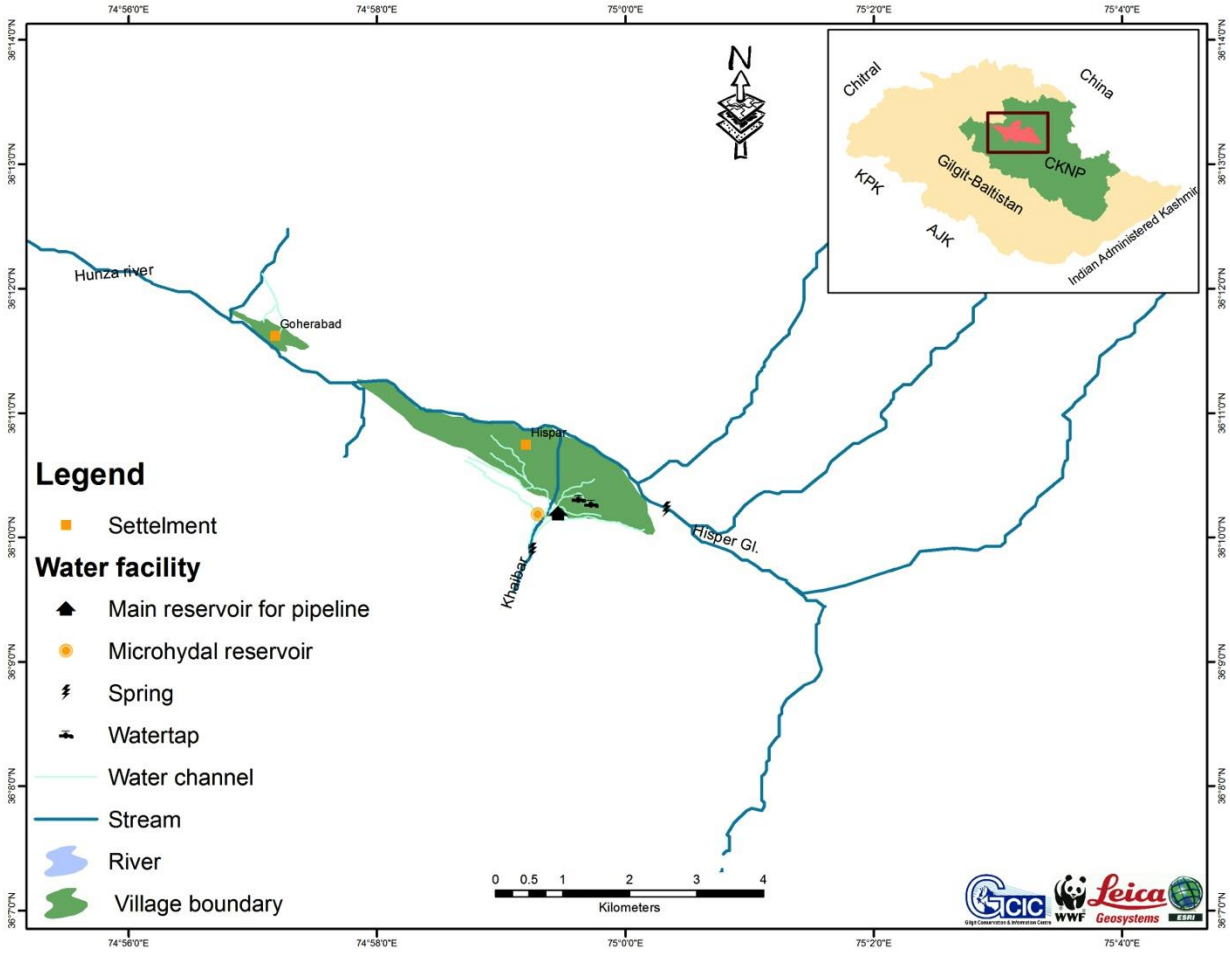


Figure 6 Water resources and facilities in Hisper village

1.7. Livestock herding

1.7.1 Livestock holding and herd composition

Livestock herding is the second largest source of livelihood in the valley followed by subsistence agriculture. Majority of the local people (>80%) rear livestock, varying in numbers and types depending upon the owner's land holding status, availability of fodder and household labour to rear livestock. Various types of livestock in the valley include sheep, goats, yaks, and cattle (including cow, bull, and few cross breeds of yak and cow) and equines (mainly donkeys and few horses).

A brief summary of livestock types and numbers in the valley is given the following table:

Villages	Sheep	Goats	Cattle (cow, bull)	Crossbreeds of yak and cow	Yak	Equines (donkeys and horses)	Total	Milking cattle
Hisper	1076	1084	472	108	316	104	3160	212
Hoper	5440	3397	2332	22	321	58	11570	1036
Total	**6516**	**4481**	**2804**	**130**	**637**	**162**	**14730**	**1248**

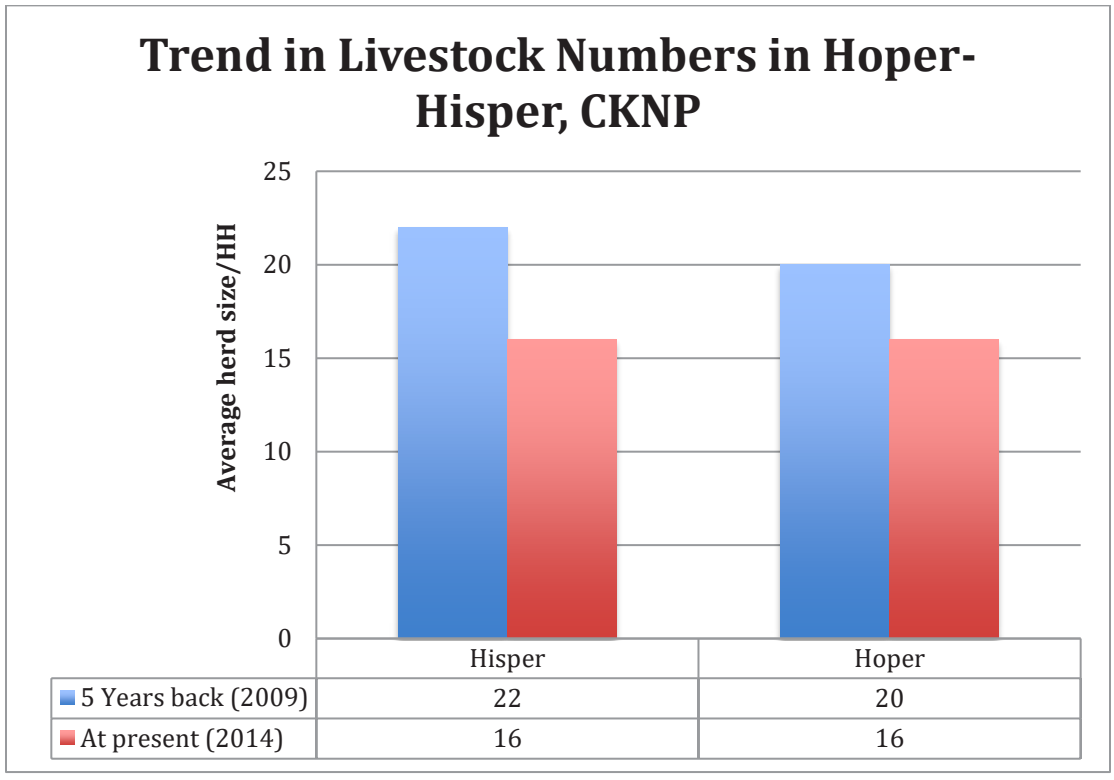
In Hoper village, average herd size has decreased by 23.33 % from 20 animals per household in 2009 to 16 animals per household in 2013. The reasons being: While in Hisper village Average herd size has been decreased by 29% as five years back (2009) the average herd size was 22 animals per household which is now (in 2014) is 16. The reasons are:

- Lack of household labour especially due to the engagement of youth in education, employment and tourism, et
- Lack of fodder due to decreased landholding
- High mortality rate due to widespread diseases and non-availability of medicine

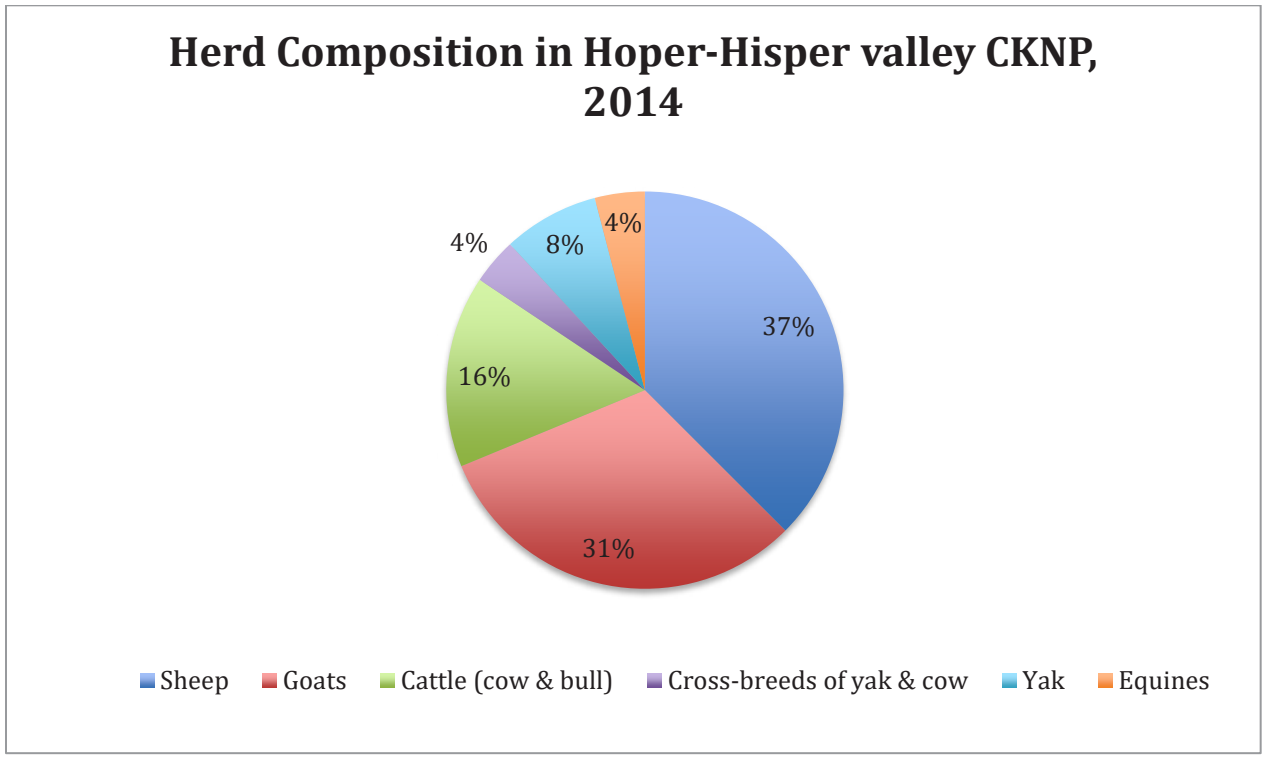
Average herd size and composition per household is given in the below table:

Villages	Sheep	Goats	Cattle (cow, bull)	Crossbrees of yak and cow	Yak	Equines (donkeys and horses)	Total	Milking cattle
Hisper	5	5	2	1	2	1	16	1
Hoper	7	5	3	0.2	0.5	0.3	16	1

Trend in livestock populations and numbers over the past five years



Herd composition in Hoper-Hisper valley shows that sheep are the dominant animal type followed by goats, cattle and yak and equines. A summary of livestock composition in Hoper-Hisper in given in the following figure.



1.7.2 Seasonality, feeding and grazing pattern

On average 90% of the total livestock in grazed in high pastures. Grazing pattern is transhumance, which involves seasonal movement of people with their livestock over relatively short distances, typically to higher pastures in summer and lower valleys during winters. Herders have permanent homes in the valleys, only the herds travel with the people necessary to tend them. There are defined customary laws for seasonal movment of livestock to pastures.

The organization of grazing in time and space is closely connected with seasonal availability of fodder for the livestock. There are insufficient grazing land near the village and the accessibility of different pasture vary during the year which lead to the necessity of a seasonal movement of livestock through and elevational range of pasture to allow the animals access to diverse fodder source.

Following is a pattern of grazing of various types of cattle in different seasons:

Hoper

Season	Livestock types	Grazing in pastures	Partly stall feeding	Fully stall feeding	Grazing pattern
Spring (April-May), depending upon snowfall	Sheep	✓	✓	✗	Grazing in pastures near to village like Hapakhund, Hununo, and Bualtar pastures and tended by owners turn by turn at daily basis
	Goats	✓	✓	✗	Grazing in pastures near to village like Hapakhund, Hununo, and Bualtar pastures and tended by owners turn by turn at daily basis
	Lactating cattle including cow and zomo	✓	✓	✗	Grazing in and around the village and taken care by an owner him/herself
	Non- lactating cattle and yak	✓	✓	✗	Free grazing in and around the village and taken care by an owner him/herself
Summer (June to Mid October)	Sheep	✓	✗	✗	Guarded grazing by two male shepherds in high pastures in all high altitude pastures of Hoper
	Goats	✓	✗	✗	Guarded grazing by two male shepherds in high pastures in all high altitude pastures of Hoper
	Lactating cattle including cow and zomo	✓	✗	✗	Lactating cattle are usually taken back to the village
	Non- lactating cattle and yak	✓	✗	✗	Free ranging/grazing in high pastures
Autumn (Mid October-Early December) depending	Sheep	✓	✗	✗	Controlled grazing in pastures near to village by owners turn by turn at daily basis
	Goats	✓	✗	✗	Controlled grazing in pastures near to village by owners turn by turn at daily basis

Season	Livestock types	Grazing in pastures	Partly stall feeding	Fully stall feeding	Grazing pattern
upon snowfall	Lactating cattle including cow and zomo	✓	✓	✗	Free grazing in and around the village and taken care by an owner him/herself
	Non- lactating cattle and yak	✓	✗	✗	Free grazing in and around the village and taken care by an owner him/herself
Winter (mid December to March)	Sheep	✗	✗	✓	Mostly remain in cattleshed during heavy snowfall, except for taking out for drinking water
	Goats	✗	✗	✓	Mostly remain in cattleshed during heavy snowfall, except for taking out for drinking water
	Lactating cattle including cow and zomo	✗	✗	✓	Mostly remain in cattleshed during heavy snowfall, except for taking out for drinking water
	Non- lactating cattle and yak	✗	✗	✓	Sometime let outside the cattleshed

Hisper

Season	Livestock types	Grazing in pastures	Partly stall feeding	Fully stall feeding	Grazing pattern
Spring (April-May), depending upon snowfall	Sheep	✓	✓	✗	Grazing in pastures near to village and tended by owners turn by turn at daily basis
	Goats	✓	✓	✗	Grazing in pastures near to village and tended by owners turn by turn at da0ily basis
	Lactating cattle including cow and zomo	✓	✓	✗	Grazing in and around the village and taken care by an owner him/herself
	Non- lactating cattle and yak	✓	✓	✗	Free grazing in and around the village and taken care by an owner him/herself
Summer (June to Mid October)	Sheep	✓	✗	✗	Guarded grazing by two or three male shepherds in high pastures in Ghorbon, Garom Bar and Tarkichandas area.
	Goats	✓	✗	✗	Guarded grazing by two or three male shepherds in high pastures in Ghorbon, Garom Bar and Tarkichandas area.
	Lactating cattle including cow and zomo	✓	✗	✗	Guarded grazing in pastures by owner themselves.

Season	Livestock types	Grazing in pastures	Partly stall feeding	Fully stall feeding	Grazing pattern
	Non- lactating cattle and yak	✓	✗	✗	Free ranging/grazing in high pastures
Autumn (Mid October-Early December) depending upon snowfall	Sheep	✓	✗	✗	Controlled grazing in pastures near to village by owners themselves.
	Goats	✓	✗	✗	Controlled grazing in pastures near to village by owners turn by turn at daily basis
	Lactating cattle including cow and zomo	✓	✓	✗	Attended grazing in and around the village by an owner him/herself.
	Non- lactating cattle and yak	✓	✗	✗	Free grazing in and around the village and taken care by an owner him/herself
Winter (mid December to March)	Sheep	✗	✗	✓	Mostly remain in cattleshed during heavy snowfall, except for taking out for drinking water
	Goats	✗	✗	✓	Mostly remain in cattleshed during heavy snowfall, except for taking out for drinking water
	Lactating cattle including cow and zomo	✗	✗	✓	Mostly remain in cattleshed during heavy snowfall, except for taking out for drinking water
	Non- lactating cattle and yak	✗	✗	✓	Sometime let outside the cattleshed

1.7.3 Status of livestock vaccination in Hoper-Hisper valley

Data obtained for the number of livestock vaccinated and treated in case of any disease in last five years (2009-2013) is given in the following table:

Village	% of people having vaccination/ treatment of various livestock types			For which diseases			Supporting Agency
	Sheep	Goats	Cattle	Sheep	Goats	Cattle	
Hoper	23	24	44	FMD, Anthrax, PPR, diarrhoea, scabies, blood infection, skin diseases	PPR, Pox, Lungs Disease, Diarrheic, Dysentery, blood infections, pox, black quarter	Dysentery, Lungs disease, Pox and PPR, blood infection, scabies, bloating	GB LS & DD, Directorate of CKNP/EvK2CNR, WWF-P
Hisper	23	24	87	FMD, Anthrax, PPR, diarrhoea, scabies, blood infection, skin diseases	PPR, Pox, Lungs Disease, Diarrheic, Dysentery, blood infections, pox, black quarter	Dysentery, Lungs disease, Pox and PPR, blood infection, scabies, bloating	CKNP/EvK2CNR, WWF-Pakistan and SLF

1.8. Pastures of the Valley

Pastures of the valley can be divided into three categories: a) summer pastures (located at higher altitudes >4000 m, b) autumn/spring pastures (located at intermediate altitudes, 3500-4000 m, and winter pastures (located around the village at lower altitudes, 2500 m-3500). Gradual upward movement of livestock starts from April-June and downward movement occurs during September and October, keeping in view the altitudinal gradient, farming activities and local customs of various villages in the valley. During November to April livestock graze freely in and around the villages or remain in cattle sheds and stall fed in case of heavy snowfall.

1.8.1 Name, location, surface area, facilities and use of pastures

Hoper village:

Id	Name	Coordinate (at pasture center)	Altitude	Estimated surface	Facilities[1]	Other use[2]
1.	Supulter	74.851131	36.182413	3428	4 small accommodation, 10 closed pens for small animals, 3 open pens for small animals	Fuelwood*, Dung, medicinal herbs
2.	Dalter	74.729800	36.160150	3781	4 small accommodation, 10 closed pens for small animals, 7 open pens for small animals	Fuelwood, Dung
3.	Dranchi	74.733839	36.218399	3834	1 small accommodation, 4 closed pens for small animals, 1 open pens for small animals	Fuelwood, Dung
4.	Hununo	74.728468	36.202175	3952	3 small accommodation, 10 closed pens for small animals, 3 open pens for small animals, 1 improved corral	Fuelwood, Dung
5.	Baulter	74.830929	36.168328	3735	4 small accommodation, 10 closed pens for small animals, 4 open pens for small animals	Fuelwood, Dung
6.	Shishkin	74.818129	36.185274	3523	4 small accommodation, 7 closed pens for small animals, 4 open pens for small animals	Fuelwood, Dung
7.	Maruk	74.802496	36.198077	3455	1 small accommodation, 5 closed pens for small animals, 1 open pens for small animals	Fuelwood, Dung
8.	Hapakun	74.824145	36.143424	4174	10 small accommodation, 20 closed pens for small animals, 15 open pens for small animals	Fuelwood, Dung
9.	Barpu	74.874188	36.161559	3899	10 small accommodation, 30 closed pens for small animals, 15 open pens for small animals, 1 improved corral	Fuelwood**, Dung
10.	Rash	74.765016	36.164428	4140	7 small accommodation, 15 closed pens for small animals, 10 open pens for small animals	Fuelwood, Medicinal herbs
11.	Hamdar	74.781852	36.206519	2883	10 small accommodation, 25 closed pens for small animals, 15 open pens for small animals	Fuelwood
12.	Shalter	74.861752	36.140022	3868	2 small accommodation, 8 closed pens for small animals, 3 open pens for small animals	Fuelwood

Id	Name	Coordinate (at pasture center)	Altitude	Estimated surface	Facilities[1]	Other use[2]
13.	Miar	74.724602	36.228096	3555	3 small accommodation, 15 closed pens for small animals, 4 open pens for small animals, 1 improved corral	Fuelwood***
14.	Sumayarbar	74.748109	36.204682	3899	2 small accommodation, 10 closed pens for small animals, 3 open pens for small animals	Fuelwood***

1=(Number of Huts,fences, pens, corrals….), 2=(medicinal or fuelwood collection,..), 3= Healthy,Partially degraded, Degraded (community perceptions)

* (seabuck thorn, Artemisia, salix, juniper), ** Myricaria, Betula, *** Betula

Hisper Village

Id	Name	Coordinate (at pasture center)		Altitude (m)	Estimated surface	Facilities[1]	Other use[2]
		Latitude (E	Longitude (N)				
1.	Buwapuch	74.877762	36.225184	3450	299.53	5 Huts and 4 closed pens	Dung
2.	Ghurbun	75.033744	36.170910	3305	410.23	1 Hut and 3 pen	Fuelwood, Dung
3.	Bitanmal	75.142862	36.148302	3873	423.56	2 Huts and coorals, 1 open corral	Fuelwood, Dung
4.	Garombar	75.017505	36.136438	3651	320.1	1 Hut and 4 small pens	-Dung
5.	Oyum Rong	75.144345	36.071723	4398	1082	-	-
6.	Machis	75.047389	36.135984	4316	443.5	1 hut, 2 small pens	Dung
7.	Makrom	75.204753	36.089959	4295	302.1	-	-

1.8.2 Pastures Grazing Fee

Livestock in the valley, especially cattle are brought from one village to another for grazing during summer. In that case the host community or grazers charge grazing fee in cash or in kind (a portion of the total ghee or butter produced from the animal during that particular grazing season). There is no grazing fee in Hisper.

Details of grazing fee charged by people of Hoper for animal brought outside of the valley is given are given in the following table:

Village	Pasture Name	Period	Animal types	Number	Grazing fee value	Name of villages from where animals are brought
Hoper	Barpu, Rash, Supultar, Sumayerbar	April to October	Cattle, goats, sheep	2000-6000	Rs. 1200 or 1ghee/cattle and hair and wool of goats and sheep	Hunza, SAS valley and Rakaposhi

1.8.3 Grazing Cycle in Hoper-Hisper valley of CKNP

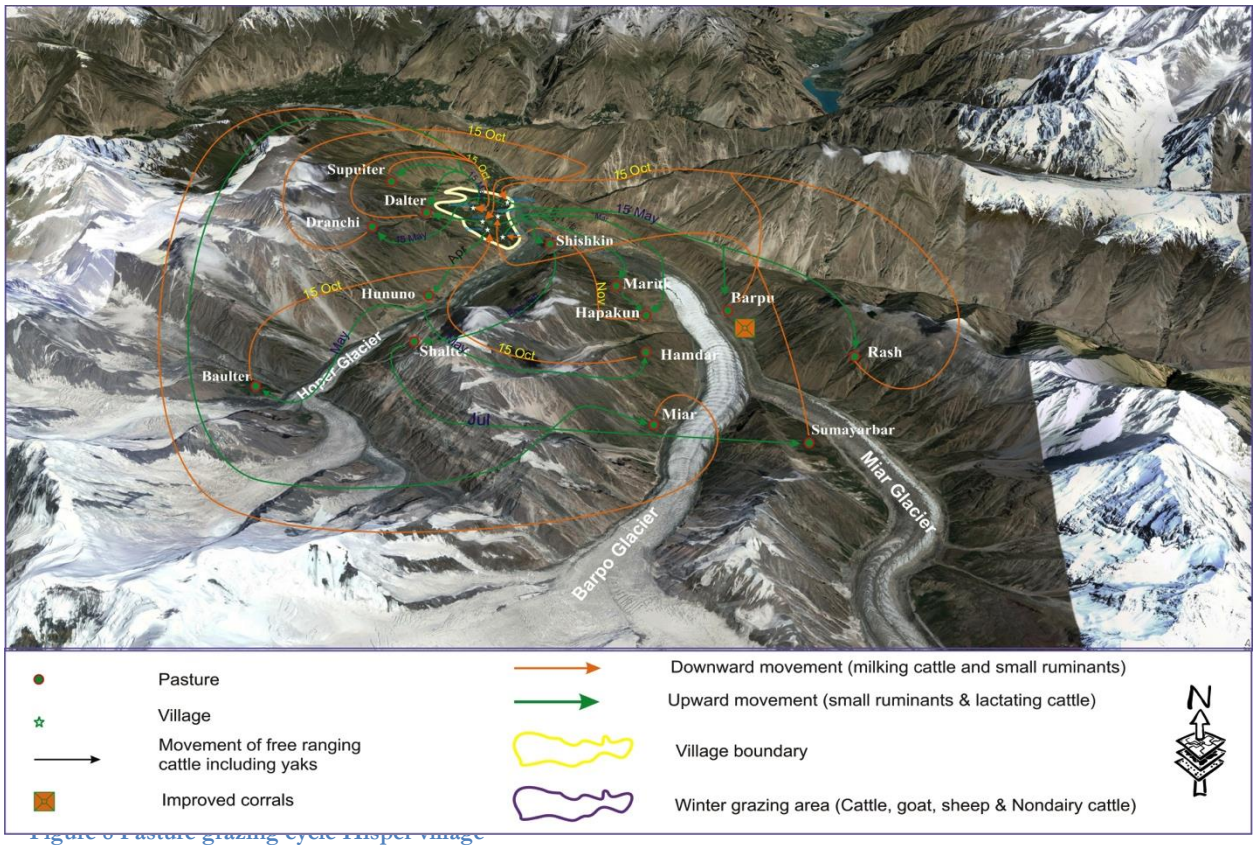


Figure 7 Pasture grazing cycle Hoper village

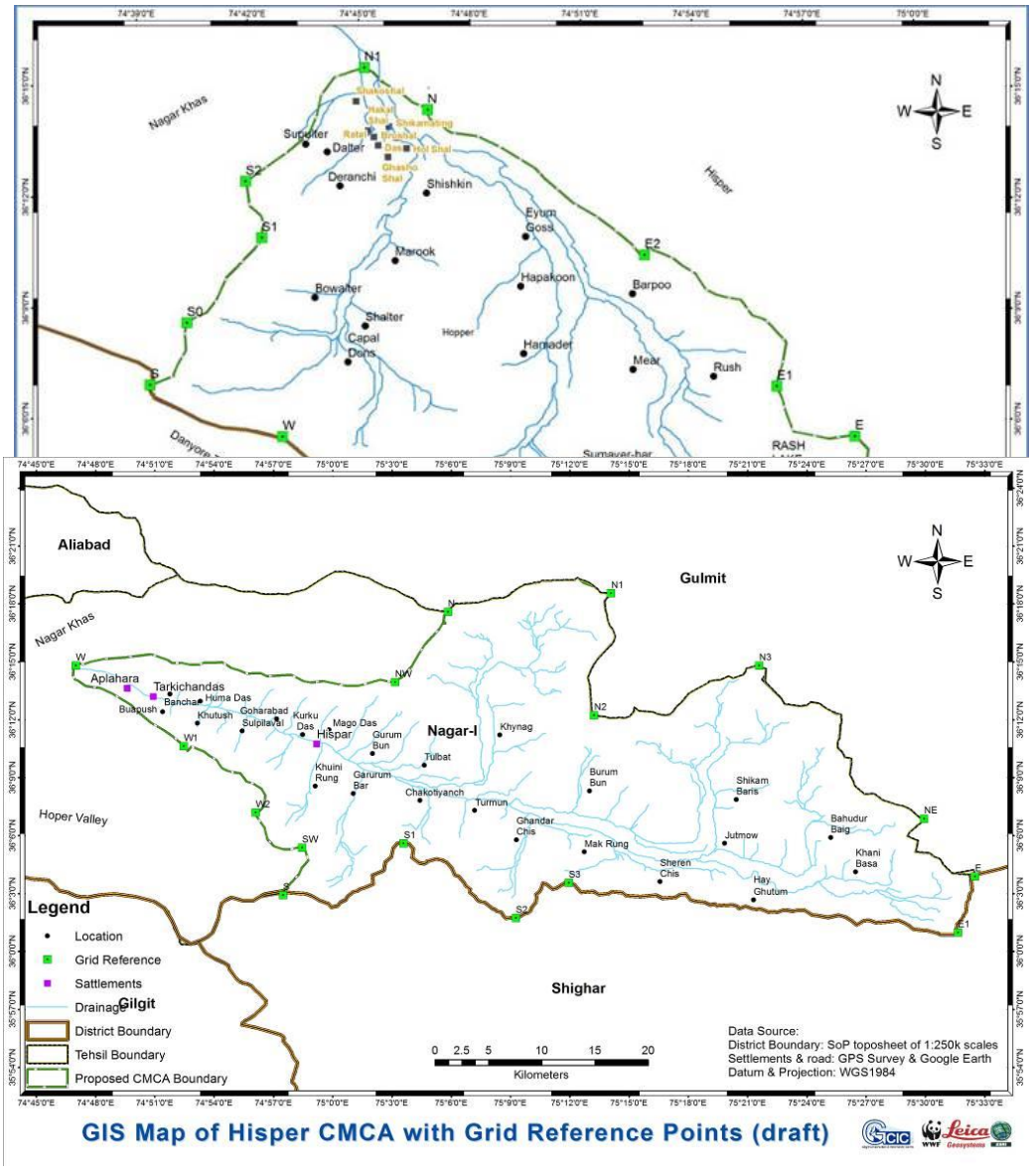
1.9. Wildlife

1.9.1 Numbers and status

Village	Species	Estimated Numbers	Source of Information
Hoper	Ibex *Capra ibex sibirica*	250-300	WWF/CKNP Survey winter 2013 (unpublished report)
	Snow leopard *Panthera unica*	Not known	- WWF survey reports, 2013-14 (unpublished) - Local people (FGD participants)
	Grey Wolf *Canis lupus*	Not known	-
Hisper	Ibex *Capra ibex sibirica*	>500	WWF-Pakistan, CKNP (unpublished reports)
	Snow leopard *Panthera unica*	8	-
	Grey Wolf *Canis lupus*	15	Local hurders and community man

1.9.2 Trophy hunting in Hoper-Hisper valley of CKNP

The case of Hoper has been approved by the Gilgit-Baltistan Wildlife Management Board for notifying the area as Community-managed Conservation Area (CMCA), primarily to facilitate trophy hunting of Himalayan ibex. The notification is yet to be made by the concerned authorities, i.e., Wildlife and Parks' Department. Map of the proposed CMCA is as under:



1.10.Forests and forestry

1.10.1 Forest cover and composition

Hoper-Hisper valley like other areas of District Hunza-Nagar is mostly rugged and barren, dominated by Artemisia slopes and devoid of natural forests, except few patches of juniper and birch at higher elevations in Hoper village. Vegetation cover in Hisper area (1305 km^2) comprises of only 1.047 km^2 of closed forests, which is 0.1% of the total area of Hisper village. Open forests are spread on 18.31 km^2 (1.4% of the surface area) while sparse vegetation on 108.89 km^2 (8.3% of the surface area)[11]. Similarly vegetation cover in Hoper area (426 km^2) comprises of only 9.49 km^2 of closed

[11] IPMP for CKNP (2014). Developed by Ev-K2-CNR, Islamabad, Pakistan

forests, which is 2.2% of the total surface area of the valley. Open forests in Hoper are spread on 17.17 km^2 (4% of the surface area) while sparse vegetation on 53.16 km^2 (12.5% of the surface area)[12].

Average biomass and increment calculated for each of the vegetation class is given below[13]:

Vegetation class	Increment (Mg ha^{-1} yr^{-1})	Biomass (Mg ha^{-1})
Sparse trees	0.910	29.37
Open forests	1.528	50.93
Closed forests	2.714	104.39

In Hoper and Hisper, natural forests are of broad leaf category comprising of Birch (*Betula utilis*), Juniper (*Juniperus spp.*) and or willows (*Salix spp.*), scattered at 3300-3800 m asl on north exposed valley sides. These forest patches heavily rely on snow accumulation and avalanches for water availability. The slopes are dominated by Artemisia, while rest of the vegetation is comprised of *Ephedra gerardiana*, wild rose (*Rosa webbiana)*, scrub, *Berberis* spp, sea buckthorn (*Hippophae rhamnoides turkistanica)*, and *Myricaria germanica etc.*

1.10.2 Use of forests for timber and fuelwood

The local people in the valley meet their requirements of firewood and timber from plant biomass obtained from agro-forestry interventions, massively carried out by AKRSP and WWF jointly with local communities, in the valley on lands, relatively less suitable for growing crops or vegetables.

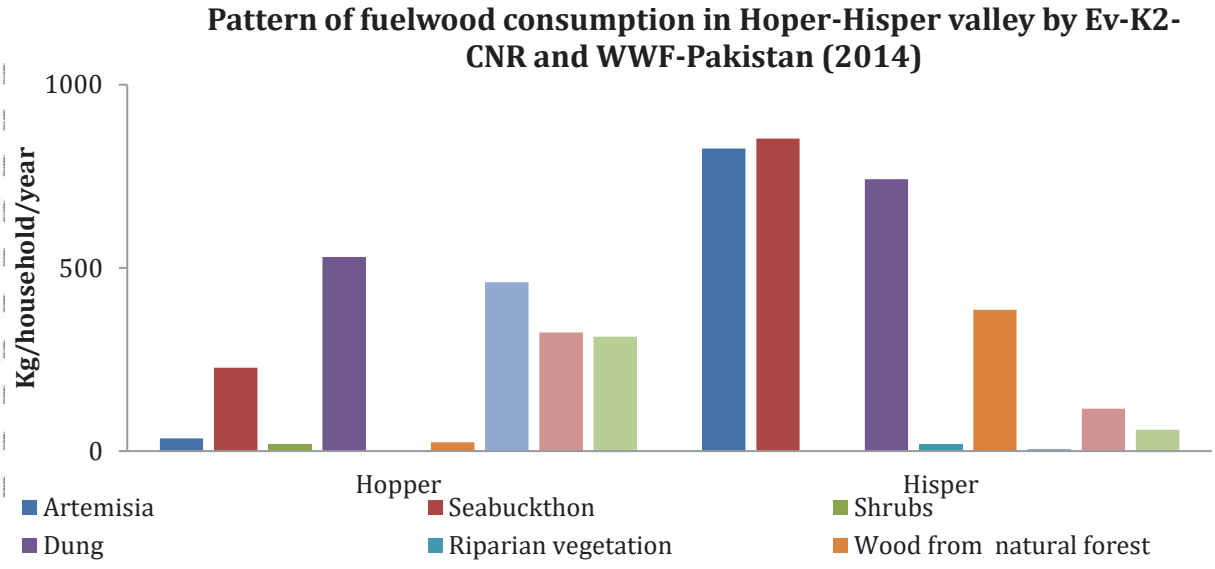
An assessment of timber use in Hoper-Hisper valley during the last five-years (2009-2014) is given in the following table:

Village	Timber consumed on construction of houses in the last five years		Species used for timber	From where timber was collected
	Number of logs	Volume (CFT)		
Hoper	4410 timber logs and 381	16,769 CFT	Kail, Spruce, Deodar, Popular and Willow	Local market and/or used from their own plantation
Hisper	917 timber logs and 106 patawa	12,805 CFT	Kail, Juniper, and Popular	the local market and/or used from their own plantation.

[12] IPMP for CKNP (2014). Developed by Ev-K2-CNR, Islamabad, Pakistan

[13] Anfodillo, T., M. Carrer, E. Dalla Valle, M. T. Melis, A. Tenca and J. Vasquez Pique (2009). A plan for promoting the CKNP Sustainable Forest Management (KARA-FOR Project). In IPMP for CKNP (2014). Developed by Ev-K2-CNR, Islamabad, Pakistan

An analysis of various sources of fuelwood is Hoper-Hisper valley is given in the following figure:



Areas of Fuelwood collection from natural forests

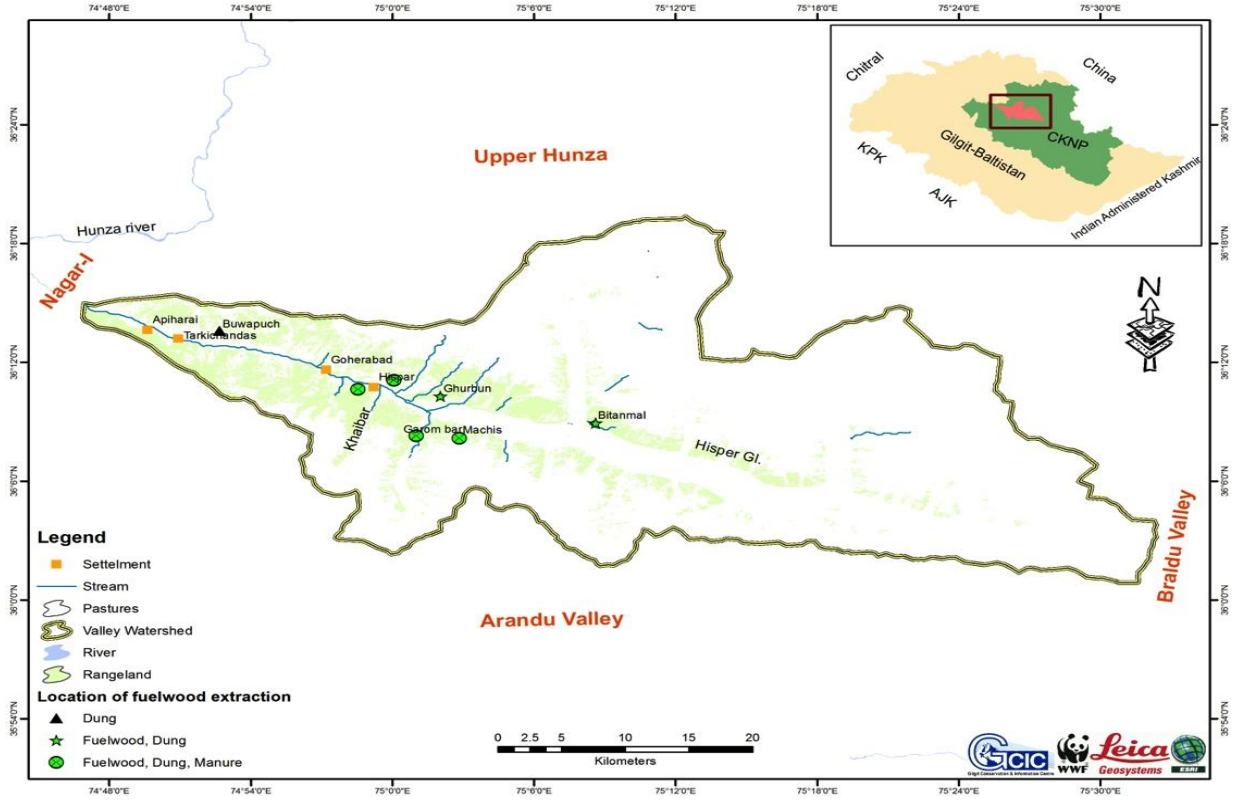


Figure 9 Areas of fuelwood collection in Hisper village

1.10.3 Social forestry interventions under SEED Project and by WWF

The CKNP partners including Ev-K2-CNR and WWF under SEED project for CKNP have started massive afforestation schemes in the valley. A summary of plantation undertaken by WWF in the framework of SEED Project for CKNP and under AHMP is given as under:

Village	Site Name	Coordinates	Alt. (m)	Species and %	Spacing *between trees* Average diameter (cm at person shoulder) and high (m) *estimated*			Concern CBO	Planting year
					Species	Diam (inch)	High (ft)		
Hoper	Shiqamating	74°45'25.36"E, 36°14'10.06"N	2689	100% Popular	Willow	4	6	HCDO Hoper	2014
	Shiqamating	74°45'29.91"E, 36°14'29.67"N	2613	100% willow	Poplar	4.5	6	HCDO Hoper	2014
	Shiqamating	74°45'30.72"E 36°14'17.21"N	2630	100 % popular	Popular	5	7	HCDO Hoper	2014
	Hakalshal	74°45'16.74"E, 36°14'25.95"N	2565	Willow 75% 25% Popular	Willow	5	7	HCDO Hoper	2013
	Hakalshal	74°45'16.74"E, 36°14'25.95"N			Poplar	4	5	HCDO Hoper	2013
	Broshal	74°45'26.56"E 36°13'5.86"N	2915	100% popular	Poplar	5	6	HCDO Hoper	2013
Hisper	Chayar (near river bank)	75° 0'25.91"E, 36°10'11.53"N	3002	5000 (90% willow, 10% pine)	Willow	4.3	6.2	Hisper VCC	2013
	Ghurbun	75° 1'59.47"E, 36°10'14.51"N	3317	Willow 100%	Willow	4.7	5.8	Hisper VCC	2012

1.11. Mining Sector

Mining in Hoper-Hisper, so far, has not been a commercially viable activity. In Hoper, some local people having been making efforts to explore mines in Gheintur since 2001 and in Hapakun since 2011 but no success made yet. In Cheintur area, deposits of Aquamarine, Quartz and Phulride while in Hapakun area Aquamarine has been identified and located, but local people, with few exceptions, have no awareness and information about marketing of minerals extracted from Hoper valley.

Hoper has deposits of Salajeet (Benione) and in 2014 a group of people from Haramosh valley extracted 25 maunds (1000 kg) of Salajeet from Hoper. The value of this was about Rs. 1,250,000-1,750,000 @ Rs. 50,000-70000 per 40 Kg.

Lack of trained personnel and proper exploration and extraction mechanisms is the biggest challenge for mining in Hoper valley.

In Hisper, mines of precious stones are yet to explored. Some locals try to bring in expertise from Haramosh and other known areas of GB, privately, to locate mining areas but no success as yet.

1.12. Tourism

Following is an assessment of tourism facilities present in the villages of Hoper-Hisper valley:

Facilities	Hoper	Hisper
Key touristic attractions	Golder peak, Rash Lake, Hoper glacier, Barpu glacier, Miar glacier. There are 9.5 camps to and from Hoper village to Rash Lake. The Rash peak provides unique opportunity for watching a huge number of peaks in Karakorams.	Biafo-Hisper Trek

Facilities	Hoper	Hisper
Accommodation	There are two hotels in Hoper consisting of 10-12 rooms altogether and beautiful lawns for camping. In addition there is a rest house operated by PWD, Gilgit-Baltistan. These lodging facilities are situated near the terminus of Hoper glacier from where the guests can have a picturesque view of the glacier and the entire Hoper valley	No any proper facility is available except the CKNP camp office/tourist information centre.
Campsites	Lawns of the above accommodation facilities is used as campsites	Bitanmal and Smelling rock area
Services	i. Guides: 4 ii. Porters: +400 iii. Cooks: 1 iv. Cooks Assistant: 4	i. Guides: 0 ii. Porters: 100 iii. Cooks: 0 iv. Cooks Assistant: 1

1.13. Local Management Institutions (LMIs) in the valley

Local Management Institutions responsible for traditional governance and decision making system in Hoper-Hisper valley is called *Jirga* run through Namberdars and notables. Namberdars are either interestedly being selected since the era of Mir or designated by the local government now a days. The notables are elders of a clan or a hamlet selected collectively by the village people or on hamlet level by inhabitants of a particular hamlet. The decisions are taken in the light of local traditions and customs through consensus among all representatives.

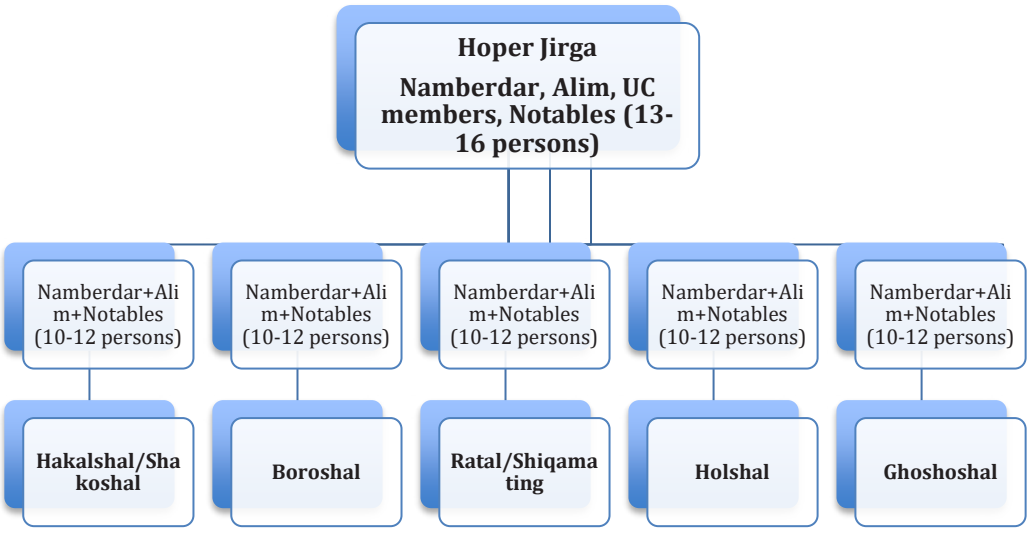
Structure of local governance system in the valley is given in the following table:

Village	Number of Clans/Hamlets	Number Notables	Other members	Total members	Headed by
Hoper	5	13-16	Namberdar (1), UC member (1) Alim (religious leader) (1)	16-19	Collective decision
Hisper	3	9-12	UC member (1), Alim (religious leader) (2)	12-15	Collective decision

Some details of the LMIs in selected villages is given as under;

Hoper

Decision making system in the valley is called *Jirga,* consisting of 13-16 community elders, comprising of *Namberdars* (local tribal elders), Aalim (religious leaders), UC members and other notables of the valley. Since 2011, the same set-up of village grand Jirga has been transformed into "Hoper Conservation and Development Organization" (HCDO). Similarly all five major villages, named after their tribes (Boroshal, Hakalshal, Holshal etc) or geographical location (Goshoshal and Ratal) also have their own village or tribe level Jirga consisting of 10-12 persons comprising of Namberdars, Alim and other notables of the tribes. From each village/tribe 2-5 members are selected for the valley level decision-making. A schematic diagram of the decision-making system in Hoper is given as under:



Hisper

In Hisper, decision-making system is the traditional representation of community elders locally called Jirga (notables) elected by villagers of the tribes or settlements, headed by a Sardar. In addition to this, at present there is a 20 member Village Conservation Committee, all men called VCC, which in collaboration with Jirga is responsible for resolving all issues, problems and disputes in the village.

1.14. Role of the local governance system in managing natural resource

Sector/areas of decision making	Role in decision making	Rate in terms of effectiveness*
Hoper		
Pasture	Grazing cycle management, fixing timing for movement into pastures and ban on free grazing in the cultivated areas	10
Forests	Ban on cutting under the umbrella of HCDO	6
Land resources	Division of new lands brought under cultivation among village people, conflict resolution on individual and communal lands	10
Water resources	Equitable distribution of water into various channels of the valley (details are given below in A5)	10
Wildlife	Ban on illegal hunting	8
Hisper		
Pasture	Grazing cycle management, moving up into the pastures in spring and returning back to the village in autumn is decided by the Jirga in consultation with the VCC.	10
Forests	no any rules and regulations relating the forest as no forest exists in the village except a few patches of juniper far away in the pastures of the valley	0
Land resources	Division of new lands brought under cultivation among village people, conflict resolution on individuals and communal lands	7
Water resources	Distribution of irrigation water among settlements. Every settlement gets water for 5 days.	10

***(1 not effective - 10 extremely effective)**

1.15. Use rights of natural resources and associated customary laws

Theme/Area	Customary laws/restrictions	Enforced by
Hoper		
Grazing areas/pasture use/livestock migration, guarding	Grazing cycle management. The right of use of various pastures in Hoper is specified by tribes/settlement. This division of pastures among tribes has been made centuries ago in the time of Mirs of Nagar. There is only one pasture namely "Barpu" commonly used by all tribes/settlement, whereas the rest of pastures belong to individual tribes/settlements. Major pastures and their use rights is as under: **Tribe/village: Name of Pastures** Boroshal Hununo, Baulter, Hamder Hakalshal Supulter, Dalter, Miar Holshal Shishkin, Shalter, Sumayerbar Ghoshoshal Maruk, Hapakun Ratal/Shiqamating Rash lake area, Dalter, Daranchi	Jirga
Timber harvesting from natural forests and use	In the past harvesting timber from natural forests was not restricted. Anyone who could manage, use to bring from his specified pasture. Secondly the natural forest patches remotely located in the valley and transportation is not possible in the absence of any road access, therefore, it is not a normal practice to fetch timber from natural forests. Greenwood cutting is banned in collaboration with HCDO.	Jirga/HCDO
Fuelwood harvesting from natural forests	Ban on cutting of Juniper in particular and other green wood in general.	Jirga/HCDO
NWFPs including MAPs collection	No rules at the moment. Mr. Ali Madad of Nagar proper (a local expert in herbal medicine) use to collect medicinal plants from Rush Lake are, Cheinter, Talkosh, Supulter pastures. His treatment is regarded as highly effective for some complex diseases.	-
Use of water resources	There are ten major water channels in Hoper; five carrying water to the upper reaches of the village while five to the settlements situated at lower altitudes or valley bottom. Timing and duration of flow of water in those channels is maintained through a proper timetable. In spring during cultivation (April-May) water flows in the upper five channels from dawn till 1 pm. After 1 pm (sharp) the upper channels will be closed and water will flow into the lower five channels. A person called *Eelguin* is deputed to regulate water flow in these channels. The *Eelguin* is paid in kind by all villagers @ 5 kg wheat grains per household. If someone goes again the timetable and brings water to his field, a fine is imposed. This system of irrigation water distribution in the valley is an old historical/traditional practice, still applicable and followed by local people in the true spirits.	Jirga
Land resources	Any new piece of land to be brought under cultivation through construction of irrigation channel is first divided into "x" number of plots keeping in view the number of household possessing rights in that particular piece of land. Then a certain plot is given to a certain household or group of households by a lucky draw. This is acceptable to everyone in the village and no grievances afterwards because the type of land in an area is not same due to the topographic or biogeographic variation in land formation. In the lucky draw one has equal chance of getting any type of land *e.g.* a plain area or a slope, with good soil formation or an eroded one, a portion with boulders or a portion without boulder, etc. Subsequently the scheme or timetable of irrigation	Jirga

Theme/Area	Customary laws/restrictions	Enforced by
	follows the same pattern through which the land was distributed keeping in view the number of plots.	
Mining	No rules at the moment. Salajeet (Benzion) is collected by the people of Haramosh.	-
Tourism	When an expedition group needs porters from the Hoper valley, the number of porters is equally divided into three groups and one *Makhso* (three equal division of households in hoper Hoper valley for benefit sharing or contribution in common cause) is asked to provide the required number of porters in a group. Thus everyone in the village gets a fair and equal change of earning as porter)	Jirga
Wildlife	Ban on hunting or killing/poaching of wild animals in collaboration with HCDO.	Jirga/HCDO
Hisper		
Grazing areas/pasture use/livestock migration, guarding	Jirga specifies use of various pastures in Hisper. The villagers jointly and equally use all pastures in Hisper valley as it owns to all. But there is restriction in movement of livestock from pastures to pasture and dates are fixed according to the seasons.	Jirga
Fuelwood harvesting from natural forests	No any law for the regulation of fuelwood harvesting from natural forest.	N/A
Timber harvesting from natural forests and use	No any specified law-relating timber harvesting from natural forest.	N/A
Use of water resources	There are three settlements in Hisper valley and water resources are distributed settlement wise. Every settlement gets water for 5 days	Jirga/VCC
Mining	N/A	N/A
NWFPs including MAPs collection	N/A	N/A
Agriculture	N/A	N/A
Wildlife	Hunting of wild animals is banned in Hisper valley.	VCC

1.16. Local NGOs and CBOs in the target villages

A list of local NGOs and CBOs in Hoper-Hisper is given as under:

Name Organization	Year of Establishment	Number of Members (Individuals/HH)	Roles	Who established (name of organization)	Rate in terms of effectiveness (mandate)
Hoper					
HCDO	2011	740 hh	Nature conservation	WWF- SEED	8
4 VOs in Hakalshal	1986	276 hh	Rural Development, Saving, Water supply, Health and Hygiene	AKRSP	8
2 VOs in Boroshal		168 hh		AKRSP	8
3 VOs in Holshal		68 hh		AKRSP	8
1 VO in Ghoshoshal		76 hh		AKRSP	8
1 VO in Ratal		100 hh		AKRSP	8

Name Organization	Year of Establishment	Number of Members (Individuals/HH)	Roles	Who established (name of organization)	Rate in terms of effectiveness (mandate)
1 VO in Shiqamating		52 hh		AKRSP	8
2 WOs in Hakalshal		276 hh		AKRSP	8
2 WOs in Boroshal		168 hh		AKRSP	8
2 WOs in Holshal		68 hh		AKRSP	8
1 WO in Ghoshoshal		76 hh		AKRSP	8
1 WO in Ratal		100 hh		AKRSP	8
1 WO in Shiqamating		52 hh		AKRSP	8
Ratal Development Organization	1991	120 hh	Water supply, Protective Bund	AKRSP	8
Hisper					
Flahi Tanzeem for Conservation of Natural Resources Also called VCC	2007	20 individuals	Education, health and Environment and development of the area.	Sheikh Fida Hussain and community elders	Education=6 Health=4 Environment=5 Development=8

2. MANAGEMENT ISSUES AND PROBLEMS

2.1 Traditional low yielding agro-practices

Yield of wheat in the valley (1434 kg/ha in Hoper and 669 kg/ha in Hisper) is far less the national average of 2833 kg/ha (Government of Pakistan, 2010-11)[14]. In addition, due to limited agriculture land holdings per household (on average 0.35 ha in Hoper and 0.44 in Hisper ha) and availability of wheat on Government subsidized rates; growing wheat seems to be economically less viable option in the valley. The area is suitable for production of potatoes; therefore, most of the time potatoes are grown in the fields without proper crop rotation, leading to decreased productivity and more chances of pest infestation. Hoper is one of the largest apricot-producing villages in Nagar area together with some other fruits like walnut and pears. In addition to lack of crop rotation, storage of high quality seed potato is another problem in agriculture sector here. Moreover, in Hoper fruit processing, packaging and marketing is not up-to the mark, causing a substantial loss of the produce annually.

Moreover, the valley has considerable quantities of wool and hair obtained from domestic stock comprising of sheep, goats, cattle and yaks. Despite having a high demand locally for woollen products to keep warm during harsh and long winters and good prices of woollen products and rugs in local and outside markets, there is no domestic or cottage industry to utilize such an easily available raw material for making vocational products. By developing cottage industry, local wool and hair can be utilized to generate employment and economic opportunities for the local women and youth. One of the reasons of marginality among local women is lack of income generating opportunities, for which women stay idle in their homes for almost six month due to no agricultural activity in harsh winters.

2.2 Pastures degradation

Intermediate (spring/autumn grazing areas located at 3000- 3500 m) and lower pastures (winter grazing areas surrounding the villages) are partly or heavily degraded due to extensive grazing. Pasture grazing cycle follows a permanent pattern practiced for a long time and the pattern is seldom changed, thus no area is deferred for grazing. Although the livestock holding per household has been decreased, but due to increasing human populations leading to multiplying households, pressure on grazing lands is still high. In addition, livestock has to graze almost 6-8 months on pastures, resulting in depletion of grazing grounds.

One of the reasons for extensive grazing of intermediate and lower pastures is lack of fodder produced on farmland which is not sufficient to feed animals during long winters, spanning over five-six months.

Secondly, as a result of conservation initiatives the number of wild ungulates has also been increased, exerting pressure on the shared grazing ground.

Moreover, due to poor accessibility or lack of drinking water in certain pastures, more accessible areas with availability of drinking water are excessively grazed. In Hoper, one pasture namely Shishkin, according to local people is degraded, two pastures namely Miar and Sumayarabar are healthy whereas the remaining 11 are partly degraded. In Hisper there are seven major pastures and according to local these pastures are healthy to some extent. One of the reasons for healthy pastures in Hisper is vastness of the area, if we compare number of animals against the total covered area of the valley; the density

[14] Government of Pakistan. 2010-11. Agriculture Statistics of Pakistan. Statistical Division, Bureau of Statistics, Islamabad.

of livestock becomes 3 animals/km^2. However, this assessment is only based local people's perception about pastures' condition, if may differ, if a scientific analysis is carried out.

A summary of pastures status in the valley indicating degraded and partly degraded valleys is given as under:

ID	Hoper		Hisper	
	Pasture Name	**Status***	**Pasture Name**	**Status***
1.	Supulter	PD	Buwapuch	H
2.	Dalter	PD	Ghurbun	H
3.	Dranchi	PD	Bitanmal	H
4.	Hununo	PD	Garombar	H
5.	Baulter	PD	Oyum Rong	H
6.	Shishkin	D	Machis	H
7.	Maruk	PD	Makrom	H
8.	Hapakun	PD		
9.	Barpu	PD		
10.	Rash	PD		
11.	Hamdar	PD		
12.	Shalter	PD		
13.	Miar	H		
14.	Sumayarbar	H		

* D degraded, PD partly degraded, H healthy

2.3 Traditional animal husbandry and associated problems

2.3.1 Livestock mortality (diseases and depredation)

From the assessment of livestock mortality in Hoper valley recorded during 2013, it was revealed that the annual livestock mortality in the valley is 5.7 % of the total livestock holding with highest in Hisper (7%), followed by Hoper (4.4%). In Hoper the major cause of death in sheep and goats is mammalian predators while in cattle diseases. In Hisper predation by large predators was considered to be the major cause of death in all the three livestock categories. The dominant diseases are PPR, pox, diarrhea, mange, FMD, gastro intestinal tract diseases, hematuria, and weakness due to lack of food and winter stress. Suspected predators are wolf and snow leopard and sometime foxes are said to prey upon young animals. No predation incidences were attributed to stray dogs and lynx.

The causes of animal mortality in high pastures during summers is less known to the livestock owners who do not stay in pastures with their livestock. Accidents caused by snow avalanches, mud or land slides and rock falls also contribute significantly to livestock mortality. One of the reasons of death is winter stress coupled with lack of food leading to weakness and sometimes death.

Status of livestock mortality during last one year (2013) in Hoper valley is given in the following table:

Hoper

Livestock type	Number of animals died (2013)	% of total deaths	Cause of mortality (%)			
			Predation	Diseases	Accidents	Unknown
Sheep	229	45	40	26	9	25
Goats	104	21	36	23	20	20

Cattle	173	34	19	36	17	28
	506					

Hisper

Livestock type	Number of animals died (2013)	% of total deaths	Cause of mortality (%)			
			Predation	Diseases	Accidents	Unknown
Sheep	140	64	60	13	20	7
Goats	51	23	55	14	32	0
Cattle	29	13	53	12	24	12
	220					

2.3.2 Lack of Veterinary Facilities

In Hisper veterinary facility is not available but veterinary attendants are present in the village, employed by LS&DD, they carry out vaccination or treatment in case of any urgency. The nearest veterinary centre is situated at a distance of about 28 kilometers in Nagar-1. In Hoper there is a veterinary dispensary but needful medicine are not readily available.

2.3.3 Lack of a permanent vaccination Programme for livestock

The villages doesn't have a permanent or systematic vaccination campaign for livestock, rather it has been an occasional activity for the last few years. Some of such campaigns have been arranged by LS& DD, WWF and Ev-K2-CNR under SEED project and also by WWF under Snow Leopard project. In Hisper livestock vaccination were also organized by SLF.

SLF has also trained local community members of Hisper in livestock vaccination and ungulates survey techniques.

The LS&DD have limited financial and human resources to make the livestock vaccination a regular activity. The individual herders cannot afford to buy vaccines as per their needs.

2.3.4 Traditional cattlesheds with poor sanitary measures

Traditionally built cattlesheds seriously lack sanitary measures, affecting health and productivity of animals. There are not separate compartments for feeding and drinking water. Cattlesheds are quite congested, often without light and ventilation. Animals defecate, feed and sleep at the same place. In the events of heavy rains or snowfall the sheds get excessively wet for longer periods adding to the stress of animals. Majority of the diseases (*CCPP, PPR, Theleriosis & Pasteurellosis*) are exacerbated by harsh winter coupled with poor hygienic conditions.

2.4 Forests and forestry related issues

2.4.1 Depletion of plant biomass due firewood extraction

The valley falls in the arid temperate zone, devoid of natural forests, comprising of only few remnant stands of Juniper, Birch (Betula) and Salix species. The lower slopes contain shrubs and bushes like Seabuck thorn, Rosa spp and Artemisia, subject to continuous extraction by locals for firewood. Plant biomass is the only available option for domestic energy for heating and cooking. Local people (50-60%) in Hoper village fetch fuelwood from their farmlands or afford to buy fuelwood (on average ca. 312 kg per HH per year in Hoper and 58 kg per HH per year in Hisper) whereas as the

remaining still have to rely on the scarce natural vegetation. In addition, majority of the HH (+80%) use cow dung to supplement fuel wood (on average ca. 530 kg per HH per year in Hoper and 742 kg per HH per year in Hisper). Using cow dung as domestic fuel causes multiple hazards such as diseases and ailments due to smoke, increased use of chemical fertilizers to replace manure leading to desertification, etc.

Construction timber is not extracted from natural forests; however, there is considerable pressure on natural forest for firewood collection in Hisper (386 kg per household per year or 77,200 kg per year), while in Hoper it is comparatively less (24 kg per household per year or 17,760 kg per year).

Removal of plant biomass by extensive grazing and for fuelwood has resulted in decreasing vegetative cover. Some areas like the lower reaches of Miar glacier in Hoper, which were once vegetated have turned into barren, degraded slops due to absence of seasonal glacial-melt water flows as a result of gradual reduction in volume of ice. The denuded slopes on one hand are prone to erosion as a result of fast melting of snow and on the other animal productivity decreases due to pastures depletion.

With growing human population the need of firewood is also exponentially increasing posing significant pressure on the scare natural forest patches of the area, if alternatives of firewood are not explored.

Average daily consumption of fuelwood per household is highest in Hisper (8 kg) followed by Hoper (5.28 kg).

An analysis of fuelwood consumption in selected village of Hoper-Hisper valley are as under:

Statistics of fuelwood consumption in Hoper village

Biomass type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Kg
Artemisia	2	2	3	3	3	3	3	4	4	4	3	2	35
Seabuckthon	20	22	20	20	17	16	17	20	18	19	19	19	228
Shrubs	0	1	2	2	2	2	2	3	3	2	1	1	19
Dung	118	107	26	11	5	3	3	5	18	35	81	118	530
Riparian vegetation	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood from natural forest	5	5	1	1	0	0	0	0	0	1	5	6	24
Wood from orchards/ fruit trees	55	54	35	31	29	28	27	28	31	38	49	55	461
Plantations	40	39	25	22	21	20	21	21	23	23	31	41	324
Firewood bought	46	45	24	16	13	12	12	14	17	24	40	48	312

Statistics of fuelwood consumption in Hisper village

Vegetation type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Kg
Artemisia	98	98	90	42	41	41	42	43	51	89	96	98	826
Seabuckthon	93	92	74	59	53	51	50	54	62	79	93	94	853
Shrubs	0	0	0	0	0	0	0	0	0	0	0	0	0
Dung	95	90	67	37	38	35	34	38	55	78	84	90	742

Vegetation type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Kg
Riparian vegetation	1	1	2	5	4	3	2	1	0	0	0	0	18
Wood from natural forest	53	54	46	18	14	11	14	10	23	45	48	52	386
Wood from orchards/ fruit trees	0	0	0	0	2	2	2	1	0	0	0	0	6
Plantations	9	10	10	11	13	13	10	7	7	8	9	9	116
Firewood bought	6	6	5	3	3	3	4	4	2	5	9	7	58

2.4.2 Free grazing, a challenge for afforestation and social forestry

During late autumn, winters and early spring livestock are left free for grazing in and around the villages, primarily due to lack of accessibility to higher pastures due to heavy snowfall. Most of the damage to newly planted forest and fruit trees occur during this time due to debarking of plants by goats, cattle and equine. In addition to debarking, animals also damage plants by trampling, due to the reason that local people are tended to plant trees very closely (as low as 1 x 1 feet) due to scarcity of cultivable lands.

However, there is strict ban on free grazing during summers, imposed by locals under customary laws.

Local people find it difficult to fence large areas of land for planting purposes, which is neither affordable for poor farmers nor easily doable in absence of stone for wall masonry. In most of the cases local people fence planting areas with the help of sea buckthorn hedges, but again that depends on availability of sea buckthorn in large quantities. Since sea buckthorn is one of the major source of fuelwood and being heavily consumed for domestic energy.

2.4.3 Lack of alternatives of domestic energy

Due to lack of alternative sources of fuelwood and fuel-efficient technologies, plant biomass is extensively used as domestic fuel for cooking and heating houses in the long winters. In most of the houses wood is burn in the traditional stoves, which in addition to excessive consumption results in various health ailments such as sight (Eyes irritation), lungs (Asthma, Cough) and Skin related disorders commonly found in local people.

In Hoper about 47.32 %, (n=205) respondents do use alternatives fuel sources while rest of the respondents depend entirely on plant biomass. Of 47.32%, 11.34% respondents use LPG whereas 13.40% use kerosene oil. 75% of the respondents use electricity. In case of LPG, people buy it by themselves while electricity supply to the area is from 1 MW hydel power station, located in Huranz area of Hoper. Another 1 MW has been recently approved by the Power Department of the Government of Gilgit-Baltistan. Similarly, kerosene oil is bought to meet domestic need.

In Hisper about 40 %, (n=50) respondents do use some sort of alternatives fuel sources while rest of the respondents depend entirely on firewood. Of 40%, none of the respondents use LPG whereas 5% use kerosene oil. 95% of the respondents use electricity from the Micro Hydel with the capacity of 150 KW. This Micro Hydel was built in 2005 with the help of Partner Aid International.

2.5 Challenges for wildlife conservation

2.5.1 Illegal hunting and poaching

Illegal hunting and poaching activities in the valley are monitored through CKNP and wildlife department's watchers. In Hisper three VWGs were also deputed by local community with support of WWF under SEED Project for CKNP, but this support was during 2012 to 2014. In Hoper two VGWs are working since 2013 with support of WWF under a snow leopard conservation project. In Hoper the illegal hunting and poaching activities have been controlled to a greater extent but in Hisper some illegal hunting activities are still going on, evident from detention of an illegal hunter during 2013 by GB Wildlife Department's watchers. In Hisper some outside influential people are said to be involved in hunting through local people.

Ladakh urial, once said to be found in Hisper[15] have now been exterminated, possibly due to persecution and challenges of an isolated population.

2.5.2 Retaliatory killing of mammalian predators

Local people, more dependent on livestock resources seem to be less tolerant towards large predators. Though during the interviews and FGDs the people were reluctant to talk about such incidences, but referring to past incidences people talk of retaliatory killing of large predators. For example in Hisper the last known incidence happened in 1996, when an unknown person, shot a snow leopard. In 2000 a gray wolf came to the village during the day time and attacked sheep and goats. Later on this was stoned to death by the villagers. In Hoper during the FGB the participants informed about the following incidences of human-carnivore interaction:

- 25 years ago a wolf was killed in the village
- 20 years ago a snow leopard was caught in a *buloot* (trap), immediately officials of wildlife department were informed but when they reached site, it had escaped.
- Some 12 years ago a snow leopard was chased by a hunter to kill at predation site
- 7 years ago four cubs were detained in Hisper after killing their mother. The cubs couldn't sustain stressful environment of captivity and died one by one.
- Some 12 years ago, a female snow leopard was seen in Hoper near a den where it had its cubs inside. The animal saw to hunters near its den and at the same night it has shifted its cubs to an unknown location and kept changing the location twice when the hunters monitored it, and lastly it disappeared with the cubs.

2.5.3 Chance of disease transmission between livestock and wildlife

In Hisper during 2010 and 2011 red foxes were found dead due to some skin diseases. In Hoper No symptoms of diseases have been noticed in any kind of wildlife. However, ibexes have been quite often seen died due to avalanches.

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[15] Roberts, T.J. 1997. The mammals of Pakistan (Revised Edition). Oxford University Press, Karachi, Pakistan.

Another example is from the nearby Shimshal Pamir area, where a severe outbreak of sarcoptic mange affected blue sheep population, whose likely source was indicated in infected livestock[16].

Usually an animals died of a disease is left outside without properly disposing off, leading to increasing change of disease transmission to scavenging wildlife, as there is no domestic dogs in Hoper-Hisper valley.

2.5.4 Challenges in running trophy hunting programme

In 2014 Gilgit-Baltistan Wildlife Board has approved notification of Hoper and Hisper as CMCA to facilitate trophy hunting of Himalayan ibex as an incentive to promote community-based conservation of natural resources. The notification is yet to be issued by GB Forests, Wildlife and Environment Secretariat. Soon after the notification the local community will expect to start trophy hunting for economic gains. The hunter coming to Gilgit-Baltistan have their own priorities in terms of a successful hunt, keeping in view easy accessibility, presence of trophy sized animals etc. When there are delays in trophy hunting, the community gets demotivated and stops proactive conservation efforts.

Secondly, for trophy hunting of wild ungulates in Pakistan and Gilgit-Baltistan, specific procedures have been identified[17],[18] (yet to be rectified and enforced by Government of Gilgit-Baltistan). The procedures provide proper guideline about wildlife census prior to allocation of a hunting permit and utilization of trophy hunting amount. The local community representatives are unaware of such procedures. The hunting is taken merely as in economic incentive rather an incentive for promotion of environmental conservation. Wildlife census undertaken by community themselves (without involvement of the GB Parks and Wildlife Department or CKNP Directorate or a supporting agency like Ev-K2-CNR, WWF, IUCN and other conservation organization) seems to be less reliable in terms of accuracy.

2.5.5 Challenges in running livestock Insurance scheme

There is no livestock insurance scheme in Hisper to compensate herders losses caused by large mammalian predators. In Hoper a Livestock Insurance Scheme (LIS) exists in the village since 2014 with support of Ev-K2-CNR/ WWF (under SEED Project) and WWF-Pakistan with financial support of USAID through WWF-US. The scheme comprises of an endowment fund (Livestock Insurance Fund-A, LIF-A), initially amounting Rs. 500,000 plus amount of premium collected by insuring livestock (Livestock Insurance Fund-B, LIF-B) amounting Rs. 15240 so far by 50 members. A Livestock Insurance Management Committee (LIMC) comprising of Village Wildlife Guards and VCC members monitors the scheme and recommends predation cases for compensation. The funds have

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[16] Dagleish, M. P., Qurban Ali, R. K. Powell, D. Butz, M. H. Woodford. 2007. Fatal sarcoptic scabbies infection of blue sheep (Pseudois nayaur) in Pakistan. *Journal of Wildlife Disease*, 43(3): 512-517

[17] Shackleton, D. M. 2001. A review of community-based trophy hunting programme in Pakistan. Prepared for the Mountain Areas Conservancy Project with the collaboration of The World Conservation Union (IUCN-Pakistan), and the National Council for the Conservation of Wildlife, Ministry of Environment, Local Government and Rural Development, Pakistan, Islamabad. 59 pp.

[18] Ashiq Ahmed Khan. 2010. Draft Procedures for Trophy Hunting Programme. Gilgit-Baltistan Parks and Wildlife Department, Gilgit.

been deposited in local banks to generate fixed interests. The VCC has planned to compensate the losses from amount of interest of LIF-A. So far (till September 2014) 150 animals (yak and cattle) by 50 households have been insured. Total number of predation cases yet to compile, since start of the scheme.

Currently the biggest challenge is insufficient amount of interest that generates from LIF-A. The amount is not enough to compensate all the cases or to recover the maximum cost of a lost animal. Secondly the LIMC members are not trained in running the scheme.

2.6 Problems associated with freshwater resources

Hoper-Hisper valley is one of the heavily glaciated portions of CKNP. The major glaciers in Hoper village are Miar, Baulter, Daranchi and Supulter. Water flowing down from the former two falls directly into Hunza River while the latter two provide irrigation water to Hoper valley and surrounding areas. According to local people the snout of Miar glacier is melting and lost a significant portion from the terminus resulting desertification in surrounding areas which were once covered by vegetation grown by the seasonal melting of glacial mass. The remaining glaciers being situated at higher elevations show no signs of melting. However, as contrary to the overall melting phenomenon of the Himalayan glaciers, Daranchi glacier in Hoper responds differently, termed as the Karakoram Anomaly[19] and cause surges/slips in addition to occasional flash flooding. The high frequency of these events during the last couple of years (1978, 2011 and 2013 floods), according to local people, is attributed to climate change effects. Floods occur in summer (August) as a result of heavy snowfall in winter and unprecedented increase in summer temperature causing loss of lives and livelihoods down the valley and adjacent areas, while in spring massive portion of the glacier slips and falls down Dranchi Nullah blocking water for the irrigation channels, which disturbs seasonal cycle of agriculture activities leading to increased vulnerabilities.

Agricultural fields and settlements in Hoper abandoned due to melting of Hoper glacier and downward movement of the glacial moraine

[19] Hewit, K.2005. The Karakoram Anomaly? Glacier Expansion and the 'Elevation Effect,' Karakoram Himalaya. *Mountain Research and Development, 25*(4): 332-340.

Figure 11 Hoper glacial melting and abandoned settlements

Construction, repair and maintenance of irrigation water channels in the valley has been a serious challenge for local communities due to limited financial resources, difficult terrain and disaster prone topographic conditions. Floods and landslides frequently damage irrigation water channels and local people have to repair such damages on a self-help basis contributing in cash or in kind (free labour work).

A summary of water channels, which need urgent repair works, is given in the following table:

Village	Name of location	Coordinates	Estimated length of water channel (m)	Detail of repair works
Hoper	Main Channel for Brushal, Gasho shal	74°44'57.68"E, 36°13'17.97"N	500m	Channel head repair
	Quiliyating Channel	74°44'5.89"E, 36°14'18.83"N	500 m	Repair channel head
Hisper	Dolaspar area	75° 0'2.93"E, 36°10'6.67"N	300m	Widening, strengthening heads, repair of side walls
	Ghurbon	75° 02'02.78"E, 36°10'14.93"N	300m	Widening, strengthening heads, repair of side walls
	Das Gochil	74°59'23.03"E, 36°10'1.30"N	1500 m	Repair slide channel side walls and install pipe on slid area

2.7 No sustainable use mechanisms for Medicinal & Aromatic Plants (MAPs)

Hoper valley like other areas of CKNP is said to have a variety of medicinal and aromatic plants. A mechanism is missing for in-situ and exitu conservation of MAPs, neither a detailed study in the area tell about the floral diversity, ethno botany and significance of MAPs in the valley. A local person in Nagar proper namely Ali Madad is said have a wealth of indigenous knowledge in herbal medicines and he used to treat people with the help of numerous medicinal plants. He collects plants from from Hoper, particularly from the areas of Rash Lake, Gheinter, Talkush and Supulter area.

2.8 Problems associated with Human and Institutional Development

2.8.1 Alienation from traditional governance systems

While establishing VCCs or other CBOs the traditional governance system has not been taken into account, despite a significant role of this system in natural resource use such as grazing cycle management, distribution of irrigation water, repair and maintenance of water channels, implementing calendar of agricultural activities, etc. Member of local management institutions (LMIs) who have a strong role in regulating natural resource use, when left out of the LSOs or VCCs, there seems a parallel system working for natural resource use or conservation. And sometime while feeling left out, these LMI members start to oppose the work of VCCS/LSOs, leading to overall failure of a community-organization

2.8.2 Community mobilization and management issues

Strengthening of COs in Hoper-Hisper valley is a daunting challenge, due to limited human and institutional capacities. Lack of financial resources is the underlying cause, however there are multiple factors, which limit COs human and institutional capacities. A synthesis of some general factors is as under:

Village	Capacity gaps
Hoper	• HCDO is not registered, however they have completed all necessary steps for registration • Governance and management system is not very much clear and separate from each other. The board members seem to do the day-to-day office business • Lack of proper selection or election process to scrutinize and bring forward competent personnel/office bearers • Improper record keeping of official matters. The record is either unavailable or fragmented. • Lack of office set up. However, WWF under the AHMP is going to support for an office set up for two year (2015-16) • No dedicated office secretary/manager for day to day matters
Hisper	• VCC seems not pro-active in important matters such as curbing illegal hunting • Lack of a proper office set up • Record keeping is very poor • Lack of proper selection or election process to scrutinize and bring forward competent personnel/office bearers • Lack of trained personnel to run matters of the CO

3. PROPOSED MANAGEMENT INTERVENTIONS

3.1. Sustainable mountain agriculture

There should be a greater focus on value chain development for agricultural produce like vegetable seeds (potatoes and peas) in both Hoper and Hisper and apricots in Hoper. Hoper valley is one of high apricot producing areas in Hunza. For packaging and marketing of apricots a farmers association in Hoper should be established and linked with Gilgit based dry fruit export agencies such as Mountain Dry Fruit Project and Hashwan Traders. Adequate market avenues need to be explored for sea buckthorn berries high value medicinal and aromatic plants. In addition, by providing training to local farmers, a small cottage industry can be developed to prepare some products for sea buckthorn.

At the moment there is no proper utilization wool and hair of domestic animals, despite a high value of woolen products in the market. With support of an organization like KADO local women need to be trained in processing of sheep wool, goat and yak hair for making of woolen products and rugs. This can be an income generating activity especially for local women who stay idle in their homes for almost six months in a year due to harsh weather conditions of snowfall.

3.2. Pasture management and improvement measures

3.2.1 Creation of Sustainably Managed Pasture Area (SMPA)

A specific pasture area in both Hisper and Hoper villages should be specified as sustainably managed pasture area (SMPA) to demonstrate controlled grazing and other pasture improvement measures. In Hoper, Barpu pasture can be a good option for this because of being common among all clans/villages, rest of other pastures are owned by individual clans/hamlets. Creation of a SMPA will need rigorous community consultations keeping in view the scope and limitation of pasture management activities. A sub-committee of CBCSDO should be formed namely SMPA Village Committee, preferably comprising of those herders who stay in pastures for extended period of times including the grazers delegated by villagers for collective grazing for certain period of time.

3.2.2 Grazing management

Uncontrolled and excessive grazing contributes to the overall degradation of resources. The case is more critical in case of ecological zones like Gilgit-Baltistan where annual precipitation level is less than 200 mm. Lower precipitation rates has a direct impact on diversity and growth rate of plants. Since plants are the primary source of production in a rangeland ecosystem, therefore, their continuous survival even in severe conditions is essential for both ecosystem functioning and livelihood of people depending on pastures. Also, uncontrolled grazing is destructive in terms of productivity as well as ecological point of view.

The objectives and envisaged benefits of the controlled grazing system include one or more of the following[20]:

[20] Beg SU. 2011. Pasture and Pastoralism in the Central Karakoram National Park (CKNP), (unpublished report). WWF-Pakistan, Gilgit-Baltistan, Gilgit and Directorate of the Central Karakoram National Park, Skardu. Pakistan, Pages. 29

- Carry out deferment or rest over a period of years, so that the key plants can complete their full growth cycle uninterrupted or replenish their carbohydrate reserves.
- Obtain uniform pasture forage use within each pasture unit, thus preventing selective grazing, and aid in the judicious management of the livestock and forage plants in other parts of the pastures.
- Meet the nutritional needs of livestock, and avoid stress on animals, and thereby reducing supplemental feeding, and the associated labor cost.

In the context of these objectives, controlled grazing system can be an integral part of overall management plan for a given pasture. However, the major goal is to improve or maintain the grazing resource (pasture) and to increase livestock production and productivity.

Most grazing systems are designed around some sort of rotation, may be short duration or long duration. A given pasture is divided into more than one unit, and the grazing is rotated in all these units, thus allowing new growth in the closed units. A number of grazing systems can be adopted in a given area with some modification, however, due to the short grazing period in the alpine pastures (June-August), only Rest Rotation and Deferred Rotation Systems are recommended. A brief description of the systems is provided below;

Rest Rotation Grazing System

In the rest rotation grazing system, one part of the pasture is un-grazed for an entire year or longer, while the other pastures are grazed for a part or perhaps all of a growing season.

Based on 90 days grazing season (June-August)

Rest rotation system differs from the deferred rotation system in that, deferment is not rotated seasonally, while in rest rotation, grazing is banned for one season (generally one, however, based on the vegetation condition and availability of alternate grazing area, grazing can be banned for two seasons as well).

Rest rotation is considered as a good system for both the vegetation and livestock in rugged mountain terrain. Furthermore, it is useful for multipurpose use of the pasture, as it will encourage the regeneration of some palatable bushes.

Introduction of this system will in most cases improve the grazing capacity due to better livestock use of upland areas and improve vegetation vigor and composition in the more productive areas.

Deferred grazing system

According to this system, one part of the pasture is protected from grazing for a longer period and second part of the pasture is allowed for grazing. This system of grazing is applied to severely depleted pastures and to improve the pasture condition. This system allows plants for seed production as well as seedling establishment, but in this case deferment always occurs during the same time period. More pasture area or units are required to apply the deferred grazing system, as animal stock requires alternate pastures for grazing.

3.2.3 Pasture Improvement Measures

Fodder cultivation

Utilization of valley slopes and barred lands for fodder production has been a practice in Baltistan and overall mountainous areas for the long time. This practice also contributes to the stabilization of valley slopes besides increasing the green cover. In order to meet the feeding requirements of lactating animals kept in the village in summer as well as stall-feeding of all animals in winters, improved varieties of fodder crops would be encouraged at the villages level. The activity also requires provision of water through construction of small water channels for which the CBOs have to make concerted efforts in collaboration with CKNP partners. In Hoper-Hisper valley large chunk of lands, mostly situated at lower valley slopes and usually less suitable for growing cereals or vegetables are used to grow fodder crop. In the valley, land cover under fodder crop is greater than under crops. An example of fodder cultivation in the valley is given in the following photograph of village Hoper:

Careful selection of fodder seeds is a must as the seeds from unreliable sources may contain weeds as well that can be invasive under favorable circumstances. Further, common varieties of seeds available in the market are hybrid and genetically modified that can survive for few years. On the other hand, there are native varieties of fodder like Medicago, which is a nitrogen fixing plant that can be promoted through seed production.

Purchase of fodder seed such as Alfalfa becomes a difficult job for local farmers due to distant market facilities, because farmers purchase seed from Gilgit. Moreover, some farmers cannot afford to buy alfalfa seed, which costs them Rs. 1500-2000 per kilogram. Therefore, local farmers should be encouraged to have their own seed production system for alfalfa, e.g. the people of Bargo village in Gilgit. This can also be an income generating opportunity for certain farmers in the valley.

Potential areas for fodder cultivation in the valley are given in the table:

Village	Name of location	Coordinates	Irrigation water availability	If no from where water can be brought?	Estimated length of water channel (m)
Hoper	Boroshal slope	74°45'30.13"E, 36°12'59.52"N	Yes	-	-
	Shiqamating	74°45'25.44"E, 36°14'10.22"N	Yes	-	-
	Hakalshal	74°44'52.25"E, 36°14'7.23"N	Yes	-	-
Hisper	Dolaspar area	75° 0'2.93"E, 36°10'6.67"N	Yes	Repair of water channel	300
	Ghurbon	75° 02'02.78"E, 36°10'14.93"N	Yes	Repair of existing water channel	300

Development of water points

The introduction of controlled grazing system requires water points in all the pasture units, in which the animals suppose to be rotated. Therefore, development of new water points is required to facilitate the design of rotational grazing system. Efforts shall be made to get the water spread throughout the pastures. In addition due to non-availability of water in some pastures, the pastures with available water sources are extensively grazed. This activity is possible, as there is sufficient source of glacier and snowmelt water. Following the grazing system mentioned above some of the pasture units would be banned for entire grazing season while some units would be allowed for grazing. Both the grazing and banned units require water to rotate the animal in different pasture units. Therefore construction of water point is mandatory to implement proposed grazing system in the valley.

While constructing water points in alpine and sub-alpine pastures, it would be desirable to make minimum use of plastic containers and pipe as well as concrete structures. Likewise, construction of large water channels in pastures should also be avoided so that pastures may not be converted into agricultural activities. The simple, cost effective and environment friendly way for developing water points could be the construction of ponds (wide enough but not very deep), made of fine clay that will make the ground layer impermeable. Preferably, channelizing spring water, where available or snowmelt water to the ponds in very small quantities.

A summary of such pastures where water points need to be developed is given as under:

Village	Name of Pasture	Problems need to address	Recommendation
Hoper	Barpu	Lack of drinking water for livestock and herdsmen. In addition there is plenty of land, if irrigated can be a great source of fodder and fuelwood	5000 meter channel and pipeline from Chokha
	Hamder	Lack of drinking water for livestock and herdsmen	4000 ft pipeline from Khaunchil Nullah
Hisper	Dumulkish Gan	Lack of drinking water for livestock and herdsmen. In addition there is plenty of land, if irrigated can be a great source of fodder and fuelwood	Construction of 700 m water channel from Dolaspar stream

	Kurko Daas	Lack of drinking water for livestock and herdsmen. In addition there is plenty of land, if irrigated can be a great source of fodder and fuelwood	Construction of 1000m water channel from Dolaspar stream
	Dolaspar area	Lack of drinking water for livestock and herdsmen. In addition there is plenty of land, if irrigated can be a great source of fodder and fuelwood	Repairing of existing 300 m of water channel
	Huma Das	Lack of drinking water for livestock and herdsmen. In addition there is plenty of land, if irrigated can be a great source of fodder and fuelwood	1000m Tarkichan Daas stream
	Ghurbon	Lack of drinking water for livestock and herdsmen. In addition there is plenty of land, if irrigated can be a great source of fodder and fuelwood	Repair of 300 m existing water channel

Improvement of Pavements

Due poor accessibility to some pastures, more accessible areas are extensively grazed for longer periods. By improving pavements to such pastures uniform grazing can be maintained and perspectives for controlled grazing can be enhanced. Pastures where the pavements are needed to repair are given as under:

Village	Name of Pasture	Problems need to address	Recommendation
Hoper	Miar	Difficult accessibility	Repair of pavement from Hamdar to Miar (400-500 ft)
Hisper	Garombar	Difficult accessibility	Repair of pavement from the edge of Hisper glacier to Garombar nullah (200-300 ft)

3.3 Livestock management

3.3.1 Improvement of veterinary services in Hoper-Hisper

Hoper village has a veterinary dispensary with required staff, run under LS&DD department of district government Hunza-Nagar. But such a facility is missing in Hisper, where a technician is placed by LS&DD for the time being. Therefore, for Hisper village following interventions are suggested:

Priority 1: Through the elected public representatives the local community organizations must strive to establish a vet facility in Hisper under LS& DD. Local community should also take up this matter in DCC Hunza-Nagar.

Priority 2: Promote community-based livestock extension services. This can be done by establishing Village Input Stores (VIS) in Hisper like the one already established by AKRSP under SEED Project in village Basha valley, Shigar. The VIS will strive to provide basic treatment to livestock in the village with the help of a community member trained in basic livestock treatment services. Another option is to depute LS&DD staff based in Hisper in VIS. Thus this can be a joint initiative between LS&DD

and CBCSDO Hisper. Performance of VIS in Basha valley should be evaluated prior considering similar intervention for Hisper.

3.3.2 Livestock Vaccination Programme

As stated above in section 2.3, many viral and bacterial diseases affect the livestock health and productivity. Sometime, epidemic diseases cause huge losses of livestock in the valley. Since livestock share the summer pastures with wild ungulates (Siberian ibex) and chances of transfer of livestock diseases to the wildlife cannot be ignored. Therefore, regular livestock vaccination is a must to avoid losses to the farmers and help promote a healthy alpine ecosystem. In this respect, the valley should have a permanent livestock vaccination program. For this purpose, additional seed money should be provided to CBCSDOs in Hoper and Hisper to top-up the valley Conservation Fund (VCF) for sparing some portion of the interest of VCF to purchase medicine for livestock vaccination. CBCSDOs in Hoper and Hisper should obtain technical support from LS&DD Hunza-Nagar in this regard and locally the services of SLF trained workers should be acquired to conduct vaccination in Hisper, whereas in Hoper some community members can be trained in this regard.

Livestock vaccination program developed by experts of Ev-K2-CNR should be followed as a guideline. However, as a matter of caution for future, it is very important to be careful about vaccination schedules and vaccine quality of different agencies while designing such extensive vaccination programs, as most recently the communities from Hoper, Nagar, and Haramosh have been complaining of post vaccination high animal mortalities, during 2013-14.

3.3.3 Improvement of cattle sheds for improved sanitation and predator avoidance

Cattle shed improvement has two aspects: first to improve health and productivity of animals and second to prevent animals from attack of predators. By improving cattle sheds, diseases of animals can be reduced that are otherwise exacerbated by winter harsh weather coupled with unhygienic shed conditions. In addition, improving structural composition of existing cattle sheds can also enhance productivity of lactating animals. For this purpose, at least 3 cattle sheds in Hoper and 1 in Hisper village should be improved for demonstration purposes, with proper hygiene, ventilation, feeding and resting areas for animals. Such interventions have already undertaken by AKRSP in some villages of GB, and the lessons learnt therefrom should be taken care of prior initiating such an intervention in Hoper-Hisper valley.

Second aspect of improving structure of traditional corrals in high pastures is to prevent killing of livestock by mammalian predators such as wolf and snow leopard. Local people in Hoper-Hisper valley have frequently reported attacks on livestock by predators, particularly snow leopard in summer pastures, primarily because of the fact that traditionally, corrals are open roofless structures where predators, particularly large cats get into very easily and kill huge number of domestic animals at once. Consequently, such attacking predators are killed by provoked herders in retaliation through shooting, stoning, poisoning and using traps (locally called *baloot*).

Free ranging animals like calves of yaks are difficult to protect from snow leopard, people can't guard them all the time. Other animals, especially sheep and goats are tended during day and kept in corrals at night. In Hoper three corrals at Barpu, Miar and Hununo pastures have been made predator-proof, two with the help of Ev-K2-CNR and WWF under SEED Project for CKNP and one by WWF-Pakistan under Asia High Mountain Project (USAID through WWF US). Similarly, one predator-proof corral has been built in Gurbon pasture of Hisper by WWF under SEED project.

Similar predator proof corrals are required at least two each in Hisper and Hoper villages. For this purpose, there are numerous structures in GB adopted under various interventions of BWCDO and WWF. The best structure suited to the local environmental conditions is a 20 x 40-50 ft hall with 7-8 ft high stone masonry walls, two wooden doors and a *katcha* roof with a 8x8 ft ventilation in the roof made of wooden poles. Where appropriate the ventilation can also be made with the help of wire mesh. But the wire mesh can be damaged by heavy snow accumulation at higher elevations. An example of such a predator proof corral is given in the following picture:

Figure 13 Predator-proof corral in CKNP area (WWF)

3.3.4 Livestock breed improvement

The most preferred animals in Hoper-Hisper valley, in order of priority, are sheep, goats and cattle. The local breeds of sheep, goats and cattle (cow and bull) are nondescript resulted after years of interbreeding. Because of interbreeding of same generations, the productivity is below average, however, they are very adaptive to the local conditions and have the ability to survive and produce with minimum forage[21].

Local people in Hunza-Nagar have started to rear cross breeds of indigenous cow and improved Jersey breed, which are regarded as highly productive in terms of milk production. Rearing improved breeds have certainly resulted in reducing the number of less-productive local breeds. Moreover, rearing such animals need stall feeding, leading to reduced pressure on pasturelands.

One of an option for breed improvement is artificial insemination (AI), but it has been observed in Baltistan that villages at higher altitudes like Tormik are less suitable for AI due to hard topographic conditions; therefore, crossing of local cow with proven Jersey bull can be a suitable option for breed improvement, which has been successfully carried out throughout GB.

[21] Beg SU. 2011. Pasture and Pastoralism in the Central Karakoram National Park (CKNP), (unpublished report). WWF-Pakistan, Gilgit-Baltistan, Gilgit and Directorate of the Central Karakoram National Park, Skardu. Pakistan, Pages. 29

One of such a proven bull has been provided to a local farmer in Hoper village in 2013 by WWF/Ev-K2-CNR under SEED Project with a view to promote more productive cattle in the area (to meet dairy requirements of local people). Under this initiative a proven Jersey bull was identified with the help of LS&DD Gilgit. A local farmer in Hoper was identified by the HCDO to take care of the bull and facilitate breeding services. The local farmer contributed 25% of the total cost of the bull, while 75% cost was born by SEED Project. Local people who get their cow serviced by the bull have to pay the bull owner in cash or in kind, e.g., grass, eggs, ghee etc. And the owner is responsible to take care of the bull's health. By end of 2013, the bull served some 16 cows in the village, but progenies are yet to come. Results of this particular intervention need to be carefully monitored and if successful, this intervention needs to be replicated in the area.

3.4 Afforestation and forest conservation

3.4.1 Regulate use of firewood from natural forests

Extraction of fuelwood from natural forests is still high in Hisper (>380 kg/household/year) while it is meagre in Hoper (<30 kg/household/year). Extraction of fuelwood from natural forests is not properly regulated as done in other valleys of CKNP, however in Hoper cutting of Juniper is completely banned, whereas in Hisper the customary laws seemed to be silent on fuelwood collection by local people, probably due to prevailing harsh climate often with freezing temperatures in winter. The CBCSDO in Hisper should have some sort of restrictions in terms of duration and quantity of firewood. Following points regarding fuelwood collection from natural forests, as specified in CKNP management plan[22] need to be integrated with customary laws regarding fuel wood extraction from natural forests in Hoper-Hisper valley:

- Juniper trees: cutting or uprooting of a complete tree should be strictly prohibited, except cutting of single branches if there is no other option
- Birch trees: cutting or uprooting of a complete tree should be strictly banned, except cutting of single branches if there is no other option
- Riparian vegetation: for coppice plants such as sea buckthorn or willows it is suggested to cut single basal shoots from each plant to preserve its root system. But doing so, new shoots can re-grow rapidly producing new biomass to be harvested
- Shrubs: for coppice plants it is suggested to partially cut the basal shoots trying to avoid, if possible the cutting of whole individual. In these cases local knowledge and traditional management system should be emphasized and taken into consideration.

[22] IPMP for CKNP. 2014. Developed by Ev-K2-CNR, Islamabad, Pakistan

3.4.2 Firewood plantation

In order to cope with lack of vegetative biomass in the valley local communities have traditionally planting trees, primarily to meet their fuelwood needs and timber for construction. Commonly grown trees are poplar, willow and sea buckthorn. AKRSP is the pioneering organization in promoting social forestry in the valley. Since 2011 the Gilgit-Baltistan Forests, Wildlife and Parks Department, Ev-K2-CNR and WWF Pakistan are also endeavoring to promote afforestation in CKNP buffer zone valleys including Hoper-Hisper. An effort has also been made to gauge the progress of plantation including planting success and growth (given in section: 1.10). Similar plantation campaigns should be carried out on barren/cultivable lands in Hoper Hisper valley. Block plantations are less successful in CKNP valleys due to challenges of protection from freely grazing animals in winters, as large chuck of lands are difficult to fence. Therefore, any plantation campaigns in the valley should encourage farmers to plant trees on individual lands, preferably covered areas with readily available irrigation water. Some of the areas identified for plantation in Hoper-Hisper are given in the following table:

Village	Name of location	Coordinates	Irrigation water availability	If no from where water can be brought?	Estimated length of water channel (m)
Hoper	Boroshal slope	74°45'30.13"E, 36°12'59.52"N	Yes	-	-
	Shiqamating	74°45'25.44"E, 36°14'10.22"N	Yes	-	-
	Hakalshal	74°44'52.25"E, 36°14'7.23"N	Yes	-	-
Hisper	Dumulkish Gan	74°58'54.36"E, 36°10'31.62"N	No	Dolaspar stream	700
	Kurko Daas	74°57'40.09"E, 36°11'41.13"N	No	Dolaspar stream	1000
	Dolaspar area	75° 0'2.93"E, 36°10'6.67"N	Yes	Repair of water channel	300
	Huma Das	75° 1'15.87"E, 36°10'24.42"N	No	Tarkichan Daas stream	1000 m
	Ghurbon	75° 02'02.78"E, 36°10'14.93"N	Yes	Repair of existing water channel	300

The firewood plantation on individual farmlands has been successful rather block plantations on large chunks of communal lands. Therefore, while carrying out plantation campaigns such lands must be considered which are divided among individual farmers and each farmer is responsible to take care of his own portion. Plantation of Sea buckthorn must be promoted around a plot of plantation, which serves as hedge besides fixing nitrogen for fertility, after 3-5 years.

3.4.3 Promotion of energy efficient technologies and alternative energy options

There are numerous ways to reduce consumption of plant biomass in domestic fuel, which is, on average 8 kg per household per day in Hisper and 6 kg per household per day in Hoper. Promoting energy efficient housing, heating and cooking techniques and use of alternative/ renewable forms of energy such as hydropower, solar and biogas, the use of plant biomass can be reduced. Aga Khan Planning & Building Services (AKPBS) has already demonstrated energy efficient housing, heating and cooking technologies. Some of which including house insulation, hatched window, improved stove connected with water geyser, etc., have been widely adapted by local communities in Gilgit-Baltistan. Very few households in Hoper-Hisper use these technologies, but there is much room to replicate these tested interventions in the valley.

The alternative energy options such as solar geyser plus radiator to warm a common living room is being used in the neighbouring areas of China near Khunjerab border with similar climatic and geographic conditions. A local person from Khunjerab has got training to replicate this technology at his own. The units are expected to reduce consumption of firewood and cow dung up to 50%.

Contrary to Hoper, there isn't any natural forest in Hisper. There are a very few plantations along with scattered bush growth on slopes. Therefore, micro-hydel scheme can be upgraded to enable Hisper community use more electricity to supplement domestic energy.

3.5 Wildlife Conservation

3.5.1 Community-based watch and ward and monitoring of wildlife populations

Monitoring of wildlife populations in Hoper-Hisper valley is undertaken by CKNP watchers, who monitor illegal hunting and poaching activities and also assess the populations of wild animals through standard survey protocols developed by University of Siena, Italy (UNISI) under SEED Project for CKNP (for details please refer to IPMP for CKNP, 2014). In addition, in Hisper village three community representatives used to work as Village Wildlife Guards (VWGs) during the implementation period of SEED Project (2011-2014). These VWGs, trained by CKNP wildlife experts from UNISI and WWF used to perform their duties under specific ToRs and report on monthly basis to CKNP partners through their VCC on a prescribed form (in Urdu), recoding their observations on numbers and distribution of wild animals, predation incidences, illegal activities such as hunting, poaching or forest cutting, etc. In Hoper two VWGs are working since 2013 under a WWF's project for snow leopard conservation. In addition to Hoper-Hisper valley this practice was much successful in other valleys like Thalay, Tormik, Hushey, Basha, Bagrote and Haramosh. The initiative on one hand was quite helpful in regular monitoring of wildlife and associated activities and on the other it supplemented the human effort of CKNP Directorate in controlling exploitative activities in and around the Park. In addition to CKNP valleys, VWGs system has also been quite significant in other buffer zone of other PAs such as KNP and Qurubmer National Park.

The biggest challenge in sustaining the VWGs is their monthly remuneration, which used to cover in Hisper village from SEED Project during 2011-2014. One of the options is to sustain the remuneration of these VWGs from the interest of VCF. Similar practice of paying VWGs also exists from community resources, e.g trophy hunting amount in some CMCAs in Gilgit-Baltistan such as KVO, Khyber, Ghulkin, SKB, Bunji and Qurumber, etc. The system of VWGs should be revived in Hoper-Hisper valley together with a system of monthly reporting to CKNP Directorate on the proforma given as ***appendix-C.*** Moreover, these VWGs can also be helpful in keeping a vigilant eye on harmful activates such as use of poisons on carcases to kill predators. They can also be helpful in monitoring use of poisonous chemical which are used to control various pests, e.g. in KNP area (some ten year back) DDT has been observed lying with some herders aimed to use on livestock to control ticks and mites[23].

In addition to VWGs, a system of appointing a community representative as Honorary Wildlife Officer (HWO) has also been practiced in the past (during 1997-2006) in various CMCAs of Gilgit-Baltistan.

[23] Personal communication with Mr. Khadim Abbas, Deputy Director, Gilgit-Baltistan Environmental Protection Agency, Gilgit

The DCC used to delegate specific powers to HWOs to deal with illegal hunting and poaching cases. Appointment of HWOs needs to be revived for Hoper-Hisper through DCC Hunza-Nagar.

3.5.2 Facilitate Notification of Hoper and Hisper as CMCA

Notification of Hoper and Hisper as CMCAs would enable local people earn some income from sustainable use initiatives such as trophy hunting of Himalayan ibex, which are abundantly found in the area. This should be promoted as an incentive for conservation rather as an incentive for economic well being of local people. This can be helpful in meeting some of the conservation expenses such as VWGs salary in some villages, also meant to generate employment for some community members. For CMCA notification following steps in Hoper and Hisper must be taken:

- Ensure proactive involvement of the people of Hisper village in community-based conservation
- Facilitate HCDO in getting itself registered under any appropriate act
- Delineate CMCA boundary of Hisper and Hoper from the Park boundary
- Continue wildlife survey under CKNP
- Persuade secretary Forests, Wildlife and Environment, Gilgit-Baltistan to issue notification of the valley as CMCA
- Inform and sensitize DDO office bearers and other community members about the procedures of trophy hunting programme

3.5.3 Strengthen Livestock Insurance Schemes in Hoper-Hisper to promote positive human-carnivore interaction

The livestock insurance scheme in Hoper-Hisper valley needs to be strengthened to reduce the chance of retaliatory killing of predators by promoting a positive interaction between local herders towards large mammalian predators, i.e. snow leopard and wolf. Such a scheme has been initiated in Hoper village by WWF under SEED Project for CKNP. Salient features and further necessary steps to strengthen the WWF introduced LIS are given as following:

- To initiate the program, community dialogues were held with the HCDO to introduce the scheme and after the community's willingness a resolution was passed by HCDO and submitted to WWF, to run the in Hoper.
- A Terms of References was signed between WWF-Pakistan and HCDO specifying terms and conditions of the scheme and responsibility of each party.
- A Livestock Insurance Fund-A (LIF-A) was established with contributions from WWF under SEED Project for CKNP (Rs. 200,000) and under AHMP (Rs. 200,000) and HCDO (Rs. 100,000).
- Local community contribution was in terms of premium amount collected by insuring their animals (by some 45 members till end of 2014), this amount needs to be kept in a fund namely Livestock Insurance Fund-B (LIF-B).
- A membership card was printed and provided to each member containing vital information such as name of member, date of membership, type and number of animals insured, amount of premium, amount of compensation obtained etc.
- A sub-committee of HCDO namely Livestock Insurance Monitoring Committee (LIMC) has to be formed to monitor the LIS in the valley. Members of the LIMC should be trained in planning, implementation and monitoring of the insurance scheme. The LIMC member will collect registration fee and premium amount and deposit in LIF-B. When a predation case occurs, the

LIMC members shall visit the site of incidence and verify the case (irrespective of the predator type).

- After verification the LIMC will recommend affected policyholder for compensation, depending upon the numbers of cases reported and total amount of interest of LIF-A.
- A compensation form has been developed in Urdu and provided to HCDO to report a compensation case
- The overall idea is to compensate predation cases from the interest amount of LIF-A while miscellaneous expenses such as cost of monitoring of predation cases from the interest of LIF-B.
- The livestock insurance scheme would compensate predation cases both from wolf and snow leopard. HCDO would try to enhance the amount in LIF-A. Initially the LIF-A would not be sufficient to compensate the full cost of animals lost but in the long run the plans are to enhance the LIF-A to compensate full cost of the animals.

The biggest challenge in running this scheme is insufficient interest amount of LIF-A, which is amounting Rs. 500,000 in Hoper while in Hisper there are no funds currently available for LIS.

Therefore, following recommendations are made to strengthen livestock insurance scheme in Hoper:

- HCDO should merge all funds provided by WWF under SEED Project (Rs. 200,000 in LIS and Rs. 250,000 as VCF) and under AHMP (Rs. 200,000 in LIS and Rs. 250,000 as VCF) into one single account (this should be approximately Rs. 1 million including community contribution of Rs. 100,000).
- The combine account should be called as CSDF, should be kept in a Bank on competitive interest rates
- An additional amount of Rs. 500,000 should be contributed to CSDF by any supporting agency of CKNP
- At least 40% of the interest of this fund should be spent to compensate verified predation cases in Hoper
- Livestock Insurance Management Committee-LIMC (preferably comprising of VWGs, where possible) needs to be strengthened by providing necessary training in monitoring predation cases. Monitoring predation incidences is a difficult task; therefore, certain remuneration should be given to LIMC members from interest of LIF-B. If a village appoints VWGs (explained above in 3.5), monitoring of predation cases for compensation must be included in the ToRs of VWGs.
- *Other conservation organizations i.e., SLF, approaching these communities for implementation of their conservation programs should strengthen the existing social and financial mechanisms, rather establishing new ones, which in future may promote inter and intra community conflicts over power to grab such funds.*

3.6 Improvement of water courses

The biggest issue to repair and maintain water channels if damaged due to landslides or floods. There are few channels (detail given in ***section 2.6***), which need immediate repair to bring additional areas under cultivation for firewood plantation and fodder cultivation. CBCSDOs of each village must contact with supporting agencies from government and civil society for needful financial help. A summary of target water channels is given below:

Village	Name of location	Coordinates	Irrigation water availability	If no from where water can be brought?	Estimated length of water channel (m)
Hoper	Main Channel for Brushal, Gasho shal	74°44'57.68"E, 36°13'17.97"N	500m	Channel head repair	Main Channel for Brushal, Gasho shal
	Quiliyating Channel	74°44'5.89"E, 36°14'18.83"N	500 m	Repair channel head	Quiliyating Channel
	Main Channel for Brushal, Gasho shal	74°44'57.68"E, 36°13'17.97"N	500m	Channel head repair	Main Channel for Brushal, Gasho shal
Hisper	Dolaspar area	75° 0'2.93"E, 36°10'6.67"N	Yes	Repair of water channel	300
	Ghurbon	75° 02'02.78"E, 36°10'14.93"N	Yes	Repair of existing water channel	300

3.7 Ecotourism promotion with community-participation

The upper reaches of Hoper-Hisper valley, comprising the famous Biafo-Hisper trek falls within Low Frequency Tourism Area (LFTA) Zone of CKNP. To preserve the ecological integrity of this zone, the park authorities have developed a code of conduct for tourism[24]. Through CBCSDOs of Hisper, this code of conduct can be followed for environment-friendly tourism in the area. In addition, Rash Lake Trek in Hoper has also been a point of attraction for trekkers, researchers and nature lovers, where ecotourism promotion should be realized through HCDO.

3.8 Conservation and sustainable utilization of MAPs

Engaging students of Karakoram International University should conduct studies on floral diversity, ethno-botany and indigenous knowledge about use of herbal medicines. Use of medicinal plants should be regulated in the light of Gilgit-Baltistan Medicinal and Aromatic Plants (Protection, Conservation, Development, Sustainable Management and Community Participation) Rules, 2014, currently being developed by the Climate Change Division, Government of Pakistan.

3.9 Institutional Strengthening of Community Organizations

3.9.1 Integration of LMIs and other CBOs

For soliciting community support in rural development, NRM and subsequently to strengthen CKNP management through community participation, the facilitating NGOs such as AKRSP and WWF have established various COs such as VOs, WOs, VCCs in Hoper-Hisper valley (a summary of which is given in section 1.16). In Hoper WWF has established a CO namely Hoper Conservation and Development Organization (HCDO) to support conservation and sustainable development activities in the village. As explained above in (sections 1.13-1.15) the LMIs or local governance system has crucial role in regulating use of natural resources such as pastures, forests, livestock and agriculture. But somehow proactive role of LMIs has not been solicited in the existing CO of Hisper, whereas it has been taken into account to a greater extent within HCDO in Hoper.

[24] IPMP for CKNP. 2014. Park Management Guidelines Part II.

Thus, for effective management of natural resources, LMIs or traditional governance system must be integrated with community organizations like VCCs, LSOs, VOs, WOs, etc. For this purpose, the IPMP for CKNP (2014) recommends integration of VCCs and LSOs into integrated conservation and development bodies (ICDB). This initiative can help institutionalize an integrated conservation and development approach at community level. For the integration purpose a CO should be termed as Community-based Conservation and Sustainable Development Organization (CBCSDO), but it can work by any name (preferably by the existing names), because changing the name or nomenclature may jeopardize their functioning.

However, Hoper and Hisper the structure of CBCDOs should be as following, including selected functionaries of LMIs and COs:

Hoper	Hisper
President CBCDO/President HCDO	President CBCDO
Trangpa/namberdar (member)	Trangpa/namberdar (member)
Religious leader (member)	Religious leader (member)
Notables representing all tribes/clans	Notables representing all tribes/clans
Member UC (member)	Member UC (member)
Presidents of VOs (members)	Presidents of VOs (members)
Presidents of WOs (members)	Presidents of WOs (members)
Manager (preferably must be paid in cash or in kind)	Manager (preferably must be paid in cash or in kind)

3.9.2 Capacity-building of CBCSDOs

The newly established CBCSDO in Hoper namely HCDO must be registered with competent government authority (as deemed necessary by the CBCSDO). Whereas in Hisper bylaws of the existing CO should be reviewed and necessary amendments should be made to deal with diversified and multi-faceted aspects and or emerging environmental challenges such as climate change adaptation, access to biological resources, co-management of protected areas, etc.

The CBCSDO's governance and management bodies should be fully acquainted with bylaws and SOPs and necessary trainings or workshops should be organized in this regard. Role of the Board and management should be clearly spelt out. In order to educate the Board members about the overall organizational policies, structures and systems, they should be fully oriented and provided with relevant information. The performance of the Board is also important to be assessed/measured. This could be done according to the governance timetable, ToRs for the Board, meetings attendance ratio and participation of each director. It is therefore advised that each new member should be provided with a kit containing documents of policies and procedures besides the bylaws.

3.9.3 Financial Management and Sustainability of CBCSDOs

In the absence of a financial support mechanism it is highly unlikely for the CBCSDOs to be efficient in their functions. One of the options is Valley/Village Conservation Funds (VCF), established in both Hisper and Hoper, which is an endowment fund for supporting activities concerning conservation and sustainable development in the valley.

Following measures are recommended to streamline financial mechanism of Hoper-Hisper valley for conservation purposes;

Village	Existing Sources	Problem	Recommendations
Hoper	VCF: PKR. 500,000 (Contributed by WWF under SEED Project and AHMP) plus interest amount for the last 2-3 years LIF-A PKR. 500,000 (contributed by WWF under SEED and AHMP Projects) plus interest amount for the last 1-2 years Total: > Rs. 1 million	- Difficulty in managing multiple funds - Insufficient to meet organizational and conservation needs - Improper record keeping	- Merging various funds under the title of Conservation and Sustainable Development Fund (CSDF) and allocating proportions of the interest amount to various initiatives given as under: Watch and Ward: 30% Livestock Insurance: 30% Livestock vaccination: 20% Office Management: 20% - Additional contribution by a CKNP supporting agency, e.g Ev-K2-CNR under SEED Project, amounting at least Rs. 500,000 in LIF-A - Strengthening CSDF by annual allocation of at least 50% amount generated from trophy (when initiated) - Training in proper record keeping of financial matters
Hisper	VCF: Rs. 250,000 plus interest amount for the last 2-3 years	- Insufficient to meet organizational and conservation needs - Improper record keeping	- Additional contribution by a CKNP supporting agency, e.g Ev-K2-CNR under SEED Project, amounting at least Rs. 500,000 in Hisper for LIF-A - Merging various funds under the title of Conservation and Sustainable Development Fund (CSDF) and allocating proportions of the interest amount to various initiatives given as under: Watch and Ward: 30% Livestock Insurance: 30% Livestock vaccination: 20% Office Management: 20% - Strengthening CSDF by annual allocation of at least 50% amount generated from trophy hunting and CKNP entry fee (when initiated) - Training in proper record keeping of financial matters

4. MANAGEMENT ACTIONS

Name of villages: Ho=Hoper, Hi=Hisper

4.1 Sustainable mountain agriculture

#	Action	Village	Priority Rank
1.	Improve marketing of high value agriculture products (potatoes, peas and apricots) by linking with export agencies in GB	Ho, Hi	Medium
2.	Improve post-harvest techniques (storage, processing and packaging) through improved technology and training	Ho, Hi	Medium
3.	Establish vocational Centre for local women to promote local handicrafts (woolen products and rugs) from wool and hair of domestic animals	Ho, Hi	Medium

4.2 Pasture management

#	Action	Village	Priority Rank
4.	Study productivity, carrying capacity and utilization of selected pastures (In collaboration with KIU and CKNP Directorate)	Ho, Hi	High
5.	In consultation with local community declare SMPA and initiate controlled grazing	Ho, Hi	High
6.	Train selected herders (those having greater dependency on livestock or those members of the community who remain in pastures quite often) in improved guarding practices in SMPA	Ho, Hi	High
7.	Promote cultivation of fodder crop such as alfalfa on individual farmlands	Ho, Hi	Medium
8.	Improve pavement to selected pastures	Ho, Hi	Medium
9.	Develop drinking water points in selected pastures	Ho, Hi	Medium

4.3 Livestock management

#	Action	Village	Priority Rank
10.	Establish Village Input Store (VIS), following a evaluation study of the current VIS in CKNP valleys in Baltistan	Hi	High
11.	Train livestock extension workers in improved animals husbandry and veterinary care and provide them with basic kits (linked to **12, 13, 14 and 15**)	Ho, Hi	High
12.	Establish and operationalize a permanent livestock vaccination programme (following guidelines of Ev-K2-CNR vet experts)	Ho, Hi	High
13.	Improve one cattleshed in each village on demonstration basis (for improved hygiene, feeding, watering to improve animal health and productivity)	Ho, Hi	Medium
14.	Improve primitive corrals to make them predator proof structures and top provide shelter against rainfall	Ho, Hi	High
15.	Improve breed of local cattle for enhanced productivity and to reduce number of less productive animals	Hi	Medium

4.4 Afforestation and sustainable forest management

#	Action	Village	Priority Rank
16.	Through VWGs ensure ban on cutting of forest trees for timber	Ho, Hi	High
17.	Through VWGs regulate use of fuelwood as prescribed in section **3.4.2**)	Ho, Hi	High
18.	Hold community-based afforestation campaigns annually in the areas specified in section **3.4.3**	Ho, Hi	High

#	Action	Village	Priority Rank
19.	Regularly monitor progress on afforestation campaigns carried out by CKNP/WWF under SEED Project	Ho, Hi	High
20.	Introduce solar energy to supplement use of domestic energy for heating and boiling water	Ho	Medium
21.	Provide needful support to Hisper community to upgrade the existing micro-hydel project	Hi	High
22.	Introduce fuel-efficient stoves in Hisper	Hi	Medium

4.5 Wildlife Conservation

#	Action	Village	Priority Rank
23.	Establish community-based watch and ward system by appointing VWGs	Ho, Hi	High
24.	Provide basic training to VWGs in monitoring of wildlife	Ho, Hi	High
25.	Monitor wildlife populations (number and structure) following standard survey protocols for CKNP	Ho, Hi	High
26.	Undertake notification of Hoper and Hisper as as CMCA (boundary delineation, notification)	Ho, Hi	High
27.	Enhance allocations for Livestock Insurance Fund	Ho, Hi	High
28.	Train LIMC members and engage CKNP directorate in monitoring of LIMC	H, K	High

4.6 Improvement for water courses

#	Action	Village	Priority Rank
29.	Construct water channels as prescribed in section **3.6**	Ho, Hi	Medium
30.	Repair water channels as prescribed in section **3.6**	Ho, Hi	Medium

4.7 Community-based ecotourism

#	Action	Village	Priority Rank
31.	Review role of CBCSDOs in tourism management	Ho, Hi	Medium
32.	Through CBCSDO ensure tourism management in LFTA	Ho, Hi	Medium

4.8 Conservation of MAPs

#	Action	Village	Priority Rank
33.	Engage students of KIU in conducting studies on MAPs	Ho, Hi	High
34.	Regulate use of MAPs in the light of Gilgit-Baltistan Medicinal and Aromatic Plants (Protection, Conservation, Development, Sustainable Management and Community Participation) Rules, 2014 (when approved by GoGB)	All	Medium

4.9 Institutional Strengthening of Community Organizations

#	Action	Village	Priority Rank
35.	Restructure VCC in Hisper and HCDO in Hoper as CBCSDOs	Ho, Hi	High

36.	Facilitate registration of HCDO and revise bylaws of HCDO Hoper and CBCSDO in Hisper	Ho, Hi	High
37.	Orientate CBCSDOs on new bylaws and operating procedures	Ho, Hi	High
38.	Provide office support to HDCO and CBCSDO Hisper	Ho, Hi	High
39.	Enhance CSDF for Hoper and Hisper from various sources such as trophy hunting, CKNP entry fee etc	Ho, Hi	High
40.	Develop Conservation and Sustainable Development Plan for Hoper-Hisper valley	Ho, Hi	High

5. INDICATORS OF PROCESS AND PROGRESS

for each of the action that are proposed under 3. These have to be assumed on the basis of any such work done anywhere, in CKNP, KNP or elsewhere to compare of what we get as a result of similar interventions elsewhere

#	Action	Process Indicator	Progress Indicator
5.1. Sustainable Mountain Agriculture			
1.	Improve marketing of high value crop such as buck wheat and walnut	New buyers linked to local farmers	Production and sale potatoes, peas and buck wheat increased
2.	Improve post-harvest techniques (processing and packaging) through improved technology and training	Training for local farmers in post-harvest techniques of buck wheat, walnut or other agro products	Marketing perspectives enhanced for value added products
3.	Vocational Centre established for local women to promote local handicrafts (woolen products and rugs) from wool and hair of domestic animals	2 vocational centres established in Hoper and I in Hisper	Enhanced role of local women in household economy
5.2. Pasture management			
4.	Study productivity, carrying capacity and utilization of selected pastures (In collaboration with KIU and CKNP Directorate)	2 research studies (one each in Hoper and Hisper)	Baseline available regarding health, productivity and carrying capacity of pastures
5.	In consultation with local community declare SMPA and initiate controlled grazing	SMPA one each in Hoper and Hisper declared with controlled grazing plan	Controlled grazing system is in-place and adopted by target communities
6.	Train selected herders (those having greater dependency on livestock or those members of the community who remain in pastures quite often) in improved guarding practices in SMPA	1 training event/30 herders trained	Selected herders have adopted improved pasture management measures
7.	Promote cultivation of fodder crop such as alfalfa on individual farmlands	Fodder crop grown on at least 10 ha in Hisper and 20 Ha in Ho	Pressure on grazing lands reduced by increasing stall feeding
8.	Improve pavement to selected pastures	1 trail to identified pasture improved in each of the target village	Grazing pressure uniformly distributed among pastures
9.	Develop drinking water points in selected pastures	1 drinking water facility developed in each of the target village	Grazing pressure uniformly distributed among pastures
5.3. Livestock Management			
10.	Establish Village Input Store (VIS) in Hisper	One village input store established in Hisper	% increase in number of beneficiary households getting treatment for their animals
11.	Train livestock extension workers in improved animals husbandry and veterinary care and provide them with basic kits (linked to **12, 13 14 and 15**)	One training (15 days) organized for at least 8 herders from Hoper-Hisper valley	% increase in number of beneficiary households getting treatment for their animals
12.	Establish and operationalize a permanent livestock vaccination program (following guidelines of Ev-K2-CNR vet experts)	Livestock vaccination plan and funds made available in Hoper and Hisper	At least 80% of the livestock going to higher pastures are vaccinated
13.	Improve one cattle shed in each village on demonstration basis (for improved hygiene, feeding, watering	1 cattle shed in Hisper and 2 in Hoper improved for better hygienic conditions	Local community have started to adapt improved structures for newly constructed cattle sheds

#	Action	Process Indicator	Progress Indicator
	to improve animal health and productivity)		
14.	Improve primitive corrals to make them predator proof structures	Two primitive corral each in Hoper and Hisper improved as predator	No incidences of mass killing of livestock inside corrals
15.	Improve breed of local cattle for enhanced productivity and to reduce number of less productive animals	One proven Jersey breeding bull provided to Hoper and Hisper for breed improvement purpose	Increased number of improved breed of local cattle
5.4. Afforestation and Sustainable Forest Management			
16.	Through VWGs or other community members ensure ban on cutting of forest trees for timber	VWGs remain on duty to ensure ban on cutting of timber from natural forests	Extraction of timber from natural forests is none
17.	With the help of VWGs monitor duration, quantity and pattern of fuelwood collection from natural forests as prescribed above in section **3.4.2**	VWGs remain on duty during fuelwood extraction period	Duration, quantity and prescribed pattern of fuelwood collection is followed by local people
18.	Hold community-based afforestation campaigns annually in the areas specified in **section 3.4.3** and reward farmers for the best plantation	At least 500 trees are planted in Hisper and 2000 in Hoper every year Every year 2 farmer in Hisper and 5 in Hoper rewarded with cash prize of Rs. 20,000	Increased area under tree plantation/No of plants owned by each household increased
19.	Regularly monitor progress on afforestation campaigns carried out by CKNP/WWF under SEED Project	CBCSDO submits annual report to CKNP Directorate regarding tree plantation	Consumption of fuelwood from natural forests reduced and from plantation increased
20.	Introduce solar energy to supplement use of domestic energy for heating and boiling water	20 HH in Hoper provided solar units (200 watts) with accessories on cost sharing basis and train at least 10 local person in repair and maintenance of these units	% reduction in consumption of fuelwood and dung per household
21.	Upgrade micro-hydel scheme of Hisper	Hisper micro-hydel project enhanced from 150-250 kw	% Households use electricity for heating and cooking
22.	Introduce CKNP FES in Hisper on subsided rates	At least 20 FES introduced in Hisper	% reduction in consumption of fuelwood and dung per household
5.5. Wildlife Conservation			
23.	Establish community-based watch and ward system by appointing VWGs	At least 2 VWG in Hisper and 2 in Hoper are in-place	No poaching or illegal hunting incidences in the target villages and if happen the incidences are reported to concerned authorities
24.	Provide basic training to VWGs in monitoring of wildlife	VWGs got basic training of watch and ward and wildlife monitoring	CKNP directorate is getting monthly report from VWGs
25.	Monitor wildlife populations (number and structure) following standard survey protocols for CKNP	Bi-annual wildlife surveys are being conducted for H. ibex	Systematic survey reports are available with CKNP Directorate
26.	Facilitate notification of Hoper and Hisper as CMCAs	Delineation of Hoper and Hisper from the Park and notification of both as CMCA	Trophy hunting of H. ibex initiated in the valley

#	Action	Process Indicator	Progress Indicator
27.	Enhance allocations for Livestock Insurance Fund	An additional amount of Rs. 500,000 provided to Hoper and Hisper each as LIF-A	Predation cases are being compensated annually
28.	Train LIMC members and engage CKNP directorate in monitoring of LIMC	One training conducted form LIMC member to monitor LIS	LIMC members are monitoring the predation cases
5.6. Improvement of water courses			
29.	Construct water channels as prescribed in section **3.6**	One new water channel in each of the target location constructed	Increased area under tree plantation and fodder cultivation
30.	Repair water channels as prescribed in section **3.6**	On existing water channel in each of the target location repaired	Increased area under tree plantation and fodder cultivation
5.7. Engage CBCDOs in Tourism Management			
31.	Review role of CBCDOs in tourism management	Review report	Plan for CBOs engagement in tourism activities
32.	Through CBCDO ensure tourism management in LFTA	Agreement with CBCSDOs for ecotourism promotion	Ecotourism promoted in LFTA
5.9. Conservation and sustainable utilization of MAPs			
33.	Engage students of KIU in conducting studies on MAPs	2 research studies (1 each from Hoper and Hisper)	Comprehensive knowledge about floral diversity, ethno-botany and indigenous knowledge about herbal treatment
34.	Regulate use of MAPs in the light of Gilgit-Baltistan Medicinal and Aromatic Plants (Protection, Conservation, Development, Sustainable Management and Community Participation) Rules, 2014 (when approved by GoGB)	A sub-plan of CSDPs of Hoper and Hisper to address conservation and sustainable use of MAPs in the light of new rules	Extraction of MAPs regulated under the new rules
5.9 Institutional Strengthening of Community Organizations			
35.	Restructure VCC in Hisper and HCDO in Hoper as CBCSDOs	HCDO Hoper and Hisper VCC restructured in the light of CBCSDOs guidelines	CBCSDOs have representation of key functionaries as indicated in **section 3.8.1**
36.	Facilitate registration of HCDO and revise bylaws of HCDO Hoper and CBCSDO in Hisper	Registration of HCDO and revised bylaws of HCDO Hoper and CBCSDO Hisper	Revised bylaws available duly endorsed by competent government authority
37.	Orientate CBCSDOs on new bylaws and operating procedures	2 orientation sessions conducted	CBCSDOs board and management officials are aware of their bylaws and operating procedures
38.	Provide office support to HDCO and CBCSDO Hisper	Needful support provided to HCDO and CBCSDO Hisper for office management	BLSO office is functional
39.	Enhance CSDF for Hoper and Hisper from various sources such as trophy hunting, CKNP entry fee etc	Community agreement in placed to strengthen CSDF from various sources such as trophy hunting, CKNP entry fee	CSDF in each village keeps increasing each year
40.	Develop Conservation and Sustainable Development Plan for Hoper-Hisper valley	Approval of CSDP of Hoper-Hisper valley after consultation with local communities and other stakeholder	Hoper-Hisper valley CSDP in place for implementation

6. IMPLEMENTATION MECHANISMS

6.1 Implementation Mechanism

The whole process needs to be facilitated by CKNP Directorate in collaboration with NGOs such as AKRSP, BWCDO, Ev-K2-CNR and WWF. Following steps are important in this regard:

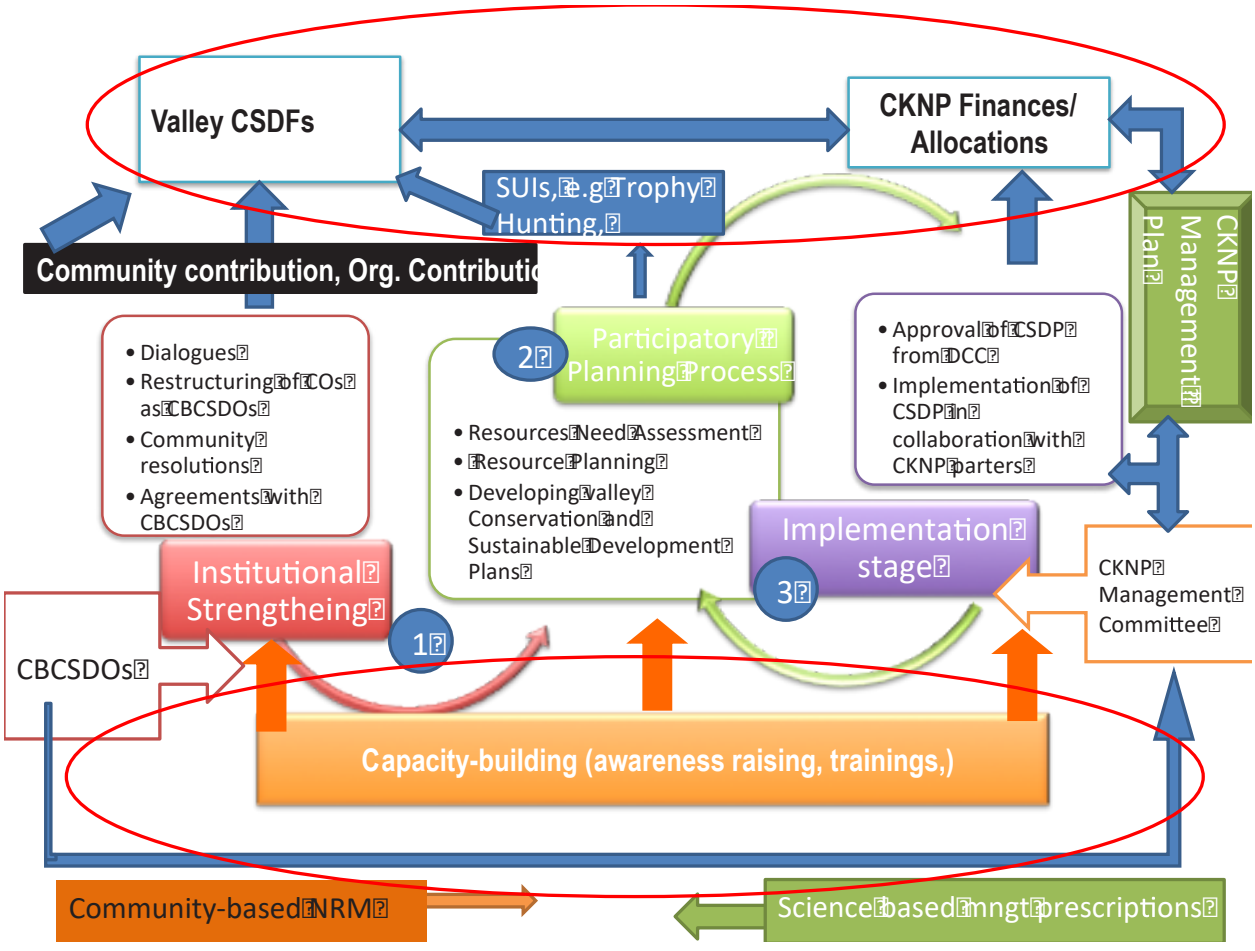
The **first step** should be the restructuring of community organizations in Hoper and Hisper in the form of CBCSDOs as prescribed above in section **3.9.1**. In Hoper the existing CO namely HCDO should be considered as CBCSDOs with needful representation of key community elements whereas in Hisper the existing VCC should be entirely restructured in the form of CBCSDO. Agreements should be signed with CBCSDOs for their proactive participation in CKNP Management. The local communities are now well mobilized in support of CKNP and the restructuring should not be a problem.

The **second step** is participatory conservation planning in which the draft CSDP should be shared with the respective communities (involving VCCs/LMIs, UC members, President of VOs and WOs (where possible)); line departments at district level (Agriculture, LS&DD, Forests, Wildlife & Parks, Tourism) and concerned NGOs such as AKRSP, AKPBS, BWCDO, Ev-K2-CNR, WWF) to solicit their technical opinion and possible support during implementation of the plans.

The third step is approval of CSDP from DCC Hunza-Nagar, and facilitation of subsequent DCC meetings to facilitate and monitor implementation on CSDP.

The first and second steps could be undertaken simultaneously to save time and resources. There are two crosscutting themes. Fist is Capacity-building involving awareness raising, trainings and exchange programmes. The second is financial sustainability which comes from various sources, primarily Government allocations for CKNP and subsequently at community level from various sustainable use initiatives such as trophy hunting, ecotourism, CKNP entry fee etc.

The overall implementation schemes is given in the following diagram:



Note: cross cutting themes are given in the red circle

6.2 Available Capacities

Local/Community Level	District Level	Provincial Level
• HCDO in Hoper and VCC in Hisper are functional • Presence of HCDO office set up in Hoper • Experience in carrying out conservation activities • Presence of VCF and other financial resources such as LIF • Membership of HCDO and VCC Hisper in DCC Skardu	District Conservation Committee of Hunza-Nagar in place Line Departments (LS&DD, Wildlife and Parks Department, Forest Department, Tourism Department) Presence of NGOs like WWF and SLF in Hoper and Hisper	CKNP Directorate CKNP Management Committee GB Wildlife Management Board

7. EXPECTED OUTPUTS

7.1. Sustainable mountain agriculture

- 20% increase in annual cash income per household from sale of high value agriculture produce (such a vegetable seeds, apricots) and woollen products

7.2. Pasture Management

- Degradation of pastures stopped by adopting best management techniques

7.3. Improved Livestock management

- At 30% reduction in livestock mortality and morbidity
- Per household livestock productivity increased while reducing number of non-productive animals

7.4. Sustainable forest management

- 40% reduction in consumption of plant biomass from natural forests by adopting better management practices and alternative sources such as farm forestry and fuel efficient techniques

7.5. Wildlife Conservation and management

- Viable populations of ungulates and predators maintained in the valley while pursuing the trophy hunting programme with ecologically acceptable standards

7.6. Efficient uses of water resources

- Area under plantation and fodder cultivation increased through construction, repair and maintenance of water channels

7.7. Sustainable mountain ecotourism

- Environment friendly tourism in CKNP areas promoted with support of CBCSDOs

7.8. Conservation and sustainable use of MAPs

- Conservation and sustainable utilization of MAPs is carried out under the framework of Gilgit-Baltistan Medicinal and Aromatic Plants (Protection, Conservation, Development, Sustainable Management and Community Participation) Rules, 2014 (when approved by GoGB)

7.9. Institutional Strengthening of Community Organizations

- Management and decision making system of community organizations strengthened through integration and capacity enhancement.

8. VISIBLE BOTTLENECKS IN REALIZING THE EXPECTED OUTPUTS, AND POSSIBLE ARRANGEMENTS

#	Outputs	Bottlenecks	Arrangements to overcome bottlenecks
1.	20% increase in annual cash income per household from sale of high value agriculture produce (such a vegetable seeds, buck wheat, walnut, etc.) and woollen products	Lack of market chains	Emerging industry of dry-fruit, vegetable seeds and medicinal herbs in GB Experience of KADO
2.	Degradation of pastures stopped by adopting best management techniques	Conventional grazing methods Interest groups among community	Incentives to progressive herders such as improvement of cattle sheds Grazers are paid by local herder thus they can be influenced for controlled grazing
3.	- At 30% reduction in livestock mortality and morbidity - Per household livestock productivity increased while reducing number of non-productive animals	Lack of resources	Enhancing amount of CSDF Engaging trained personnel available within local community Soliciting government's support
4.	40% reduction in consumption of plant biomass from natural forests by adopting better management and alternative sources such as farm forestry and fuel efficient techniques	Free grazing causing damage to newly established plantation Lack of resources for alternative option of domestic energy	Economic reward for farmers achieving highest number of plantation Provision of alternative of domestic energy on subsidized rates
5.	Viable populations of ungulates and predators maintained in the valley while pursuing the trophy hunting programme with ecologically acceptable standards	Interest groups among local community Human-carnivore conflicts Grazing competition with domestic stock Illegal hunting and poaching	Linking provision of hunting permit with systematic monitoring of wildlife and spending of trophy hunting amount on specified conservation initiatives A strong community-based watch and ward mechanism Enhancing CSDF
6.	Area under plantation and fodder cultivation increased through construction, repair and maintenance of water channels	Required huge financial resources	Soliciting community participation in terms of free labour and local resources Only to initiate where community needs is genuine and urgent
7.	Environment friendly tourism in CKNP areas promoted with support of CBCSDOs	Priorities of tour operating agencies sometime do not match with local needs and aspirations	Engagement of guides, cook and porters from local communities
8.	Conservation and sustainable utilization of MAPs is carried out under the framework of Gilgit-Baltistan Medicinal and Aromatic Plants Rules, 2014	The rules may not be timely enacted	A local code of conduct can be developed through community participation and sensitization
9.	Management and decision making system of community organizations strengthened through integration and capacity enhancement	Community interest groups Lack of resources	Rewarding most effective and trustworthy community activists Providing office support to CBCSDOs

9. MONITORING MECHANISM

9.1 CKNP Directorate

The major responsibility of monitoring all action of a CBCSDO carried out under the framework of CSDP should be with CKNP Directorate. The CKNP Directorate can monitor their progress in the following steps:

- Visiting individual CBCSDOs and checking their records and verifying physical progress on activities
- Attending DCC meetings and reviewing progress of CBCSDOs annual plans
- Monitoring CBCSDOs performance against their annual plans in the meeting of the CKNP Management Committee

9.2 District Conservation Committee Meetings

The CSDP should be presented in DCC Hunza-Nagar and endorsed by the Chairman of DCC with recommendations from CKNP Director. The DCC Hunza-Nagar in its bi-annual meeting should review the progress of implementation on CSDP. Each village should have an annual plan to be presented and subsequently reviewed in the DCC.

9.3 Community Agreements

CKNP Directorate or any supporting agency intending to initiate any activity with a CBCSDO should sign a letter of agreement explaining the roles and responsibilities of all parties involved in undertaking the activity. A copy of such an agreement should be made available in CBCSOs office records.

9.4 CBCSDOs Audit and Record Keeping

CKNP Directorate or any supporting organizations should emphasize on proper record keeping of all activities undertaken by CBCSDOs. Checking monthly minutes sheet, proceedings of the special meetings and financial records of CBCSDOs can do this. It should be mandatory for every CBCSDO to have their annual audit report. Any financial support to a CBCSDO should be linked to availability of annual audit report. The community must have a separate file for all major activities to be undertaken as part of the CSDP.

For all major initiatives the CBCSDO should constitute two committees: a) project execution committee and b) project audit committee. Most of the local communities are familiar of this system due to the projects of AKRSP.

9.5 CBCSDO Visitors Diary

CBCSDO should maintain a Visitors Diary for noting comments, feedback and observations of all visitors coming to a village in connection with conservation and sustainable development initiatives. The CKNP Directorate and supporting agencies or organizations should clearly instruct their employees visiting any village of Hoper-Hisper valley to write down their notes in CBCSDOs Visitors Diary. This way the supporting agencies can avoid duplication of efforts and it will be helpful in carrying out the activities systematically and logically. A sample of the visitors' diary of CBCSDOs to be filled in by a visitor can be as following:

Visitors Diary

Name of CBCSDO……

Name of Visitor …….

Organization/institution …….

Date of visit ……

Purpose of visit ……..

Venue of meeting ……...

Meeting participants……

Key discussions or decision points

……
……
……
……
……

Required follow up actions

……
……
……
……

Signature of the visitor……

10. PROPOSED BUDGET FOR IMPLEMENTATION

For five years (2015-2020)

#	Action	Units	Quantity	Unit cost	Total Cost (PKR)
5.1. Sustainable Mountain Agriculture					
1.	Improve marketing of agro products (potatoes, peas, apricots)	Business plans	1	250000	250000
2.	Improve post-harvest techniques (processing and packaging) through improved technology and training	Training workshops	2	100000	200000
3.	Vocational centre established for local women to promote local handicrafts (woollen products and rugs) from wool and hair of domestic animals	Vocational Centres	3	800000	2400000
	Sub-total				**2850000**
5.2. Pasture management					
4.	Study productivity, carrying capacity and utilization of selected pastures (In collaboration with KIU and CKNP Directorate)	Research studies	2	200000	400000
5.	In consultation with local community declare SMPA and initiate controlled grazing	Community consultation workshops	4	20000	80000
6.	Train selected herders (those having greater dependency on livestock or those members of the community who remain in pastures quite often) in improved guarding practices in SMPA	Training workshop	1	200000	200000
7.	Promote cultivation of fodder crop such as alfalfa on individual farmlands	Hectare	20	40000	800000
8.	Improve pavement to selected pastures	Improved trails	2	100000	200000
9.	Develop drinking water points in selected pastures	1 drinking water facility developed in each of the target village	2	300000	600000
	Sub-total				**2280000**
5.3. Livestock Management					
10.	Establish Village Input Store (VIS), following a evaluation study of the current VIS in CKNP valleys in Baltistan	(a basic laboratory), (freezer or cooler, sterilizer, cattle crush) and required medicine	1	1000000	1000000
11.	Train livestock extension workers in improved animals husbandry and veterinary care and provide them with basic kits (linked to 12, 13, 14 and 15)	Training workshop	1	500000	500000

#	Action	Units	Quantity	Unit cost	Total Cost (PKR)
12.	Establish and operationalize a permanent livestock vaccination programme (following guidelines of Ev-K2-CNR vet experts)	Funds	2	500000	1000000
13.	Improve one cattle shed in each village on demonstration basis (for improved hygiene, feeding, watering to improve animal health and productivity)	Improved cattle sheds	3	100000	300000
14.	Improve primitive corrals to make them predator proof structures	Improved corrals	4	100000	400000
15.	Improve breed of local cattle for enhanced productivity and to reduce number of less productive animals	Proven Jersey bulls	2	70000	140000
	Sub-total				**3340000**
5.4. Afforestation and Sustainable Forest Management					
16.	Through VWGs or other community members ensure ban on cutting of forest trees for timber	VWGs Honorarium (Man Months)	240	1000	240000
17.	With the help of VWGs monitor duration, quantity and pattern of fuelwood collection from natural forests as prescribed above in section 3.4.2	VWGs Honorarium (Man Months)	240	1000	240000
18.	Hold community-based afforestation campaigns annually in the areas specified in section 3.4.3 and reward farmers for the best plantation	Cash Awards	35	20000	700000
19.	Regularly monitor progress on afforestation campaigns carried out by CKNP/WWF under SEED Project	Visits	20	20000	400000
20.	Introduce solar energy to supplement use of domestic energy for heating and boiling water	200 watt solar units	20	25000	500000
21.	Upgrade micro-hydel scheme of Hisper	MH Scheme in Hisper up-gradation (L/S)	1	1000000	1000000
22.	Introduce CKNP FES in Hisper on subsided rates	FES	20	6000	120000
	Sub-total				**3200000**
5.5. Wildlife Conservation					
23.	Establish community-based watch and ward system by appointing VWGs	VWGs Honorarium (Man Months)	240	1000	240000
24.	Provide basic training to VWGs in monitoring of wildlife	Training workshop	1	50000	50000
25.	Monitor wildlife populations (number and structure) following standard survey protocols for CKNP	Wildlife surveys	20	50000	1000000
26.	Facilitate notification of Hoper and Hisper as CMCAs	Visits	4	20000	80000
27.	Enhance allocations for Livestock Insurance Fund	Funds	2	500000	1000000
28.	Train LIMC members and engage CKNP directorate in monitoring of LIMC	Training workshop	1	100000	100000
	Sub-total				**2470000**
5.6. Improvement of water courses					

#	Action	Units	Quantity	Unit cost	Total Cost (PKR)
29.	Construct water channels as prescribed in section 3.6	Channels (new)	2	1500000	3000000
30.	Repair water channels as prescribed in section 3.6	Channels (repaired)	4	600000	2400000
	Sub-total				**5400000**
5.7. Engage CBCDOs in Tourism Management					
31.	Review role of CBCDOs in tourism management	Review report	1	50000	50000
32.	Through CBCDO ensure tourism management in LFTA	Awareness raising workshops	4	50000	200000
	Sub-total				**250000**
5.8. Engage CBCDOs in Tourism Management					
34.	Engage students of KIU in conducting studies on MAPs	Research studies	4	50000	200000
36.	Regulate use of MAPs in the light of Gilgit-Baltistan Medicinal and Aromatic Plants (Protection, Conservation, Development, Sustainable Management and Community Participation) Rules, 2014 (when approved by GoGB)	Awareness raising workshops	2	50000	100000
	Sub-total				**300000**
5.9 Institutional Strengthening of Community Organizations					
37.	Restructure VCC in Hisper and HCDO in Hoper as CBCSDOs	Consultative meetings	4	20000	80000
38.	Facilitate registration of HCDO and revise bylaws of HCDO Hoper and CBCSDO in Hisper	Visits	4	25000	100000
39.	Orientate CBCSDOs on new bylaws and operating procedures	Orientation sessions	4	20000	80000
40.	Provide office support to HDCO and CBCSDO Hisper	Office support (lump sum)	2	200000	400000
39.	Enhance CSDF for Hoper and Hisper	Funds	2	200000	400000
40.	Share Conservation and Sustainable Development Plan for Hoper-Hisper valley for local communities and stakeholder to solicit their technical and financial support	consultative workshops (2 at community level and 1 at other stakeholder level)	3	20000	60000
		DCC meeting	1	15000	15000
	Sub-total				**1135000**
	Grand total				**21225000**

11. APPENDICES

Appendix-A Sampling plan for household surveys

Valley	Name of villages for survey	Population (HH)	Sample size (Household heads CI 5, CL 95%)	Number of days	FGD
Hisper-Hoper	Hipser	185	52	0.7	1
	Shakushal	60	17	0.2	1
	Hakashal	250	70	1.0	
	Ratal	150	42	0.6	
	Skamatang	60	17	0.2	
	Broshal	160	45	0.6	
	Goshashal	60	17	0.2	
	Halshal	70	19	0.3	
	Total	**995**	**277**	**4**	**2**
	%		**27.8**		
Hushey	Hushey	160	63	0.9	1
	Kanday	155	61	0.9	1
	Marzigond	64	25	0.4	1
	Tallis	209	83	1.2	1
	Total	**588**	**233**	**3**	**4**
	%		**39.6**		
Basha	Doghoro	130	45	0.6	2
	Bein	55	19	0.3	
	Zil	45	16	0.2	
	Saisko	125	43	0.6	
	Sibirdi	42	14	0.2	
	Doko	50	17	0.2	
	Bisil	110	38	0.5	
	Niaslo	40	14	0.2	
	Arindu	120	41	0.6	1
	Arindu gond	13	4	0.1	
	Total	**730**	**252**	**4**	**3**
	%		**34.5**		
Bagrote	Hamaran	80	13	0.2	1
	Taisote	350	59	0.8	
	Missingote	300	51	0.7	
	Sinaker	150	25	0.4	
	Hopey	120	20	0.3	
	Datuche	200	34	0.5	
	Farfo	300	51	0.7	
	Bulche	250	42	0.6	1
	Chira	150	25	0.4	
	Sub total	**1900**	**320**	**4**	**2**

Valley	Name of villages for survey	Population (HH)	Sample size (Household heads CI 5, CL 95%)	Number of days	FGD
	%		16.8		
	Grand total	4213	1082	15.0	11
	%		25.7		

Appendix-B Participants of FGDs in Hoper-Hisper Valley

#	Hoper	Hisper
1.	Haji Amir Hamza	
2.	Nambardar Ghulam Abbas	
3.	Haji Ramza Ali	
4.	Haji Qurban Ali	
5.	Haji Ali	
6.	Ijlal Hussain	
7.	Namberdar Moahmmad Ibrahim	
8.	Havaldar Ali	
9.	Muhammad Issa	
10.	Mohammad Din	
11.	Nasir Abbas	
12.	Haji Ismail	

Appendix-c Template for Monthly Report by VWGs

ماہانہ کارکردگی رپورٹ ۔ ویلج وائیلڈ لائف گائیڈز

رپورٹ برائے ماہ ---------- علاقہ ----------

ا۔جنگلی حیات کا مشاہدہ:

نمبر شمار	وقت و تاریخ سروے	قسم جانور	نام جگہ جہاں سے جانور دیکھے گئے	نام جگہ جہاں پر جانور دیکھے گئے	جانوروں کے گروپ کے بارے میں معلومات: نر	مادہ	ایک نشالہ	بچے	مین کی شناخت نہیں ہوسکی	کل	ٹرافی سائز (نر)	موسم کی صورتحال	مسکن کے بارے میں معلومات

نوٹ

☆ قسم جانور : آئی بیکس، مارخور، اُڑیال ،برفانی چیتا، بھیڑیا، دیگر(نام)

☆ موسم کی صورتحال: : دھوپ ،ابرآلود یا بادل ،بارش ،ژالہ باری برف باری

☆ مسکن کی صورتحال: : برف سے ڈھکا ہوا، گھاس والی جگہ، بنجر یا پتھریلی جگہ

۲۔اس مہینے علاقے میں جنگلی حیات اور دیگر قدرتی وسائل سے متعلق رونما ہونے والی غیر قانونی سرگرمیوں پر (✓) کا نشان لگائیں اور درج ذیل جدول کو پر کریں:

نمبر شمار	سرگرمی	تعداد اور قسم جانور	جگہ جہاں پر یہ واقع پیش آیا	گائیڈ کی طرف سے کاروائی	وی سی سی کی طرف سے کاروائی
۱	غیر قانونی شکار ہوا				
۲	جنگلات کی کٹائی عمل میں آئی				
۳	آزاد چرائی پر پابندی کی خلاف ورزی ہوئی				
۴	کوئی اور واقع----------				

۳۔اس مہینے گوشت خور جنگلی جانوروں کی وجہ سے مال مویشی کوئی نقصان پہنچا؟ ہاں نہیں: اگر ہاں تو درج ذیل جدول کو پر کریں:

نمبر شمار	نام مویشی مالکان	تعداد اور قسم جانور	جگہ جہاں پر یہ واقع پیش آیا	مویشی مالک کا ردعمل	وی سی سی کی طرف سے کاروائی
۱					
۲					
۳					

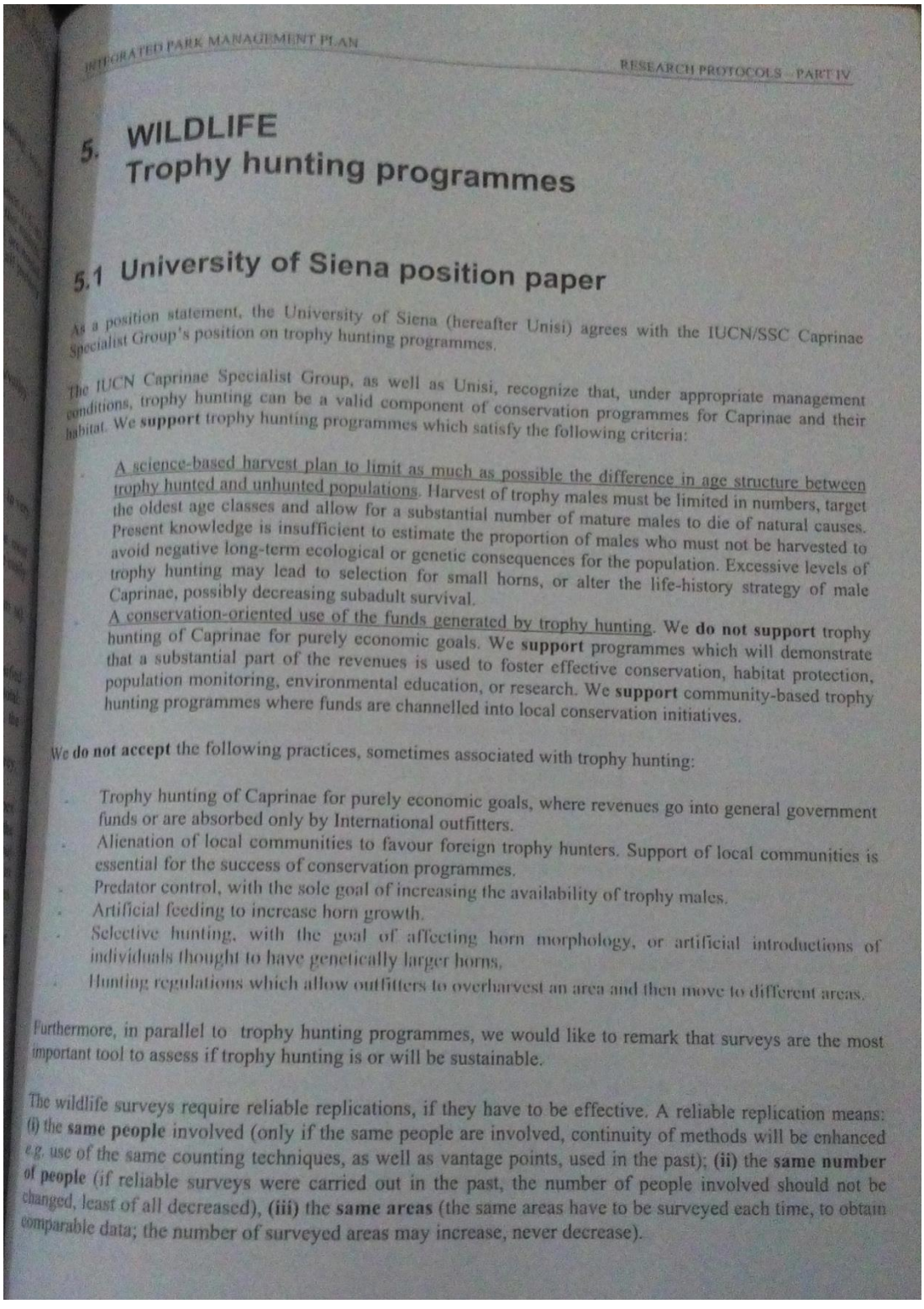
نام و دستخط گائیڈ ۱---------- تاریخ ---------- نام و دستخط گائیڈ ۲---------- تاریخ ----------

نام و دستخط گائیڈ ۳---------- تاریخ ----------

تصدیق کیجاتی ہے کہ گائیڈ نے مقررہ فرائض کی انجام دہی کی ہے۔ہم اس کی کارکردگی سے مطمئن ہیں اور سفارش کیجاتی ہے کہ ان کا مشارہ ادا کیا جائے۔

چیرمین/صدر ویلی کنزرویشن کمیٹی ---------- نام معہ دستخط ----------تاریخ----------

Appendix D. Position paper on trophy hunting developed by CKNP wildlife experts from UNISI duly endorsed by Caprinae Specialist Group of the Species Survival Commission of IUCN



5. WILDLIFE
Trophy hunting programmes

5.1 University of Siena position paper

As a position statement, the University of Siena (hereafter Unisi) agrees with the IUCN/SSC Caprinae Specialist Group's position on trophy hunting programmes.

The IUCN Caprinae Specialist Group, as well as Unisi, recognize that, under appropriate management conditions, trophy hunting can be a valid component of conservation programmes for Caprinae and their habitat. We **support** trophy hunting programmes which satisfy the following criteria:

- A science-based harvest plan to limit as much as possible the difference in age structure between trophy hunted and unhunted populations. Harvest of trophy males must be limited in numbers, target the oldest age classes and allow for a substantial number of mature males to die of natural causes. Present knowledge is insufficient to estimate the proportion of males who must not be harvested to avoid negative long-term ecological or genetic consequences for the population. Excessive levels of trophy hunting may lead to selection for small horns, or alter the life-history strategy of male Caprinae, possibly decreasing subadult survival.
- A conservation-oriented use of the funds generated by trophy hunting. We **do not support** trophy hunting of Caprinae for purely economic goals. We **support** programmes which will demonstrate that a substantial part of the revenues is used to foster effective conservation, habitat protection, population monitoring, environmental education, or research. We **support** community-based trophy hunting programmes where funds are channelled into local conservation initiatives.

We **do not accept** the following practices, sometimes associated with trophy hunting:

- Trophy hunting of Caprinae for purely economic goals, where revenues go into general government funds or are absorbed only by International outfitters.
- Alienation of local communities to favour foreign trophy hunters. Support of local communities is essential for the success of conservation programmes.
- Predator control, with the sole goal of increasing the availability of trophy males.
- Artificial feeding to increase horn growth.
- Selective hunting, with the goal of affecting horn morphology, or artificial introductions of individuals thought to have genetically larger horns.
- Hunting regulations which allow outfitters to overharvest an area and then move to different areas.

Furthermore, in parallel to trophy hunting programmes, we would like to remark that surveys are the most important tool to assess if trophy hunting is or will be sustainable.

The wildlife surveys require reliable replications, if they have to be effective. A reliable replication means: (i) the **same people** involved (only if the same people are involved, continuity of methods will be enhanced e.g. use of the same counting techniques, as well as vantage points, used in the past); **(ii)** the **same number of people** (if reliable surveys were carried out in the past, the number of people involved should not be changed, least of all decreased), **(iii)** the **same areas** (the same areas have to be surveyed each time, to obtain comparable data; the number of surveyed areas may increase, never decrease).

Wildlife surveys: standardization of methods and periods for CKNP Area

3.1 Standardize data collection

In order to enhance collaboration among stakeholders working on Wildlife in CKNP area and to make data available for all partners, a standardized data collection should be considered. Therefore priority valleys for CKNP management should be agreed and for each valley specific action plans should be developed mentioning specific tasks, roles, sharing of resources and costs. Data collection and filing should be carries out in a standardize way.

Methods, data and objectives of surveys should be shared among all the stakeholders (i.e. if surveys are carried out to set up a trophy hunting programme, the goal of the survey has to be clear to all the interested organizations).

The basic concept is to operate with the same methodology and in the same periods for the wildlife surveys.

3.2 Proposed Wildlife Surveys

Survey team

Each survey team should be made up by groups composed by 1 to 3 members. For each valley to be surveyed the number of people involved will be function of the extension of the area to be surveyed.

Wildlife surveys require reliable replications, to be effective. A reliable replication means: (i) the **same people** involved (only if the same people is involved it will be easy to find out the same vantage points used in the past) – it is important that at least *1 person for each group* (team=all the people involved in the wildlife survey; group=part of the team attending specific areas of the selected valley) *is the same than in the previous survey*; (ii) **same number of people** (if reliable surveys were carried out in the past, the number of people involved should not be changed, least of all decreased), (iii) **same areas** (the same areas have to be surveyed each time, in order to obtain comparable data; the number of surveyed areas may increase, never decrease).

Planning

A good planning is essential to obtain reliable wildlife surveys, and then reliable data. Therefore, an effective organization of wildlife surveys (where to go, how many people and how many teams) should be planned well in advance, following the organisation of previous surveys.

For this purpose, a valley specific action plan should be drafted and shared 1-2 weeks before the surveys, in order to inform the other stakeholders working in the area about the planning. This document has to mention vantage points to be used (a map should be attached), people involved, days of the survey, specific tasks, roles, sharing of resources and cost by each partner.

Requirements during survey

The following items will be required during the wildlife survey: camera, binoculars, spotting scope, altimeter, compass, data sheet, GPS, tents, sleeping bags, food items, map of the area.

If the planning is well done and the number of groups and vantage points known well in advance (i.e. we know, by now, that 3 groups are needed for the Nar valley, therefore a team of 9 people), also the material retrieval (each group has to be provided by 1 compass, 1 GPS and 1 spotting scope; i.e. if 3 teams are needed to survey the Nar valley, 3 GPS, 3 spotting scopes and 3 compasses should be available) among all partners will be easier.

Objectives of the survey

1. To count and estimate the population of Himalayan ibex and Markhor in the catchment area/valley.
2. To record any other wildlife species observed in the area.

Methodology of the survey

1. Surveys should be normally carried out twice a year, on May and December (approximately). In very few areas, surveys will be carried out only in Autumn, because of difficult access in spring.
2. Surveys should be carried out early in the morning and/or late in the afternoon because most ungulates, *i.e.* ibex and markhor, are active and graze during these parts of the day and can be easily sighted.
3. Vantage points should be established taking GPS references (WGS84-UTM system; dd mm ss). Binoculars and spotting scope will be used to scan wildlife in the area.
4. A camera should be used to take photographs of pastures where observations are carried out.
5. Direct counts should be used to determine wildlife numbers. The herds seen will be further classified into different age and sex classes (males, females, yearling, kids and undetermined individuals, total; among males, a separate count on trophy size individuals will be made). In autumn counts, the number of kids will be a very useful population parameter to assess reproductive rate.
6. For all wildlife monitoring surveys, the same vantage points, established during the first field survey, should be used. It is paramount to get involved the same people.
7. While using the same vantage points each year, if a certain pasture in one year has an ibex population/herd and, in the next survey season, no ibex herd is seen in the same pasture, from the same vantage points (VP), we should note down that VP and pasture. We should not ignore that but we should write real zero in that place. This will show that the same pasture has been visited in consecutive years. This information will help to analyze data, e.g. the impact of different variables on the ibex population etc.
8. For each observation, also the distance (roughly estimated) and the angle to the North (using the compass) should be useful to locate the herd.
9. Investigation through a questionnaire and general discussions with the local people, shepherds and former hunters living in the village/valley (10% of the population of the Valley – randomly selected) should be carried out.

Conservation and Sustainable Development Plan

for Hoper-Hisper Valley of

Central Karakoram National Park (CKNP)

Gilgit-Baltistan

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