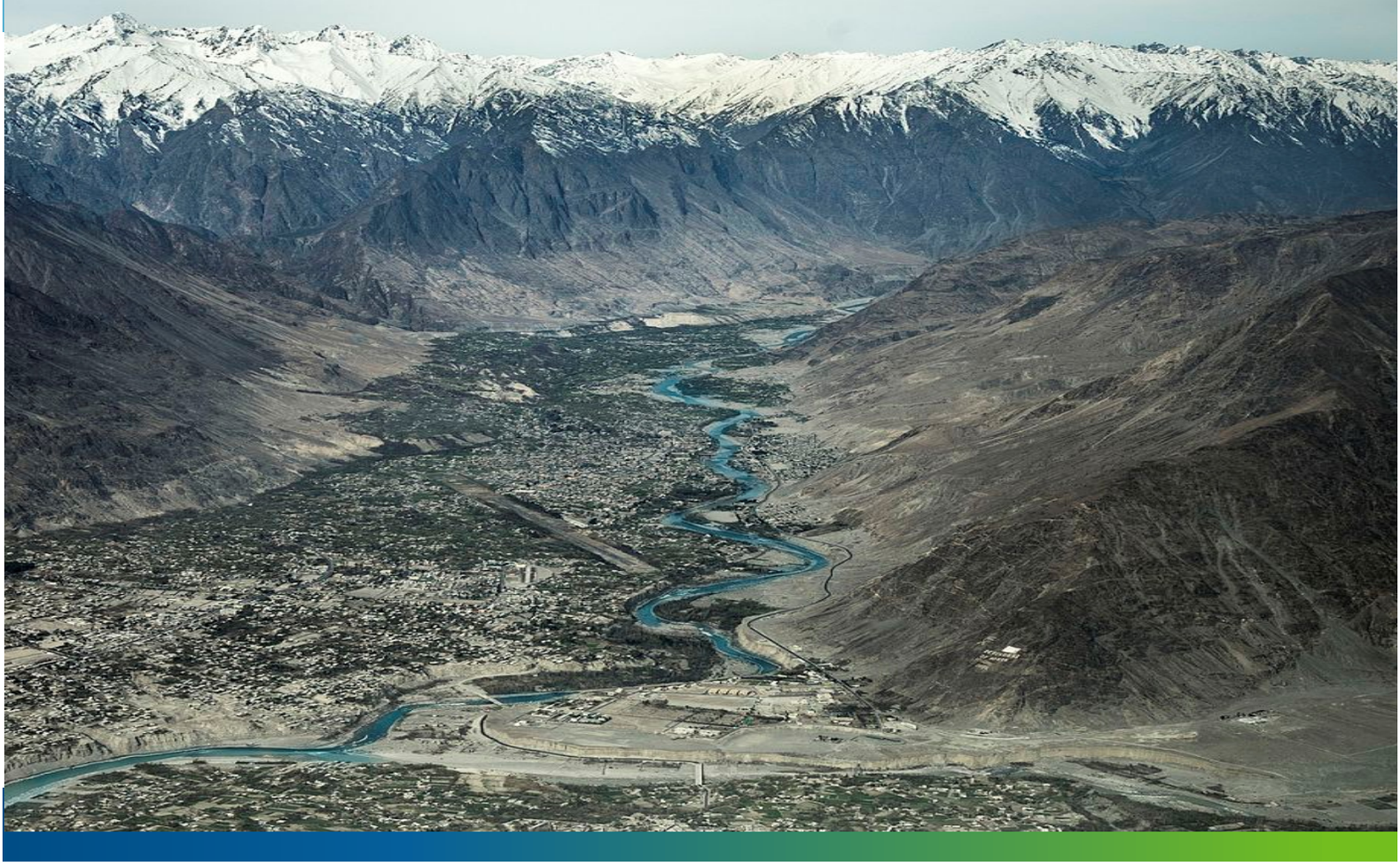
Valley Conservation and Sustainable Development Plans
Central Karakorum National Park
2016-2026
Gilgit Baltistan
District Gilgit



EvK2CNR PAKISTAN

CENTRAL KARAKURAM NATIONAL PARK CKNP

seed Social Economic Environmental Development

Valley Conservation And Sustainable Development Plans
2016-2026
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 CKNP valley of CKNP. Ev-K2-CNR Pakistan.

Developed by Ev-K2-CNR-Pakistan in continuation of management plan and operational plan of CKNP

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This is a working document to welcome your suggestions for further improvement prior to its approval.

Document prepared by: Ev-K2-CNR Pakistan in the framework of SEED Project, Phase-II funded by the Governments of Pakistan and Italy within the Pakistan – Italian Debt for Development Swap Agreement (PIDSA).

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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

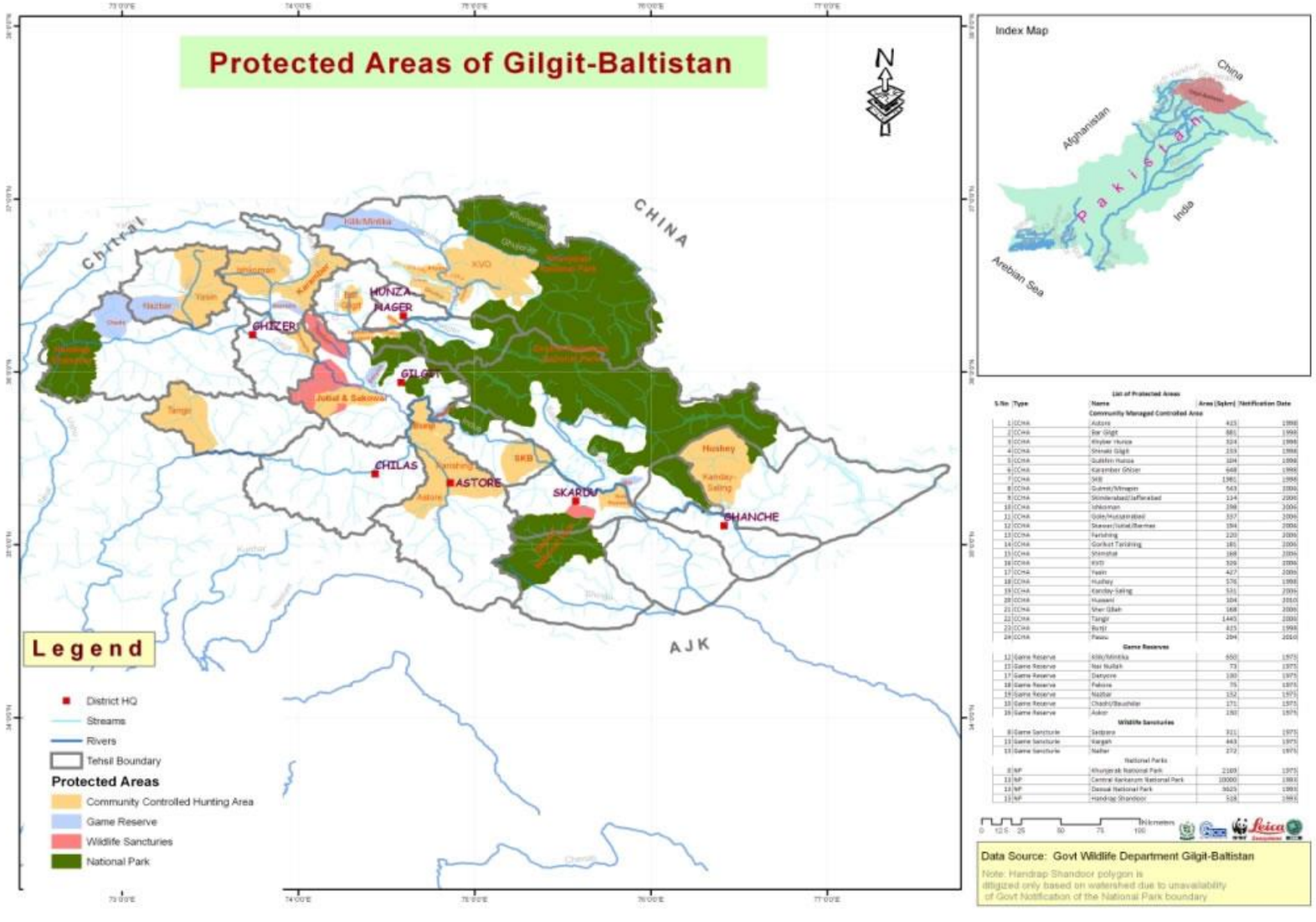

Exhibit 2: Protected areas of Gilgit-Baltistan

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 year2.

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.

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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.

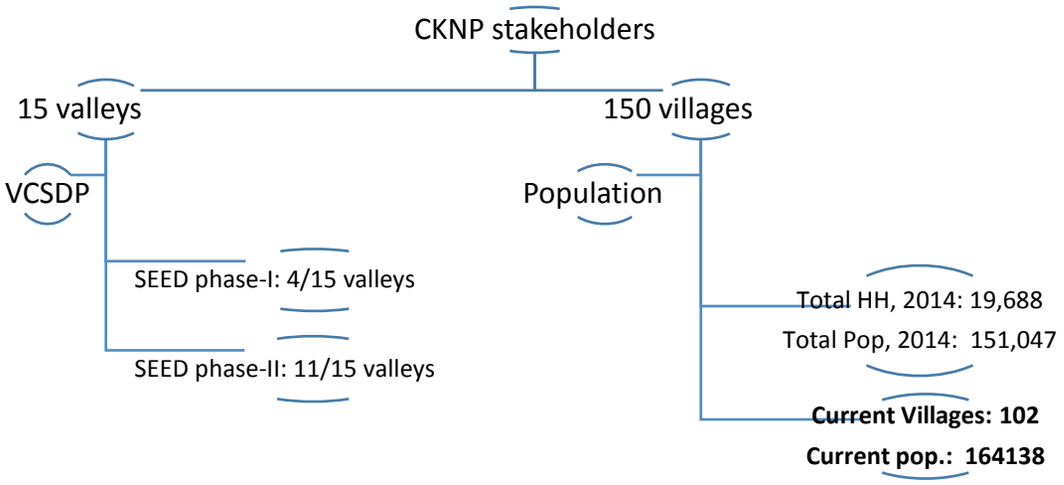
Based on this evaluation, the CKNP Management Plan (2014) has recommended to "revise and amend the VCPs according to a tested and universally acknowledged planning instrument, such as the logical framework approach, for example if they are to fulfill their functions as an instrument for grass-roots planning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

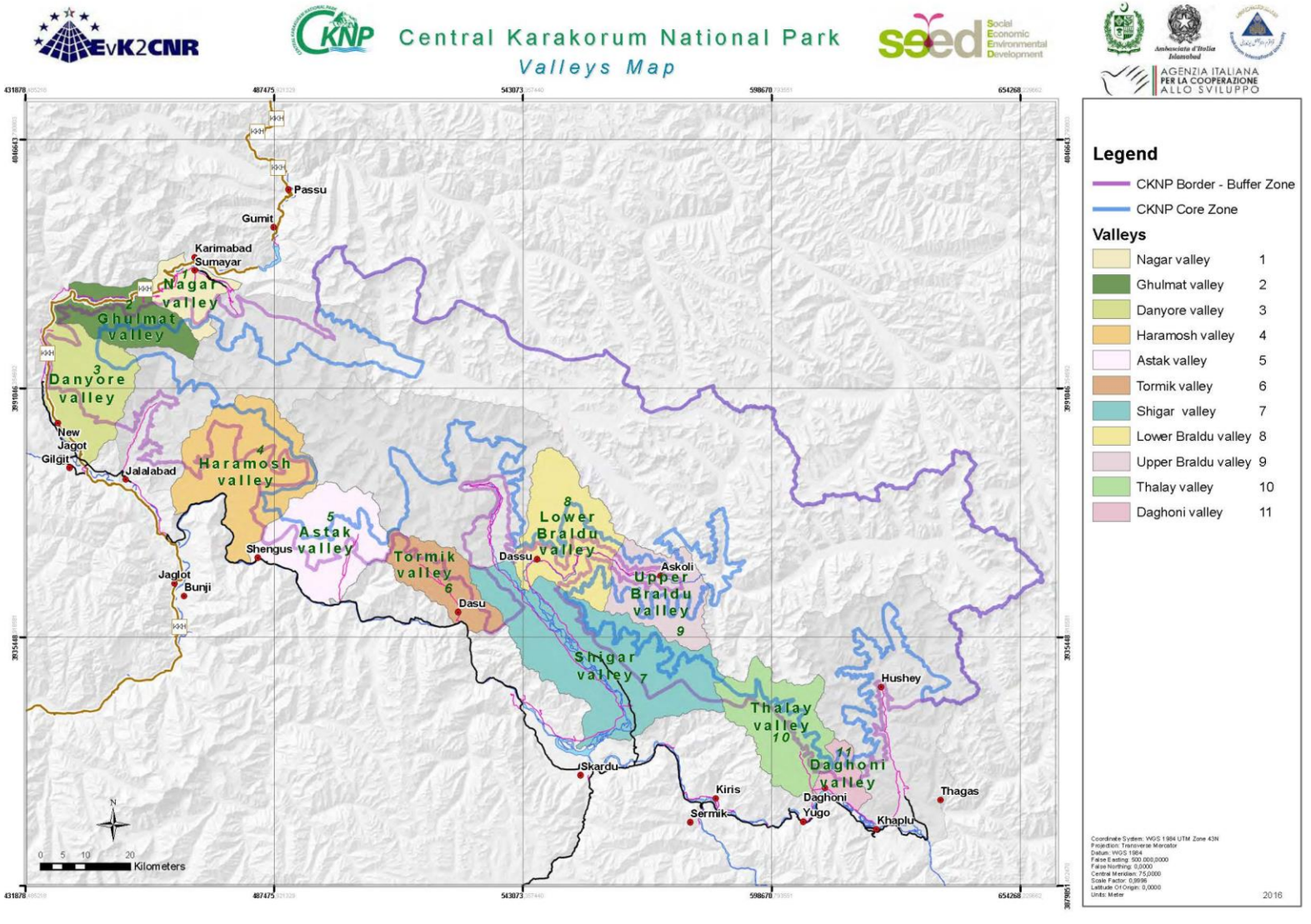


Exhibit 13: Valleys of CKNP

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
Danyore Valley
Central Karakorum National Park
Gilgit Baltistan

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This is a working document to welcome your suggestions for further improvement prior to its approval.

Document prepared by: Ev-K2-CNR Pakistan in the framework of SEED Project, Phase-II funded by the Governments of Pakistan and Italy within the Pakistan – Italian Debt for Development Swap Agreement (PIDSA).

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PLAN EDORSEMENT

Signed by President LSO Danyore .....

Endorsed Director CKNP .....

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

Dated.....

CONTENTS

LIST OF EXHIBITS

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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 DANYORE VALLEY

1.1. History of Danyore Valley

DANYORE MEANS DAAVE
RUNNING MILL

The human settlement in the area date back centuries told by local habitants. However, no one knows about the exact date of settlements in the area. The name of the valley is kept after two Shina words Daaye means a monster and Yore meaning a Traditional Floor Mill i.e Chakki in Urdu. It is found in the local fables that there was a Daave in Danyore running a Mill and from there this area is called Danyore. It is one of most populated valleys of CKNP.

1.2. Locality and Demography of Danyore Valley

Danyore valley is part of UC and Tehsil Danyore, District Gilgit and a representative of heterogeneous community with approximately equal population of both genders. It comprises of five villages naming Danyore/ Sultanabad, Jutal, Goro, Juglot and Rahimabad situated on left bank of River Gilgit. The area is irrigated by nearby streams such as Danyore Nullah, Juglot Gah etc.

Exhibit 1: Village locations of Danyore Valley, 2016

Villages	Coordinates		Elevation (m asl)
	N	E	
Jutal	35°02'23.7''	074°17'50.0''	1560
Rahimabad	36°06'51.7'	074°17'58.7''	1671
Danyore/Sultanabad	36°55'13.4''	074°22'44.1''	1487
Juglot	36°10'50.3''	074°18'18.7''	1983
Goro	36°10'17.5''	074°17'14.0''	1670

1.3. Ecological Profile of Danyore Valley

Danyore is located among the southwestern valleys of Central Karakoram National Park. The climate is arid but because of lying at the outskirts it receives only 120-240mm average annual rainfall. This rain water is significantly important for the farmers which also rely on snow melt water feed into the streams and water channels from glaciers. The biodiversity of Danyore valley is adapted to harsh and varied climatic conditions and topography. Vegetation is sparse and represented by trees, which at some locations become dense. The vegetation of the area is the mix of sub-tropical scrub type at lower elevations and dry temperate coniferous forest zone at higher elevations. The whole Danyore valley is representative of semi-urban areas and has degraded and fragmented habitats for the wildlife and associated fauna. These forests also provide timber the local use for domestic and commercial purposes (Sheikh, 1977).

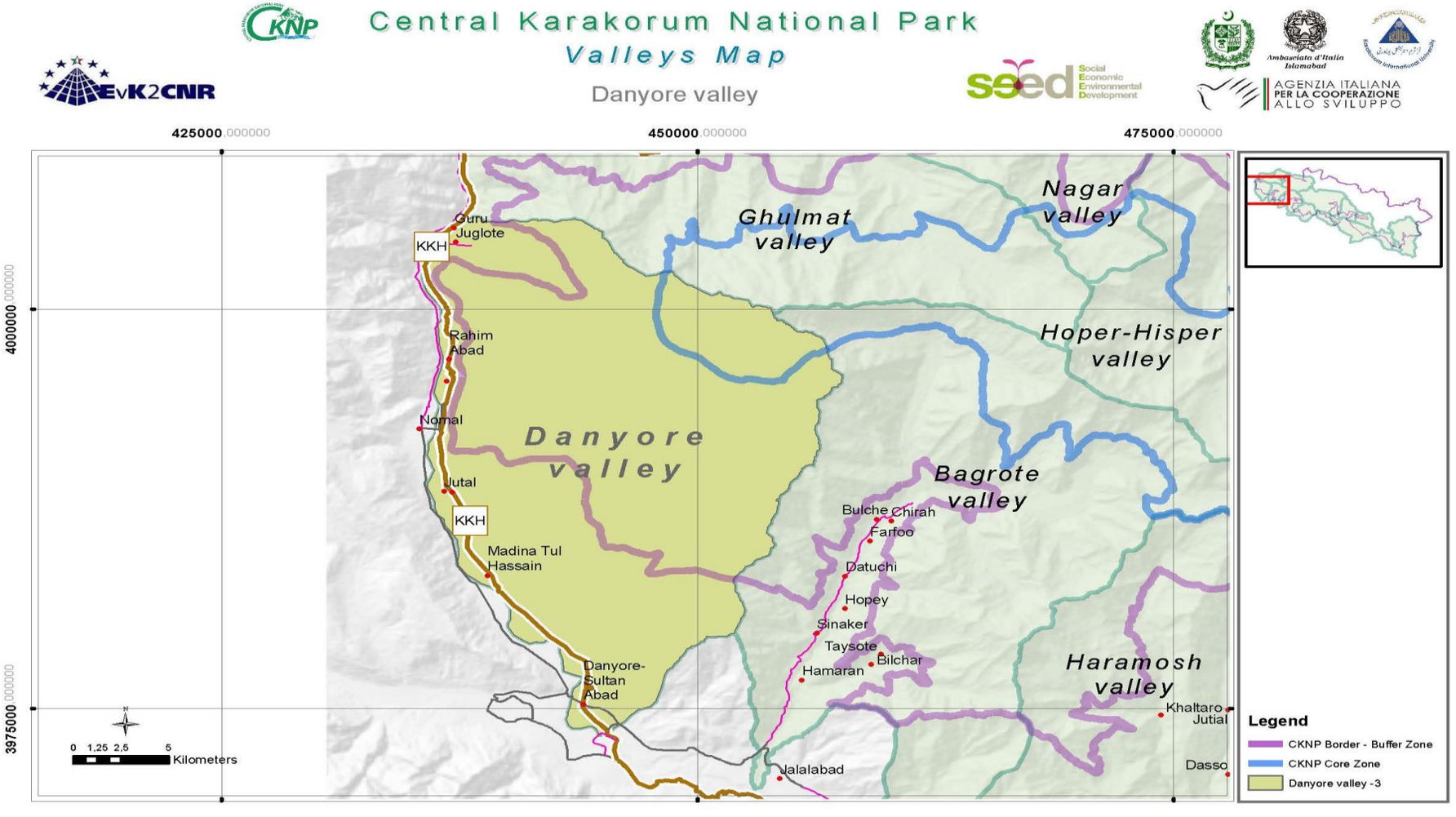


Exhibit 2: Map of Danyore Valley

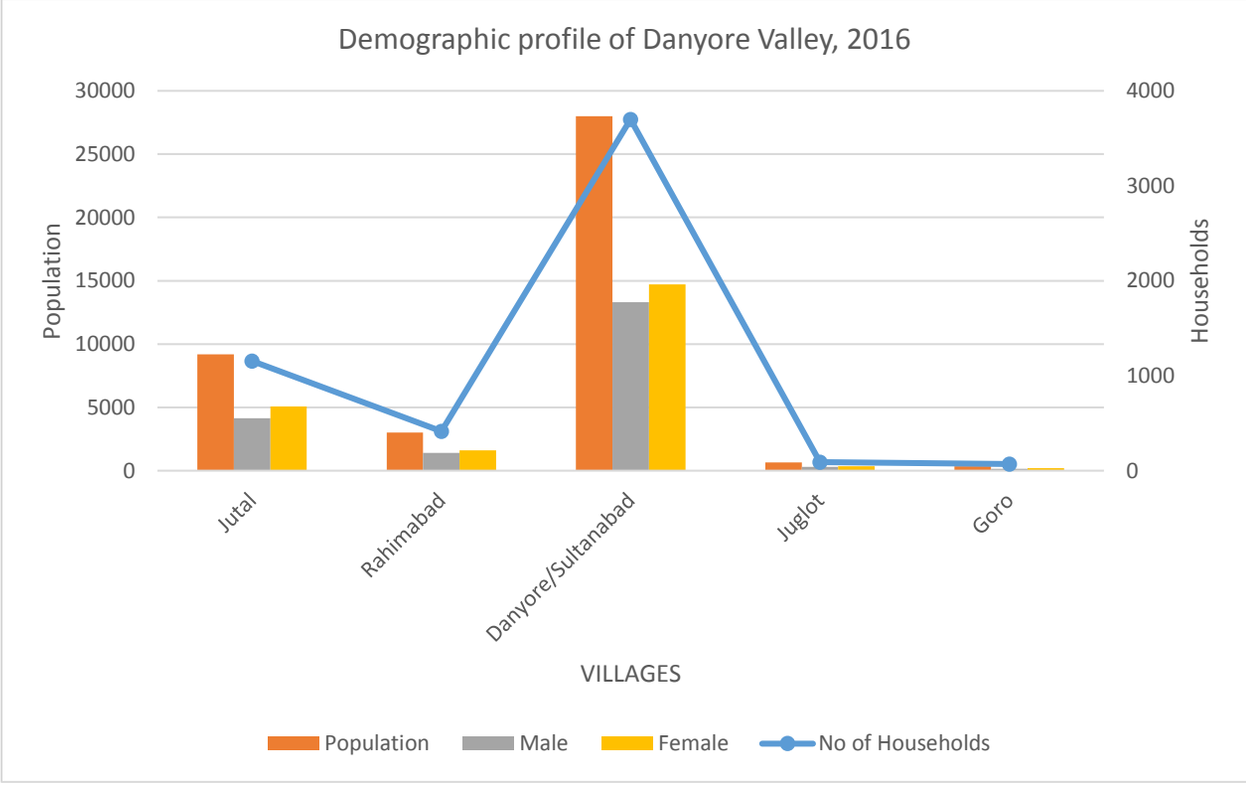
1.4. Demographic Profile of Danyore Valley

According to the 1998 census, the population for Danyore was 18,095 but now according to the survey conducted for VCSDPs development, the population has increased till 26,238 people approx. and expected to increase up to 274,773 in Danyore valley and nearby areas (Annandale, 2014). All these villages are based around buffer area of CKNP which spans 2757.88 m^2 and serves as reserve of natural resources for the local people and transitional area between park and local communities. This local community depends heavily upon natural resources both for subsistence and income.

Exhibit 3: Demographic profile of villages

Village	HH	Population	Av. HH size	Male	Female	Male: Female
Jutal	1155	9200	7.96	4140	5060	0.82 :1.222222
Rahimabad	415	3000	7.22	1400	1600	0.87 : 1.142857
Danyore/Sultanabad	3700	28000	7.56	13300	14700	0.9 : 1.105263
Juglot	90	650	7.22	300	350	0.86 :1.166667
Goro	70	350	5	150	200	0.75:1.333333
Total	**5430**	**41200**	**6.992**	**19290**	**21910**	**0.84:1.194069**

Exhibit 4: Demographics of Danyore Valley, Gilgit, 2016



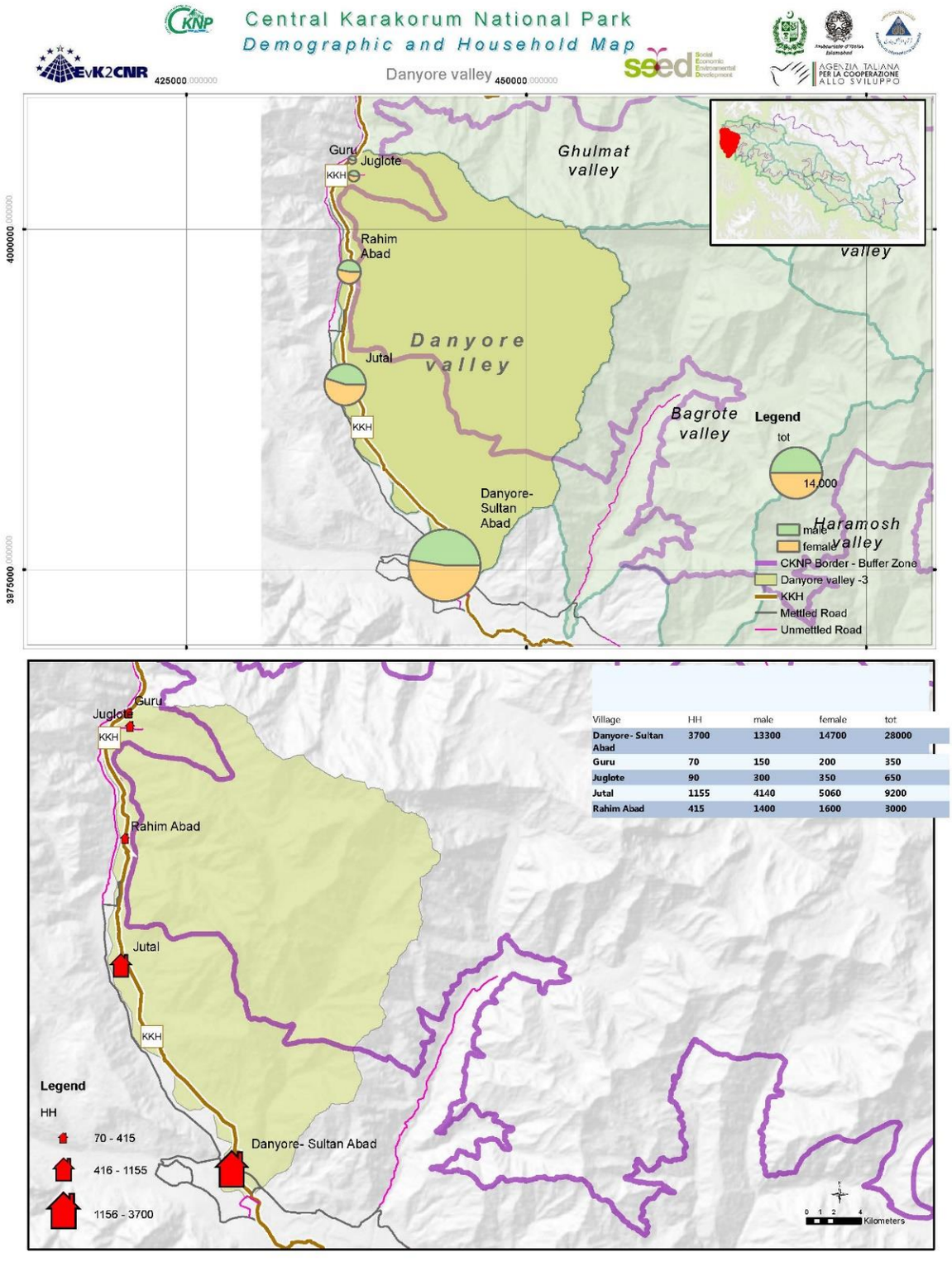


Exhibit 5: Map of Danyore valley

1.5. Socio-Economic Profile of Danyore Valley

1.5.1. Road Accessibility

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. Danyore valley mainly lies beside KKH while Juglot and Danyore are little faraway and linked to KKH by jeep able roads. The KKH is one of world's most important routes and link Pakistan to China, crosses through the GB about 840 km and provides them with a vital link to the rest of Pakistan and contributes majorly to the prosperity of Danyore Valley Education facilities

Being close to KKH Danyore village has the high school both for boys and girls. Inhabitants of other villages access the private and public schools of Danyore village to seek secondary education. Primary and middle school facility is available in the respective villages to ensure access of education to local community.

1.5.2. Health facilities

Basic health facilities in every village of Danyore valley are managed either privately or publicly but owing to limited facilities and unavailability of staff, medicines, state of art equipment people are forced to access Gilgit rural health center, public, private or military hospitals, depending upon their financial situation and availability of beds. Rural Health Centre and Civil Dispensary are managed by Health Department of Gilgit with staff comprising of a Dispenser. Few health facilities managed by individuals and charitable organizations like Sehat Foundation are also functional in area. There is Aga Khan Health Centre and a civil dispensary at Juglot which is managed by Health Department of Gilgit with staff comprising of a Dispenser only. In Goro there is only first aid post in the village; patients visit Rahim Abad Civil Dispensary for treatment or Gilgit city.

Amid open discussions, ladies referred an increment in the rate of respiratory illness and skin hypersensitivities. Particularly pregnant ladies and young kids are more inclined to fall prey to these ailments. An overall decline in health is reported during group discussions in both genders as compared to past. Disease appearance in community is attributable to seasonal shift, poor health facilities and several other environmental pressures.

1.5.3. Veterinary facilities

Veterinary facilities like dispensary is available only in Danyore and Rahim Abad while rest of villages including have to seek animal health facilities from these two villages lying at a distance of 3 to 12 km approximately from their respective villages (Exhibit No. 6). Most frequently occurring diseases in livestock are Goat pox, Interotoxemia (Goat, sheep and cattle), Black quarter, Mange (Large animal's cattle, yak, zo and zomo) as mentioned by local community and Livestock department, Gilgit-Baltistan. Presently, there are only two animal health units in the valley therefore the availability of veterinary doctors, vaccines, and equipment for diagnosis is integral but unfortunately these centers have limited basic facilities which make the contagious disease spread easier and accentuates the livestock mortality.

Exhibit 6: Socio-economic profile of Danyore Valley

Villages	Education facilities				Health facilities		Veterinary facilities	Electricity
	Category / Level	Ownership	Geographic Location	Gender	Facility	Geographic Location		
Jutal	Middle	Govt. and private both	36°55'04.9'' N 74°23'32.6'' E	Both girls and boys	Dispensary	36°02'27.6'' N 74°17'56.1''E 1569 m asl	Community take their livestock to Rahim Abad vet facility	Yes
Rahim Abad	Middle	Govt. and private both	36°06'21.7'' N 74°18'02.9'' E 1740 m asl	-do-	Dispensary	36°06'19.9''N 74°18'01.9''E 1713 m asl	Dispensary	Yes
Danyore /Sultanabad	High	Govt. and private both	36°55'04.9'' N 74°23'32.6'' E 1512 m asl	-do-	Dispensary	36°53'41.0''N 74°26'07.0''E 1499 m asl	Dispensary	Yes
Juglot	Primary	Private only	36°10'49.9'' N 74°18'06.6'' E 1973 m asl	-do-	Dispensary	36°10'49.0''N 74°18'06.4''E 1975 m asl	Community take their livestock to Rahim Abad vet facility	Yes
Goro	Primary	Private only	36°10'50.3'' N 74°18'18.7'' E 1982 m asl	-do-	As there is no basic health center except first aid post therefore community access to dispensaries of Rahim Abad and Danyore	--	Community take their livestock to Rahim Abad vet facility	Yes

1.5.4. Electricity

Present electricity generation is 90MW but the conservative demand has reached up to 528MW which is expected to escalate till 863 MW by 20305 (GB Water and Power Dep., 2016) All the villages in Danyore valley has the access to electricity facility provided and managed by Water and Power Department, GB but supply-demand lapse is managed by load shedding (Exhibit No. 4). 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.

1.5.5. 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.

There is a LSO working in Danyore valley named as LSO-Danyore. Varied sort of opinions from community regarding the performance of LSO have been reported during interviews. Local community seems satisfied with LSO performance in projects but during the unavailability of projects LSO's remains dormant. Other community-based organizations working in the villages are as under.

Danyore: Along with LSO Danyore other social organizations working in the village are: Village organization, Women organization, Youth organization and Valley Conservation Committee

Jutal: Along with LSO Danyore other social organizations working in the village are: Village organization, Women organization, Valley Conservation Committee and a religious student organization.

Juglot: Only one women organization Zehra Tanzeem is working.

Goro: One village organization and women organization are working only. The opinion from the community was that the people do not cooperate with social organizations.

1.5.6. Gender Impact

The social and cultural set-up did not levy much on women in Danyore valley unlike other CKNP valleys. The underlying facts are its vicinity to Gilgit city and foreign community that has majorly came from other areas of GB. The social and cultural environment evolved and allowed the women education and jobs along with the house hold activities. Number of female populations is slightly higher than male population in the whole valley. Women are involved in agricultural activities, tending to livestock, wood and water collection. With the evolution of culture, importance of females in other departments has also been acknowledged by the local community and inclination towards teaching, corporate and managerial jobs have been increased.

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 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

Danyore valley is rich in fresh water resources and mostly villages divide these channels according to the customary rights which creates an atmosphere of the unfair distribution. In Jutal and Danyore water is scarce while sufficient in others. New settlements/villages have the less water share as compared to the old villages. The water shortage during winter also fuels the issue and highlights the mismanagement of water governed by the customary rules. These rules are not documented and neither available to common man of the local community. It is recommended that statutory rules should be devised for the division of water resources.

2.3. Agriculture

Danyore community has consequently developed a wide range of mechanical and biological measures, largely through trialing several procedures along time since decades from natural environment and in consistence with prevailing factors for mitigating small sized land, mountainous patches, rocky structures, traditional varieties of seeds, fertilizers, fluvial and Aeolian effects. These measures allowed the community to adapt into the environment.

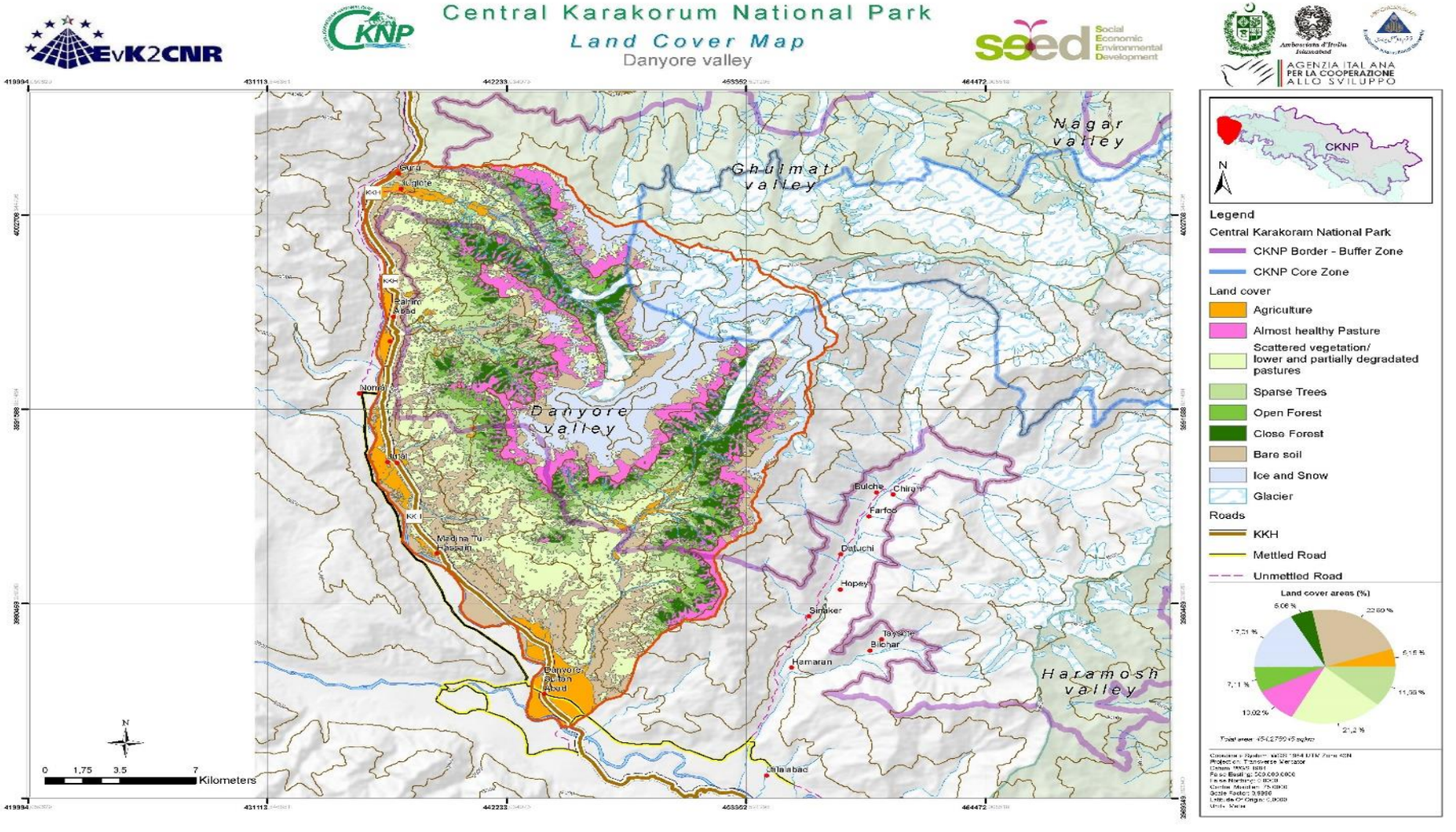


Exhibit 7: Land cover map of Danyore

These adaptations are predominantly imperative because their temperate influences produce amiable and pleasant conditions that are critical for provision of a healthy environment, increased crop and livestock yields and monetary profits for subsistence.

In Danyore 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 Danyore valley to avoid erosion and increase in fertility.

Two types of agriculture systems naming subsistence and commercial agriculture are common in the local community. Production of wheat, barley, fodder is as limited as their family's need playing a key role in ensuring household food security, while potato, apricot, almond, and walnut are notable cash crops for the farmer and generates good amount of profit (Exhibit No. 5). Danyore/Sultanabad valley community is majorly at advantage due to NLI market and other commercial products avenues of agriculture at Gilgit.

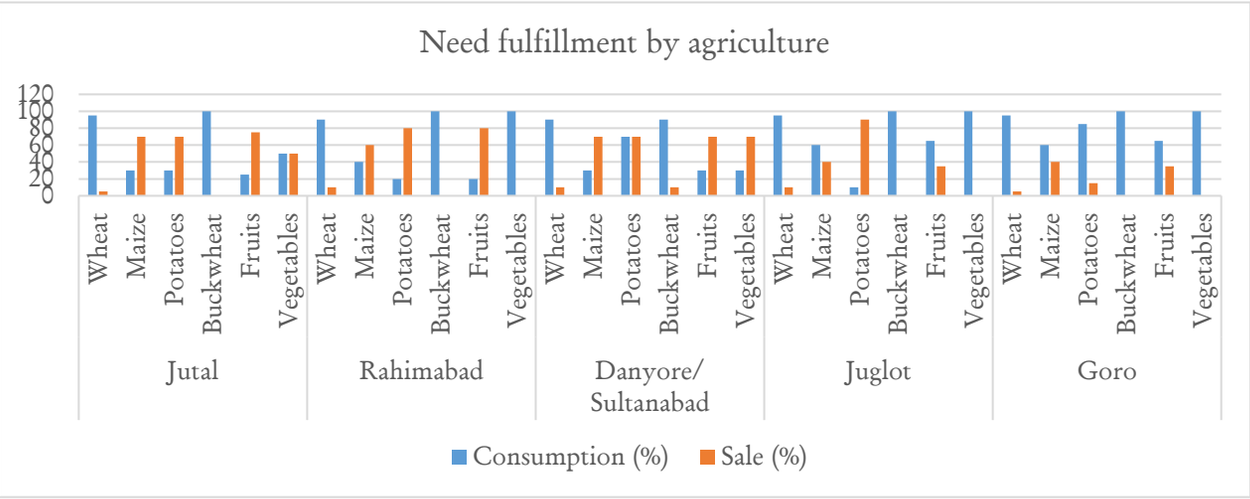
As population is increasing day by day so traditional agriculture farms are not able to meet the demand. Also land pieces divide further due to distribution of assets among heirs. Added to these, weather conditions are often adverse and can result in total or partial crop failure from hail, flood or landslide. To rectify these problems local community is reclaiming the natural mountainous patches and replacing the natural flora with agricultural crops as fast as the increasing population. This process reflects an unsustainable approach of the local community towards management of natural resources.

Exhibit 8: Economic benefits of agriculture production

Village	Crops	Consumption (%)	Sale (%)	Av. Income/HH	Av. Value/HH/yr.
Jutal	Wheat	95	5	55000	78000
	Maize	30	70		
	Potatoes	30	70		
	Buckwheat	100	0		
	Fruits	25	75		
	Vegetables	50	50		
Rahimabad	Wheat	90	10	82000	100000
	Maize	40	60		
	Potatoes	20	80		
	Buckwheat	100	0		
	Fruits	20	80		
	Vegetables	100	0		
Danyore/ Sultanabad	Wheat	90	10	53262.5	72688
	Maize	30	70		
	Potatoes	70	70		

	Buckwheat	90	10		
	Fruits	30	70		
	Vegetables	30	70		
Juglot	Wheat	95	10	80000	95000
	Maize	60	40		
	Potatoes	10	90		
	Buckwheat	100	0		
	Fruits	65	35		
	Vegetables	100	0		
Goro	Wheat	95	5	60500	117500
	Maize	60	40		
	Potatoes	85	15		
	Buckwheat	100	0		
	Fruits	65	35		
	Vegetables	100	0		

Exhibit 9: Need fulfillment by agriculture in Danyore Valley, 2016



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 are adaptation strategies for livestock herding. However, the livestock population highly depends on pastures of Danyore valley due to insufficient fodder from the agriculture fields. Moreover, the pastorals also collect the huge amount of fodder from pastures and range lands during late summer and autumn season for the over-wintering.

Danyore valley lies between the elevation ranges of 15,000-20,000m asl, which is an ideal ground for xeric vegetation and *Artmesia spp.* shrub land occasionally with scattered Juniper stands. Juniper stand density is low and stand dynamic is slow (scatter regeneration) as observed during

the survey of the area. Fresh saplings of xeric vegetation are preferred by both the domestic and wild goats and sheep, while Artemisia provides forage during the autumn and winter when fresh fodder is occasional. Livestock rearing trend decreased considerably during last ten years owing to less economic return for the following reasons.

1. Most working class of today have grown up and been educated. Many of them never return but stay in town and join alternative livelihood options.
2. Danyore valley although have prolonged summer and short winter as compared to other CKNP valleys but still the pasture reserves of the area do not provide enough fodder for the livestock due to grazing land scarcity and increasing fragmentation. Pastorals faces scarcity of fodder for livestock due to which animals produce a reduced amount of meat. Weak animals cause the economic capsizal for the owner and discourage the herding practices.
3. Pastorals are aware of changing climate but they 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.
4. Disease spread is common and frequently spreads from shared places such as grazing areas such as pastures, water points and other such places. It benefits the infectious agents to spread quickly and infect healthy animals. Pastorals can't avoid the situation owing to insufficient fodder production from their farms. This condition becomes worse when precautionary measure of such zoonotic diseases is unknown and allow the exponential blowout of infectious agents from diseased animals.
5. The common livestock in this low-lying valley is goat and sheep particularly due to scarcity of fodder and unavailability of vast pastures. These animals required less forage than large animals such as cattle, yaks, donkey and mules. Being small sized they provide less economic return as compared to large animals and discourage herding practices.
6. There is huge dependence of livestock on the pastures for fodder. With the increase in human population and ultimately livestock population the pressure on pastures have been increased, subsequently both size and 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.

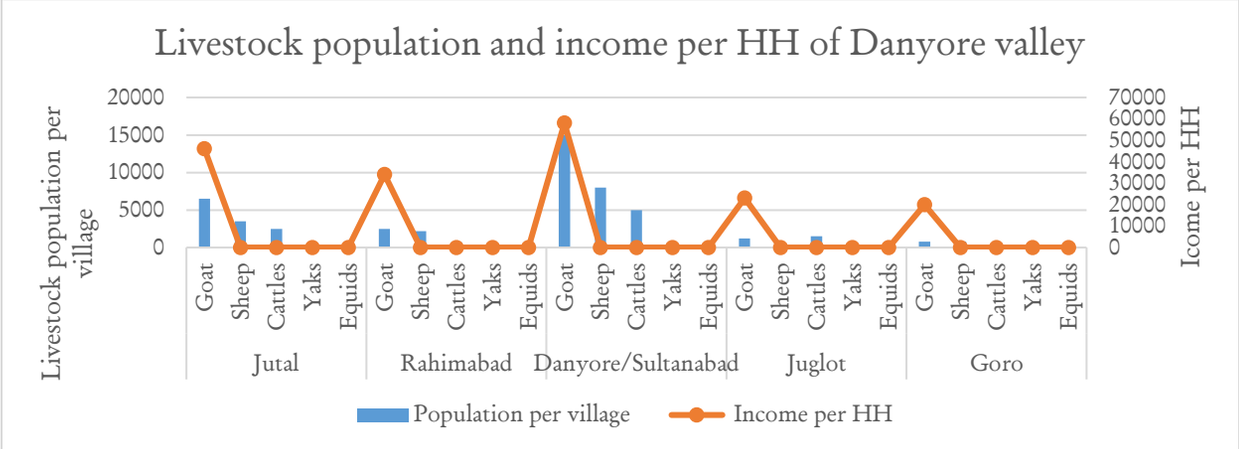
The observed decree in the livestock rearing has both positive and negative impacts. The need is to assess the direction of adaptations towards the actions that are more suitable for natural resources and its components. On one hand decreasing trend in livestock rearing is useful as it reduces the pressure on the pastures, by leaving space and food for the wild herbivores such as Markhor, Ibex, and several small rodent species and ultimately increasing prey density for wild carnivores. But on the other hand, decreased economic incentives by livestock in annual income per household increases the dependence of local community on the wood and non-wood products. This dependence of 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 make 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 10: Contribution of livestock in economics of Danyore Valley

Villages	Kind of livestock	Population per village	Av. Income per HH	Rearing trend
Jutal	Goat	6500	46000	Decrease
	Sheep	3500		
	Cattles	2500		
	Yaks	60		
	Equids	0		
Rahimabad	Goat	2500	34000	Decrease
	Sheep	2200		
	Cattles	700		
	Yaks	0		
	Equids	0		
Danyore/Sultanabad	Goat	15000	58000	Decrease
	Sheep	8000		
	Cattles	5000		
	Yaks	20		
	Equids	0		
Juglot	Goat	1200	23000	Decrease
	Sheep	500		
	Cattles	1500		
	Yaks	0		
	Equids	0		
Goro	Goat	800	20000	Decrease
	Sheep	800		
	Cattles	600		
	Yaks	150		
	Equids	0		

Exhibit 11: Livestock population and income per HH of Danyore Valley, 2016



2.5. Pastures

Animal rearing dominates land use with pastures and water management being guided by customary rules in Danyore Valley. Sometimes pastures are shared by the neighboring villages if it borders two or more villages. Local community depend upon pastures for livestock herding, fuel wood collection, medicinal plants harvest, honey and other consumable products on the basis of rights to access.

Local community reported horizontal and vertical transhumance patterns in the area during FGD interviews. Horizontal transhumance patterns take place with seasonal moves of livestock herds from the plains of upper Punjab to mountainous pastures of Gilgit-Baltistan via Azad Kashmir, during late spring and summer, and returning back at the beginning of autumn. This trend shows that pastures harbor the livestock from local as well as nomads from far flung areas too ultimately increasing the pressure and decreasing productivity.

Local pastorals at Danyore exhibit vertical transhumance patterns with seasonal movements from top mountain pastures to downside. Vertical transhumance either guided by shepherd or family members is customary practice to avoid grazing of livestock on fields. During springs, when the fields are ploughed and grains are sowed. Consequently, household's livestock is moved out of villages to the lower pastures, free of snow, to protect cultivated areas from animal browsing. As the season advance, livestock is gradually moved at higher elevation to the summer pasture (July-August) above the timberline (4500 m a.s.l.). In the meantime, crops are grown and finally harvested. Then, livestock gradually return to lower pastures and to stables at village levels (November). There, they will stay during all winter (November – March) until successive spring, feeding on the crop residuals and hay collected during summer stored and dried by the households. Farm protection from browsing prior to its movement during early spring, linear hedge of Russian olives is common on the terraces of agriculture patches.

It is customary to keep all the dairy products as a payment or exchange the 50% for a certain amount of grains in the case when livestock is herd by shepherd in the pasture. Such pastures have only few huts in them. Contrary to it, villages where number of animals is not very large,

several families might join together their livestock, each keeping them for one/two weeks or pre-settled time. Usually several huts are located in such pasture zones.

Another customary practice exercised to avoid the livestock of the neighboring villages which don't have access rights on particular pasture is the penalty. If livestock of one village moves to pasture of neighboring village intentionally then penalty has been fixed by village community according to the loss.

At present, highest concentrations of livestock fed upon pastures of Danyore village. The FGD interviews indicates that only 30% pastures of Danyore valley are healthy while other 70% are degrading gradually. Decline in health of pastures is direct indicator of unsustainable harvesting practices due to increasing local population (Exhibit No. 11) fueled by climate change.

Uncontrolled grazing and other consumable products irrespective of decreasing productivity allows 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. An increase in livestock population is a factor of human population increase in these semi-urban and rural settlements which shows an increased dependence on the natural resources.

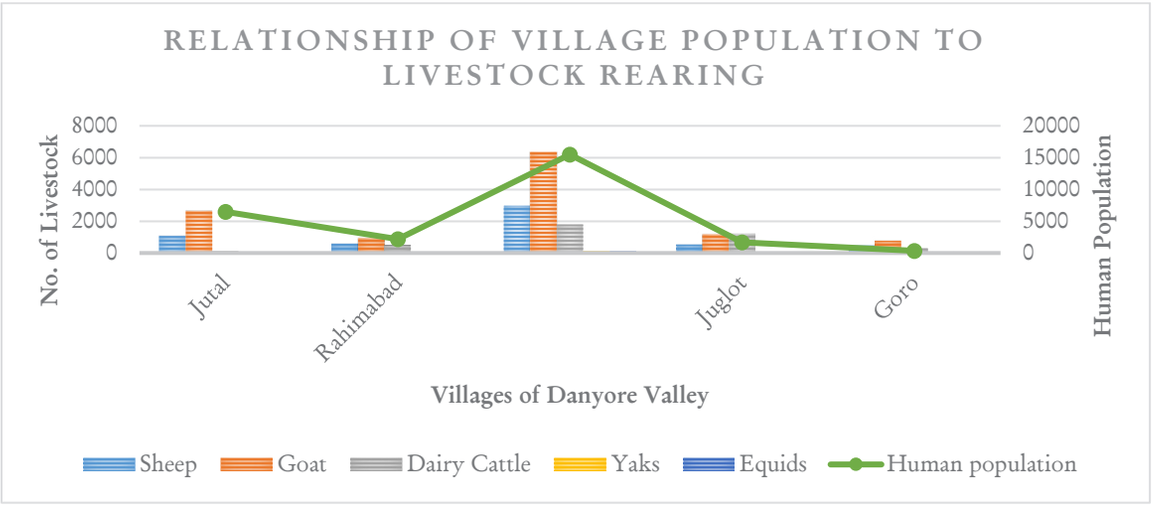


Exhibit 12: Relationship of human population to livestock grazing at Danyore Valley

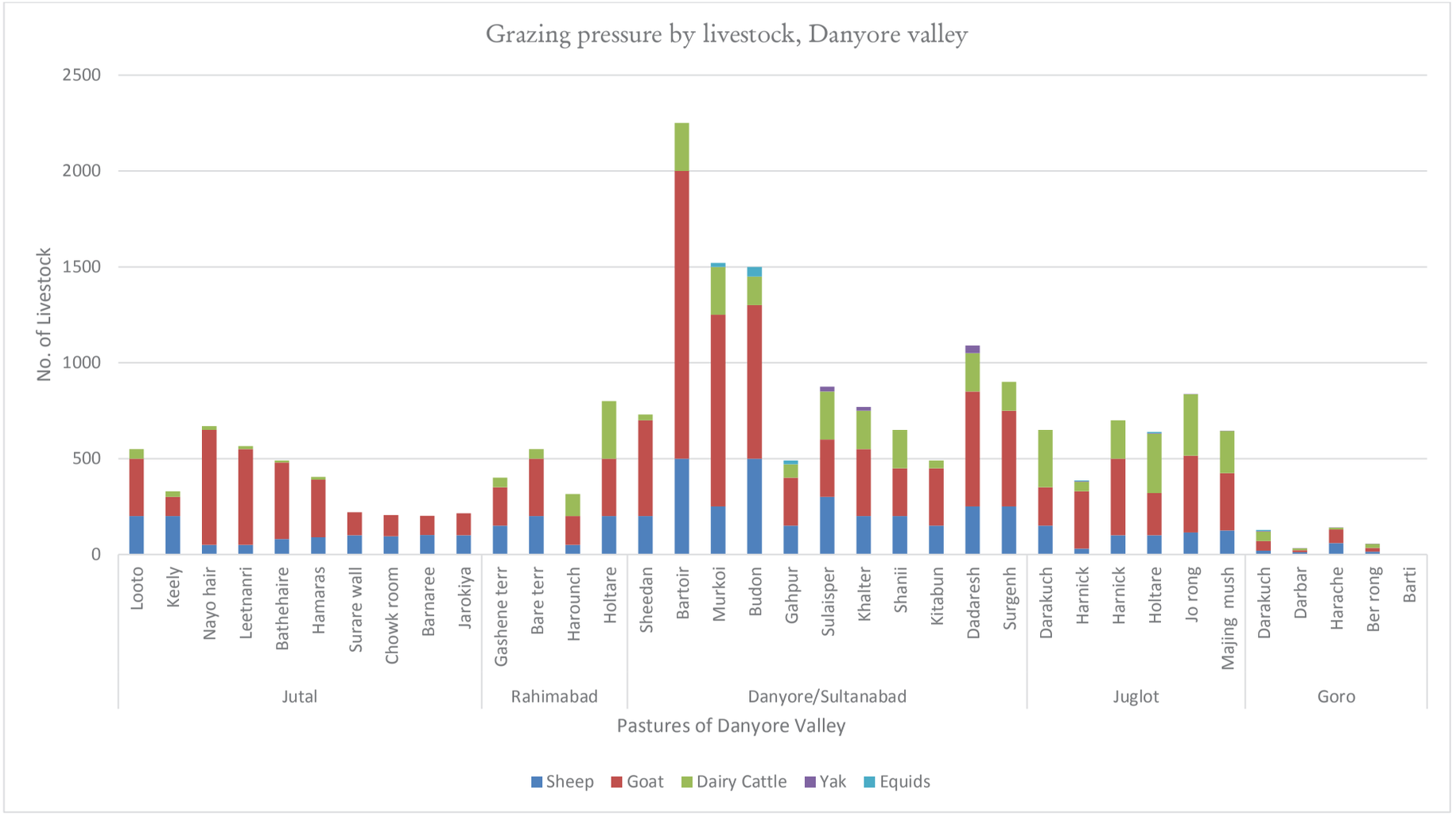


Exhibit 13: Livestock grazing at Danyore Valley

Exhibit 14: Assessment of grazing pressure from each livestock classes on pastures of Danyore Valley

Pastures	Village	Other Uses	Status	Grazing Period	Livestock Classes					
					Sheep	**Goat**	**Dairy Cattle**	**Yak**	**Equids**	**Total**
Looto	Jutal	Fuel wood and Medicinal herbs	PD	Apr-May Oct-Nov	200	300	50	0	0	550
Keely					200	100	30	0	0	330
Nayo hair					50	600	20	0	0	670
Leetnanri					50	500	15	0	0	565
Bathehaire					80	400	10	0	0	490
Hamaras					90	300	15	0	0	405
Surare wall					100	120	0	0	0	220
Chowk room					95	110	0	0	0	205
Barnaree					102	100	0	0	0	202
Jarokiya					100	115	0	0	0	215
Gashene terr	Rahimabad	Fuel wood, Mdicinal herbs, Tumuro/Salajeet			150	200	50	0	0	400
Bare terr					200	300	50	0	0	550
Harounch					50	150	115	0	0	315
Holtare					200	300	300	0	0	800
Sheedan	Danyore Sultanabad	Fuel wood, Mdicinal herbs, Tumuro/Salajeet	H		200	500	30	0	0	730
Bartoir					500	1500	250	0	0	2250
Murkoi					250	1000	250	0	20	1520
Budon					500	800	150	0	50	1500
Gahpur					150	250	70	0	20	490
Sulaisper					300	300	250	25	0	875
Khalter					200	350	200	20	0	770
Shanii					200	250	200	0	0	650
Kitabun					150	300	40	0	0	490
Dadaresh					250	600	200	40	0	1090
Surgenh					250	500	150	0	0	900

Darakuch	Juglot	Fuel Wood and Morel Collection,	PD		170	250	350	3	5	650
Harnick					100	400	200	0	0	700
Holtare					70	200	250	0	0	520
Jorong					100	200	250	0	0	550
Majing mush					110	200	200	0	0	510
Darakuch	Goro	Fuel Wood Collection	PD		20	50	50	3	5	128
Harnick					30	300	50	2	4	386
Holtare					300	20	60	2	7	389
Jo rong					15	200	70	2	0	287
Darbar					12	10	10	1	0	33
Harache					60	70	10	1	0	141
Ber rong					15	20	20	1	0	56
Barti		Abandoned								

2.6. Fuel Wood Collection/ Timber Harvesting

Danyore valley which lies at southern side of CKNP has comparatively rich forest as compared to northern sides of CKNP but among the southern valleys it is barren and only 29.9 km^2 is under vegetation and its average ABG is 133,206 Mg or 4460.6 $MgKm^{-2}$ and CAI of 852.7 Mg/year (Ferrari, 2014). The natural forest around Danyore comprised of 70% Junipers, 20% coniferous and 10% broad leaves and also the artificial plantation sites of *Populus* spp. 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 has made poplar a commercially valuable energy crop. Poplars also produce higher amounts of energy than other feed stocks and are predicted to displace more gasoline and diesel than shrubs and other crop remnants (Adler *et al.,* 2007). Walnut (*Juglans regia*) is a slow growing tree with approximate increment of 1m in diameter per 60 years (Sheikh, 1993). It is also cultivated on the private lands for valuable timber and fruits. Old apricot trees which have low productivity either due to age or disease are also harvested for same purpose. Among the natural forest community depend upon slow growing juniper species both for timber and fuel wood, Artemisia, Sea buckthorn and other vegetation.

The preferred firewood is Junipers, which has less dense stand in Danyore and very slow growing, followed by shrubs, Artemisia roots, dung and riparian vegetation (as Sea buckthorn) all important component of household fuel portfolio. Additionally, fruit trees pruning residuals are often being used. 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 then the consumption of 32% natural flora annually will soon turns the forest areas into barren lands. Our data collected during the survey reports that approximately 41,200 people living alone in Danyore valley harvests about 25,762 kg/year/household of the natural resources and 271 kg/year/household from natural forest or 18,970 kg/year/valley is acquired from natural forests as fuel. Fuel wood harvesting from forest is done by Goro only. Natural plantation contributes to 32% of the basic needs of Danyore Valley. Exhibit 13 is reflecting the behavior of local community towards the natural resource exploitation. Juglot located at highest elevation in Danyore valley and close to forest area do not prefer alternative fuel sources and consumes up to 6666.6 kg/year/household while Rahim Abad that is low lying and located far away from the forest consumes only 180 kg/year/household and depends upon alternative fuel sources. Goro which is small village of only 70 households near forest area is located at the same elevation as Rahimabad consumes 2000kg/year/household of fuel wood with no preference to alternative resources other than fuel wood. Such a huge dependence on the natural resources disturbs the ecosystem balance and push the ecosystem to unsustainability.

As a consequence of ever-increasing population villages are expanding and thus construction of settlements/houses is also on rise. The timber for construction purposes is either purchased from Gilgit timber market or from natural/artificial plantations (Exhibit No. 14). Average

annual timber wood needs per household, obtained from the plantation has been estimated to be 500 Mg per household per year in forest poor villages such as Danyore valley where no regulations upon timber collection exist (Ferrari, 2014). From a large tree, locals usually obtain around 50 logs. The value of a large tree harvested, divided into logs and transported to the nearest city (Gilgit), can vary between 100,000 Rupees (Picea) and 125,000 (Pinus).

Customary laws are being followed in the valley for exploitation of natural resources. They allow the collection of fuel wood and timber up to need basis only. Although it does not allow sale of timber but illegal transport is being done to the nearby markets. These laws also not address the maximum amount of wood harvest from the buffer area. Moreover, customary laws have no rules regarding the types of floral species that can be harvested therefore juniper conservation is becoming an issue. Juniper is harvested extensively by local community without taking into consideration its slow growth. There are several other gaps in customary laws which provoke the need of revitalization of these 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 (Melo *et al.*, 2013)[1] and incorporate the findings into laws to ensure sustainable and healthy environment in order to mitigate the haphazard changes of climate.

Exhibit 15: Timber harvesting and use at Danyore Valley

Village	Houses constructed in last 5 years (2010-2015)	Number of trees used	Tree species used
Jutal	15	05	Poplars, Walnut, Juniper
Rahimabad	36	04	Poplars, Walnut, Juniper
Danyore/Sultanabad	250	06	Poplars, Walnut, Juniper
Juglot	25	04	Poplars, Walnut, Juniper
Goro	49	05	Poplars, Walnut, Juniper

Exhibit 16: Summary of seasonal fuel wood harvest and consumption in Danyore Valley

Village	HH	Consumption per HH (Mg)			Consumption per Village (Mg)		
		S	**W**	**Total**	**S**	**W**	**Total**
Jutal	1155	1.56	2.27	3.83	2627	743	3370
Rahim Abad	415	0.12	1.67	1.79	25	50	75
Danyore/ Sultanabad	3700	0.74	1.49	2.23	1377	2754	4130
Juglot	90	1.98	4.00	5.98	360	240	600
Goro	70	1.20	1.67	2.87	56	84	140

[1] F.P.L. Melo, V. Arroyo-Rodríguez, L. Fahrig, M. Martínez-Ramos, M. Tabarelli. On the hope for biodiversity-friendly tropical landscapes, Trends Ecol. Evolut., 28 (2013), pp. 462–468.

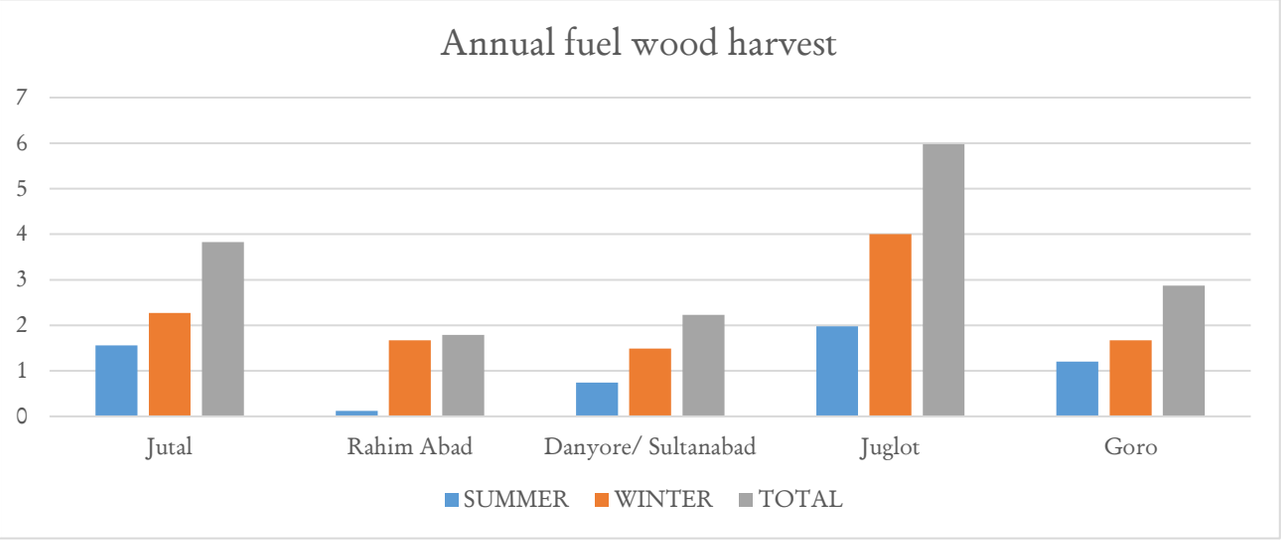


Exhibit 17: Annual fuel wood harvest, Danyore valley

Exhibit 18: Details of fuel wood harvested from several sources per household

Villages	Jutal		Rahimabad		Danyore/ Sultanabad		Juglot		Goro		Total (kg)
Suorces	**W (kg)**	**S (kg)**	**W (kg)**	**S (kg)**	**W (kg)**	**S (kg)**	**W (kg)**	**S (kg)**	**W (kg)**	**S (kg)**	
Artemisia	14	06	0	0	200	80	580	0	70	34	984
Sea buckthorn	0	0	0	0	290	110	0	0	160	40	600
Shrubs/Grasses	360	140	117	63	0	0	360	140	157	68	1584
Dung	40	20	0	0	217	103	40	20	0	0	2184
Natural forest	-	-	-	-	-	-	-	-	176	95	271
Fruit trees	350	150	756	324	535	265	576	224	450	150	3780
Other riparian vegetation	33	08	84	36	223	105	-	-	140	60	689
Plantation	-	-	574	246	145	55	315	105	312	88	1840
Market	477.3	320	-	-	-	-	-	-	-	-	949
Total	1497	573	1531	669	1610	718	1871	489	1465	535	**12881**

2.7. Mining

The presence of unique and specialized geological features designates the entire region of GB having most suitable geological environments as compared to the rest of the world where mineral deposits of economic grade are being extracted. These include metallic, non-metallic, energy minerals, precious/dimension stones and different rocks of industrial use. Adequate deposits of dimension stones are found in Ghizer, Skardu, Hunza/Nagar and Gilgit Districts, besides serpentinite deposits at District Skardu. Presently these are being mined using indiscriminate blasting techniques which not only destroy this natural resource but also result wastage of more than 75% of the total yield. Mining sector contributes a lot to the household economics of the local community but no such activities are reported at Danyore valley during the interviews.

2.8. Tourism

Tourism can be vital source of revenues and employment if appropriate revenue-sharing mechanisms are put in place to enhance the benefits for local communities and pro-poor impacts of tourism (Hamilton *et al.*, 2007)[2]. Almost 40% of Gilgit-Baltistan is protected legally to conserve natural landscapes, endemic, unique, rare and endangered biodiversity along with cultural aspects. These protected areas are ideal places to address the wide-ranging interests of the tourists. The Chinese Graveyard or cemetery remains an important visitor attraction situated in Danyore, 10 km away from Gilgit. This cemetery has almost 5,000 graves of the workers that were killed due to landslides and falls during the construction of Karakorum highway during 1980s. Another attraction is the trekking route to Rakaposhi via Juglot. This way is rarely used by the tourists therefore comprising all the porters, guides and other services economic incentive is little. The CKNP Use Right shares 3.6% of CKNP entry fee as the share of Danyore valley in CKNP MP.

[2] Hamilton, K. and Pavy, J.M. (2010), 'Unlocking the potential of tourism in Zambia', in: Private Sector Development, 7th issue.

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

The global climate change risk Index 1993-2012 has ranked Pakistan 12th in the list of countries most effected by climate change (UNDP Project Brief, 2016). 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.

3.1. Climate Change in the Perspective of Indigenous Knowledge

People at Danyore 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

Gradual increase in temperature has been reported by local community during last 30 years the most visible evidence of temperature increase is the earlier melt out of snow cover and glaciers across the region. Trend analyses of the historical data for the period 1955-2010 show that winter season temperatures have increased in this region during the past 55 years (Raza,

2015). 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. Danyore valley hardly gets snow itself but due to less snow at the tops the area water quantity declines in the area

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.

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.

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 23% since last 30 years. However, the flood frequency is also reported to be increased by the local community by 27% since last 30 years.

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 (34%) since last 30 years. 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.

Exhibit 19: Climate change at Danyore Valley in the perspective of indigenous knowledge

Factors	Status	Change (days/ % age)	Trend		
			10 y ago (2006)	30 y ago (1985)	Future prediction
Rain	Increase	25	Increase	Less rains as compared to present	Increase
Snow	Decrease	45	Decrease	More snow as compared to present	Decrease
Temperature	Increase	15	Increase	Less as compared to present	Increase
Summer season duration	Increase		Increase	Summer starts early and ends late. Temperature is comparatively high in summer now a day	Increase
Winter season duration	Decrease		Decrease	Winter starts late and ends early. Winter is not as colder as it was before.	Decrease
Glacier recession	Increase	20	Increase	Glaciers were stable	Increase
Land slides	Increase	34	Increase	They were not frequent as now	Increase

Flood frequency	Increase	27	Increase	Less flood as compared to present	Increase
Flood magnitude	Increase	23	Increase	Less magnitude as compared to present	Increase
Drought	Increase	29	Decrease	Less drought as compared to present due to less snow	Increase
GLOF	Never occurred				

3.7. Pastures

The global temperature is increasing and in Earth's alpine regions signs of climate change can already be observed visually by the melting of the alpine glaciers (Oerlemans, 2005) or upward migration of plant species (Grabherr *et al.*, 1994). As pasture areas at alpine and sub-alpine levels are shaped by extreme climatic conditions such as a long-lasting snow cover and a short vegetation period therefore such ecosystems are expected to be highly vulnerable to global environmental change. Alpine plant species have been migrating upward (Walther *et al.*, 2005; Sanz-Elorza *et al.*, 2003) and the tree line has expanded to higher elevations (Gehrig-Fasel *et al.*, 2007; Shiyatov *et al.*, 2007).

Regional climate scenarios for CKNP valleys shows prolonged growing seasons and shifts in temperature and precipitation as currently happening in the valleys around CKNP are likely to affect plant phenology and growth. 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 37% degradation has been observed. However mid and low land grazing areas have declined 31%.

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 (Hagedorn *et al.*, 2009). Since a higher amount of carbon is stored in soils than in the aboveground biomass above tree line (Devi *et al.*, 2008; Kammer *et al.*, 2009) this indicates that alpine ecosystems may turn into carbon sources rather than sinks.

Exhibit 20: Impact of climate change at pasture of Danyore Valley in the perspective of indigenous knowledge

Pastures	Status	Change (days/ %age)	Trend			Adaptation Measures by local community
			10 y ago	30 y ago	Future prediction	
Alpine and sub-alpine pastures	Degrading	37	Degrading	Less degraded as compared to present	More degradation	Don't reduce the number of livestock due to unavailability of alternative grazing areas but restrict the use of degrading areas in the pastures. Use of supplement feed for livestock
Mid and low land grazing	Degrading	31	Degrading	Less degraded as compared to present	More degradation	

3.8. Biodiversity

3.8.1. Crops 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 Danyore. 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.

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 Danyore 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 Danyore valley represents a mix of woody

and non woody vegetation. Major floral species are Pine, Junipers, Poplar, Fraxinus, Olea, Berberis, Wild Rose, Cotoneaster, Sea buckthorn, Artemisia, Stipa.

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 Danyore 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 nullahs 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 Danyore 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 Danyore valley, faunal biodiversity which was once common is now at decline. Ranging from trophy species such as Markhor and Ibex irrespective of conservation efforts the number is continuously decreasing. It indicates that either climate is posing pressure on the survival of species or species may have the difficulty in adapting to the changing climate. In either case comprehensive study is required to assess the breeding potential and adaptability of the species in changing climate.

Considering the birds and butterflies it has 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 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 Danyore 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.

3.8.4. Fishery

Climate change is likely to affect fisheries and aquaculture, their dependent communities and related economic activities along three main pathways. Many fisheries-dependent communities already live a precarious and vulnerable existence because of poverty, lack of social services and essential infrastructure. The fragility of these communities is further undermined by overexploited fishery resources and degraded ecosystems. Danyore valley is not dependent on the fishery for subsistence and therefore local community has no idea about the impact of climate change on the fishery. The implications of climate change for food security and livelihoods in the neighboring community of Danyore are need to be evaluated.

Exhibit 21: Climate change at Danyore Valley in the perspective of indigenous knowledge

Biodiversity	Status	Altitudinal Shift	Trend			Adaptation Measures by Local Community
			10 y ago	**30 y ago**	**Future Prediction**	
Agriculture crops and fruit trees	Degrading	N/A	New pest varieties have been reported	Pests and crop infections were not frequent Artificial fertilizers were not required	Weeds will become common Irregular precipitation patterns will lead to productivity decline	Increase in cropping area by levelling to enhance productivity Use of pesticides has been increased to remove pests
Natural Forest	Degrading	Reported for some non woody vegetation	Degrading	Forest patches were dense and healthy	More degradation	No adaptation yet
Wildlife						
Ibex	Decreasing	Increasing	Less population due to hunting and habitat shrinkage	Population was good in number	Population will increase due to the conservation efforts	Poaching and Illegal hunting is controlled due to trophy hunting initiatives but it is not the part of customary laws
Urial	N/A	–	--	--	--	–
Markhor	Decreasing	Increasing	Population was good and is increasing continuously	Population was so less that it was rarely seen	Population is increasing but at low rates than it should be	Illegal hunting and poaching has been controlled to ensure the population increase

Biodiversity	Status	Altitudinal Shift	Trend			Adaptation Measures by local community
			10 y ago	**30 y ago**	**Future prediction**	
Birds	Decreasing	–	Bird population and diversity was less	Population and diversity was good	Bird population can either decrease due to removal of natural vegetation or it can be expected to increase due to increase in their prey	No adaptations
Butterflies	Decreasing	–	Due to absence of flowering plants butterflies are no more common	Butterflies of several types were common	They will decrease because of land erosion and shrinking of natural vegetation areas	Not adaptation has been done yet
Fishery	N/A					

3.9. Water

GB is the largest fresh water reservoir of Pakistan due to high precipitation rates. Owing to the recent climate changes the water availability has been changed. Snow fall has declined up to 45% according to the perception of local community but rain fall has increased. 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.

3.10. Tourism

Mountain areas are sensitive to climate change. Implications of climate change include less snow, altered rain timings, receding glaciers, melting permafrost and more extreme events like landslides. However, climate change is a severe threat to snow related sports such as skiing, snowboarding and climbing. 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. Danyore valley is not a tourism dependent because of lack of tourist attractions and facilities.

CONSERVATION MANAGEMENT ISSUES & PROBLEM OF DANYOR VALLEY

4. MANAGEMENT ISSUES AND PROBLEMS

The Intergovernmental Panel on Climate Change (IPCC) believes that climate change has already contributed to increases in annual precipitation, cloud cover and extreme temperatures over the last 50 years. It suggests that it in order to develop an effective strategy for adaptation, it is necessary to understand the vulnerability of each sector to climate change in terms of the nature of climate change, the climatic sensitivity of the region being considered, and the capacity to adapt to the changes. These adaptation approaches must then be disseminated to the communities and relevant laws up-gradation. In case of Danyore valley customary laws are being practiced in almost all sectors. These laws are unable to sustain and address the suitable practices and continuously generating issues, therefore needs an up-gradation and must be in line with the statutory laws.

4.1. Agriculture

Only 1 % arable land is available in Danyore valley which is cultivated 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:** The arable land of Danyore and Sultanabad are continuously shrinking due to its encroachment by expanding human settlement, commercial buildings, especially at Danyore village. This shrinking is being aided by the division of available land of forefathers divide among the generations and declines the agriculture productivity.
2. **Irrigation and water rights:** Customary rights 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. Situation become worse during the winter season which foster low availability of water in streams. Moreover, division of water quantity between old and new villages is also an issue. Newly established villages don't get the water up to the demand and agriculture along with other water dependent sectors get worse effects.
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 Danyore and Sultanabad valleys. 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 Danyore and Sultanabad regions. 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 feeling helpless against the inconsistent weather even they are thinking to abandon growing maize and wheat, and cultivate cash crops like tomato and potato because that are short-duration.

4.2. Pasture

Majority of the pastures of Danyore and Sultanabad 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.

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**.** 70% pastures of 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 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 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 Danyore and Sultanabad 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. Recent kills at Danyore/Sultanabad valley are not reported recently but due to currently non-functional 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:** According to WHO, 80% of the human population of Africa still use medicinal plants in their primary health care. The popularity of herbal drugs is on the constant rise in many developed countries of the world, while in developing countries like Pakistan; medicinal plants contribute significantly to the income sources of people living in the Gilgit-Baltistan. Danyore and Sultanabad pastures and forest areas also have these 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 concept 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 at Danyore and Sultanabad 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 for irrigation. 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 hotels and increasing tourist pressures. 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 unanimously reported about the water quantity as "**Either lot of water or no water**". As an adaptation to this issue they exploit the water points which are often far flung and also take their livestock to such areas. But irrigation becomes an unsolved issue because it demands the on-site availability of water.
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 Danyore and Sultanabad for subsistence purposes at the cost of degenerating forest.
2. **Harvest pressure:** Heavy collection of timber and non-timber products from the forests allow the community to fulfill their needs. With continuously increasing population dependence of local community is also increasing on these natural resources. Majority of Danyore and Sultanabad has open canopy coniferous tree species which are unable to cope with natural changes in climate and also facing threat due to the fuel wood and wild fruits collection. This harvesting is not limited to here only but includes the removal of foliage, branches and plants cutting for livestock forage and morel for commercial purpose 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. 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, designated camping areas, information boards, sign board and other facilities are rarely available.
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.
4. **Winter sports:** Time period is shrinking for skiing and other snow related activities. Rising temperatures is also reducing the viability of winter sports destinations at high altitudes in and around CKNP.

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 27^{tb}, 2012).

This mining provides some of the valleys around CKNP with a good opportunity to earn livelihood. In Danyore and Sultanabad, mining opportunities are not available.

"Lack of alternative livelihood opportunities for communities and uncontrolled mining in mountains are some of the issues that require attention" (Express tribune: June 27^{tb}, 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 Markhor, Urial and Ibex 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 at Danyore and Sultanabad regions 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 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 DANYOR 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 needs four tiers. (i) Technological developments, (ii) government programs and insurance (iii) farm production practices, and (iv) farm financial management.

1. **Population expansions:** Government housing schemes are encroaching the rural and natural areas to accommodate the exponentially increasing population. The relevant planning department ignores importance of arable areas and allow its utilization for buildings therefore shrinking the land. To avoid this 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 only. The little economic innovation lies in the sale of dry fruits and crops such as maize during which million rupees' products waste annually. 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.

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.
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 and out of the buffer zone 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.

5.2. Pasture

1. **Upgradation of customary laws:** Customary practices should be amended in such a way that ensure 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.
2. **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.
3. **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.
4. **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.
5. **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.

6. **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.
7. **Encourage the pasture extension services by other in 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.
8. **Cultivation and marketing of medicinal herbs:** Cultivation of 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.
9. **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.
10. **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.
11. **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.

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 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 the Danyore and Sultanabad, 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 and NTFP

1. **Upgradation 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. **Out-of-forest firewood plantation diffusion:** Keeping in view the unsustainable use of local community, it seems to be important to encourage out-of-forest firewood plantation diffusion, through highly productive and easy to maintain short rotation coppice systems. Those interventions shall be prioritizing in all the villages of Danyore valley where CAI is low and at low elevation villages, where with sufficient watering, production capabilities are higher.
3. **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.
4. **Regulation of timber harvest:** Timber harvesting needs to be managed according to sound silvi-cultural principles as target diameter, planning of harvesting in time and space, specie-

specific treatments for Pinus, Picea and Juniper respectful of the different ecologic needs of these species.

5. **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.
6. **Restoration cum conservation:** Several sustainability practices are being carried out in Danyore and Sultanabad valleys 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.
7. **Adoption of alternative fuel devices:** Incentives in the adoption of fuel-efficient cooking stove should be encouraged instead in high altitude villages in Juglot and Goro where fuel harvest is high due to harsh and long winter season as compared to low lying villages such as Danyore.
8. **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 seems 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 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.

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 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.

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, 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 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

a 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 DANYORE 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 are 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.
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 DANYORE 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
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	Lack of awareness about	2.2.1. Preview the existing capacity of relevant LSOs for the identification of gaps	Suggested for inclusion in revised	All	Urgent	Short term

		local social originations	interventions implementations and subsequent sustainability	sustainability avenues		MP/OP activities			
					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 revised community development plan	Danyore, Rahim Abad	Urgent Urgent Urgent	Long term Short term Medium term
			Lack of access community health facilities		3.1.4. Establishment of new dispensaries	Suggested for inclusion in revised community development plan	Goro	Urgent	Long term
			Unhygienic practices by locals		3.1.5. Awareness conferences about hygienic practices	Suggested for inclusion in revised	All	Urgent	Short term

					3.1.6. Dissemination of brochures and pamphlets to educate community about prevention from sporadic diseases 3.1.7. Promotion of healthy and hygienic practices by women and children through workshops, campaign and social organizations	MP/OP activities			
						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 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 No. 14.2	All Jutal Juglot	Urgent Urgent	Short term Short term
5.	Education	5.1. Curb electricity	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	Rahimabad, Danyore	Medium	Long term
					5.1.2. Creation of new educational facilities	Suggested for inclusion in revised MP/OP activities	Goro, juglot	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 Activity 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	All All Rahimabad	Medium Medium Urgent	Medium Term Long Term Long term
				Less arable land per household	6.1.9. 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 Poor breeds with lesser dairy productivity Lack of proper grazing management regeneration	7.1.1. Improvement of existing vet facilities 7.1.2. Establishment of new vet facilities	Suggested for inclusion in revised MP/OP activities Suggested for inclusion in revised MP/OP activities	Danyore, Rahimabad Jutal	Medium Medium	Medium term Medium Term

			Depredation of livestock by wildlife	with lesser productivity	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	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 8.1.3. Promotion of fodder cultivation on suitable land patches 8.1.4. Awareness of herders/professional shepherd about sustainable herding practices 8.1.5. Revive the use of indigenous grazing system	Suggested for inclusion in revised MP/OP activities Suggested for inclusion in revised MP/OP activities	All All All All	High Moderate High Urgent	Medium Medium term Short term 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 8.1.7. Establishment of enclosure to measure productivity with surrounding pastures	Activity 9.2.1. Suggested for inclusion in revised MP/OP activities	All One healthy/least degraded pasture in whole valley	Urgent Urgent	Long Term 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	Suggested for inclusion in revised MP/OP activities Activity 9.1.3.	All Goro, Juglot, Jutal All All All All	Urgent Urgent Urgent Medium Medium Urgent	Long term Long term Short term Short term Short term

					community guards) to minimize illegal harvest				
10.	Wildlife	10.1. To improve and maintain healthy wildlife population	Unsustainable hunting Habitat degradation Poaching Diseases from livestock resulting in un-natural mortality	Habitat fragmentation and degradation 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	Goro, Juglot	High	Long term
					10.1.2. Improve habitat connectivity in existing fragmented habitats	-do-	Goro, Juglot	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 with inclusion of local SOs	Activity 6.1	All	High	Long Term
					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
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 Skardu – Askoli road 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	Suggested for inclusion in revised MP/OP activities	Goro, Juglot	High	Short term
					11.1.2. Development and dissemination of brochures for interpretation of tourist opportunities	-do-	Danyore	High	Short term
					11.1.3. Water supply, waste disposal and improvement in washroom condition	-do-	All	Urgent	Medium term
					11.1.4. Community based residence and restaurants	-do-	Goro, Juglot	Medium	Medium term
					11.1.5. Establishment of bath rooms, rest area	-do-	Goro, Juglot	Medium	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	12.1.1. Water quality testing from all water channels 12.1.2. Awareness of local community with focus to keep water	Suggested for inclusion in revised MP/OP activities	All	High	Long term

				Waste disposal into water channels	resources clean and its minimal usage				

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 Gilgit, 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 Gilgit and CKNP Directorate. The DFO Gilgit 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 Gilgit and endorsed by the chairman of DCC with recommendations from CKNP Director and DFO Gilgit. The DCC Gilgit 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 Gilgit, 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 Gilgit, 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 Gilgit 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
Bagrot Valley
Central Karakorum National Park
Gilgit Baltistan

Disclaimer:

The opinions and spatial demarcations included in this document are those of the authors and are not endorsed by, nor do they necessarily reflect, the opinion of any of the agencies involved in the SEED Project for CKNP, concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries.

Document prepared by: WWF-Pakistan (Gilgit-Baltistan), Gilgit with financial support of Ev-K2-CNR under the framework of Social, Economic and Environmental Development (SEED) Project for Central Karakoram National Park (CKNP).

WWF Pakistan's regional office for Gilgit-Baltistan developed the document "Conservation and Sustainable Development Plan for Bagrote Valley of CKNP" in the framework of the Social, Economic and Environmental Development (SEED) Project for CKNP, funded by Ev-K2-CNR through the Governments of Italy and Pakistan.

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Cover Photograph: Bagrote valley © Ghulam Rasool/WWF-Pakistan

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Citation:

Muhammad Zafar Khan, Babar Khan, Garee Khan and Maurizo Gallo. 2015. Conservation and Sustainable Development Plan for Bagrote valley of CKNP. WWF-Pakistan and Ev-K2-CNR, Pakistan, 105 pages.

Available from

Gilgit Conservation Information Centre
GCIC NLI Colony, Jutial Gilgit,
Gilgit-Baltistan, Pakistan
www.wwfpak.org

Directorate of the CKNP
Sadpara Road, Skardu
Gilgit-Baltistan, Pakistan
www.cknp.org.pk

PLAN EDORSEMENT

Signed by President CBCSDO/DDO Bagrote .....

Endorsed by Director, CKNP .....

Approved by Deputy Commissioner/ .....
Chairman DCC Gilgit in .... meeting
of the District Conservation Committee for
Gilgit.

Dated.....

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ABBREVIATIONS

AKPBS .....Aga Khan Planning & Building Service

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 Area

CO ..... Community Organization

CSDF .....Conservation and Sustainable Development Fund

CSDP .....Conservation and Sustainable Development Plan

DCC .....District Conservation Committee

DDO .....Dobani Development Organization

E .....East

GLOF .....Glacial Lake Outburst Flood

HH ..... Households

IUCN .....International Union for Conservation of Nature

IPMP .....Integrated Park Management Plan

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

MH .....Micro-hydel

M .....meter

N .....North

SKB .....Skoyo-Karabathang-Basingo

SUI ..... Sustainable Use Initiative

UNDP .....United Nations Development Programme

VCC .....Valley Conservation Committee

VCF .....Valley Conservation Fund

VO .....Village Organization

WO .....Women Organization

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 the north of 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 2000m asl to 8,000m asl and partly covering four of the seven districts of Gilgit-Baltistan[1]. With K2 (8,611m 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 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 millions of

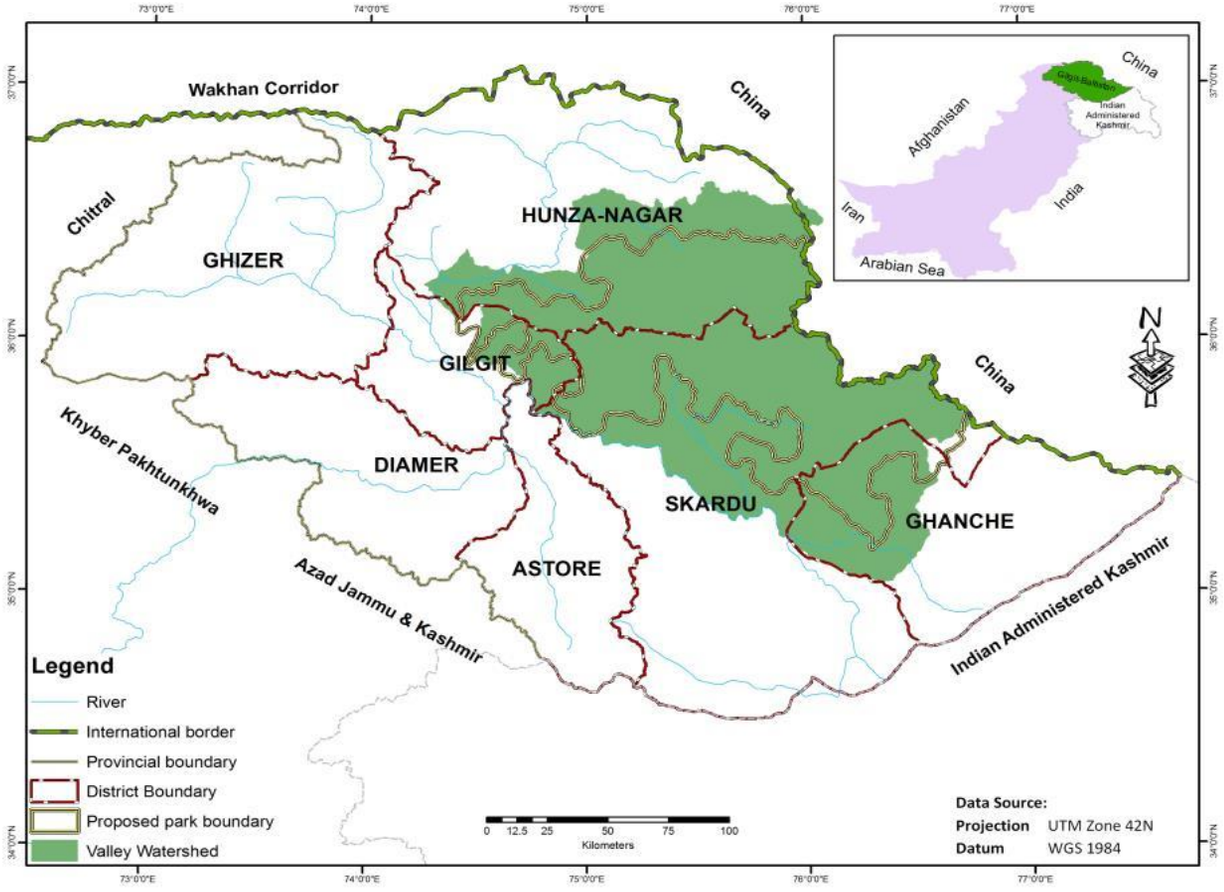

Figure 1 Location map of CKNP

[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.

people in Gilgit-Baltistan as well as living downstream River Indus in Pakistan, and elsewhere in the world who like to venture through the rugged and glaciated landscape of Karakoram Mountain Range[3].

Most of the CKNP areas are characterized by the dry alpine vegetation, comprising of floral species like Artemesia, Juniperus, Polygoum and Rosa on slopes, whereas Myricaria and Sea buckthorn bushes along riverbanks 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 in 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 yet 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].

There are some 230 villages, inhabited by over 115,000 people living in 13,000 households, surround CKNP. Majority of the local communities live an agro-pastoral life depending upon the Parks resources like pastures and rangelands, forests, wildlife, medicinal flora, *etc.*, for food, firewood, fodder and medicine. Moreover, a considerable number of local people are also engaged in tourism and mining industries in and around the Park. Thus, the local communities living in peripheries of 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 the Integrated Park Management Plan (IPMP) for CKNP[7] for the following reasons:

i. One of the National Park's goals is to preserve and promote, in a sustainable way, local cultural heritage, which is widely spearhead in CKNP valleys;
ii. The Park's management process is guided by 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

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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.

at committing community organizations for collaboration in management of the Park resources[8];

iii. However, difficult 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[9]. 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 by WWF in 1993 in Bar Valley of Gilgit-Baltistan, and replicated later by IUCN in 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 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 Committee (DCCs) and; Implementation of VCP through VCCs and other stakeholders. DCC forum has the mandate to monitor the progress on implementation of the VCPs through DCC meetings.

Integrated Park Management Plan (IPMP) for CKNP (2014)[11] 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;

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[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.

[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, Islamabad, Pakistan

IBID

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 plan, lack of conceptual clarity, lack of a monitoring mechanism, less clear role and responsibilities and inadequate information about major resources required to undertake the desirable actions.

Based on this evaluation, the CKNP Management Plan (2014) recommended to "revise and update 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".

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

- Promote participatory NRM in CKNP buffer zone villages and valleys to ameliorate environmental conservation of the park; and
- Create synergies among park stakeholders to promote community-based conservation in CKNP buffer zone communities.

Scope of the Plan

The Bagrote valley forms an important part of the Park for the presence of dry temperate coniferous forests. DDO, Bagrote deals with the integrated conservation and sustainable development matters of seven villages of Bagrote valley including Sinaker, Datuchi, Hopay, Bulchi, Chira in Bari Bar sub catchment and Taisot and Masingot in Chuni Bar sub catchment and Batkore.

Structure and Composition of the Plan

The plan comprises of the following ten segments:

i) Socio-economic and ecological profile of Bagrote 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

Process of Plan Development

Information for socio-economic and ecological profile of four villages of Bagrote valley, management issues and problems and proposed interventions was obtained with the help of three Focused Group Discussions (FGD); and holding interviews with household heads, covering 233 households out of 588 (40% of the total households of the valley, calculated based on CI 5 and CL 95%). Sampling plan for household interviews is given in the ***appendix-A*** and list of participants 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 valley 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 for relevant recommendations. Lessons learned by CKNP partners under SEED Project were reviewed from various documents available with WWF-Pakistan. Previous VCP of Bagrote was also reviewed to obtain useful information therefrom.

1. Socio-economic and Ecological Profile of Bagrote Valley

Bagrote valley is part of Union Council (UC) Jalalabad, sub division Danyore, and District Gilgit, situated about 35 km northeast of Gilgit city. The valley comprises of two sub-catchments, namely Bari Bar (large nullah) and Chuni Bar (small nullah). Bari Bar makes the main valley comprising of six villages namely Sinaker, Hopey, Datuchi, Bulchi, Farfoi, and Chira whereas, Chuni Bar branching out of Bari Bar towards left situated at the foothills of Bilchar-Dobani peak comprises of three small villages called Taisot, Masingot and Hamaran.

1.1. Geographic location of villages

Location and altitude of the seven villages of Bagrote valley, which fall in the buffer zone of CKNP including Sinaker, Hopey, Datuchi, Bulchi, Farfoi, Chira Taisot and Masingot is given in the following table:

Table 1: Location of villages in Bagrote

Villages	Settlements	Coordinates		Elevation (m ASL)
		E	N	
Sinaker	Sinaker	74°30'49.61"E	35°57'39.87"N	2043
Datuchi	Datuchi Das, Datuchi Bala, Datuchi Khaas	74°31'56.99"E	35°59'40.97"N	2227
Hopey	Hopey	74°31'58.91"E	35°58'43.04"N	2010
Bulchi	Bulchi Bala, Bulchi Paeen	74°33'5.50"E	36°1'34.76"N	2406
Chira	Chira	74°33'50.71"E	36° 1'54.90"N	2380
Farfoi	Farfoi	74°33'26.88"E	36° 1'35.31"N	2349
Taisot	Kot, Bulchey Bai, Hait, Younro Hait	74°33'7.89"E	35°56'55.82"N	2612
Masingot	Masingote Kote	74°32'42.82"E	35°56'33.77"N	2405
Batkore	Batkore	74°34'54.52"E	35°52'16.97"N	2556

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

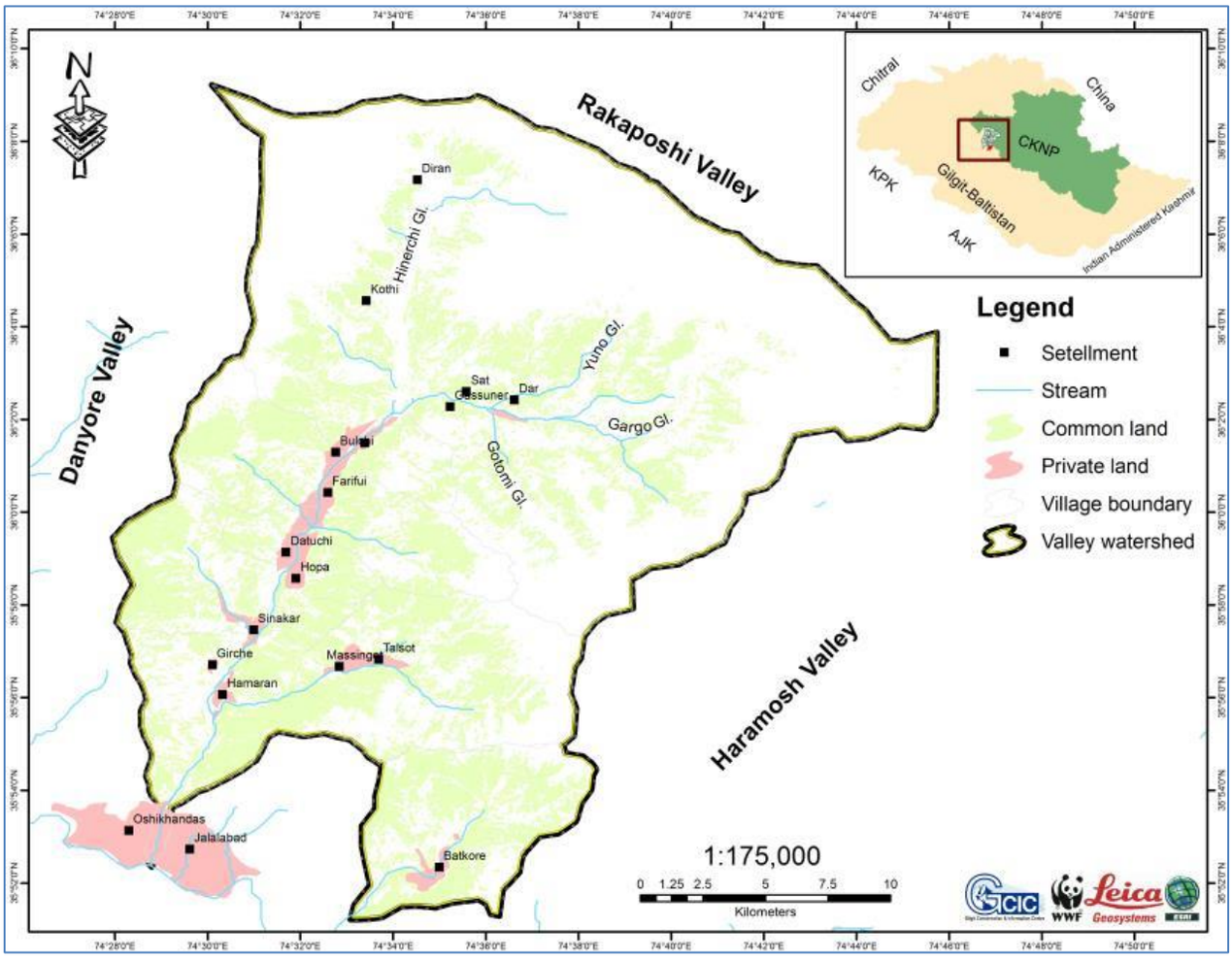


Figure 2: Territory use in Bagrote Valley

1.2. Demographic profile of villages

Table 2: Demographic profile of villages in Bagrote valley

Village	No of Households	Population	Average household size	Agricultural land per household (Ha)	Yearly Cash Income/household (PKR)
Sinaker	150	1680	11.2	0.36	183885
Datuchi	200	1980	9.5	0.70	290441
Hopey	120	1320	11	0.54	190555
Bulchi	240	2328	9.7	0.74	213614
Taisot	150	1410	9.4	0.78	108511
Masingot	100	870	8.6	1.1	151333
Total:			**Average:**		

The major sources of income in Bagrote valley include agriculture (contributing 73%, n=262 of the cash income) followed by government jobs (15%, n= 262) and others including daily wage labour (9%, n= 262). Table 3 gives an overview of the sources of income in different villages of the valley.

Table 3: Sources of income in Bagrote valley

Village	Source of income (%)			
	Agriculture and livestock herding	Government Jobs	Private Jobs	Others (daily wage labour and others)
Sinaker (n=26)	73.08	11.54	3.85	11.54
Datuchi (n=34)	47.06	31.43	8.82	17.65
Hopey (n=20)	85.00	8.33	2.00	4.70
Bulchi (n=118)	73.73	19.49	1.69	5.08
Taisot (n=49)	83.67	8.16	2.04	6.12
Masingot (n=15)	73.33	12.00	6.67	8.00
Average at valley level	72.65	15.16	4.18	8.85

1.3. Education

Table 4: Education facilities in the Valley

#	Village	Name of school	Level/ Grade	Target group (Boys, Girls/Mix	Government/ Private	Private institutions
1.	Sinaker					
2.	Datuchi	FG Boys High School Bulchi	10th	Boys	Government	
3.	Hopey	FG Boys Middle School Bulchi	8th	Boys	Government	
4.	Bulchi	FG Boys Middle School Bulchi	8th	Boys	Government	-
		FG Girls Middle School Bulchi	8th	Girls	Government	-
		BASE Public School (a branch of Datuchi BASE primary school)	2nd	Mix	Private	BASE (NGO)
5.	Farfoi					
6.	Taisot	F.G Primary School	2nd	Mix	Government	
7.	Masingot					

Some of the villages like Taisot do not have schools at all and the children go to nearby village Masingot. Education is one of the major factors in the village, which has made the locals of the area migrate to Jalalabad. However, the literacy rate is still appreciable with a value of 46% (n=64) given the fact that, the area doesn't even have a single primary school. A small proportion of the total population (1.56%, n=64) is graduate, while 3.1% of the total appeared to have post graduate degree. Some 6.4% (n=64) of the population had primary education while the figures obtained for the people with secondary and higher secondary education are 7.8% and 21%, respectively.

On the other hand in Bulchi, majority of adult population (54%) is illiterate. 3.3% and 14% (n=118) were recorded to have primary and secondary education. A very small proportion of the total population (2.5%, n=118) had master level education while 9.3% (n=118) were reported to be graduates in the valley.

1.4. Health

Majority of the villages in Bagrote valley are deprived of basic health facilities. There is a First Aid Post located in Masingot villages and dispensaries in Chira and Farfoi, which are being

visited for minor treatments. However, patients with complex and serious ailments prefer to visit government, military or private hospitals in Gilgit city.

1.5. Agriculture

The area falls under single cropping zone with potato as major crop, while wheat, maize and vegetables are also grown in small amounts. Having a short and specific growing season, both the cereals and vegetables are grown at the same time, and harvested before inception of winter season.

Table 5: Major crops in Bagrote valley

Village	Major crops	Yield (kg/ha)	Average production per household (Kg/year)	Consumption (%)	
				Domestic	Sale
Sinaker	Wheat	3217	1158	100	0
	Maize	3533	1272	100	0
	Potatoes	11731	4223	6.8	93.2
Datuchi	Wheat	875	608	97	3
	Maize	235	163	50.6	2.4
	Potatoes	4030	2801	12.5	81.6
Hopay	Wheat	1919	1036	100	0
	Maize	819	442	100	0
	Potatoes	4756	2568	6.6	88.6
Bulchi	Wheat	1351	1000	99.2	0.8
	Maize	892	660	100	0
	Potatoes	6722	4974.1	6.2	92.9
Taisot	Wheat	1136	886	100	0
	Maize	769	600	100	0
	Potatoes	2822	2201	10.8	89.2
Masingot	Wheat	364	400	100	0
	Maize	415	457	75	25
	Potatoes	2948	3243	4.5	87.8

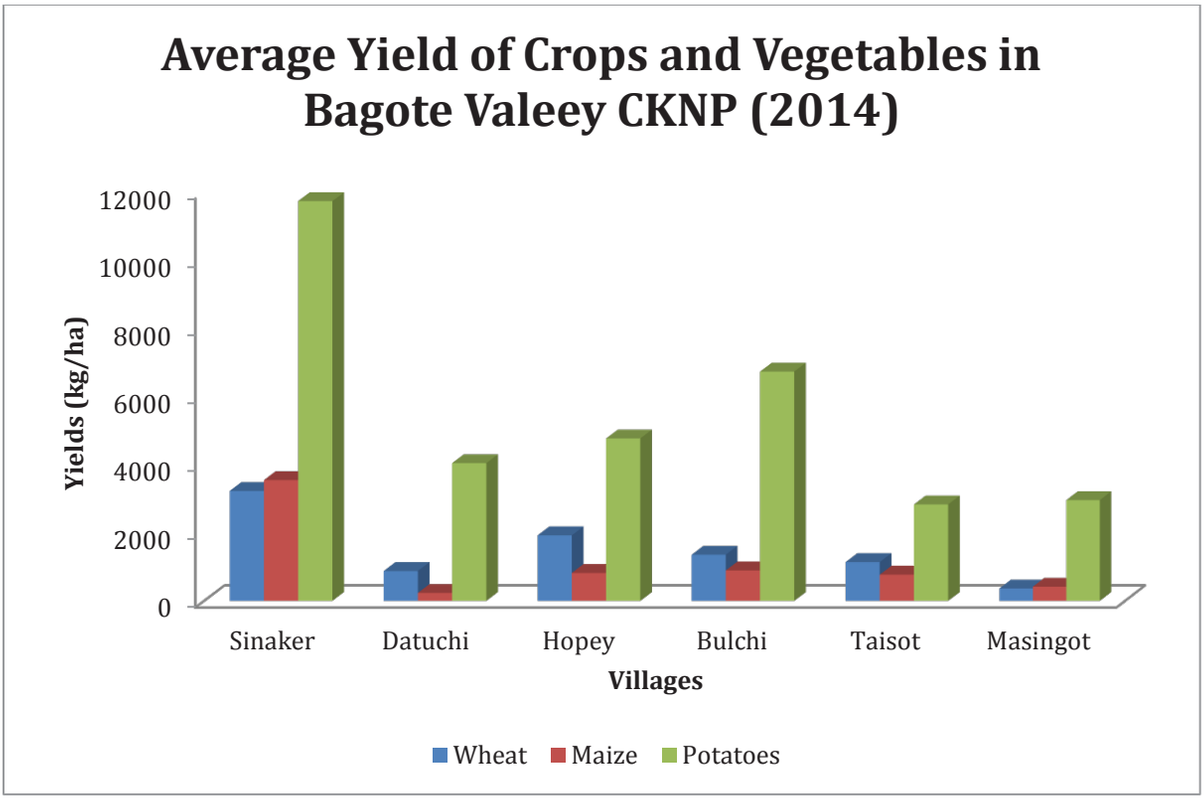


Figure 3: Average Yields of Wheat, Maize and Potato (kg/ha) in Bagrote valley of CKNP

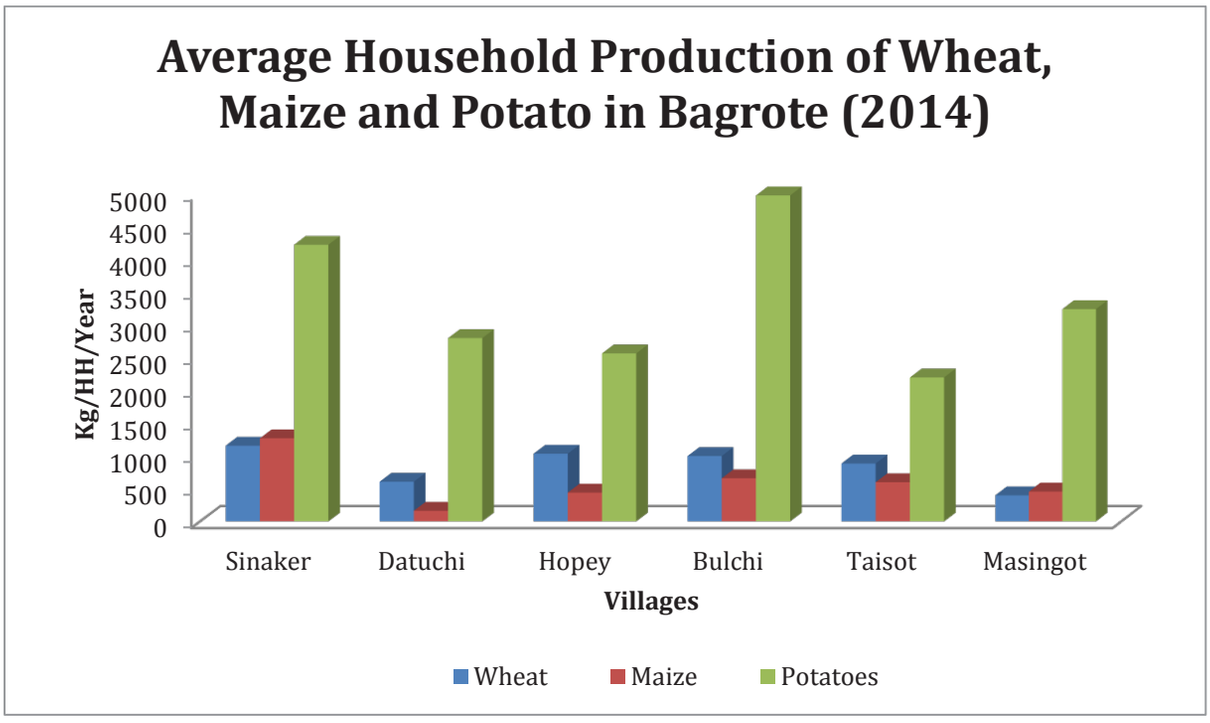


Figure 4: Average annual production per household in Bagrote Valley of CKNP

1.6. Water resources and irrigation infrastructure

The drinking water supply to the villages is from natural springs brought down to villages through installed GI pipe lines, while irrigation water is mostly from glacier melt drawn through channels from nearby perennial streams. Basic source of water for drinking and irrigation in different villages, is indicated in the following table:

Table 6: Water resources and irrigation infrastructure in Bulchi

Source / Facilities	Name of Location	GPS Coordinate (UTM WGS84)	Elevation (m asl)	Used by No households	Administrative Units	Type of water Water Courses	Water condition
Spring	Chubagin nallah	74°34'0.28"E , 36° 2'52.75"N	2729	240	Bagrote UC	Spring	Clear
Pipe line	Chubagin nallah	74°33'5.19"E , 36° 1'47.51"N	2495				Clear
Water tap	Bulchi Bala	74°33'5.50"E , 36° 1'34.76"N	2318				Clear
Reservoir	• Reservoir small (near source) • Main reservoir	74°34'0.85"E , 36° 2'52.10"N 74°33'5.19"E , 36° 1'47.51"N	2746 2495				Clear

Table 7: Water resources and irrigation infrastructure in Datuchi, Ferpho, Sinaker, Masigon

Name of Village	Name of Village & Location	Source/Facilities	GPS Coordinate (UTM WGS84)	Elevation (m .s.l.)	Used by No households	Administrative Units	Type of water Water Courses (Spring, Gl.)	Water condition
Datuchi	Onoe illee	Spring	74°31'43.69"E 36° 0'13.23"N	2443	200 HH	Bagrote UC	Spring	Clear
	Datuchi Khass	Pipe line	74°31'54.99"E 36° 0'10.72"N	2392				
	Datuchi Khass	Water tap	74°32'2.10"E 36° 0'8.90"N	2348				
	Datuchi Khass	Reservoir	74°31'54.99"E 36° 0'10.72"N	2392				
Hopey		Spring	74°32'37.57"E 35°59'40.64"N	2410	120 HH	Bagrote UC	Spring	Clear
		Pipe line	74°32'35.58"E 35°59'39.29"N	2382				
		Water tap	74°31'58.70"E 35°58'42.68"N	2193				
		Reservoir	74°32'35.58"E 35°59'39.29"N	2382				
Ferpho	Gorchi Ferpho	Spring	74°32'52.24"E 36° 0'47.39"N	2375	150-200 HH	Bagrote UC	Spring	Clear
	Gorchi	Pipe line	74°32'52.24"E 36° 0'47.39"N	2375				
	Ferpho village	Water tap	74°32'39.34"E					
	Gorchi	Reservoir	74°32'52.24"E 36° 0'47.39"N	2375				

Sinakar	Gawachi harai	Spring	74°30'3.09"E 35°57'48.48"N	2625	100-140	Bagrote UC	Spring	Clear
	Sani Hyate	Pipe line	74°30'41.67"E 35°57'42.71"N	2199				
	Sanakar	Water tap	74°30'49.49"E 35°57'39.34"N	2145				
	Sani Hyate	Reservoir	74°30'41.67"E 35°57'42.71"N	2199				

Bulchi village

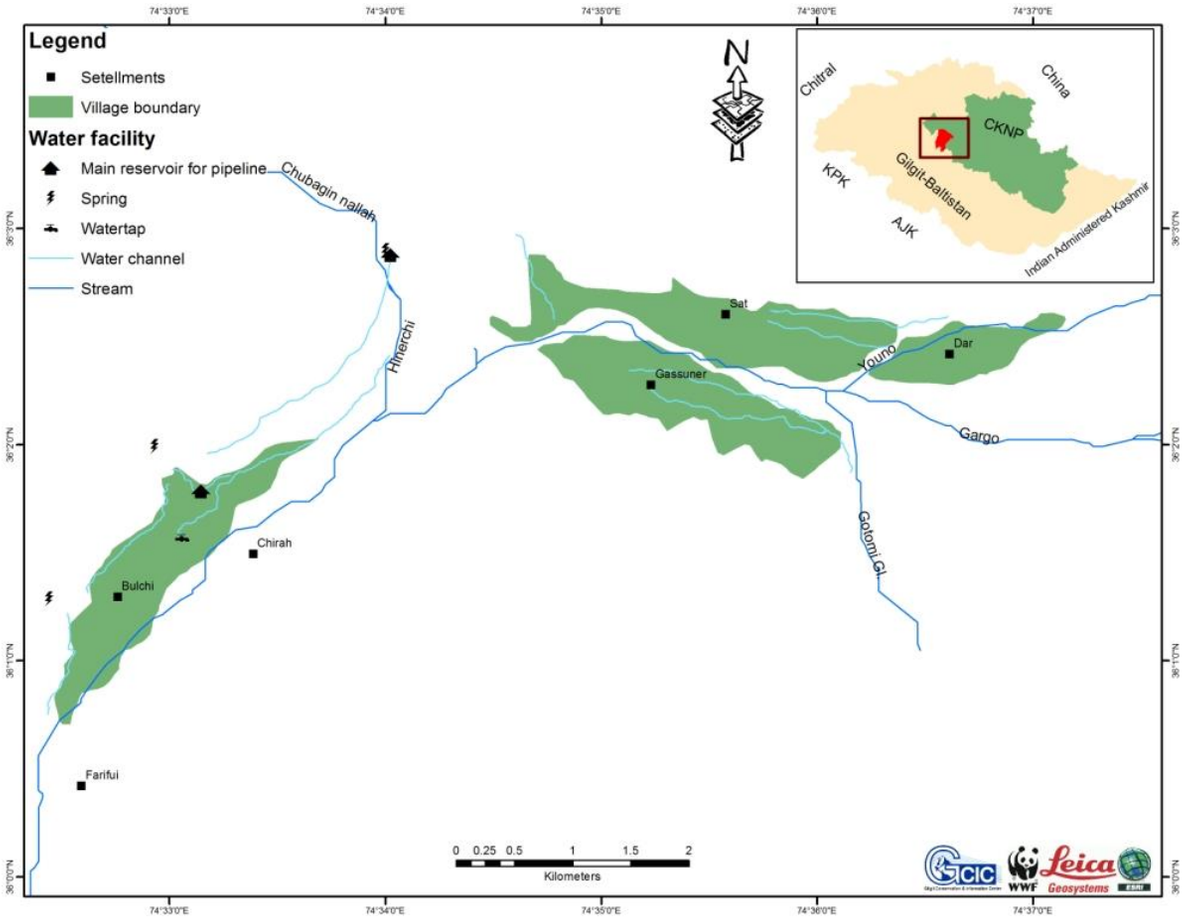


Figure 5: Water resources and facilities in Bulchi village of Bari Bar

Table 8: Water resources and irrigation infrastructure in Taisot

Source/Facilities	Name of Location	GPS Coordinate (UTM WGS84)	Elevation (m a.s.l.)	No of beneficiary households	Type of water source	Water conditions
Spring	Chunni Bar	74°33'7.87"E, 35°57'9.40"N	2711		Bagrote	Clear
Pipe line	No facility of pipe line in taisot	*for pipeline indicate gps coordinates for start point and end point*				No
Water tap	No such type of facility					No
Reservoir	Late	74°33'8.23"E 35°57'6.98"N (Damage)	2661		Bagrote	Damage

Taisot village

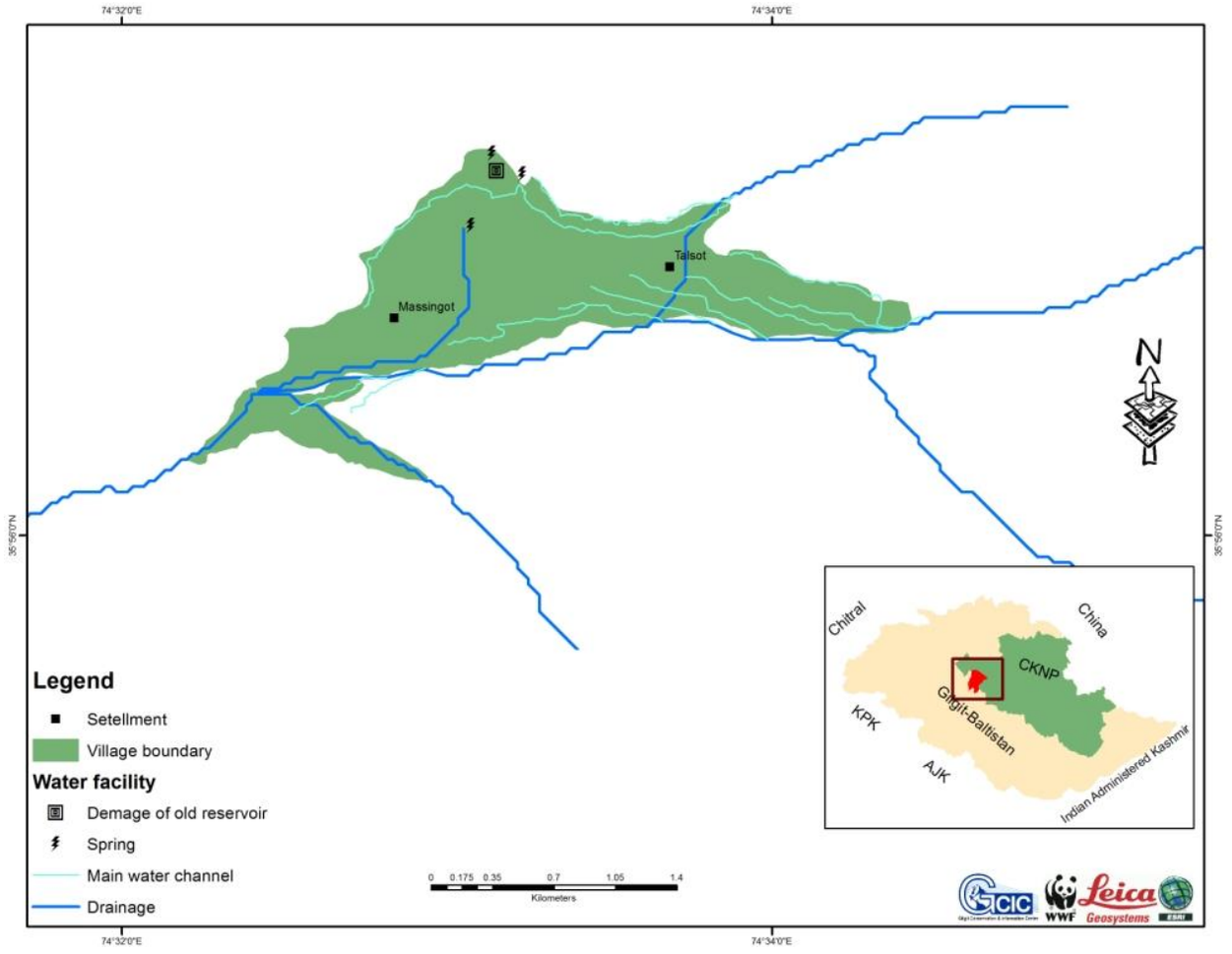


Figure 6: Water resources and facilities in Taisot village of Chuni Bar

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 rear livestock, varying in numbers and types depending upon the owner's land holding status, availability of fodder and household labour to feed their animals. Various types of livestock in the valley include goats, sheep and cattle i.e., cow, bull and *zo /zomo* and other crossbreeds of yak and cow. Equines are also present among herds in the valley. A brief summary of livestock types and numbers in six villages of the valley is given Table :

Table 9: Livestock in Bagrote valley

Villages	Sheep	Goats	Cattle (cow, bull)	Cross breed of yak and cow	Yak	Equines (donkeys and horses)	Total	Milking cattle
Sinaker	315	1710	390	0	0	9	2424	255
Datuchi	560	1220	700	0	100	0	2580	380
Hopey	636	1896	468	12	12	3.6	3028	192
Bulchi	1470	2220	1080	9	24	126	4929	420
Taisot	270	810	525	3	0	6	1614	285
Masingot	330	1120	390	0	0	3	1843	170
Total	**3581**	**8976**	**3553**	**24**	**136**	**148**	**16418**	**1702**

Herd composition in Bagrote valley shows that goats are the dominant animal type followed by cattle and sheep (Fig. 7).

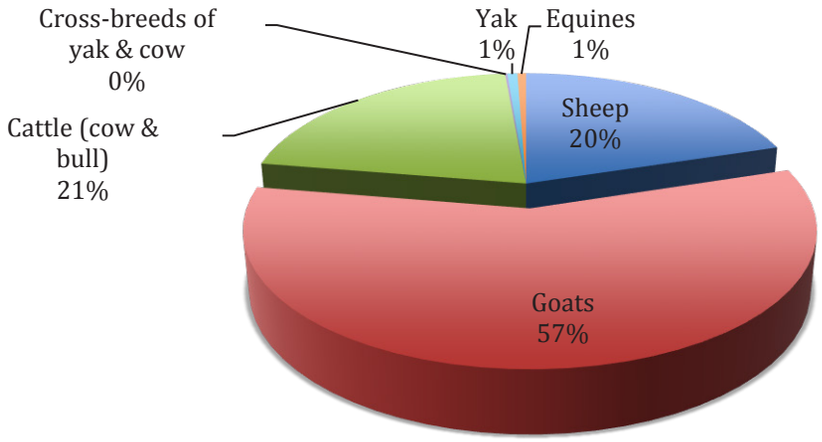


Figure 7: herd size and composition in Bagrote Valley

Average herd size in the valley is 17 animals per household (Table 9), which has appeared to decrease by 20.56% from 21.4 animals per household in 2009 to 17 animals per household in 2014 (Table 10, Figure 8). The reasons being:

- Lack of household labour especially due to the engagement of youth in education, employment and tourism, etc.,
- Lack of fodder due to decreased landholding.

Table 10: Average herd size and composition per household is given in table:

Villages	Sheep	Goats	Cattle (cow, bull)	Crossbreeds of yak and cow	Yak	Equines (donkeys and horses)	Total	Milking cattle
Sinaker	2.1	11.4	2.6	0	0	0.06	16.16	1.7
Datuchi	2.8	6.1	3.5	0	0.5	0	12.9	1.9
Hopey	5.3	15.8	3.9	0.1	0.1	0.03	25.23	1.6
Bulchi	4.9	7.4	3.6	0.03	0.08	0.42	16.43	1.4
Taisot	1.8	5.4	3.5	0.02	0	0.04	10.76	1.9
Masingot	3.3	11.2	3.9	0	0	0.03	18.43	1.7
Average	**3**	**10**	**4**	**0.03**	**0.1**	**0.1**	**17**	**1.7**

Table 7: Trend in livestock populations and numbers over the past five years

Villages	Average herd size 5 year ago	Average Herd size (at present)	Difference (%)
Sinaker	16.6	16.16	2.7
Datuchi	18.7	12.9	31.0
Hopey	31.0	25.23	18.5
Bulchi	21.4	16.43	23.2
Taisot	10.8	10.76	0.4
Masingot	20.2	18.43	8.8
Average	20	17	15.8

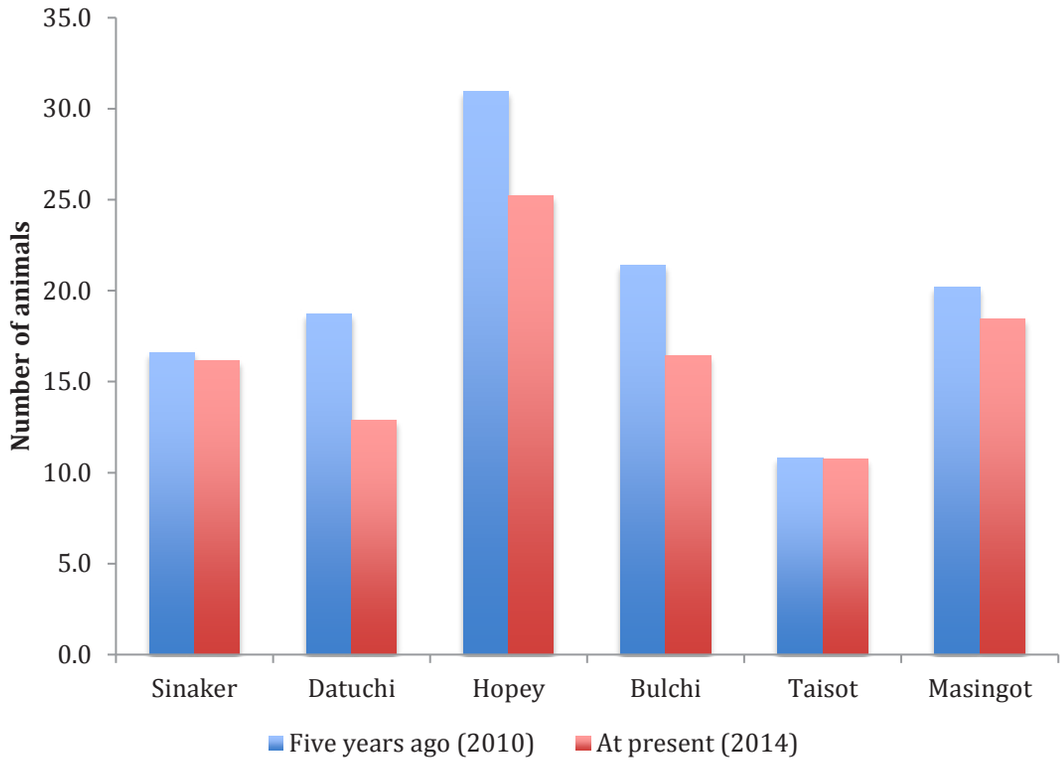


Figure 8: Status of per household livestock holding in Bagrote valley

1.7.2. Seasonality, feeding and grazing pattern

On average, 90% of the total livestock are 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 valley bottoms in winter. Herders have permanent homes in the villages, only the herds' travel with the people necessary to tend them. There are defined customary laws governing season, movement and stay of livestock into high land pastures.

The organization of grazing in time and space is closely connected with seasonal availability of forage for livestock. There are insufficient grazing lands near villages and the accessibility of different pastures vary during the year which lead to the necessity of a seasonal movement of livestock through an altitudinal range of pastures to allow animal's access to diverse fodder sources.

Livestock in most of the villages in the valley are taken to higher grazing lands and pastures mostly during late spring and summer (April- September) with maximum number of days at pastures in June and July. While in winters (October – March) the livestock are either grazed in winter grazing areas, adjacent to their permanent settlements in the village, or stall fed on stored hay collected from their own fields or from nearby pastures.

Table 82: Summary of feeding, grazing pattern and seasonality in Bari Bar

* Note: Animals kept in the village for milking are stall-fed

Bulchi				
Season	**Livestock types**	**Grazing in pastures**	**Stall feeding**	**Grazing pattern**
Winter and Spring (Mid November to May)	Sheep and goats	Yes	Partly (but only Baspoor meaning grains are given to females of weak animals)	Guarded grazing in Harali pastures (the hilly tract above KIU) by 10-15 paid shepherds (who are themselves also livestock owners). In case of less snowfall animals are brought to Skarkoi (Gilgit) for drinking water.
	Lactating cattle including (cow)	No	Yes	Grazing in and around the village and taken care by an owner him/herself
	Non- lactating cattle and yak	Partly	Partly	Free grazing in and around the village and taken care by an owner him/herself
Summer to early Autumn (Mid June to Oct) depending upon snow fall	Sheep and goats	Yes	No	Grazed in Bulchi pastures by group of 10-15 shepherds (who are livestock owners as well but more dependent on livestock rearing)
	Lactating cattle including (cow)	Yes	No*	Grazed in Bulchi pastures by group of 10-15 shepherds (who are livestock owners as well but more dependent on livestock rearing)
	Non- lactating cattle and yak	Yes	No	Free ranging/grazing in high pastures
Autumn (First half of Nov until the livestock are moved to Harali) depending upon snow fall	Sheep and goats	Yes	No	Controlled grazing in pastures near to village by owners turn by turn at daily basis
	Lactating cattle including (cow)	Partly	Partly	Free grazing in and around the village and taken care by an owner him/herself
	Non- lactating cattle and yak	No	No	Free grazing in and around the village and taken care by an owner him/herself

Table 13: Summary of feeding, grazing pattern and seasonality in Chuni Bar

Taisot				
Season	**Livestock types**	**Grazing in pastures**	**Stall feeding**	**Grazing pattern**
Winter and early spring (December to May)	Sheep and goats	Yes	Partly (but only Baspoor meaning grains are given to females of weak animals)	Guarded grazing in lower pastures adjacent to Jalalabad (Lashi Dari, Daishay, Maligiri, Hamaran, Maqpoon Das, Palailat, Sanjabrangsa) by a group of 10-15 herders (who are owners themselves and more dependent on livestock herding)
	Lactating cattle including (cow)	No	Yes	Guarded grazing in in pastures adjacent to Jalalabad
	Non- lactating cattle and yak	Partly	Partly	Guarded grazing in in pastures adjacent to Jalalabad
Summer and early Autumn (June to October)	Sheep and goats	Yes	No	Grazed in Taisot pastures by owner themselves ((who are owners themselves and more dependent on livestock herding)
	Lactating cattle including (cow)	Yes	No*	Grazed in Taisot pastures by owner themselves ((who are owners themselves and more dependent on livestock herding)
	Non- lactating cattle and yak	Yes	No	Free ranging/grazing in high pastures
Late autumn (Oct-Nov)	Sheep and goats	Yes	No	Controlled grazing in pastures near to village by owners turn by turn at daily basis
	Lactating cattle including (cow)	Partly	Partly	Free grazing in and around the village and taken care by an owner him/herself
	Non- lactating cattle and yak	No	No	Free grazing in and around the village and taken care by an owner him/herself

- Note: Animals kept in the village for milking are stall-fed

1.7.3. Status of livestock vaccination in Bagrote valley

Data obtained for the number of livestock vaccinated and treated in case of any disease during the 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	
Sinaker	30 (n=27)	52 (n=27)	67 (n=27)	N/A FMD, Indigestion	Indigestion	FMD, Indigestion	Government
Datuchi	6 (n=34)	35 (n=34)	76 (n=34)	Viral	Pox, PPR, Phunar runi, FMD	Pox, PPR, viral	Government, LSO
Hopey	24 (n=21)	38 (n=21)	86 (n=21)				Gov
Bulchi	16	34	69	(Respiratory diseases, Eye infections, viral diseases, Lungs & Skin Disease, FMD, Pox & PPR)	Respiratory diseases, Eye infections, viral diseases, Lungs & Skin Disease, FMD, Pox & PPR	Respiratory diseases, Eye infections, viral diseases, Lungs & Skin Disease, FMD, Pox & PPR	GB Livestock and Dairy Development Department and Directorate of CKNP/EvK2 CNR
Taisot	29	42		Gastrointestinal diseases, viral diseases, FMD, and Pox	Gastrointestinal diseases, viral diseases, FMD, and Pox	Gastrointestinal diseases, viral diseases, FMD, and Pox	local government and livestock department
Masingot	25 (n=16)	19 (n=16)	31 (n=16)	FMD, GIT problems	FMD, GIT problems	FMD, GIT problems	Govt., LSO and DDO

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 c) 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 are stall fed in case of heavy rain and snowfall.

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

Bulchi Village

Id	Name	Coordinate (at pasture centre)		Altitude (m)	Estimated surface (ha)	Facilities [1]	Other use[2]	In use	Not used since	Status [3]
		X	Y							
1.	Harali	74.283605	35.974715	3090	4553	Huts	FW+		-	PD
2.	Chubagin	74.552457	36.049630	3287	390	12 huts and corrals	FW+		-	H
3.	Khama	74.562597	36.062345	2899	279	70 huts and corrals	FW*		-	H
4.	Surgin	74.536032	36.062849	4039	410	3-4 corrals	FW+		-	H
5.	Baring	74.567559	36.103931	3487	410	3-4 corrals	FW*		-	PD
6.	Hinarchi	74.594473	36.123338	3706	438	8 corrals and huts	Mining, extraction of glacier for sale in market used in water or other drinks for refreshment		-	H
7.	SBD	74.602709	36.042188	2832	539	180 huts and corrals	FW*		-	D
8.	Barchi	74.643552	36.042482	3270	297	10-12 huts and corrals	WF*		-	PD
9.	Manugushi	74.663772	36.047100	3522	210	5-6 huts and corrals	FW+		-	H
10.	Dodormal	74.673318	36.059580	3835	213	4 huts and corrals	FW+		-	H

11.	Shaki	74.689585	36.049887	4108	219	1 hut and corral	-		-	H
12.	Celleili	74.682406	36.035304	3793	254	-	-		-	H
13.	Rajimani	74.593354	36.102281	4094	312	-	-		40-50 years	H
14.	Surroundings of the village	74.555428	36.077269	3712	320	-	FW*		-	D

Taisot Village

Id	Name	Coordinate (at pasture centre)		Altitude (m)	Estimated surface (hac)	Facilities	Other use[2]	In use	Not used since	Status
		X	X							
1	Becili Bar	74.565265	35.951015	2793	264.32	Huts & Corals	FW*		-	D
2	Hopsar	74.563010	35.969012	3785	410.55	Huts	FW+		-	H
3	Margushi	74.589780	35.963502	4021	395.43	Huts & coral	-		-	PD
4	Gamasar	74.610880	35.945663	4466	298.09	Huts & coral	-		-	PD
5	Bilchar	74.596370	35.955559	4173	280.34	-	-		-	H
6	Kotowal	74.625896	35.935794	4723	220.52	-	FW+		-	H
7	Serkon Harai	74.598592	35.930842	3625	320.78	-	FW+		-	PD
8	Shotal harai	74.584963	35.929036	3229	210.23	-	FW+		-	PD
9	Yourai Harai	74.581723	35.930113	3141	147.25	Huts & coral	FW+		-	PD
10	Walo Harai	74.569394	35.924678	3863	360.03	Hut	FW+		-	D

Pastures of Bagrote

Id	Village	Name	Coordinate (at pasture center)		Altitude (m)	Facilities[1]	In use	Status[3]
			X	Y				
15.	**Masingot**	Khoja	74.560910	35.927312	3370	Corals		PD
		Shardaye	74.536352	35.941996	3515	-		H
		Shumolo lot	74.545490	35.927409	4750	-		H
16.	**Sinakar**	Gowating	74.490486	35.991975	3345	Corals & huts		H
		Girch bar	74.483949	35.979981	3517	Coral		PD
		Bani rong	74.489188	35.998749	4011	Huts & coral		H
		Kulo haraye	74.481988	35.986026	3365	Huts & coral		D
		Rahate haraye	74.480442	35.991542	3672	Huts & coral		PD
17.	**Ferpho**	Thorgin	74.565556	35.965666	3361	Huts		H
		Pushani	74.552988	35.969170	3465	Huts & coral		H
18.	**Datuchi**	Gowachi	74.506088	36.006330	3898	Huts & coral		H
		Bar	74.509266	36.019954	3168	Huts & coral		H
		Walaye toki	74.495044	36.016197	4083	coral		H
		Surgin	74.517766	36.016943	3253	Huts		D

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 some grazing fee in cash or in kind (a portion of the total ghee or butter produced from the animal during that particular grazing season). Details of grazing fee charged for grazing animals from outside the village in the valley is given in the following table:

Village	Pasture Name	Period	Animal types	Number	Grazing fee value	Name of villages from where animals are brought
Bari Bar	Barchi to Shaki	July-Sep	Cattle, goats, sheep, but majority is of cattle	100-200	Rs. 50/small animal and Rs. 100/large animal	Non-Bagoros of Oshikhankhas and Danyore
Chuni Bar	Animal from other villages are not brought to Taisote and hence no grazing fee at the moment					

1.8.3. Grazing Cycle in Bagrote valley of CKNP

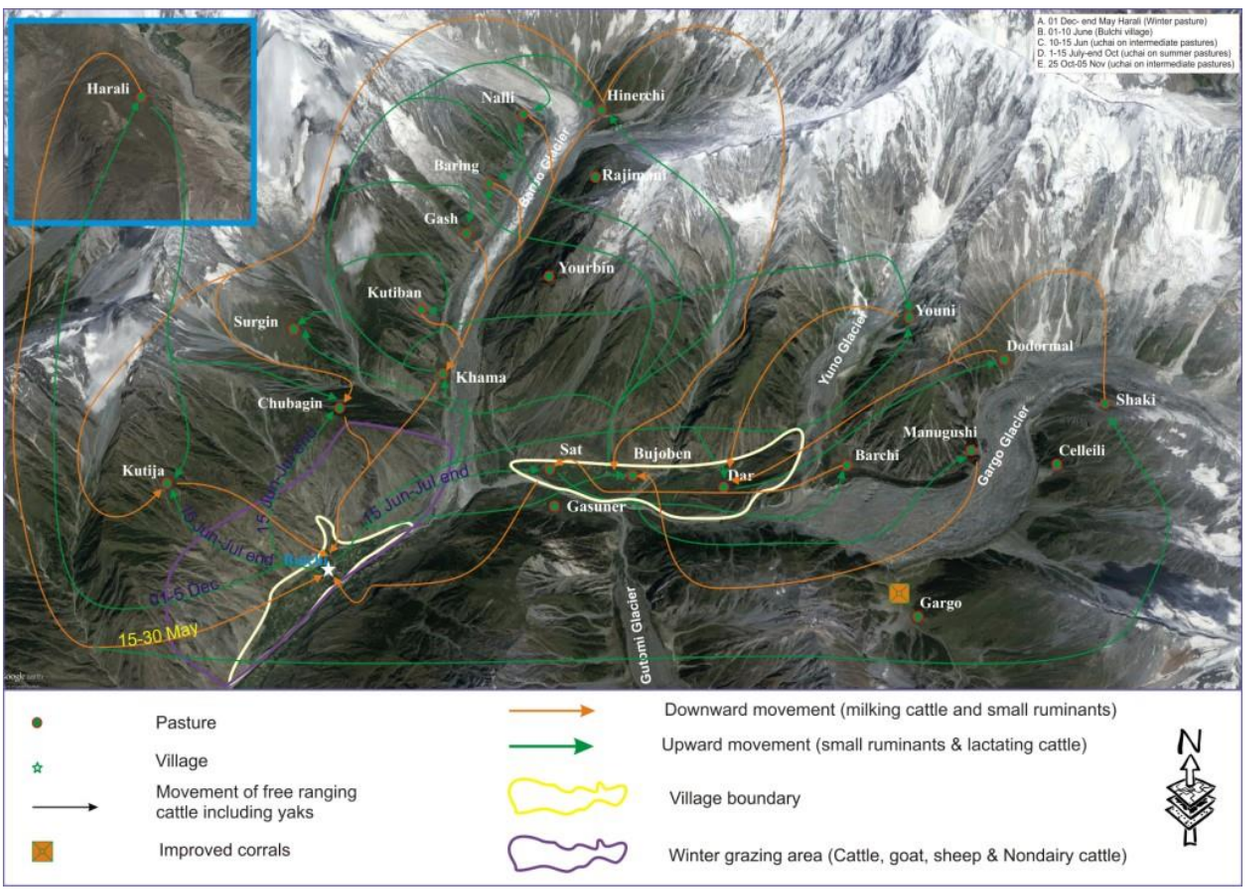


Figure 9 Pastures grazing cyle in Bulchi village of Bari Bar

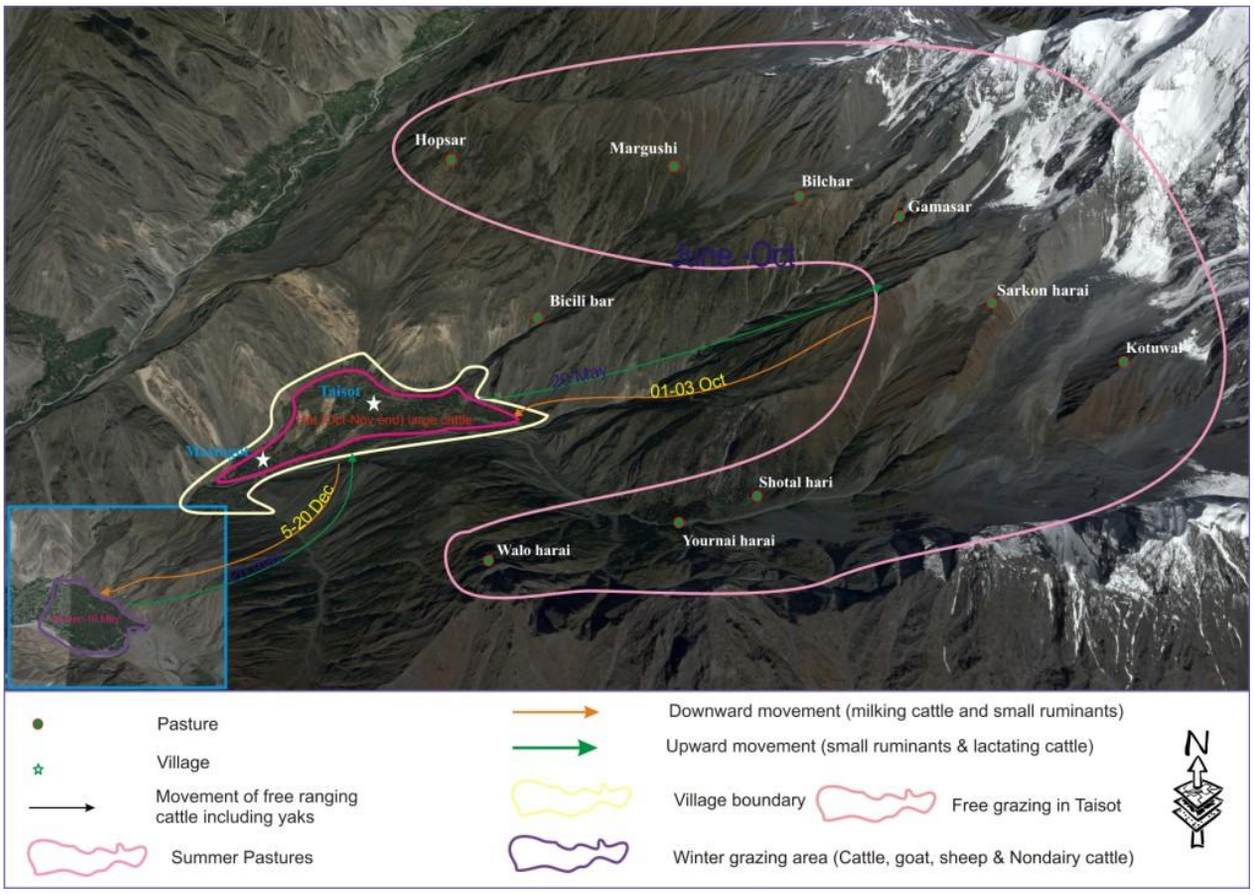


Figure 10 Pasture grazing cycle of Taisot village in Chuni Bar

1.9. Wildlife

1.9.1. Numbers and status

Village/Location	Siberian ibex	Musk deer	Snow leopard	Grey wolf	Lynx
Bulchi	24*	+	+	+	-
Furfui	15*	+	+	+	-
Datuchi	15*	-	+	+	++
Sinaker nullah	7*	-	+	+	+
Batkore	27**	-	+	+	-

* CKNP/WWF Wildlife Survey Report, 2011, **CKNP/WWF Wildlife Survey Report 2013,

+ Present but number is not known, ++An animal was seen near the village, later it was confirmed by GB Wildlife Department Officials to be a lynx

1.10. Forests and forestry

1.10.1. Forest cover and composition

Bagrote is one of the few valleys of CKNP having some good patches of closed forests comprising of pine and birch trees. The slopes of Bagrote show very good regeneration of natural forests due to effective community-based forest management practices. Vegetation cover in Bagrote valley (432 km^2) comprises of 47 km^2 of closed forests, which is 10% of the total surface area of the valley. Open forests are spread on 33 km^2 (7.6% of the surface area) while sparse vegetation on 77 km^2 (18% 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

1.10.2. Use of forests for timber and fuel wood

An assessment of timber use by 262 households in Bagrote valley showed that 37% of the households had some sort of timber use from local forests for construction of houses and cattle sheds, during the last five years (2010-2014). Use of timber for construction of new houses and cattle-sheds, was on average 10 logs or 35CFT per household per year (n=262households). Almost 7.6% of timber is extracted from a household's own plantation while 6.4% is purchased locally or from nearby villages and valleys, comprising of poplar and willows. Rest of the 24% of timber is obtained from natural forests.

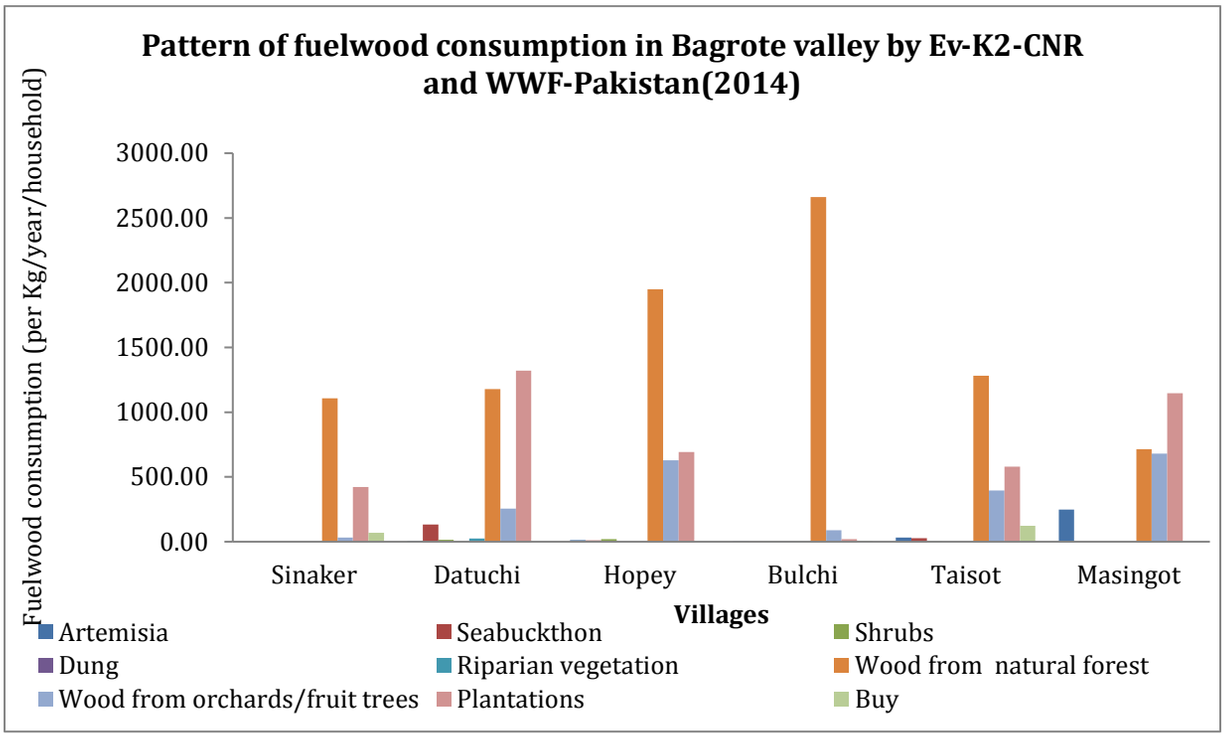
From the table given below one can assess the demand of timber for construction and importance of social forestry to meet timber wood demand for local populace in Bagrote valley:

Village	Timber consumed on construction of houses in the last five years	
	Number of logs	**Volume (CFT)**
Sinaker	83	290.5
Datuchi	294	1029
Hopey	259	906.5
Bulchi	1785	6247.5
Taisot	159	556.5
Masingot	46	161

[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 fuel wood in Bagrote valley is given in the following figure:



The local people in the valley meet their requirements of firewood and timber from plant biomass obtained from agro-forestry interventions, massively carried out in the valley on lands, relatively less suitable for growing crops or vegetables. However, dependence of local people on plant biomass from natural forests is still high in the valley. Average quantity of wood consumed for fuel and fire is 7.3 kg/HH/year with highest in Hopay village standing at 09.10 kg/HH/year and lowest in Sinaker (4.5kg/HH/year).

During interviews with local people in Bulchi village of Chuni Bar, it was revealed that selling of wood outside village or to a non-Bagoro (people from outside Bagrote valley) is not allowed. If someone has timber left from a given permit, it can be sold to a local (a person residing in the village) for actual cost (cutting, sawing and transportation) plus Rs. 100 per patawa (log) without any profit. Such excessive timber if sold to a Bagoro residing in Gilgit Rs. 700-800 is charged per log.

During interviews with local people only 8.4% (n=118) respondents reported that customary law allows them selling of the timber while the remaining 92% (n=118) reported that they were not allowed by customary law to sell the timber. Selling fuel wood outside the village is also not allowed. However, during the interview with local peoples majority of the respondents (89%, n=118) were of the view that customary law doesn't allow selling of fuel wood outside the village while 11% (n=118), of the respondents said customary law does allow selling of fuel wood from the village.

In Chuni Bar's Taisot village, during the last 5 years, some 212 timber logs (742 CFT) were used for construction of new buildings. Species cut for use as timber included Popular, Pine, Spruce, Birch and Juniper, extracted from the natural forest. According to FGD, selling of timber

outside village or to a non-local (people from outside of Bagrote valley) is not allowed. If someone has timber left from a given permit, it can be sold to a local (a person residing in the village) for actual cost (cutting, sawing and transportation) plus Rs. 100 per patawa (log) without any profit. Such excessive timber if sold to a Bagoro residing in Gilgit Rs. 700-800 is charged per log. From Household interviews we found that 28% (n=64) reported that customary law allows them the selling of the timber while the remaining 72% (n=64) reported that they were not allowed by customary law to sell the timber

Areas of Fuelwood collection from natural forests

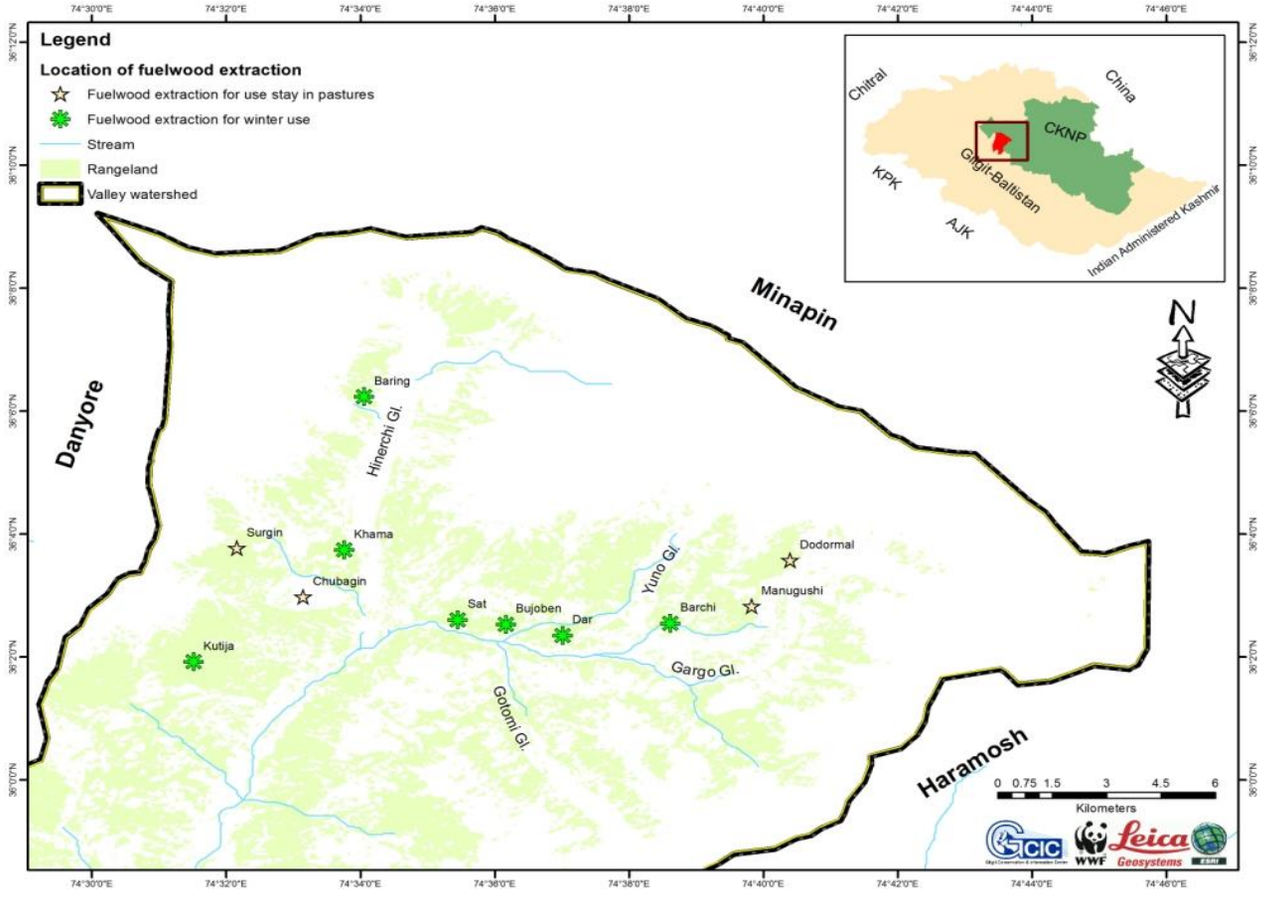


Figure 11 Areas of fuel wood collection in Bulchi village

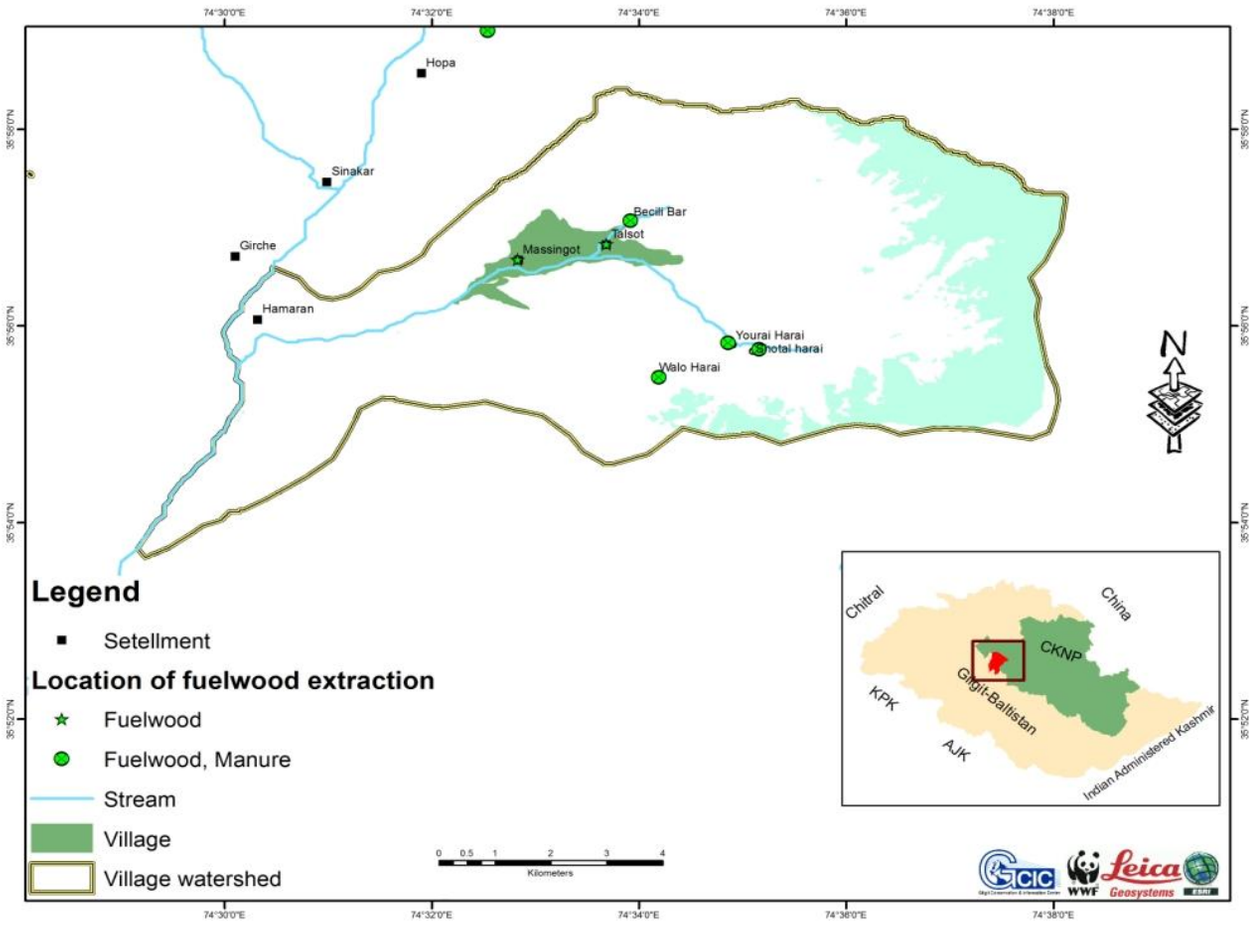


Figure 12 Areas of fuelwood collection in Taisot village of Chuni Bar

1.10.3. Social forestry interventions

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, Ev-K2-CNR and Directorate of CKNP under SEED Project is given as under:

Villages	Site Name	Coordinates	Alt. (m)	# of trees	Area (Kanals)	Spacing distance *between trees* Average diameter (cm at person shoulder) and high (m) *estimated*			Concern CBO	Planting year
						Species	Diam (inch)	High (ft)		
Datuchi		74°31'56.98"E, 35°59'28.46"N	2129	80% 20%	0.5	Willow Popular	3.4 4	5 5.4	Village conservation Committee DDO	2013
Hopey		74°32'1.34"E, 35°59'6.46"N	2110		.5	Popular	3	5	Village conservation Committee DDO	2014
Bulchi	Chirah	74°34'8.07"E, 36° 2'4.84"N	2479	60 %		Willow			Village conservation Committee DDO	2011
	Chirah	74°34'9.86"E, 36° 2'6.77"N	2483	40 %		Popular			Village conservation Committee DDO	2011
Taisot	Kirakoi	74°34'12.13"E, 35°56'43.17"N	2730	1005 Popular		Popular (partially trees are dead due lake of water)	3.3	5	Village conservation Committee DDO	2011

1.11. Mining Sector

Mining has been an important income generation activity in Bulchi village till recent past, where mining has been carried out for almost ten years from 1990 to 2010 but often at a small scale, carried out by a few (3-5) mining groups, each group consisting of 3-4 persons. Each year, nearly 1200-1600 kg Quartz and some 10-20 lots of Saveen are extracted with value of Rs. 3000-300,000 per 40 kg for Quartz and Rs. 10,000-100,000 per lot for Saveen. However, no such mining activity has happened in the village due to heavy snowfall and less melting of snow because most of the quarts mines are located in glaciated fields.

Taisot

There are quite a few mining areas in the village, e.g. deposits of marble near the village centre and deposits of quarts have also been identified at several locations, but no proper mining activity so far has been practiced in these areas.

1.12. Tourism

Following is an assessment of tourism facilities present in some of the villages of Bagrote valley:

Facilities	Bulchi	Taisot
Accommodation	In Bulchi there is a village guest house	Camping places and hospitable people.
Campsites	Key tourist attractions are Peaks such as Rakaposhi, Diran, Bilchar-Dubani (7 facets), Laila peak and Phophoruch Dar. Prominent glaciers include Hinarchi (21 km), Gargo (18 km), Younay, Ghutoomi, Boifer, Baring and Diran. Treks are listed as under: -Hinarchi-Diran-Nagar -Gargo-Khaltaro (Haramosh valley) -Shaki-Arandu, Shigar (Skardu) -Surgin-Manoga (Danyor)	Taisot village is famous for the presence of Dubani peak, a beautiful snow-capped, cone shaped peak, locally known to be the living place of fairies. Another importance is its cultural richness. Taisot is famous for presence and performance of Danyal (Shemenism). The Shemen dance is usually performed to recover a lost thing including a disappeared person or an animal. Some 50-60 years back Dubani peak and adjacent landscapes were used to visit by a large number of foreign tourists but now-a-days tourism sector has been badly affected due to the geo-political and local law and order situations.
Services	Guides: 0 Porters: 150 Cook: 0 Cooks Assistant: 10	Guides: 0 Porters: 100 Cook: 0 Cooks Assistant: 0

1.13. Local Management Institutions (LMIs) in the Valley

Local Management Institutions (LMIs) are present and responsible for traditional governance system in Bagrote valley. LMIs are run through notables or village representatives often selected by villagers for their hamlet or village. Selection of the members for each LMI in

the village is based on mutual consensus of the villagers for a certain period of time like 1-3 years, depending upon their performance or reliance of local people on them. Structure of the LMIs in each village of Bagrote Valley is slightly different from each other. Details in Bulchi and Taisot are as under:

Table 9: Structure of local governance system in Bagrote valley

Village	Number of Haiti	Number of Astaqals	Other members	Total members	Headed by
Bulchi	4	3 people by each Haiti	-UC member (1) chowkidars (one per Haiti) (4)	12	Trangpa or Namberdar
Taisot	3	5-6 One or two people elected by each *Haiti*	-chowkidars (one or two per Haiti) (4) -UC member (1) -Religious Leader (1)	5	Namberdar or UC member or Religious Leader

Bulchi

Decision making system in the village is called *Haiti,* consisting of 12 *Astaqals* (notables) headed by a *Trangpha or Numberdar* (local tribe elder). The 12 *Astaqals* are nominated by four *Haities* (administrative units of the village), three each by a Haiti. These 12 Haiti members together with *Trangpha* and a UC member make a village level forum called "Supreme Council" of the village.

Each year one of the four *Haities* is designated or made responsible for carrying out all the village matters as per the table given in section A5. Responsibility is transferred to the next *Haiti* each year on the day of *Nawroz* (21st March, the very fist day of new year). The responsible Haiti deputes 10-12 *Zaitos* (representative of a governing Haiti) and four chowkidars (one per Haiti) to run the governance affairs. Zaito's role is to ensure ban on free grazing, reporting any illegal act to the Haiti, watch and ward of village resource while the Chowkidar's main role is to inform a certain Haiti about some collective works and inform village people about arrival of certain guests, etc. Zaito is paid @ Rs. 500-1000 and he is exempted from *Rajaki* (collective works in the village e.g repair of water channels or pavement to pastures etc.,). Each year on the day of Nawroz, the deputed Haiti makes a public announcement about the rules and regulations of the year, emphasizing amount of fines in cash or in kind for various offenses/unwanted activities regulating use of natural resources.

In addition there is a Jungle committee comprising of 14 persons (2-3 Astaqals per Haiti and other notables). The jungle committee looks after the matter of forest conservation and also drinking water supply to the village while rest of all matters regarding social and rural

development is the responsibility of the village supreme council. For religious affairs, there is a forum in the village called Imamia Council comprising of one Alim (religious leader) and two Astaqals per Haiti. A schematic diagram of the Decision Making System in Bulchi village of Bagrote is given as under:

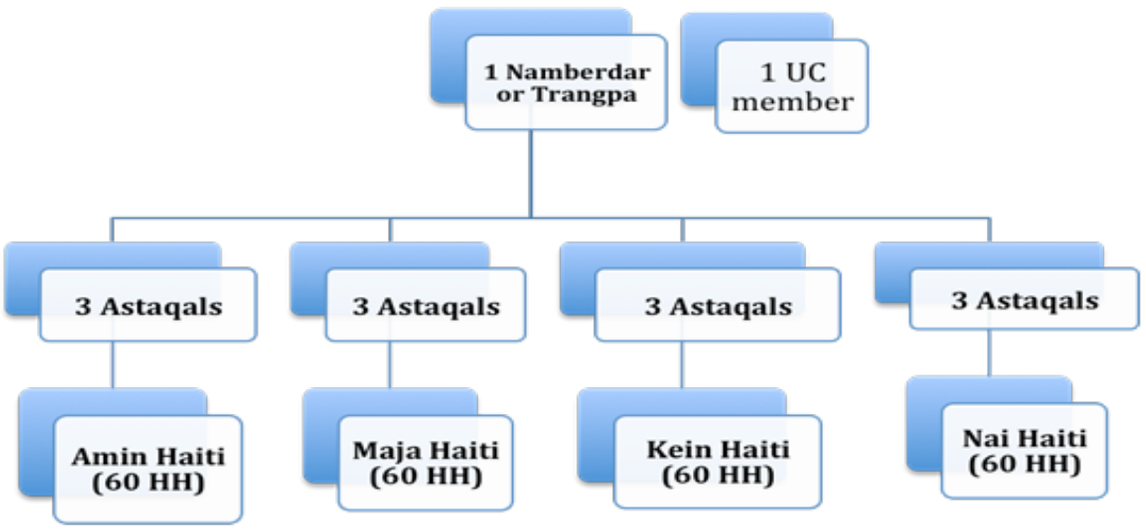


Figure 13: Schematic diagram of the decision making system in Bulchi

Taisot

Decision making system in the village is called *Rawaj* (rules and regulation) operated through *Haiti*, consisting of 5-6 *Astaqals* (notables) headed by a *Trangpha or Namberdar* (local tribe's elder). The Astaqals are nominated by three *Haities* (administrative units of the village), one or two by each Haiti. On need basis, the UC member or religious leader is also involved in the decision making process.

Each year one of the four *Haities* is designated or made responsible for carrying out all the village matters as per the table given in section A5. Responsibility is transferred to the next *Haiti* each year on the day of *Nawroz*. The responsible Haiti deputes 10-12 *Zaitos* (representative of a governing Haiti) and four chowkidars (one per Haiti) to run the governance affairs. Zaito's role is to ensure ban on free grazing, reporting any illegal act to the Haiti, watch and ward of village resource while the Chowkidar's main role is to inform a certain Haiti about some collective works and inform village people about arrival of certain guests, etc. Zaito is paid @ Rs. 500-1000 and he is exempted from *Rajaki* (collective works in the village e.g repair of water channels or pavement to pastures etc). Each year on the day of Nauroz, the deputed Haiti made a public

announcement about the rules and regulations of the year, emphasizing amount of fines in cash or in kind for various offenses/unwanted activities regarding natural resources.

In addition, there is a Jungle committee comprising of 14 persons (2-3 Astaqals per Haiti and other notables). The jungle committee looks after the matter of forest conservation and also drinking water supply to the village while rest of all matters regarding social and rural development is the responsibility of the village supreme council. For religious matters there is a forum in the village called Imamia Council comprising of one Alim (religious leader) and two Astaqals per Haiti. A schematic diagram of the decision making system in Taisot village is given as under:

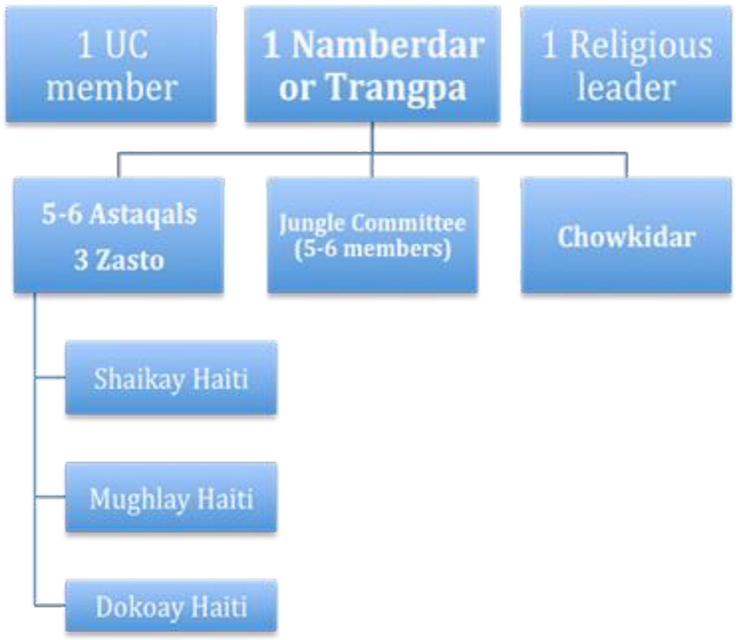


Figure 14: Schematic diagram of the decision making system in Taisot

1.14. Role of LMIs in managing natural resources

Sector/areas of decision making	Role in decision making	Rate in terms of effectiveness*
Bulchi		
Pasture	Fix date for Uchai (upward/downward movement of livestock to and from pastures), levying fine or fee for outsiders herders, grazing management (on rotation) and ban on free grazing.	8
Forests	Jungle Committee is responsible for forest management (details in section A5)	10
Land resources	Division of new lands brought under cultivation among village people, conflict resolution on individual and communal lands	10
Water resources	Construction of new channels, repair of old channels and collection of drinking water fee	9
Wildlife	Ban on illegal hunting	9
Pasture	Fix date for Uchai (upward/downward movement of livestock to and from pastures), levying fine or fee for outsiders herders, grazing management (on rotation) and ban on free grazing.	8
Taisot		
Pasture	Fix date for *Uchai* (upward/downward movement of livestock to and from pastures), levying fine or fee for outsiders herders, grazing management (on rotation) and ban on free grazing.	10
Forests	Regulate forest use through Jungle Committee (JC), if not resolved by the JC the case is referred to Jirga (UC member+Astaqals+Namberdar)	10
Land resources	Division of new lands brought under cultivation among village people, conflict resolution on individual and communal lands	8
Water resources	Regulate equitable distribution of irrigation water	9
Wildlife	Ban on illegal hunting with support of DDO	8
Mining	Ban on outsider miners	9

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

1.15. Use rights of natural resources and associated customary laws

Theme/Area	Customary laws/restrictions	Enforced by
Bulchi		
Grazing areas/pasture use/livestock migration, guarding	Grazing management including fixing date of *Uchai* (collective movement of all animals from village to pastures in early spring (15 June) and from pastures back to villages in mid or end of autumn (25 Oct-5 Nov); rotational grazing (step by step upward or downward with changing season); Change in grazing system in case of drought or other natural calamities; Impose fine if someone violates grazing system (@ Rs. 200-1000 keeping in view the nature of unwanted act or in case of severe offence *e.g.* intentionally violating ban on free grazing, a heavy fine is imposed such a bull or a goat is confiscated from the offender). Livestock owner pay to the shepherd in kind such as 40-80 kg cereals (called *Baspoor)* and grocery including sugar, salt, oil and 40 kg of wheat flour (collectively called *Saiyo*) and half of the ghee produced from milking animals during the whole summer season, while in winters in addition to *Baspoor* and *Saiyo,* the shepherds are given a lavish treat at the time of *Noose / Nasalo* (slaughtering animals to store meat for winters) and served with traditional dishes including *Diram* with apricot oil.	Haiti
Fuelwood harvesting from natural forests	Only dry biomass is allowed to collect as fuel wood; Any wood which, by any means is suitable to use as timber is not allowed to use as firewood, if someone does it, a fine is imposed @ Rs. 50/log; Cutting of green wood for the purpose of domestic energy is unlawful and thus completely restricted.	Haiti / Jungle Committee
Timber harvesting from natural forests and use	For protection and wise use of natural forests a Jungle Committee (JC) has been formed in the village; Transportation of timber (including the old used wood) outside the valley (Bagote) is completely banned; Only a permanent resident of the village (a person owns land property and home in the village and stays there for at-least six months) is eligible to apply for timber from natural forests; A person belonging to the village but migrated outside, e.g. in Gilgit or Jalalabad and having no land in the village or not staying in the village for at least six month is not eligible to acquire timber from the village forest/s; A person in want of timber for construction of a house in the village first submits an application to the JC, which meets once in a month and each month 8-10 applications are entertained; The applicant has to pay the JC a fee of Rs. 500 for an adult Kail tree (*Pinus walliciana*) and Rs. 400 for an adult spruce tree (Picea smithiana). The fee	Jungle Committee

	deposited remains valid for a period of one month only, otherwise it is non-refundable and the applicant has to pay again if the tree was not cut within the specified time period; Kail is preferred for doors and windows while Spruce is used for making kari/patawa (wood log); The JC members along with the applicant visit the forest area and mark the tree for cutting (preferably a dried, defective, or diseased, in any) in favor of the applicant who is responsible to cut the tree and transport it to the village within 40 days of the approval of application otherwise fine is imposed in the form of a patawa/kari (wood log) if didn't cut within the specified time; If someone caught fetching timber from the forest without JC's prior permission, the timber is confiscated and fine is imposed valuing three times market value of the confiscated timber volume; Any applicant cannot sell timber, which is excessive to his needs. Rather such excess quantity is handed over to the JC, after receiving Rs. 100/patawa for cutting and transportation charges; All saw machines in the village have to work under the supervision of JC.	
Use of water resources	Tap water is not allowed to use for farming; Everyone is the village has to participate the collective work of water channels repair, if someone gets absent, has to pay a fine.	Haiti / Jirga
Mining	Outsiders are not allowed to work on mines in the village	Haiti / Jirga
NWFPs including MAPs collection	Utensils (e.g. plough, spoons, bowls) made from birch (*Betula utilis*) trees are not allowed for sale, rather made only to use within the village; No outside is allowed to collect NTFPs from local forests, unless permitted by JC or GB Forest department for special purposes	Haiti / Jungle Committee
Wildlife	Illegal hunting or killing/poaching of wild animals is completely banned. If someone commits such an offence, a fine is imposed upto Rs. 5000. Gun is confiscated and case is referred to Wildlife Department or Police for jurisprudence / prosecution.	Haiti / JC
Collective work in the village	The collective work in the village is called *Rajaki*, carried out by the participation of all villagers, e.g, repair of water channels, repair of pavement or food bridges on the way to pastures, etc. The ones who can't participate physically in such activities, e.g a shepherd, employed by army or other government organizations etc have to pay Rs. 1500-2000 per year. This kind of persons are called "*Laspik walay*" and the amount collected is called "*Laspikali*". The amount collected is used for various activities of common interest, e.g. entertainment of common guests, any development activity such as maintaining a hostel in Gilgit or matching grant for any development activity in the village. Thus each Haiti has a saving of Rs. 100,000-200,000 per year. Right holder of Bulchi who are settled in Oshikhandas, Jalalabad, Danyore and Gilgit have to pay Rs. 500/year as his part of contribution for collective developmental activities in the village.	Haiti / Jirga

Taisot		
Grazing areas/pasture use/livestock migration, guarding	Grazing management including fixing date of *Uchai* (collective movement of all livestock to pastures in spring and from pastures in autumn, rotational grazing (step by step upward or downward with changing season). A shepherd carrying livestock of local people to high pastures in summer or winters is paid in kind by the livestock owners. If the herd size of a herder handed over to a shepherd is less than five goats, the shepherd consumes or takes all production while if herd size is more than five goats the off-springs and production (butter) is equally divided between the herder and shepherd.	Haiti/Jirga
Fuel wood collection from natural forests	Areas are specified to collect firewood for domestic energy, no one can fetch fuel or fire wood beyond the specified limits, amounts and areas.	Haiti/Jirga
Timber harvesting from natural forests and use	The JC get permit of harvesting dead/fallen wood for natural forests (from Forest Department of Gilgit-Baltistan) and provides that permit to a local resident applicant @ Rs. 300/patawa (12-14 cft log of timber). JC also monitors that the applicant doesn't exceed the quantity and replace an identified tree with another one in the forest. If someone violates the rules, a fine of Rs. 1000 is imposed by the JC.	Jungle Committee
Use of water resources	There are six channels carrying varied quantity of irrigation water to different parts of the village. That quantity is regulated through a set pattern or irrigation.	Haiti/Jirga
Mining	Outsiders are not allowed to explode any mines in the village for minerals and stones	Haiti
NTFPs/MAPs	Outsiders are not allowed to collect NTFPs	Jungle Committee/ Haiti
Wildlife	There is a complete ban on illegal hunting or killing/poaching of wild animals in the village, through active involvement and support of DDO. If someone violates the rules, a fine is imposed on him in the form of an adult cattle preferably a bull.	Haiti/Jirga

1.16. Local NGOs and CBOs in the target villages

Name Organization	Year of Establishment	Number of Members (Individuals/HH)	Roles	Who established (name of organization)	Rate in terms of effectiveness (mandate)
Bulchi					
Jungle Committee		240	Forest Conservation and manage drinking water supply scheme	Local people	10
Dubani Development Organizaion		240 HH	Nature conservation, rural and social development	AKRSP	7
Bulchi Development Organization (VO)	2011	34 HH	Saving	Local activists	10
Raki Development Organization (VO)	2012	19 HH	Saving	Local activists	10
Hinarchi Development Organization (VO)	2012	24 HH	Saving	Local activists	8
Women Organization Bulchi Bala	2013		Saving and Vocational training	AKRSP	6
Women Development Organization Bulchi Paeen	2012	32 HH	Saving and Vocational training	AKRSP	6
Taisot					
Abshar Welfare and Development Organization	2008	46 individuals	Education	Manzoor, Dubani Publishing Network	2
Four village Organizations (VOs)	1980s	Not known	Social and rural development	AKRSP	10
One Women Organization (WO) named Sosan WO after the name of a lady Social Organization of AKRSP who traveled by food to the village when there was no jeep access to Taisot village	1990s	Not known	Social and rural development	AKRSP	7
Dubani Development Organization (DDO)		All HH of the village	Social and rural development and nature conservation		5

Dobani Development Organization (DDO)

Dobani Development Organization was established in 1996-97 with facilitation of AKRSP. It is the first local support organisation formed by the community with the support of AKRSP, in Gilgit region. It comprises of 28 VOs, 28 WOs, 11VDOs and 2 YOs and is headed by a chairman and governed by a General Body comprises of 60 members, 28 members from Village Organizations and Women Organization each and 2 members from Civil Society Organizations and Youth Organizations each. However, the Board of Directors comprises of 26 members, with 11 members from VOs and WOs each and 2 members from CSOs and YOs each.

The organization aims to serve as an institute and platform for human development and promoting culture of peace and violence, elimination of poverty through participatory action of the people and to equip society with formal, non-formal, skills and democratic values by realizing their social and economic development and basic human rights.

Since its establishment, DDO has successfully organized different community awareness sessions in areas of disaster management, agriculture and business entrepreneurship, as facilitator to different national and international organizations including: FOCUS, LEAD Pakistan, USAID and AKRSP.

2. Management issues and problems

2.1. Traditional low yielding agricultural practices

Yield of cereal crops in the valley, particularly that of wheat is 1477 kg/ha, which is less the national average of 2833 kg/ha (GoP, 2010-11)[14]. In addition, due to limited agricultural land holdings (on average 0.70 ha per household) and easy access to subsidized wheat, growing wheat seems to be an economically less viable option in the valley. The area is suitable for production of high value crops such as potatoes and fruits. In Bagrote valley, a considerable quantity of potatoes (on average 81-93%) of the total production is sold in the local market but despite having huge potential, marketing of fruits like apricots, apple, pear and walnut needs lot of intervention in horticultural value chain development. Due to smaller landholding, there is little option for crop rotation, leading to declined productivity.

Moreover, the valley has considerable quantities of wool and hair obtained from domestic livestock. Despite having a high demand of 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 raw material for making products. By developing cottage industry, the wool and hair raw material can be utilized to make these a good source of income generation and self-employment for local youth, both men and women.

2.2. Pastures degradation

Intermediate (spring/autumn grazing areas located at 3500-4000m asl) 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 continuously graze on pastures for almost 6-8 months of the year, resulting in depletion of pastures / grazing grounds.

One of the reasons for extensive grazing of intermediate and lower pastures is lack of fodder produced on farmland. The fodder produced on marginal lands (less suitable for growing cereals and vegetables) is still not sufficient to feed animals during long and harsh winters, spanning over five-six months.

Secondly, as a result of conservation initiatives the number of wild ungulates also has increased, exerting even more foraging pressure on the shared grazing grounds. Moreover, due to poor accessibility or lack of water for drinking in certain pastures, more accessible areas with availability of drinking water are excessively grazed, while farther patches even with high quality ample forage are left ungrazed.

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

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

ID	Bulchi		Taisot	
	Pasture Name	**Status***	**Pasture Name**	**Status***
1.	Harali	PD	Becili Bar	D
2.	Chubagin	H	Hopsar	H
3.	Khama	H	Margushi	PD
4.	Surgin	H	Gamasar	PD
5.	Baring	PD	Bilchar	H
6.	Hinarchi	H	Kotowal	H
7.	SBD	D	Serkon Harai	PD
8.	Barchi	PD	Shotal harai	PD
9.	Manugushi	H	Yourai Harai	PD
10.	Dodormal	H	Walo Harai	D
11.	Shaki	H		
12.	Celleili	H		
13.	Rajimani	H		
14.	Surroundings of the village	D		

* D degraded, PD partly degraded, H healthy

A summary of most desired activities in some of the pastures is given as under:

Village	Name of Pasture	Problems need to address	Recommendation
Bulchi	Harali	Drought (low snowfall)	Water supply from Nomal Hichini/Naltar
	Chubagin	Lack of drinking water for livestock	Water supply from Bar/Surgin
	Khama	Lack of drinking water for livestock	Water from Tikoyo spring can be stored and supplied through pipeline
	SBD	Excessive Grazing	Timely transfer to Harali, if water is made available for Harali
	Shaki		
	Surrounding of Bulchi		
Masingot	Beinja	Lack of drinking water for livestock Loss of animals to predators	Development of water points Construction of predator-proof corrals
	Pharkochay		
	Goshala		
	Kotumua		

2.3. Traditional animal husbandry and associated problems

2.3.1. Livestock mortality

Annual livestock mortality in Bagrote valley is around 12.8% of the total livestock holding. Local people attribute majority of the goats and cattle deaths to diseases followed by accidents (avalanches, landslides etc) and mammalian predators (snow leopard and wolf). Whereas, in sheep diseases are told to be the major cause of livestock loss followed by mammalian predators. The dominant diseases are Pestes Petitis Ruminants (PPR), pox, viral diarrhea, mange, Foot and mouth disease (FMD), Black quarter (BQ), Gastro intestinal tract disorders, hematuria, and weakness due to lack of food and winter stresses. Suspected predators are wolf and snow leopard and sometime foxes are said to prey upon young animals.

The causes of animal mortality in high pastures during summer months is less known to livestock owners who do not stay in pastures with their livestock. One of the reasons for death of animals is winter stress coupled with lack of food leading to weakness and sometimes death.

Status of livestock mortality during last one year (2013) in Bagrote valley is given in the following table and Fig 15:

Mortality causes	Cattle		Goats		Sheep	
	Number	**Percentage**	**Number**	**Percentage**	**Numbers**	**Percentage**
Predation	31	18	47	19	33	29
Diseases	69	41	117	47	37	33
Accidents	54	32	61	24	20	18
Unknown	15	9	26	10	22	20
Total deaths	169		251		112	

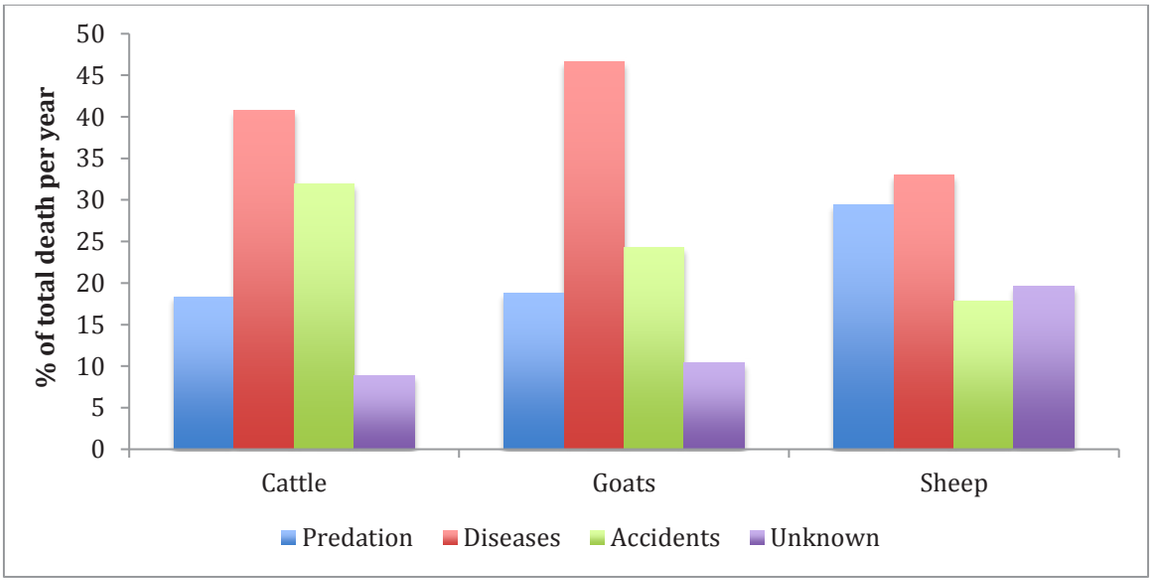

Figure 15 Causes of livestock mortality in different types of livestock

2.3.2. Lack of Veterinary Facilities

Bulchi:

There is no veterinary facility in the village. For treatment people take their livestock to veterinary dispensary in Farfoh (3 km) or fetch medicine from Gilgit. Most of the people try to treat animals at home, through some indigenous techniques.

Taisot:

There is no veterinary facility in Taisot village. For treatment, people take their livestock to veterinary dispensary at Jalalabad (15-20 km) or fetch medicine from the dispensary at Jalalabad or Veterinary hospital at Gilgit.

2.3.3. Lack of a permanent vaccination Programme for livestock

Generally, Bagrote valley severely lacks in adequate veterinary health facilities, despite having a good livestock population in the region. For treatment, people either take their animals to veterinary dispensary at Farfoh (3 km) or fetch medicine from Jalalabad (15-20 km) or Gilgit. Most of the people try to treat animals conventionally at home, using most primitive conventional techniques.

However in recent years, LS& DD department, WWF and Ev-K2-CNR under SEED project in the valley, has arranged few vaccination campaigns. The LS&DDD has limited financial and human resources to make the livestock vaccination a regular activity and the herders cannot afford to buy vaccines for their animals as per their needs.

2.3.4. Traditional cattle sheds with poor sanitary measures

Traditionally built cattle sheds in the valleys seriously lack in sanitary measures, affecting both the health and productivity of domestic animals. There are no separate compartments for feeding and drinking water. Cattle sheds are quite congested, often without light and ventilation. Animals defecate, feed and sleep in the same place. In heavy rains or snowfall the, sheds get

excessively wet for longer periods adding to the stress of animals. Majority of the diseases (*CPP-Contagious Pleuro Pneumonia*, *PPR*, *Theleriosis & Pasteurellosis*) are exacerbated by harsh winter coupled with poor hygiene.

2.4. Forests and forestry related issues

2.4.1. Depletion of plant biomass due to timber and firewood extraction

Natural forests in Bagrote valley are relatively better protected, comprising of good regenerating patches of economically important tree species like Pine, Spruce and Kail. Deforestation in the valley due to extraction of timber was at high prior implementation of customary laws some 15-20 years ago but at present, timber extraction from natural forests is being regulated under customary laws. However, still there is considerable pressure due to extraction of firewood.

With growing human population the need for firewood to meet domestic energy needs has also exponentially increased putting significant amount pressure on the natural forests of the area. Analysis of firewood consumption in the valley shows that clinging pressure on natural forests is mostly due to extraction of wood for fuel, fire and timber. An analysis of fuel wood consumption in the six villages of Bagrote valley is as under:

Table 10: Statistics of fuel wood consumption in Sinaker village

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Kg
Artemisia	0	0	0	0	0	0	0	0	0	0	0	0	0.00
Sea buckthorn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0.00
Shrubs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0.00
Dung	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0.00
Riparian vegetation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0.00
Natural forest	169.23	153.85	130.77	80.00	29.23	20.00	23.08	29.23	70.77	115.38	138.46	146.15	1106.15
Wood from orchards/ fruit trees	4.62	3.08	3.08	1.54	1.54	3.08	3.08	1.54	3.08	0.00	3.08	4.62	32.31
Plantations	53.85	51.54	53.08	34.62	10.00	15.83	13.08	13.08	32.31	44.62	49.23	53.08	423.08
Buy	9.23	9.23	7.69	4.62	1.54	3.08	3.08	1.54	3.08	7.69	10.77	7.69	69.23

Table 11: Statistics of fuel wood consumption in Datuchi village

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Kg
Artemisia	1.47	0.29	1.32	1.32	0.74	0.74	0.44	0.74	0.15	0.15	0.24	0.29	7.88
Sea buckthorn	20.00	16.03	7.94	6.91	6.47	4.26	4.26	4.26	7.06	19.85	23.24	24.41	134.12
Shrubs	1.47	1.32	1.18	1.62	1.18	1.32	1.32	1.32	0.59	1.32	1.47	1.18	15.29
Dung	0.74	0.74	0.29	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.59	0.88	3.53

Riparian vegetation	6.76	3.68	1.91	0.00	0.00	0.00	0.00	0.00	0.00	1.18	5.88	5.88	25.29
Natural forest	153.18	145.44	102.85	76.29	53.94	50.12	53.35	48.65	82.76	121.50	141.71	149.88	1179.68
Wood from orchards/ fruit trees	22.21	21.18	19.41	14.71	19.41	18.82	18.24	20.59	21.47	21.62	28.94	29.56	255.29
Plantations	148.91	136.85	109.59	97.68	86.06	85.74	74.88	77.32	97.74	123.73	136.85	148.32	1320.03
Buy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 12: Statistics of fuel wood consumption in Hopay village

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Kg
Artemisia	0.00	0.00	0.00	0.00	2.00	3.00	2.00	3.00	1.00	1.00	0.00	0.00	12.00
Sea buckthorn	0.00	0.00	0.00	0.00	2.00	0.00	0.00	2.00	0.00	0.00	2.00	4.00	10.00
Shrubs	0.00	0.00	0.00	2.00	3.00	5.00	3.00	1.00	1.00	3.00	4.21	0.00	21.00
Dung	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Riparian vegetation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wood from natural forest	430.00	419.0	93.00	68.50	40.00	31.00	31.50	30.00	55.50	120.50	228.50	402.0	1949.50
Wood from orchards/ fruit trees	72.00	71.00	82.00	56.00	28.00	28.00	28.00	30.00	44.00	63.68	81.00	50.53	628.50
Plantations	46.50	39.00	70.00	50.50	48.00	55.00	53.00	51.00	56.50	74.50	72.00	75.50	691.50
Buy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 13: Statistics of fuel wood consumption in Bulchi village

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Kg
Artemisia	0.00	0.00	0.00	0.51	0.85	1.19	0.85	0.51	0.85	0.34	0.00	1.02	6.10
Sea buckthorn	0	0	0	0	0	0.34	0.34	0.34	0.34	0	0	0	1.36
Shrubs	0.68	0.68	0.00	0.17	0.34	0.34	0.34	0.34	0.17	0.00	0.00	0.00	3.05
Dung	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.68
Riparian vegetation	0.34	0.00	0.00	0.00	0.00	0.34	0.34	0.34	0.00	0.00	0.00	0.00	1.36
Wood from natural forest	431.53	403.67	203.56	138.31	104.24	97.63	97.63	108.81	154.41	223.39	297.12	400.96	2661.24
Wood from orchards/ fruit trees	11.86	12.20	5.08	3.39	5.76	6.10	6.44	5.42	5.76	7.63	6.95	12.54	89.15
Plantations	2.71	2.71	2.03	0.68	0.34	0.00	0.00	0.68	1.02	3.73	4.41	2.71	21.02
Buy	0.00	0.00	0.00	0.00	3.39	3.39	0.00	0.00	0.00	0.00	0.00	0.00	6.78

Table 14: Statistics of fuel wood consumption in Taisot village

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Kg
Artemisia	0.00	0.00	5.00	4.17	3.33	5.00	2.50	2.50	2.50	2.50	3.33	1.67	31.84
Seabuckthon	4.17	0.00	0.00	0.00	0.83	1.67	0.83	2.50	2.50	6.67	5.83	2.50	26.94
Shrubs	0.00	0.00	0.83	0.00	0.00	0.83	1.67	0.00	0.00	0.00	0.00	0.00	3.27
Dung	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Riparian vegetation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wood from natural forest	168.33	165.00	118.75	85.83	67.50	58.33	50.83	51.67	101.67	125.00	148.33	166.67	1281.22

Wood from orchards/ fruit trees	26.67	26.67	43.54	30.31	24.38	21.67	20.00	24.17	28.96	45.00	60.42	59.58	395.61
Plantations	83.33	74.17	52.50	23.33	20.00	19.17	25.00	24.17	38.33	64.17	79.17	88.33	579.59
Buy	20.83	20.00	10.00	7.50	6.67	5.00	5.00	4.17	10.00	12.50	12.50	12.50	124.08

Table 15: Statistics of fuel wood consumption in Masingot village

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Kg
Artemisia	0.00	0.00	8.00	5.33	2.67	2.67	0.00	0.00	2.67	0.00	2.67	2.67	248.00
Sea buckthorn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shrubs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dung	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Riparian vegetation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wood from natural forest	69.33	69.33	58.67	58.67	37.33	29.33	26.67	21.33	61.33	72.00	85.33	125.33	714.67
Wood from orchards/ fruit trees	32.00	24.00	85.33	66.67	42.67	30.67	40.00	48.67	85.33	98.67	88.00	37.33	679.33
Plantations	122.67	122.67	102.67	88.00	69.33	57.33	56.00	53.33	106.67	122.67	128.00	117.33	1146.67
Buy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

2.4.2. Free grazing, a challenge for afforestation and social forestry

During late autumn, winter, and early spring, livestock are left free for grazing in and around the villages, primarily due to scarcity of fodder for stall-feeding and lack of access to pastures due to heavy snowfall. Most of the damage to natural regeneration, new plantations of forest and fruit trees occurs during this time due to trampling of juvenile regrowth and debarking of young plants by goats, cattle and equines. In addition, animals also damage plants by shaking as people tend to raise 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, under local 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 masonry and bushes to use as fence. 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 fuel wood and therefore is being heavily consumed for domestic energy.

2.4.3. Lack of alternatives of domestic energy

Due to lack of alternative sources of fuel wood 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 burnt 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 addition to firewood, some households (only 38%, n=262) use some sort of alternative sources of domestic energy, like LPG, electricity and kerosene. LPG is being used by 4.6%, n=262, electricity by 19.5%, n=262 and kerosene oil by 20.6%. Kerosene and LPG are being used in winters (December – February) while electricity is mostly used in summer (April – September) when there is surplus electricity due higher glacier melt in local streams, as an alternative source of domestic energy, mostly for cooking. There isn't any supporting agency in the valley so people buy these alternate fuel sources by themselves from the local market.

2.5. Challenges for wildlife conservation

2.5.1. Illegal hunting and poaching

There are no recorded incidences of illegal hunting and poaching in Bulchi and Taisot villages of Bagrote valley, but such activities cannot be ruled out as indicated by some anonymous reports about hunting of ibex or shooting of game birds in the area, inclusive of Bagrote The wildlife watchers employed by GB department of wildlife, CKNP and community (during implementation of SEED Project, 2011-2014) are not enough in number to cover the large geographical extent of the valley.

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, one of the participants of FGD in Bulchi informed that some 15 years back a female snow leopard was gun shot in Gais while attacking on cattle. According to other informants, iron traps are still used to kill wolf and fox in the valley and carcasses are poisoned if a mass killing of livestock occurs due to a predator. However, no predators as of then, were killed for pelts, the respondents claimed.

2.5.3. Chance of disease transmission between livestock and wildlife

Foxes have quite often been observed in Bulchi and other villages, suffering from skin diseases such as scabies. The villagers in Bulchi reported that almost 20 years ago an Ibex was observed to have suffered from some sort of skin disease, not scabies exactly. Moreover, a local veterinary expert in Bulchi village informed that a disease namely *Coryza* was observed in Ram Chakor (*Tetraogallus himalayansis*). Incidences of disease outbreak in wild ungulates has been observed in other habitats in Karakoram, e.g. Shimshal Pamir, Pakistan (adjacent to CKNP) where a severe outbreak of *sarcoptic scabies* affected blue sheep population in early 2000, whose likely source was indicated in infected livestock[15]. Similarly contact with infected livestock was suspected on occasion of a deadly *Contagious Caprine Pleuropneumonia* (CCPP) episode amongst threatened Markhor in Tajikistan[16].

Usually, an animal died of a disease is left outside without properly disposing off, leading to increasing chance of disease transmission to scavenging wildlife, as there is no domestic dogs in Bagrote valley.

2.5.4. Issues in initiation of trophy hunting of S. ibex

In 2014, the Wildlife Management Board for Gilgit-Baltistan (WMBGB) has notified Bagrote valley as a Community Controlled Hunting Area (CCHA) to facilitate trophy hunting of Siberian 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 size animals etc. When there are delays in trophy hunting, the community gets demotivated and stops proactive conservation efforts.

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[15] 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

[16] Ostrowski, S., Thiaucourt F, Amirbekov M, Mahmadshoev A, Manso-Silvan L, et al. 2011.Fatal outbreak of Mycoplasma capricolum pneumonia in endangered markhor, Tajikistan. Emerg Infect Dis, http://dx.doi.org/10.3201/eid1712.110187

Secondly, for trophy hunting of wild ungulates in Pakistan and Gilgit-Baltistan, specific procedures have been framed[17],[18] (yet to be rectified and enforced by Government of Gilgit-Baltistan). The procedures provide proper guidelines 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 an economic incentive rather than an incentive for 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 organizations) seems to be less reliable in terms of accuracy and scientific standards.

2.5.5. Challenges in running livestock Insurance scheme

Dubani Development Organization (DDO) initiates a Livestock Insurance Scheme in six villages of Bagrote valley; district Gilgit with technical and financial support from WWF-Pakistan under SEED Project. A brief account of the Scheme in Bagrote valley is as follows:

Some 40 Households are registered members of the Scheme, who have insured 520 animals in total. In the scheme WWF-Pakistan has provided Rs. 200000/- and DDO shared Rs. 50000/-. (Fund-A). So far, members have contributed Rs. 9400 as premium of the insured animals for first year (Fund-B). Compensation for livestock losses are supposed to be made from the amount of interest of Fund-A. Both funds have been kept in a local Bank based on maximum profit providing in Gilgit and the signatories to the accounts are two community representatives in Fund-A and a representative of local community with a representative of DDO in Fund-B. So far DDO has not constituted a sub-committee namely Livestock Insurance Management Committee (LIMC) to deal with compensation related matters.

For the shepherds and local people, it is challenging to verify a predation case with reference to a snow leopard kill or any other predator because in wild or near the village the dead livestock is difficult to verify. The DDO office bearers are facing difficulties in maintaining proper record of the scheme including finances so it is difficult to assess success of the scheme. Another biggest challenge to run this scheme is lack of funds to compensate all losses.

During the year 2013-2014, 15 animals (2 yaks, 6 goats, 3 cattle and 4 sheep) were reported being killed by a snow leopard in Bulchi village only. The committee did not make any compensation to the losses, because of the insufficient amount of interest of the Fund-A.

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[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] WWF-Pakistan. 2003. Draft Procedures for Community based Trophy Hunting Programme in Pakistan. Gilgit-Baltistan Parks and Wildlife Department, Gilgit.

2.6. Freshwater resources and associated problems

2.6.1. Problems associated with irrigation water supply

Construction, repair and maintenance of irrigation 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
Sinaker	Gady ill	74°30'13.79"E, 35°58'15.19"N	-	-
Datuchi	Datuchi Khass	74°31'49.44"E, 36° 0'10.74"N	-	-
Hopey	Hopey main channel	74°32'37.05"E, 35°59'39.19"N	-	-
Bulchi	Daldalum	74°33'42.18"E, 36° 2'10.15"N	± 4000 m	
	Shutmani /Musko	74°33'57.24"E, 36° 2'19.37"N	±1600ft	Under process for construction
	Burum	74°33'46.11"E, 36° 2'16.12"N	±3000m	
Taisot	Daray	74°33'27.56"E, 35°56'56.04"N	-	-
	Jimmy	74°33'47.84"E, 35°57'0.32"N	-	-
	Kino ouch	74°33'9.32"E, 35°57'3.67"N	-	-
	Bar	74°34'1.60"E, 35°56'27.00"N	-	-
Masingot	Main channel masingot	74°33'3.61"E 35°56'32.67"N	-	-

2.6.2. The threat of Glacial Lake Outburst Floods

The Bagrot valley being amidst Hinarche, Burche, Gutumi, Yune and several smaller cirque glaciers existing in the higher reaches of the valley, is considered to be at high risk of GLOF for the last few years. Bagrot valley, covering an area of 452 km^2 is characterized by an extreme geomorphological relief, ranging from 1500 m up to 7788 m at the summit of Rakaposhi. The glaciated area is about 42.3 km^2 and major part of the lower tongue is covered by supra-glacial debris, similar to the other glacier tongues in the valley. The valley has 1100 households with an estimated population of 10,000 people, vulnerable to GLOF risk, and thus need immediate

attention for preparedness and risk mitigation measures. The UN Adaptation Fund supported GLOF project of the MoCC has started some preparedness work in the valley, but a lot more is yet to be done to enhance disaster resilience of local people against GLOF related risks in the area.

2.6.3. Extraction of Glaciers

Extraction of ice, fern and snow from the glaciers for sale in local markets of Gilgit is an important source of livelihood for some local people in Bagrote valley. Large slabs of ice and fern are cut from the terminus of Hinarchi glacier and transported down to Bulchi village (1-2 km) on the back of donkeys and horses, from where the same are transported to Gilgit on jeeps and tractors. This glacier is used as ice in homes and also to make sort of ice cream in bazar of Gilgit and nearby villages of Danyore, Oshikhandas and Jalalabad. Scope of this business has been exponentially increasing for the last 5-8 years due to various factors especially lack of electricity in surrounding areas of Gilgit for ice making and lack of affordability for poor people to purchase refrigerators.

Exact quantity of extraction in not known but from the fragmented terminus of Hinarchi glacier it can be assumed that this extraction would have a considerable impact on the glacier's volume in the long run. In addition, the digging and trampling activity amidst the extraction would make the glacier more vulnerable for melting and degradation.

2.7. Problems associated with Human and Institutional Development

Strengthening of Community Organisations (CO) in Bagrote valley is a daunting challenge, due to limited human and institutional capacities and vast geographical spread of the valley. 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:

- Geographic spread of Bagrote valley, making it quite challenging for a valley level community organization to work effectively due to long distances between villages (e.g almost 30-40 km between Taisot and Bulchi)
- No proper office space of the COs
- Interest groups hindering community-based initiatives
- Lack of proper election process to scrutinize and bring forward competent personnel/office bearers
- Lack of information among DDO members about by-laws of the DDO, and
- Lack of a dedicated sub-committee under DDO to work on conservation related activities.

3. Proposed management interventions

3.1.1. Sustainable mountain agriculture

There should be a greater focus on value chain development for key horticultural produce like vegetable, seeds (potatoes), and fruits like pear, apple and walnuts. Bagrote valley is one of high pear producing areas in Gilgit region. For packaging and marketing of fruits a farmers' association in Bagrote should be established and linked with Gilgit based dry fruit export agencies such as Mountain Dry Fruit Project and Hashwan Traders and others. Adequate market avenues need to be explored for fresh and dry fruits.

At the moment there is no proper utilization of wool and hair of domestic animals, despite a high value of woolen products in local market. With support of an organization like KADO, local women need to be trained in processing of wool, hair and milk for making of woolen, hair and milk products for sale in local and national markets. 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 and snowfall in winter.

3.2. Pasture management and improvement measures

3.2.1. Creation of Sustainably Managed Pasture Area (SMPA)

A specific pasture area in selected villages of Bagrote valley (preferably, Bulchi, Taisot, Hopay) can be specified as SMPA to demonstrate controlled grazing and other pasture improvement measures. Creation of a SMPA will need rigorous community consultations keeping in view the scope and limitation of pasture management activities. A sub-committee of DDO/VCC should be formed namely SMPA Valley 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 situation is more critical in case of a fragile mountain ecosystem like Bagrote valley where annual precipitation is less than 200 mm. Lower precipitation rates has a direct impact on diversity, regeneration 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 few or all of the following[19]:

[19] 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.

Mostly 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 these 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, throughout the 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 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

In Deferred Grazing System, one part of the pasture is protected from grazing for a longer period while the other part is allowed for grazing. This system of grazing is applied to severely depleted pastures with intention to restore and improve ecological health of the pasture. 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 good practice in Bagrote valley. DDO with financial and technical support from WWF under the framework of SEED have already established fodder cultivation on barren lands of the valley. This practice, in addition to fulfilling feeding requirement of domestic livestock, also contributes to the stabilization of vulnerable slopes by increasing green cover. In order to meet the feeding requirements of lactating animals left behind in the village during summer, as well as stall-feeding of all animals in winters, improved varieties of fodder crops should be encouraged at the village 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 this regard, careful selection of fodder seeds is a must as the seeds from unreliable sources may contain weeds as well alien species 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 (3-5 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 markets, because farmers purchase seed from Gilgit. Moreover, some farmers cannot afford to buy alfalfa seed which costs them Rs. 1500-2000/kg. The local farmers should be urged to have their own seed production system for alfalfa, e.g. the people of Bargo village in Gilgit have their own seed production system for alfalfa. 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 in ***section 4.4.***

Village	Name of location	Coordinates	Irrigation water availability	If no from where water can be brought?	Estimated length of water channel (m)
Sinaker	Nai Jot ille	74°30'56.35"E 35°57'43.76"N	Yes	By repairing the channel	± 500 m
	Gadai ille	74°30'32.99"E, 35°57'38.21"N	Yes	By repairing the channel	± 5000 m
Datuchi	Datuchi Das	74°31'30.64"E, 35°59'1.53"N	Yes	-	-
	Datuchi Kahri	74°31'57.66"E, 35°59'32.60"N	Yes	-	-
Hopey	Slope of Hopey	74°32'6.96"E 35°59'0.96"N	Yes	-	-
	Hopey Das	74°31'45.62"E 35°58'14.98"N	Yes	By repairing the channel & extention	± 5000 m
Bulchi	Daldalum	74°33'42.18"E, 36° 2'10.15"N	No (required to repair a water channel)	By repairing the channel	± 4000 m
	Shutmani /Musko	74°33'57.24"E, 36° 2'19.37"N	Yes	Protective wall	±1600ft
	Burum	74°33'46.11"E, 36° 2'16.12"N	No	Extention of Channel	±3000m
	Daldalum	74°33'42.18"E, 36° 2'10.15"N	No (required to repair a water channel)	By repairing the channel	± 4000 m
Taisot	Daray	74°33'27.56"E, 35°56'56.04"N	Yes	-	-
	Jimmy	74°33'47.84"E, 35°57'0.32"N	Yes	-	-
	Kino ouch	74°33'9.32"E, 35°57'3.67"N	Yes	-	-
	Bar	74°34'1.60"E, 35°56'27.00"N	Yes	-	-
Masingot	Masingot khas	74°32'42.19"E, 35°56'18.24"N	Yes	-	-

Development of water points in selected pastures

The introduction of controlled grazing system requires water points in all the pasture units, in which the animals supposed to be rotated. Therefore, development of new water points is required to facilitate the design of rotational grazing system. Efforts are required to evenly spread drinking water points throughout the pasture. In addition, due to non-availability of water in some pastures, animals avoid grazing there and thus pastures with water available are extensively grazed. This activity is possible, as there is sufficient source of glacier and snowmelt water around. Following the grazing system mentioned above, some of the pasture units would be banned for entire grazing season while some units would be allowed intermittently for grazing. Both the grazing and banned units require water to rotate the animal in different pasture units. Therefore development 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, and the slopes should not be dig out deeper to make them active and hazardous either. The simple, cost effective and environment friendly way of 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 pasture where water points are needed to be developed is given as under:

Village	Name of Pasture	Problems need to address	Recommendation
Bulchi	Harali	Drought (low snowfall)	Water supply from Nomal Hichini/Naltar
	Chubagin	Lack of drinking water for livestock	Water supply from Bar/Surgin
	Khama	Lack of drinking water for livestock	Water from Tikoyo spring can be stored and supplied through pipeline
Chini Bar	Beinja	Lack of drinking water for livestock and herders	Pipe water supply from any nearest place
	Pharkochay		
	Goshala		
	Kotumua		

Improvement of Pavements in selected pastures

Due to poor accessibility to some of the pastures, more accessible areas are extensively grazed for longer periods, causing depletion. By improving pavements or developing pony tracks to such pastures, uniform grazing can be maintained and perspectives for controlled grazing can be enhanced. One of such a pasture with difficult accessibility was identified as Rajimani in Bulchi village of Bagrote for future consideration.

3.3. Livestock management

3.3.1. Improvement of veterinary services in the valley

Following options are suggested to improve veterinary services in Bagrote valley:

Priority 1: Through the elected public representatives, the local Community Organizations must strive to establish a vet facility in a central place of Bagrote valley under LS&DD department of the GoGB. Local community should also take up this matter in the meeting/s of DCC Gilgit for discussion and support.

Priority 2: LS&DD department should recruit, train and place Livestock Assistants in distant villages like Taisot, Bulchi and Baktore for primary animal health care. A supporting agency may also provide training, refreshers and field kits to such employees to make them more efficient in service delivery.

Priority 3: Promote community-based livestock extension services. This can be done by establishing Village Input Stores (VIS) in main villages of the valley like the one already established by AKRSP under SEED Project in village Zil of Basha valley. The VIS aims at providing basic treatment to livestock in the villages with the help of a community member trained in basic livestock treatment services. Problem with the VIS in Basha valley was replenishment of the store with required medicine and vaccines after exhausting the first batch of medicines provided. Performance of VIS in Basha valley should be evaluated and keeping in view the lessons of this intervention, similar VISs should be established in selected villages of Barote like Bulchi and Taisot for fast track provisioning of basic veterinary services.

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 but at the same time quite a higher number of herds share summer grazing areas with wild ungulates i.e., ibex, markhor, urial and musk deer, where chances of transmission of contagious disease from wild to domestic animals and vice versa cannot be ignored. Therefore, regular livestock vaccination is a must to avoid losses to the farmers and help promote healthy animals and healthy ecosystems. In this respect, the valley should have a permanent livestock vaccination programme. For this purpose, additional seed money should be provided to DDO to top-up the joint Valley Conservation Fund (VCF) established by WWF and DDO under SEED framework, for sparing some portion of the interest of VCF to purchase medicine for livestock vaccination. DDO should obtain technical support from LS&DD department in this regard. Livestock

vaccination program developed by the veterinary experts of Ev-K2-CNR may be followed as a guideline.

3.3.3. Improvement of cattle sheds for improved sanitation and predator avoidance

Cattle shed improvement has two aspects: first to bring about structural improvements in cattle sheds in the villages to improve health and productivity of animals and second to make structural improvements of corrals in high pastures to prevent animals from attack of predators.

By improving cattle shed in the village diseases of animals can be reduced, which are exacerbated by harsh weather, coupled with poor hygienic conditions. In addition, improving structure of existing cattle sheds can also enhance productivity of livestock. For this purpose, at least one cattle-shed in each of the main village should be improved for proper hygiene, ventilation, feeding and resting areas of the animals. Such interventions for demonstration purposes has already undertaken by AKRSP in some villages of GB. There experiences need to be learnt prior initiating such interventions in Bagrote valley.

Second aspect of improving structure of traditional corrals in high pastures is to prevent mass killing of livestock by mammalian predators such as wolf and snow leopard. Local people in Bagrote valley have frequently reported attacks on livestock by predators, particularly snow leopard in summer pastures. The traditional corrals are normally open structures and animals are unsafe in case of any attack by a predator. The loss of livestock by predators leads to retaliatory killing of the predators through poisoning, using traps or guns.

A predator-proof corral has already been built in Bagrote valley with support of WWF under SEED Project. While replicating such a predator-proof corral in other villages of the valley, experiences from the already built corral should be taken into account. A photograph/sketch of a predator-proof corral built by WWF under SEED Project in Basha valley of Baltistan, well suited to the local climatic and topographic conditions of mountainous areas of Gilgit-Baltistan, is given below for consideration:

3.3.4. Livestock breed improvement

The most preferred animals in the project area, in order of priority are goats, cattle and sheep, respectively. The local breed of livestock is nondescript resulted after years of interbreeding. Because of interbreeding, the productivity is below average, however, they are very adaptive to the local conditions and have the ability to

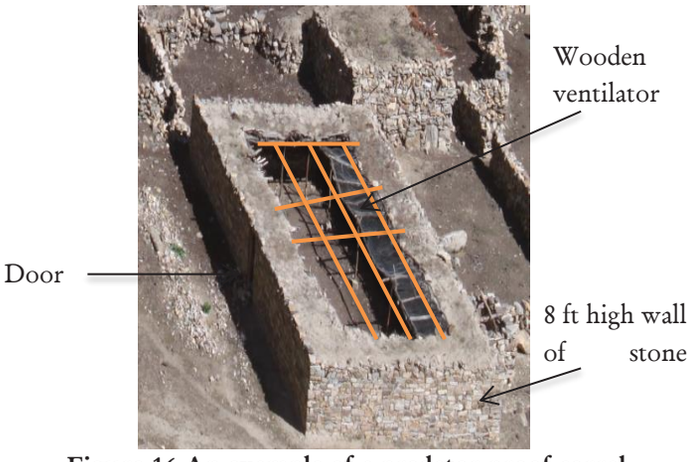


Figure 16 An example of a predator-proof corral

survive and produce with minimum forage[20].

Local people in Gilgit, including low lying villages such as Jalalabad, Oshikhandas, Danyore and Sultanabad, have already started to rear cross breeds of indigenous cow and improved Jersey breed, which are regarded as highly productive in terms of dairy 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 pasture lands.

One of an option for breed improvement is artificial insemination (AI), but it has been observed in some village of Baltistan like Tormik that villages at higher altitudes like the ones in Bagrote are less suitable for AI due to hard topographic conditions; therefore, crossing of local cow with proven Jersey bull can be a more suitable option for breed improvement in these valleys.

Few of such a proven bulls have been provided by WWF under SEED and SWSH projects to local communities in Hoper, Basha, Tormik, Hushey, Gahkuch and Qurumber valleys, which seems quite successful both in terms of successful births to quality animals and their adaptability to local environs. The experiences from the mentioned valleys should be kept in mind prior any such intervention in Bagrote valley.

3.4. Afforestation and forest conservation

3.4.1. Regulate timber extraction from natural forests

In Bagrote valley timber extraction from natural forests is being regulated under customary laws (explained above in section 1.14 and 1.15). The system seems to work efficiently as evident from very good patches of regenerating forests on valley slopes. The system needs to be studies for further improvement and replication in other CKNP valleys.

Following aspects need to be integrated into the customary laws regarding extraction of timber:

- Location of extraction must be fixed for certain period of time, e.g during 2015-2018 from location X, 2019-2022 from location Y and 2023-2026 from location Z....
- The whole process needs to be documented by a concerned CO including information such as name of applicant, date of extraction of timber, quantity of timber extracted, location of timber harvest, plant species harvested etc.

3.4.2. Regulate use of firewood from natural forests

Extraction of firewood from natural forests is still high in Bulchi and Hopay (>1900 kg/year/household) while it is <1100 kg/household/year in rest of the villages in same valley. Extraction of fuelwood from natural forests is also regulated under specific customary laws (see section 1.15 above), but quantity is not fixed. Following points need to be integrated in customary laws regarding fuel wood extraction from natural forests in Bagrote valley:

[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

- Juniper trees: cutting or uprooting of a complete tree should be strictly prohibited, except cutting of single dry branches if there are no other options available;
- 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.

While doing so, local knowledge and traditional management system should be emphasized and taken into consideration.

3.4.3. Firewood plantation

In order to cope with lack of vegetative biomass in the valley local communities have been traditionally planting trees, primarily to meet their fuelwood and timber needs for domestic energy and for construction. Commonly grown trees are poplar, willow, walnut, mulberry and sea buckthorn. AKRSP is the pioneer in promoting social forestry in the valley. Since 2011 the Gilgit-Baltistan Forests, Wildlife and Environment Department, Ev-K2-CNR and WWF Pakistan have also been endeavoring to promote afforestation in CKNP buffer zone valleys. 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 also be carried out on barren and waste lands to meet biomass needs of the valley for domestic energy and timber. An assessment of such locations in Bagrote valley is as under:

Proposed areas for future plantation

Village	Name of location	Coordinates	Irrigation water availability	If no from where water can be brought?	Estimated length of water channel (m)
Sinaker	Nai jut Ille	74°30'52.16"E, 35°57'44.55"N	No	Repairing of AKRSP water channel	±5000m
	Upper Channel (amin pura)	74°30'37.51"E 35°57'48.61"N	Yes	By repairing the channel	±3000
Datuchi	Datuchi Kot (Slope)	74°31'44.90"E 35°59'36.63"N	Yes	-	-
	Datuchi Das	74°31'35.65"E, 35°59'19.08"N	Yes	-	-
Hopey	Hopey Das (new plantation)	74°31'44.67"E , 35°58'17.46"N	Yes	By repairing the Channel	±5000m
Bulchi	Daldalum	74°33'42.18"E, 36° 2'10.15"N	No (required to repair a water channel)	By repairing the channel	± 4000 m
	Shutmani /Musko	74°33'57.24"E, 36° 2'19.37"N	Yes	Protective wall	±1600ft
	Burum	74°33'46.11"E, 36° 2'16.12"N	No	Extension of Channel	±3000m
	Daldalum	74°33'42.18"E, 36° 2'10.15"N	No (required to repair a water channel)	By repairing the channel	± 4000 m
Taisot	Daray	74°33'27.56"E, 35°56'56.04"N	Yes	-	-
	Jimmy	74°33'47.84"E, 35°57'0.32"N	Yes	-	-
	Kino ouch	74°33'9.32"E, 35°57'3.67"N	Yes	-	-
	Bar	74°34'1.60"E, 35°56'27.00"N	Yes	-	-
Masingot	Masingot Kot (slope above bridge)	74°32'43.77"E, 35°56'26.05"N	Yes	By repairing of water head	300 m

The firewood plantation on individual farmlands has been more successful as compared to block plantations done on large chunks of communal lands. Therefore, while carrying out planation campaigns such lands must be considered which are divided among individual farmers and each farmer is responsible to take care of his own part. Plantations of sea buckthorn must be promoted around a plot of plantation which serves as a hedge to safeguard plants from free ranging animals and enhance fertility by fixing ample nitrogen to soil, after 3-5 years.

3.4.4. Promotion of energy efficient technologies and alternative energy options

Promoting energy efficient housing, heating and cooking techniques and use of alternative/renewable forms of energy such as hydropower and biogas can reduce use of plant biomass for domestic energy. Aga Khan Planning & Building Services (AKPBS) has already demonstrated energy efficient housing, heating and cooking technologies in GB and Chitral. Some of which including house insulation, hatched window, improved stove connected with water geyser, etc., have been widely adapted by local communities in the region. Some community members in Bagrote valley, who could afford, are using these technologies, but this needs to be promoted in the valley through subsidized rates with the help of AKPBS or other organizations aimed to improve built environment or conservation of natural forests.

Secondly, Ev-K2-CNR has also introduced an improved stove in Arandu village of Basha, Baltistan and Haramosh valley of Gilgit, cherished by local people for its efficient use. This stove needs to be replicated in some villages of Bagrote valley, adjacent to natural forests, by making it affordable to local people initially through some subsidized rates. This stove costs about Rs. 7000 per unit excluding installation cost.

The third option could be of *BIO-BRACKETS* as already a major portion of domestic energy in Bagrote valley is cattle dunk, which is up to 500 kg per household per year.

3.5. Wildlife Conservation

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

Monitoring of wildlife populations in Bagrote valley is undertaken by CKNP watchers, who monitor illegal hunting and poaching activities and also assess the populations of wild animals, mostly ungulates, 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 Bagrote valley three community representatives used to work as Village Wildlife Guards (VWGs), engaged by WWF under SEED project during 2011-2014. One of these VWGs was later on inducted by CKNP as Park watcher. 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), recording their observations on numbers and distribution of wild animals, predation incidences, illegal activities such as hunting, poaching or forest cutting, etc. In addition to Bagrote valley this practice was much successful in other valleys like Thalay, Tormik, Hushey, Basha and Hisper.

The initiative on one hand was quite helpful in regular monitoring of wildlife and associated activities and on the other is supplemented regulatory efforts of CKNP Directorate in controlling exploitative activities in and around the Park. In addition to CKNP valleys, community-based watch and ward system (of VWGs) has also been quite useful in other buffer zone of other PAs such as KNP and Qurumber National Park.

The biggest challenge in sustaining the VWGs is their monthly remuneration, which used to cover in Bagrote valley 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 Bagrote valley together with a system of monthly reporting to CKNP Directorate on the Performa 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[21].

In addition to VWGs, a system of appointing a community representative as Honorary Wildlife Officer (HWO) which was practiced in the past (during 1997-2006) in various CMCAs (of GB). 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 Bagrote valley through DCC Gilgit.

A traditional system of community watch also does exist in Bagrote valley, where a community nominated person called *Zaitu*, performs the duty of imposing ban on free grazing in the village during cropping season, ban on forest cutting, etc.

3.5.2. Facilitate Notification of Bagrote valley as CMCA

Notification of Bagrote valley as CMCA would enable local people earn some income from sustainable use initiatives such as trophy hunting of Siberian ibex, which are abundant in areas of Batkore, Taisot, Bulchi and Datuchi. This should be promoted as an incentive for conservation rather as an incentive for economic wellbeing 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 Bagrote valley must be taken:

- Delineate CMCB boundary in Bagrote from the Park boundary
- Continue wildlife survey under CKNP

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

- Persuade Secretary Forest, 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 Bagrote to promote positive human-carnivore interaction

The livestock insurance scheme in Bagrote 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 Bagrote Valley 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 DDO to introduce the scheme and after the community's willingness a resolution was passed by DDO and submitted to WWF, to run the LIS in Bagrote valley.
- A Terms of References was signed between WWF-Pakistan and DDO 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 DDO (Rs. 50,000).
- Local community contribution was in terms of premium amount collected by ensuring their animals (by some 40 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 DDO 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 number of cases reported and the total amount of interest of LIF-A.
- A compensation form has been developed in Urdu and provided to DDO 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. DDO 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. 250,000, only, in case of Bagrote valley. Therefore, following recommendations are made to strengthen livestock insurance scheme in Bagrote valley:

- DDO should shift and deposit all funds provided by WWF under SEED Project (Rs. 200,000 in LIS and Rs. 20,000 as VCF) and community contribution in both the interventions amounting Rs. 100,000 into one single account (this should be more than Rs. 0.5 million at the end of 2014), serving both the purposes of compensation and vaccination.
- 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 50% of the interest of this fund should be spent to compensate verified predation cases whereas 25% of interest on vaccination and rest of 25% should be kept for watch & ward and operations.
- Livestock Insurance Management Committee-LIMC (preferably comprising of VWGs, where possible) needs to be strengthened by providing necessary training in monitoring and verification of 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.

3.6. Conservation of freshwater resources

3.6.1. 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 use either for raising firewood plantations or fodder cultivation or doing both simultaneously. DDO sub committees for 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	Estimated length of water channel (m)
Sinaker	Nai Jut ill	74°30'57.14"E, 35°57'44.29"N	± 55000 m
Bulchi	Daldalum	74°33'42.18"E, 36° 2'10.15"N	± 4000 m
	Shutmani /Musko	74°33'57.24"E, 36° 2'19.37"N	±1600ft
	Burum	74°32'30.16"E, 36° 0'54.42"N	±3000m
Datuchi	Main water channel head of kot	74°31'51.34"E, 36° 0'10.59"N	±1000m
	Main Channel of head of Das	74°31'55.73"E, 36° 0'7.44"N	±1500m
Hopey	By repairing the main Channel head & extension of channel	74°31'44.67"E, 35°58'17.46"N	±5000m
Farfoi	By repairing the main Channel head	74°33'31.67"E, 36° 1'24.72"N	±500m
Taisot	By repairing the main Channel head of Racho	74°33'51.16"E, 35°57'0.82"N	±300m
	By repairing the main Channel head of Taisot kot, Kira koi and Hataw ill	1. 74°34'25.61"E, 35°56'39.61"N 2. 74°34'14.73"E, 35°56'37.18"N 3. 74°33'56.07"E, 35°56'38.36"N	±150m ±100-150m ±300m
Masingot	By repairing the main Channel head	74°33'8.77"E, 35°56'33.68"N	±500m

3.6.2. Regulate extraction of glacier

There should be an assessment of glacier extraction to determine the quantity of ice extracted annually, number of local and non-local people associated with this enterprise, significance of ice extraction activity as a livelihood option for local people, impact of the activity on volume of glacier, especially on the terminus area and ecological and socio-economic implications of glacier extraction in the long run.

DDO should constitute a sub-committee to oversee extraction of glacier for sale. The UNDP GLOF project is also working to introduce a regulatory mechanism for this activity. In addition, by introducing alternative sources of income for local people associated with this enterprise the quantity of extraction can be minimized.

3.7. Institutional Strengthening of Community Organizations

3.7.1. Integration of LMIs and other CBOs

For soliciting community support in rural development, NRM and to strengthen CKNP management through community participation, the facilitating NGOs such as AKRSP and WWF have established various COs such VOs, WOs, VCCs in each village and LSO at valley level (a summary of which is given in section 1.16). As explained above in (sections 1.13-1.15) the LMIs or local governance system has a very important role in regulating use of natural resources such as pastures, forests, livestock and water for agriculture. DDO in Bagrote has grassroots representation of LMIs and other COs, and thus working effectively for a wide array of initiatives including conservation and sustainable development.

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 DDO, generically 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, for each village, the structure of CBCDOs should be as following including selected functionaries of LMIs and COs:

- President CBCSDO
- Namberdar (member)
- Religious leader
- UC member (member)
- Astaqal of each Haiti (member)
- Presidents of VOs and WOs (members)

The Astaqals can be delegated with specific sectors such as forest, wildlife, water resources, grazing management etc. All the Presidents of village CBCSDOs should have representation in DDO as a General Body member. Some existing ones are already members in DDO GB, however, it should be mandatory where required.

3.7.2. Capacity-building of CBCSDOs

Bylaws of DDO should be revised to deal with emerging challenges, diverse and multi-faceted aspects of development and environmental conservation such as climate change adaptation, sustainable use initiatives like trophy hunting and sustainable harvest of medicinal flora, access to biological resources, co-management of protected areas, etc.

The DDO/CBCSDO's governance and management bodies should be fully acquainted with bylaws and SOPs and awareness 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.

3.7.3. 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), which is an endowment fund for conservation, established by conservation supporting organization, e.g UNDP, AKRSP and WWF in case of Bagrote valley. Following measures are recommended to streamline financial mechanism of Bagrote valley for conservation purposes:

Existing Sources	Problem	Recommendations
Endowment Fund		
VCF: PKR. 300,000 LIF-A PKR. 200,000 by WWF and PKR. 50,000 by DDO Total: Upto Rs. 550,000 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: 40% Livestock Insurance: 40% Livestock vaccination: 20% - Allocation of additional funds amounting Rs. 1 Million (PKR. 250,000 for livestock vaccination, Rs. 250,000 for livestock insurance fund and PR. 500,000 to strengthen CSDF) - Strengthening CSDF by annual allocation of at least 50% amount generated from trophy hunting and CKNP entry fee

4. Management actions

Name of villages: C=Chira, B=Bulchi, H=Hopay, F=Farfoi, D=Datuchi, S=Sinaker, CB=Chuni bar (Batkore, Taisot, Massingot, Hamaran), BB=All villages of Bari Bar

All=means all villages of Bagrote valley

4.1. Sustainable mountain agriculture

#	Action	Village*	Priority Rank
1.	Improve marketing of high value agriculture products (potatoes, pears, walnut, apple) by linking with export agencies in GB	All	Medium
2.	Improve post-harvest techniques (processing and packaging) through improved technology and training	All	Medium
3.	Establish Vocational Centre for local women to promote local handicrafts (woolen products and rugs) from wool and hair of domestic animals and milk plus milk bi-products	CB, B	Medium

4.2. Pasture management

#	Action	Village*	Priority Rank
4.	Study productivity, carrying capacity and utilization of selected pastures (In collaboration with MARC, IMARC-KIU, and CKNP Directorate)	B, CB	High
5.	In consultation with local community declare SMPA and initiate controlled grazing	B, CB	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	B, CB	High
7.	Promote cultivation of fodder crop such as alfalfa on individual farm and waste lands	All	Medium
8.	Improve access to inaccessible pastures through pony tracks and pavements	B, CB	Medium
9.	Develop drinking water points for animals in less grazed pastures	B, CB	Medium

4.3. Livestock management

#	Action	Village*	Priority Rank
10.	Establish Village Input Store (VIS), following an evaluation study of the current VIS in Basha valley, Shigar	B, CB	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**)	All	High
12.	Establish and operationalize a permanent livestock vaccination programme (following guidelines of Ev-K2-CNR vet experts)	All	High
13.	Improve one cattle-shed in each village on demonstration basis (for improved hygiene, feeding, watering to improve animal health and productivity)	B, D, S, CB	Medium
14.	Improve primitive corrals to make them predator proof structures and on top provide shelter against rainfall	CB	High
15.	Provide high pedigree bulls to improve breed of local cattle for enhanced productivity and less numbers	CB, and a selected village of BB	Medium

4.4. Afforestation and sustainable forest management

#	Action	Village*	Priority Rank
16.	Through VWGs/Astaqal regulate use of timber (as prescribed in section **3.4.1**)	All	High
17.	Through VWGs/Astaqals regulate use of fuelwood as prescribed in section **3.4.2**)	All	High
18.	Hold community-based afforestation campaigns annually in the areas specified in **section 3.4.3**, reward at least two farmers per target village (any six) with a cash prize of Rs. 20,000 for highest number of plants in each village	All	High
19.	Regularly monitor progress on afforestation campaigns carried out by CKNP/WWF under SEED Project	All	High
20.	Introduce fuel-efficient stoves and energy efficient technologies in Bulchi and Farfoi	B, F	High

4.5. Wildlife Conservation

#	Action	Village	Priority Rank
21.	Establish community-based watch and ward system by appointing VWGs or deputing Astaqals	B, CB, D	High
22.	Provide basic training to VWGs in survey and monitoring of wildlife populations	All	High
23.	Monitor wildlife populations (number and structure) following standard survey protocols for CKNP	B, CB, D	High
24.	Facilitate DDO in obtaining notification of the valley as CMCA	All	High
25.	Enhance allocation for Livestock Insurance Fund	H, K	High
26.	Train LIMC members and engage CKNP directorate in monitoring of LIMC	H, K	High

4.6. Conserve freshwater resources and promote on-farm water use efficiency

#	Action	Village	Priority Rank
27.	Conduct study on glacier extraction in Bagrote valley	Bulchi	Medium
28.	Construct water channels as prescribed in section **3.6**	Any suitable	High
29.	Repair water channels as prescribed in section **3.6**	Any suitable	Medium

4.7. Institutional Strengthening of Community Organizations

#	Action	Village	Priority Rank
30.	Hold meetings to restructure CBCSDOs and DDO as per the guidelines given in section **3.7.1**	All	High
31.	Hold consultative meetings to revise bylaws of DDO	All	High
32.	Orientate CBCSDOs on new bylaws and operating procedures	All	High
33.	Provide office support to DDO for its effectiveness	All	High
34.	Enhance CSDF for Bagrote through various income avenues	All	High
35.	Share Conservation and Sustainable Development Plan for Bagrote valley for local communities and stakeholder to solicit their technical and financial support	All	High

5. Indicators of process and progress

For each of the action that are proposed under 3, 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, plus milk and milk bi-products	1 vocational centre established in each target village	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 Bari Bar and Chuni Bar)	Baseline available regarding health, productivity and carrying capacity of pastures
5.	In consultation with local community declare SMPA and initiate controlled grazing	One SMPA in each Chuni Bar and Bari Bar declared with controlled grazing plan	Controlled grazing system in-placed 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/40 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 16 ha in selected villages of the valley	Pressure on grazing lands reduced
8.	Improve pavement to selected pastures	2 trails/treks to pasture improved (1 each in Chuni Bar and Bari Bar)	All the pastures are evenly grazed
9.	Develop drinking water points in selected pastures	2 drinking water facilities developed (1 each in Chuni Bar and Bari Bar)	All the pastures are evenly grazed
5.3. Livestock Management			
10.	Establish Village Input Store (VIS), following an evaluation	One village input store established in Bari Bar	% increase in number of beneficiary households

	study of the current VIS in Basha valley of Shigar, Skardu		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 **14, 15, 16 and 17**)	One training (15 days) organized for at least 8-10 herders from Bagrote 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 each target village	At least 80% of the livestock going to higher pastures are vaccinated
13.	Improve cattle-sheds on demonstration basis (for improved hygiene, feeding, watering to improve animal health and productivity)	2 cattle sheds improved (one each in Chuni Bar and Bari Bar)	Local community have started to adapt improved structures for newly constructed cattle sheds
14.	Improve primitive corrals to make them predator proof structures	4 primitive corrals (two each in Chuni Bar and Bari Bar) improved as predator-proof structures	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	1 proven Jersey breeding bull provided to target villages (one each in Chuni Bar and Bari Bar) for breed improvement purpose	Increased number of improved breeds of local cattle
5.4. Afforestation and Sustainable Forest Management			
16.	Through VWGs/Astaqal ensure ban on cutting of forest trees for timber	VWGs/Astaqal is on duty to regulate timber use from natural forests in each village	Extraction of timber from natural forest in regulated in Arandu and Besil and banned in all other villages
17.	With the help of VWGs/Astaqal monitor duration, quantity and pattern of fuel wood collection from natural forests as prescribed above in section 3.4.2	VWGs/Astaqal remains 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**, reward at least two farmers per village with a cash prize of Rs. 20,000 for highest number of plants in each village	At least 1000 trees are planted in each target village every year Every year two farmers/target village 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 fuel-efficient stoves in Bulchi and Farfoi	At least 50% of the households in target villages use fuel efficient stoves	% reduction in consumption of fuelwood per household
5.5. Wildlife Conservation			
21.	Establish community-based watch and ward system by appointing VWGs	One VWG in place in each of the target village	No poaching or illegal hunting incidences in the target villages
22.	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
23.	Monitor wildlife populations (number and structure) following standard survey protocols for CKNP	Bi-annual wildlife surveys are being conducted for H. ibex and population survey for large predators have been undertaken following standard monitoring protocols	Systematic survey reports are available with CKNP Directorate
24.	Facilitate notification of Bagrote valley as CMCA (necessary visits and workshops)	Bagrote valley designated as CMCA and DDO office bearers are aware of the trophy hunting procedures	Trophy hunting of H. ibex initiated in the valley
25.	Enhance allocations for Livestock Insurance Fund	An additional amount of Rs. 250,000 provided to BLSO for LIF-A	Predation cases are being compensated annually
26.	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			
27.	Conduct study on glacier extraction in Bagrote valley	Research study on glacial extractions with its implications and recommendations for sustainable use or alternative livelihood options	Knowledge about quantity of glacier extracted each year, its socio-economic significance and ecological implications and recommendations for sustainable use or alternatives to reduce glacier extraction
28.	Construct water channels as prescribed in section 3.6	2 water channels at any suitable locations constructed	Increased area under tree plantation and fodder cultivation
29.	Repair water channels as prescribed in section 3.6	2 water channels at any suitable locations repaired	Increased area under tree plantation and fodder cultivation

5.7 Institutional Strengthening of Community Organizations			
30.	Hold meetings to restructure CBCSDOs and DDO as per the guidelines given in section **3.7.1**	CBCSDOs at village level and DDO as valley level restructured to have representation of all COs and LMIs	CBCSDOs have representation of key functionaries as indicated in **section 3.7.1**
31.	Hold consultative meetings to revise bylaws of DDO	Bylaws of DDO revised	Revised bylaws endorsed by competent Government Authority
32.	Orientate DDO office bearers on new bylaws and operating procedures	2 orientation sessions conducted	DDO board and management officials are aware of their bylaws and operating procedures
33.	Provide office support to DDO	Needful support provided to DDO for office management	DDO office is functional
34.	Enhance CSDF for Bagrote valley	Additional amount of Rs. 500,000 provided to DDO	CBCSDOs are meeting their expenses of conservation and office management from CSDF
35.	Share Conservation and Sustainable Development Plan for Bagrote valley for local communities and stakeholder to solicit their technical and financial support	Approval of CSDP of Bagrote valley after consultation with local communities and other stakeholder	Bagrote valley CSDP in place for implementation

6. Implementation mechanisms/Available capacities for the implementation of the Valley Conservation Plans: Social organizations - CKNP Directorate - Facilitating NGOs/CBOs – Other

6.1. Implementation Mechanism

The whole process needs to be facilitated by the Directorate of CKNP jointly with DDO, in close collaboration with mainstream development agencies, line departments and active iNGOs and NGOs such as AKRSP, UNDP-GLOF Project, Ev-K2-CNR and WWF-Pakistan. Following steps are important in this regard:

The **first step** should be reorganization of village level COs as well as DDO as CBCSDOs, as elaborated above. Agreements should be signed with DDO for their proactive participation in CKNP Management. The local communities are now well mobilized in support of CKNP. Their representative organizations need to be restructured through consultations and dialogues. After restructuring agreements should be signed specifying roles of the CBCSDOs, DDO and CKNP Partners.

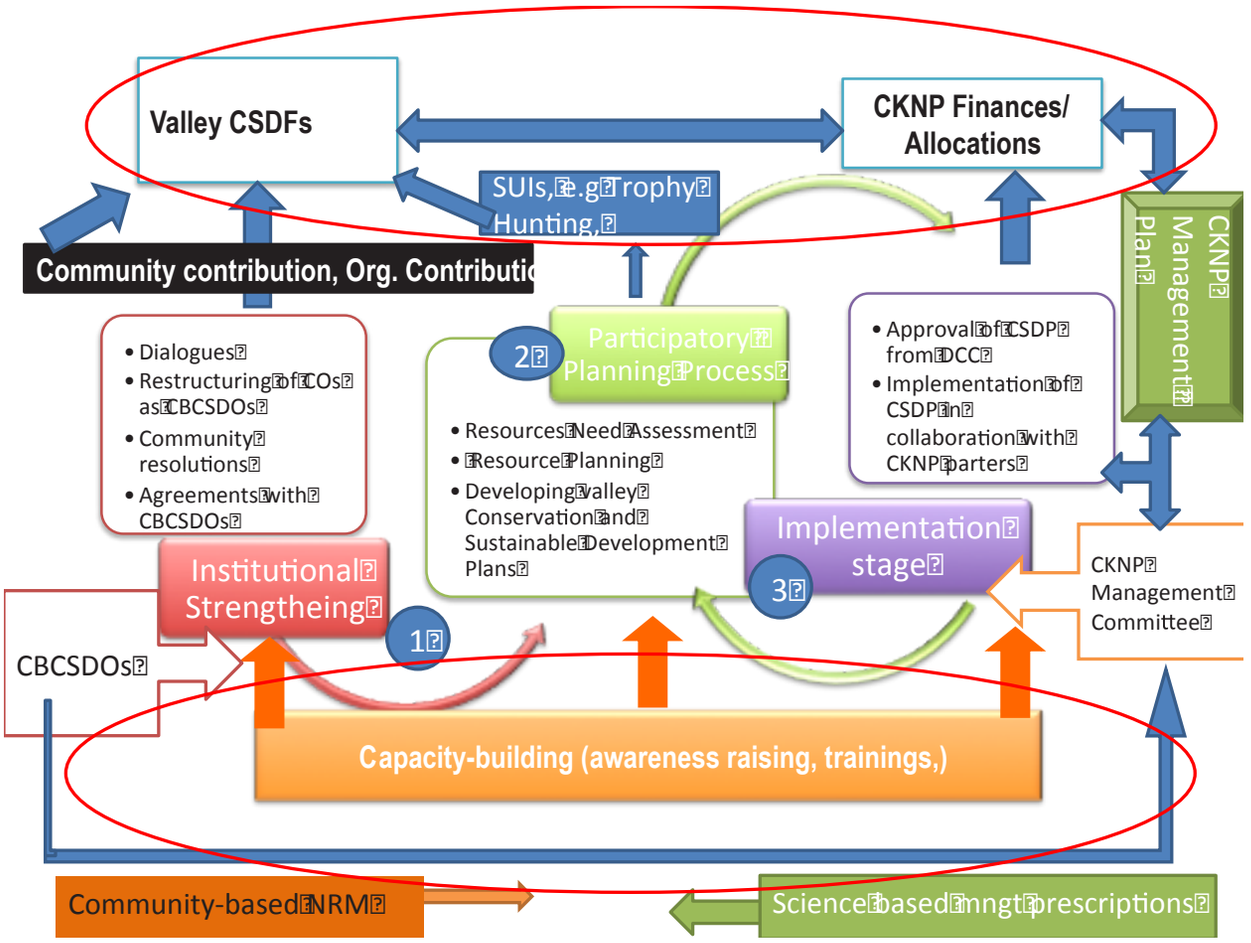
The **second step,** draft CSDP should be shared with the respective communities (involving VCCs/LMIs, UC members, President of VOs and WOs (where possible)); line departments at district level (Agriculture, LS&DD, Forests, Wildlife & Parks, Tourism) and concerned NGOs such as AKRSP, AKPBS, BWCDO, Ev-K2-CNR,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

The **third step** is approval of CSDP from the District Conservation Committee (DCC) Gilgit, and monitoring the progress on implementation of CSDP in the subsequent DCC meetings.

There are two crosscutting themes. Fist is Capacity-building involving awareness raising, trainings and exchange programmes, and 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 and income avenues such as trophy hunting, ecotourism, CKNP entry fee etc.

Restructuring of COs as CBCSDOs can also be continued after finalizing and getting approval of the plan and these steps can also be undertaken simultaneously.

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
• DDO is functional • Presence of DDO Office and paid staff • Presence of VCF and other financial resources such as LIF and endowment fund provided by WWF • Valley FUND established by UNPD GLOF Project • Membership of DDO in DCC Gilgit	District Conservation Committee Line Departments (LS&DD, Wildlife and Parks Department, Forest Department, Tourism Department) Presence of NGOs like UNDP GLOF project, WWF-Pakistan	CKNP Directorate CKNP Management Committee GB Wildlife Management Board

7. Expected outputs

7.1. Sustainable mountain agriculture

- 20% increase in annual cash income of local households from sale of high value agriculture produce (potatoes, pears, walnut and apricots) and woollen products

7.2. Pasture Management

- Degradation of pastures stopped by adopting best management techniques
- Ecologically healthy pastures in the valley

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 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. Safe mining

- A code of conduct for safe mining available with CBCSDOs of target villages and adhered by workers and mine owners to some extent

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 arrangements (available and potential both) to overcome the bottlenecks

#	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 BCDF, KADO
2.	Degradation of pastures stopped by adopting best management techniques	Conventional grazing methods Interest groups among community	Incentives to progressive herders for 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	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 initiative 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.	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

CKNP Directorate should be responsible for overall monitoring of actions undertaken by DDO and CBCSDOs under the framework of this CSDP, 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 against their annual plans and targets
- 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 Gilgit and endorsed by the Chairman of DCC with recommendations from CKNP Director and other concerned stakeholders such as GB Wildlife and Parks Department. The DCC Gilgit in its bi-annual meeting should review the progress of implementation on CSDP. DDO 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 project of AKRSP.

9.5. CBCSDO Visitors Diary

CBCSDO should maintain a Visitors Diary for recording 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 Bagrote 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 agric. products	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 (woolen products and rugs) from wool and hair of domestic animals	Vocational Centre	2	800000	1600000
	Sub-total				**2050000**
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	16	40000	640000
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				**2120000**
5.3. Livestock Management					
10.	Establish Village Input Store (VIS), following an evaluation study of the current VIS in CKNP valleys in Baltistan	(a basic laboratory), (freezer or cooler, sterilizer, cattle crush) and required medicine	2	1000000	2000000
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
12.	Establish and operationalize a permanent livestock vaccination programme (following guidelines of Ev-K2-CNR vet experts)	Funds	1	250000	250000

13.	Improve one cattle shed in each village on demonstration basis (for improved hygiene, feeding, watering to improve animal health and productivity)	Improved cattle shed	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 bull	2	70000	140000
	Sub-total				**3590000**
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 fuel wood 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	30	20000	600000
19.	Regularly monitor progress on afforestation campaigns carried out by CKNP/WWF under SEED Project	Visits	20	20000	400000
20.	Introduce CKNP FES in two target villages on subsided rates	FES	100	4000	400000
	Sub-total				**1880000**
5.5. Wildlife Conservation					
21.	Establish community-based watch and ward system by appointing VWGs	VWGs Honorarium (Man Months)	240	1000	240000

22.	Provide basic training to VWGs in monitoring of wildlife	Training workshop	1	50000	50000
23.	Monitor wildlife populations (number and structure) following standard survey protocols for CKNP	Wildlife surveys	20	50000	1000000
24.	Facilitate DDO in obtaining notification of the valley as CMCA	2 Visits and 2 workshops	4	20000	80000
25.	Enhance allocations for Livestock Insurance Fund	Funds	1	250000	250000
26.	Train LIMC members and engage CKNP directorate in monitoring of LIMC	Training workshop	1	100000	100000
	Sub-total				**1720000**
5.6. Conserve freshwater resources and promote on-farm water use efficiency					
27.	Conduct study on glacier extraction in Bagrote valley	Study	1	250000	250000
28.	Construct water channels as prescribed in section 3.6	Channels (new)	2	1500000	3000000
29.	Repair water channels as prescribed in section 3.6	Channels (repaired)	4	600000	2400000
					5650000
5.7 Institutional Strengthening of Community Organizations					
30.	Hold meetings to restructure CBCSDOs and DDO as per the guidelines given in section **3.7.1**	Consultative meetings	10	20000	200000
31.	Hold consultative meetings to revise bylaws of DDO	Consultative meetings	2	20000	40000
32.	Orientate DDO office bearers on new bylaws and operating procedures	Orientation sessions	6	20000	120000

33.	Provide office support to DDO	Office support (lump sum)	1	200000	200000
34.	Enhance CSDF for Bagrote valley	Funds	1	500000	500000
35.	Share Conservation and Sustainable Development Plan for Hushey valley for local communities and stakeholder to solicit their technical and financial support	Consultative workshops (1 at community level and 1 at other stakeholder level)	2	20000	40000
		DCC meeting	1	15000	15000
	Sub-total				**1115000**
	Grand total				**18,125,000**

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**
	%		**16.8**		
	Grand total	**4213**	**1082**	**15.0**	**11**
	%		**25.7**		

Appendix-B: Participants of FGDs in Bagrote Valley

S. No.	TAISOT	BULCHI	MASINGOT
1.	Muhammad Ali Khan	Mazhar Hussain	Tehzeeb Hussain
2.	Ali Faraz	Beharam Khan	Yawar Abbas
3.	Mussa Khan	Muhammad Ali	Hajat Mir
4.	Jahangeer Khan	Hawas Khan	Muzaffar Ali
5.	Nazimuddin	Muhammad Ibrahim	Imran
6.	Yawar Abbas	Zaid Ullah	Ayat Ali
7.	Manzoom Ali	Amir Hamza	Muhammad Ali
8.	Wazir Shah	Hussain Ali	Manzoom Ali
9.	Inayat Ali	Manzoor	Ali Dad
10.	Sultan Ameer	Abdullah	Ali Daad
11.	Hajat Mir	Mir Wali	Shoukat Ali
12.	Sajid Ali	Sher Shahadat Khan	Wazir Shah
13.	Muhammad Ibrahim	Ahmad Qadir	Hakeem Shah
14.	Ghulam Hassan	Mirza Baig	Zaid Ali
15.	Muhammad Essa	Aayat Ali	Abbas Khan
16.	Kaka Jan	MuzaffarAli	M. Hassan

17.	Imran	Ghulam Nabi	Hassan Shah
18.	Danish Haider	Syed Muhammad Afzal	Manzoor
19.	Akhtar Hussain	Ahmad Ali	Amir Abbas
20.	Hussain Akbar	Alif Shah	Malik Shah
21.	Akbar Khan	Ali Dad	Ali Jan
22.	Haji Ibadat Khan	Muzaffar Ali	Mohammad Akber
23.	Mohammad Akber	Ibrahim Khan	Akhter Hussain
24.	Hassan Shah	Hussain Ali	Hussain Ali
25.	Farzand Ali	Ghulam Ali	HAjat Mir
26.	Ghulam Ali	Muhammad Shafi	Akbar Ali
27.	Zakir Hussain	Muhammad Ayub	Sultan Ameer
28.	Khalil U Rahman	Saeed Ali	Nazim Uddin
29.	Ali Jan	Ghulam Ali	Mohammad Essa
30.	Tahir Hussain	Nawaz Ali	Abdullah
31.	Mohammad Nabi	Yousuf Ali	Farzand Ali
32.	Mujahid Hussain	Malik Shah	
33.	Sadiq Ali	Naib Khan	
34.	Shoukat Ali	Dildar Hussain	

35.	Muhammad Hassan	Abbas Khan	
36.	Ali Daad	Wali Hussain	
37.	Amir Abbass	Sabir Hussain	
38.		Hakeem Shah	
39.		Syed Mir. M. Shah	

Appendix-c Template for Monthly Report by VWGs

ماہانہ کارکردگی رپورٹ ۔ ولیج 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						ٹرافی سائز (نر)	موسم کی صورتحال	مسکن کے بارے میں معلومات
					نر	مادہ	نسالہ	بچے	نامعلوم	کل			

نوٹ

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

☆ موسم کی صورتحال: : دھوپ ، ابر آلود 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 کارروائی	وی سی سی کی طرف سے کارروائی
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 رد عمل	وی سی سی کی طرف سے کارروائی
۱					
۲					
۳					

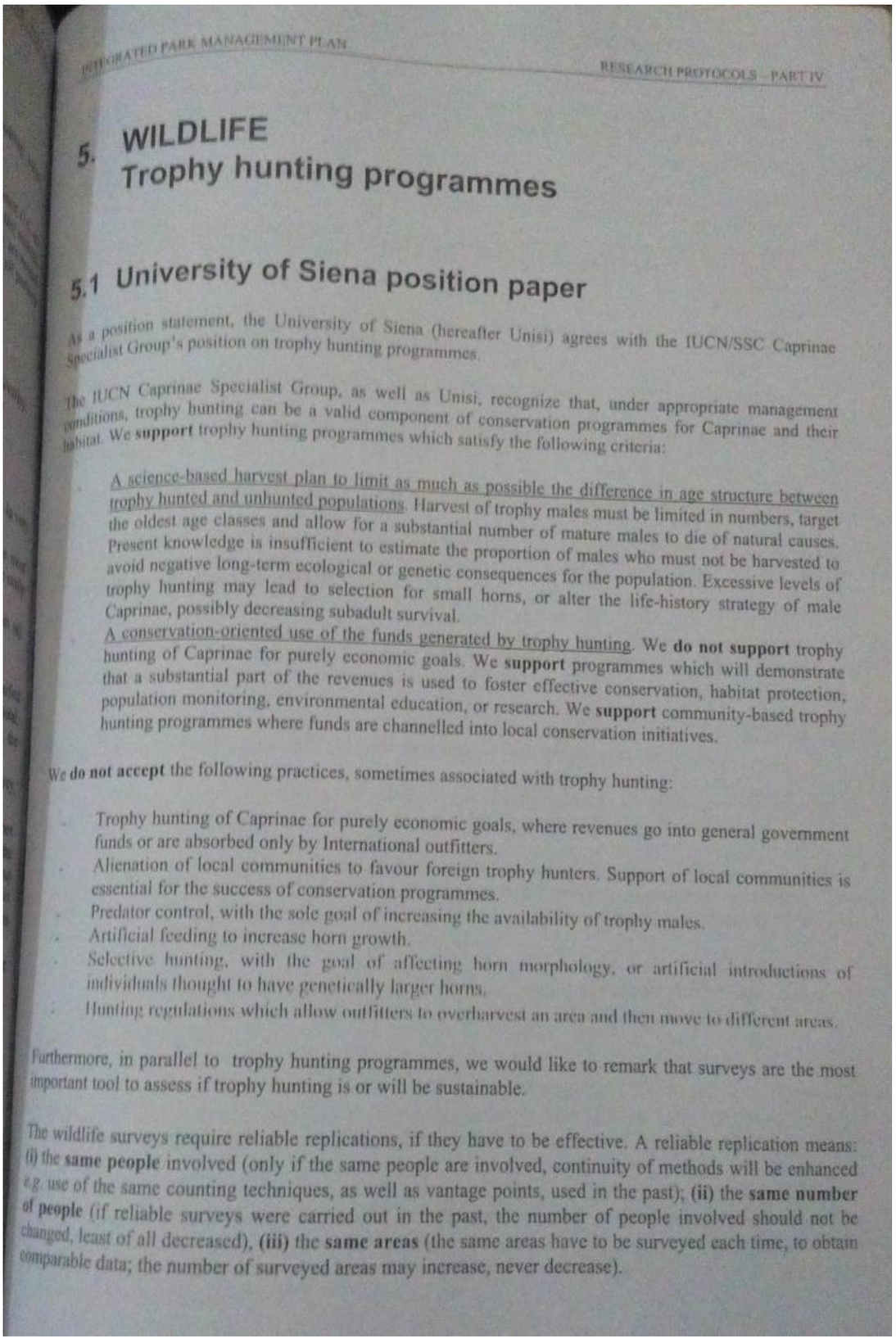
نام و دستخط گائیڈ ۱---------- تاریخ ---------- نام و دستخط گائیڈ ۲---------- تاریخ ----------

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 ولی 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).

Appendix E. Wildlife Survey/Monitoring Protocols in CKNP

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 2016 – 2026
Haramosh Valley
Central Karakorum National Park
Gilgit Baltistan

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This is a working document to welcome your suggestions for further improvement prior to its approval.

Document prepared by: Ev-K2-CNR Pakistan in the framework of SEED Project, Phase-II funded by the Governments of Pakistan and Italy within the Pakistan – Italian Debt for Development Swap Agreement (PIDSA).

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Available from

Ev-K2-CNR Pakistan
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Skardu, Gilgit-Baltistan, Pakistan
www.evk2cnr.org

Directorate of the CKNP
Sadpara Road, Skardu
Gilgit-Baltistan, Pakistan
www.cknp.org.pk

PLAN EDORSEMENT

Signed by President LSO Haramosh .....

Endorsed Director CKNP .....

Approved by Deputy Commissioner/ .....

Chairman District Conservation Committee

For Gilgit in ..... meeting of DCC Gilgit

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 HARAMOSH VALLEY

1.1. History of Haramosh

Before1840 it was part of Baltistan region ruled by Maqpoon Dynasty. After 1840 Wazir Ghulam who was basically from Haramosh Valley merged it with Gilgit dynasty. The meaning of the Haramosh is said to have derived from Balti word "Khora Mosh" meaning forest. Over time the name changed and was called Haramosh instead. As per another interpretation, Haramosh was originally "Heramosh" which means place of precious stones, local people told.

HARAMOSH IS KNOWN AS VALLEY OF PRECIOUS STONES

1.2. Locality of Haramosh Valley

Haramosh valley is part of UC Haramosh and Tehsil Danyore, District Gilgit. It consists of villages naming Sassi, Shatot, Dasso, Iskere, Dache, Hanuchal, Jutial, Shuta, Barchi and Khaltoro situated on right bank of River Gilgit while going to Gilgit and left side of Skardu river while going to Skardu and on northern side of River Indus. Haramosh peak (7409m) stances on the northern side of the Indus River, in the south central position of the Karakoram Range.

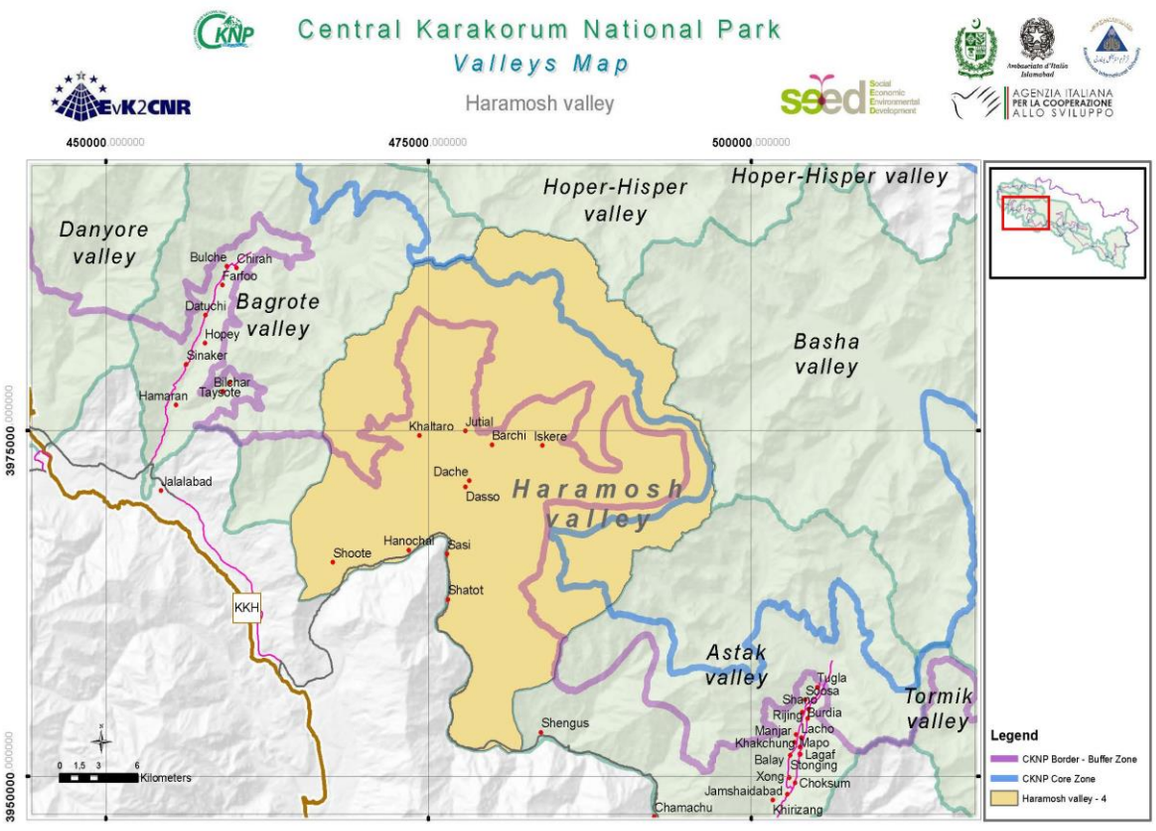


Exhibit 1: Map of Haramosh Valley

The jagged valley of Haramosh has two strata of villages. One at lower elevation and the other at higher elevation. Villages namely Sassi, Shatot, and Hanuchal are low lying with elevation range of 1400- 1450 m and located nearby. However, the other villages Dasso/Iskere, Jutial, Shuta, and Barchi are located at the elevation range of 1850 – 2100m.

Exhibit 2: Village locations of Haramosh Valley, 2016

Villages	Coordinates		Elevation (m)
	N	E	
Sassi / Shatot	36°55'13.4''	074°22'44.1''	1487
Dasso / Iskere	35°02'23.7''	074°17'50.0''	1560
Hanuchal	36°06'51.7'	074°17'58.7''	1671
Jutial	36°10'50.3''	074°18'18.7''	1983
Shuta	36°10'17.5''	074°17'14.0''	1670
Barchi	35°54'29.9"	074°47'05.4"	2075
Khaltoro	Dropped from survey due to inaccessibility		

1.3. Ecological Profile of Haramosh Valley

Haramosh is located on the south western side of Central Karakoram National Park due to which it has dense vegetation as compared to valleys at northern side. Vegetation of the area is the mix of sub-tropical scrub type at lower elevations and dry temperate coniferous forest zone at higher elevations. Haramosh valley is consists of 18.7 % broad-leaved, 26.9% coniferous forest and 54.4% juniper trees. These forests are the source of consumptive and non-consumptive uses as reported by the local community.

The biodiversity of Haramosh 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, road sides and permanent glaciers etc., which support a rich and equally diverse floristic wealth. Wildlife species of the area such as Markhor and Ibex, which also contributes in the economic stability of Haramosh by trophy hunting.

1.4. Socio-Economic Profile of Haramosh Valley

1.4.1. Demography of Haramosh Valley

According to the survey conducted for VCSDPs development, the population has increased till 9,845 people approximately. Haramosh valley is a representative of heterogeneous community with slightly higher population of females (Exhibit. 3). Dache is a small-sized seasonal hamlet of Dasso village. All these villages are centered on buffer area of CKNP which spans 2757.88 m^2 (CKNP Management plan, 2014) and serves as reserves of natural resources for the local people and transitional area between park and local communities.

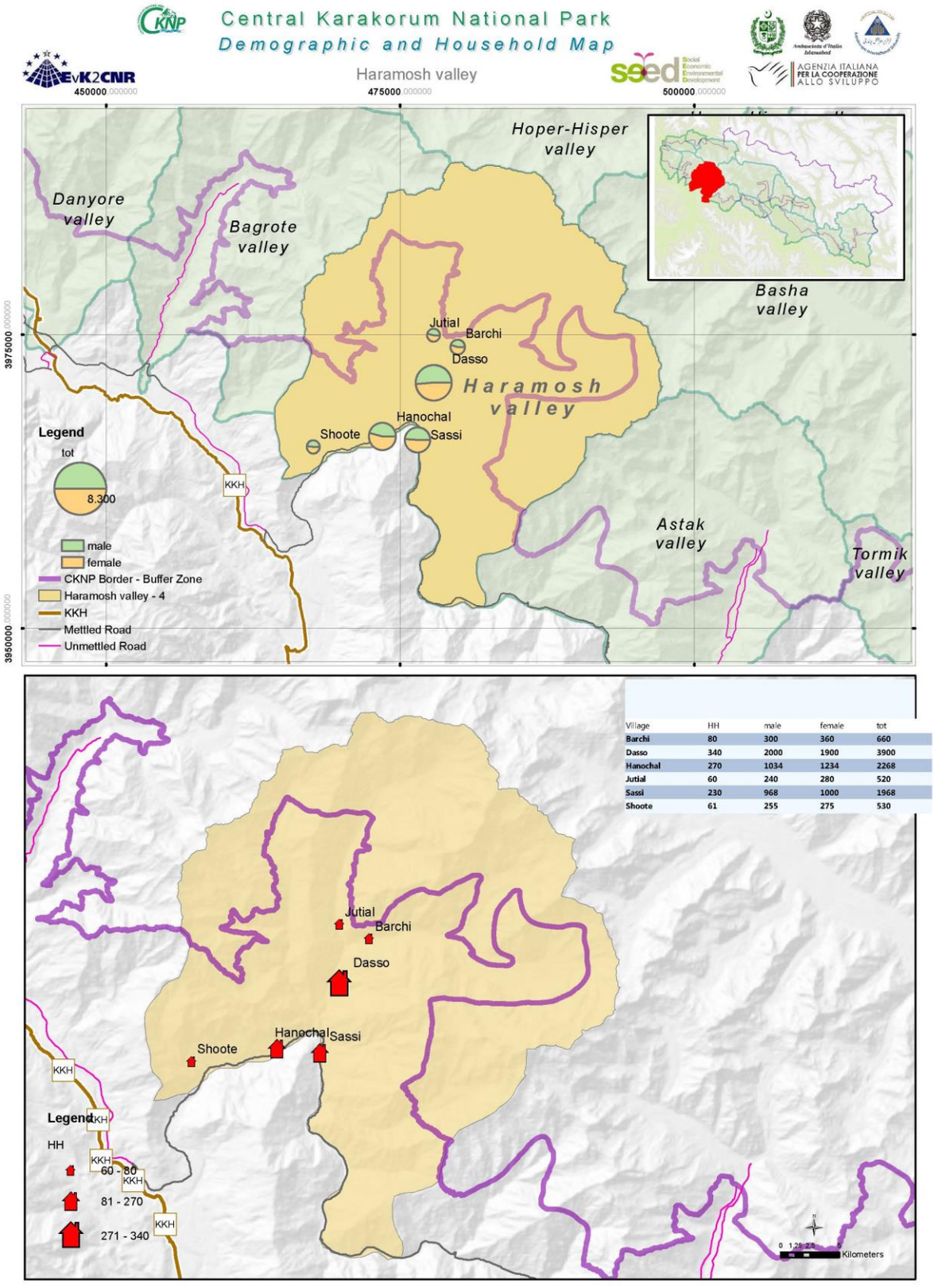


Exhibit 3: Demographic map of Haramosh Valley

Exhibit 4: Demographic view of villages, Haramosh Valley

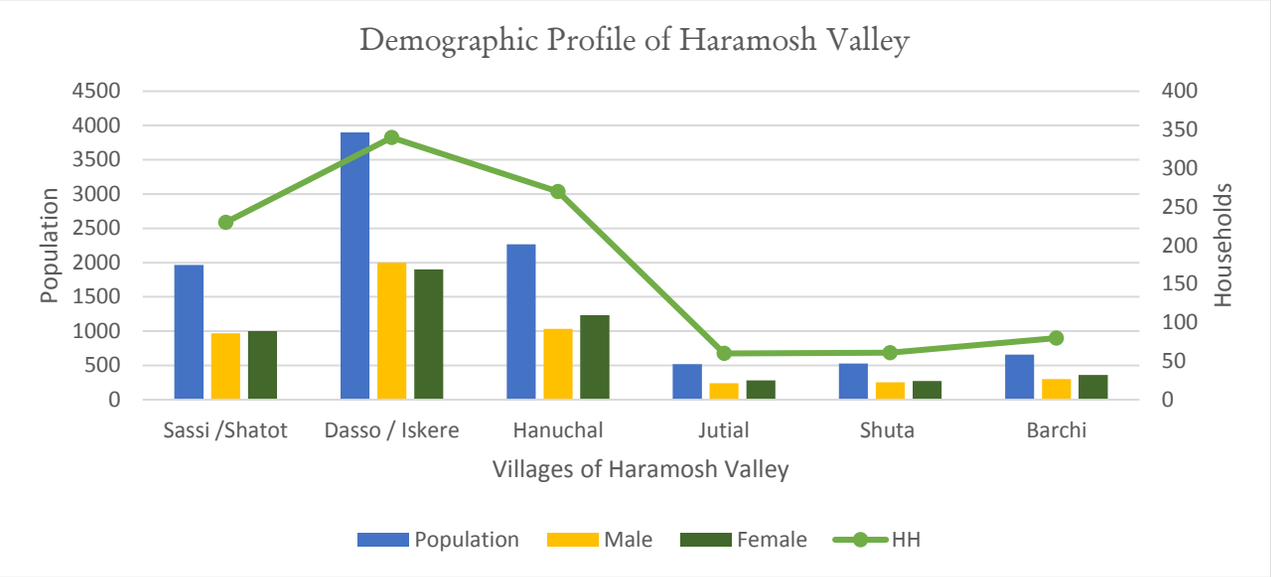


Exhibit 5: Demographic profile of Haramosh Valley, 2016

Village	HH	Av. HH size	Population	Male	Female	Male: Female Ratio
Sassi /Shatot	230	8.55	1968	968	1000	0.96:1.04
Dasso / Iskere	340	11.47	3900	2000	1900	1.05:0.95
Hanuchal	270	8.40	2268	1034	1234	0.83:1.17
Jutial	60	8.66	520	240	280	0.85: 1.15
Shuta	61	8.68	530	255	275	0.92:1.08
Barchi	80	8.25	660	300	360	0.83:1.17
Total	**1041**	**9.00**	**9846**	**4797**	**5049**	**0.91:1.09**

1.4.2. 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. Haramosh valley mainly lies beside KKH-Skardu main road and its villages are connected to this main road via jeep able roads. The KKH-Skardu main road provided the window of opportunities and contributed majorly to its prosperity. The KKH is one of world's most important routes and link Pakistan to China, crosses through the GB for about 840 km and provides them with a vital link to the rest of Pakistan.

1.4.3. Education Facilities

The whole valley has only one higher school in Sassi and one middle school in Dasso for educating the children. Primary schools in Hanuchal, Shuta, Barchi and Jutial which provides

basic education facility for the children of village itself and nearby areas. Inhabitants of Sassi access the Hanuchal private school for primary education and Dasso for middle level education. As Dasso and Shuta are closely located therefore both villages get benefit from the education facilities in the neighboring villages. Only Primary school facility is available in the most of villages to ensure access of basic education to local community (Exhibit No. 6).

1.4.4. Health Facilities

Basic health facilities are available only in Sassi and Dasso both managed publicly. Dispensary at Dasso has all the basic facilities for normal medical cases and support patients from villages of Haramosh and other nearby areas access this facility.

Owing to limited facilities and unavailability of staff, medicines, state of art equipment the dispensary at Sassi is partially functioning. The people of the Haramosh valley are dependent on Dasso dispensary for minor health issues and Gilgit rural health center public, private or military hospitals for the severe health issues, depending upon their financial situation and availability of beds. Rural Health Centre and Civil Dispensary are managed by Health Department of Gilgit with staff comprising of only a Dispenser.

Amid open discussions, ladies referred an increment in the rate of respiratory illness and skin hypersensitivities. Particularly pregnant ladies and young offspring being more vulnerable to infections are more inclined to fall prey to these ailments. An overall decline in health is reported during group discussions in both genders as compared to past. Disease appearance in community is attributable to seasonal shift, poor health facilities and several other environmental pressures.

Exhibit 6: Socio-economic Profile of Haramosh Valley

Villages	Education facilities				Health facilities		Veterinary facilities	Electricity
	Category / Level	Ownership	Geographic Location	Gender	Facility	Geographic Location		
Sassi /Shatot	Higher	Govt.	N35°50'22.8 E74°44'22.8 " 1445 m asl	Both	Dispensary	N35°50'24.1 E74°44'25.6 " 1458 m asl	Dispensary	Yes
Dasso/ Iskere	Middle	Govt.	N35°50'18.5 " E74°45'49.5 " 1896 m asl	-do-	Basic health unit	N35°53'17.5 " E74°45'19.9 " 1904 m asl	Dispensary	Yes
Hanuchal	Primary	Private	N35°5026.4 " E74°4233.2" 1424 m asl	Boys	N/A	N35°50'20.6 " E74°42'28.3 " 1411 m asl	Sassi vet facility	Yes
Jutial	Primary	Govt.	N35°55'57.4 "	Boys	N/A	N/A	Dasso vet facility	Yes

Villages	Education facilities				Health facilities		Veterinary facilities	Electricity
	Category / Level	Ownership	Geographic Location	Gender	Facility	Geographic Location		
			E74°45'11.4 " 2178 m asl					
Shuta	Primary	Private	N35°50'07.9 " E74038'26.4 " 1961 m asl	Both	N/A	N35°50'05.2 E74°38'26.4 " 1943 m asl	Sassi vet facility	Yes
Barchi	Primary	Private	N35°54'38.5 " E74046'37.9 " 2022 m asl	Both boys and girls	N/A	N35°54'38.9 " E74°47'09.2 " 207 1m asl	Dasso vet facility	Yes

1.4.5. Veterinary Facilities

Veterinary facilities like dispensary is available only in Sassi and Shatot while rest of villages have to seek animal health facilities from these two villages (Exhibit No. 6). Most frequently occurring diseases in livestock are Goat pox, Interotoxemia (Goat, sheep and cattle), Black quarter, Mange (Large animal's cattle, yak, zo and zomo) as mentioned by local community and Livestock department, Gilgit-Baltistan. Presently, there are only two animal health units in the Haramosh valley therefore the availability of veterinary doctors, vaccines, and equipment for diagnosis is integral but unfortunately these centers have limited basic facilities which make the contagious disease spread easier and accentuates the livestock mortality.

1.4.6. Electricity

Present electricity generation is 90MW but the conservative demand has reached up to 528MW which is expected to escalate till 863 MW by 2030 (GB Water and Power Dep., 2016) for Gilgit. All the villages in Haramosh valley has the access to electricity facility provided and managed by Water and Power Department, GB but supply-demand lapse is managed by load shedding (Exhibit No. 6). 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.

1.4.7. 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 serve 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.

There is a LSO working in Haramosh valley named as LSO-Haramosh. Varied sort of opinions from community regarding the performance of LSO components i.e. VCC, VO, WO have been reported during interviews. Local community seems satisfied with LSO performance in projects but during the unavailability of projects LSO's remains dormant. Other community-based organizations working in the villages are as under.

In Sassi and Shatot along with social organizations working under the umbrella of LSO in the village area is Valley Conservation Committee. In Dasso and Iskere both Village organization and Valley Conservation Committee are functional. In Hanuchal Valley Conservation Committee and Village organization are working. In Jutial village organization and women organization are working only. Shuta and Barchi also have these organizations but due to weak intervening of LSO in these villages, organizations are dormant and not working any more.

LSO approach although provides an organizational network in the village but the mobility and activity of these LSO are dependent upon the NGO driven projects which induces un-sustainability in the LSO mechanisms. Instead of working for their own sustainability LSO collapse and diminishes in the area. The ownership of LSO is also denied by the villages as in the cases of Barchi and Shuta which are excluded from the project area due to any reasons. Such things generate the biasness among the villages and halts administrative procedures and acceptance of LSO mechanism.

1.4.8. Gender Impact

The social and cultural set-up levied multiple constrictions on women in Haramosh valley. The social and cultural environment was to put women more with the house hold activities. Women mobility is restricted and limited to occasions. Number of female populations is slightly higher than male population in the whole valley except Dasso and Iskere. Women are involved in agricultural activities, tending to livestock, wood and water collection – more so within their own yards. Education attainment was not common for females but now the scenario is changing. With the evolution of culture, importance of education for females has been acknowledged by the local community and inclination towards female education has been raised.

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 down 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.

2.2. Water

Haramosh valley is rich in fresh water resources and mostly villages divide these channels according to the customary rights which creates an atmosphere of the unfair distribution. New settlements/villages as a result of population expansion have the less water share as compared to the old settlements. The water shortage during winter also fuels the issue and highlights the mismanagement of water governed by the customary rules. These rules are not documented and neither available to common man of the local community. It is therefore important to contrive statutory rules for the division of water resources.

2.3. Agriculture

Haramosh community has consequently developed a wide range of mechanical and biological measures, largely through trialing several procedures along time since decades from natural environment and in consistence with prevailing factors for mitigating small sized land, mountainous patches, rocky structures, traditional varieties of seeds, fertilizers, Fluvial and Aeolian effects. These measures allowed the community to adapt into the environment. Such adaptations are predominantly imperative because their temperate influences produce amiable and pleasant conditions that are critical for provision of a healthy environment, increased crop and livestock yields and monetary profits for subsistence.

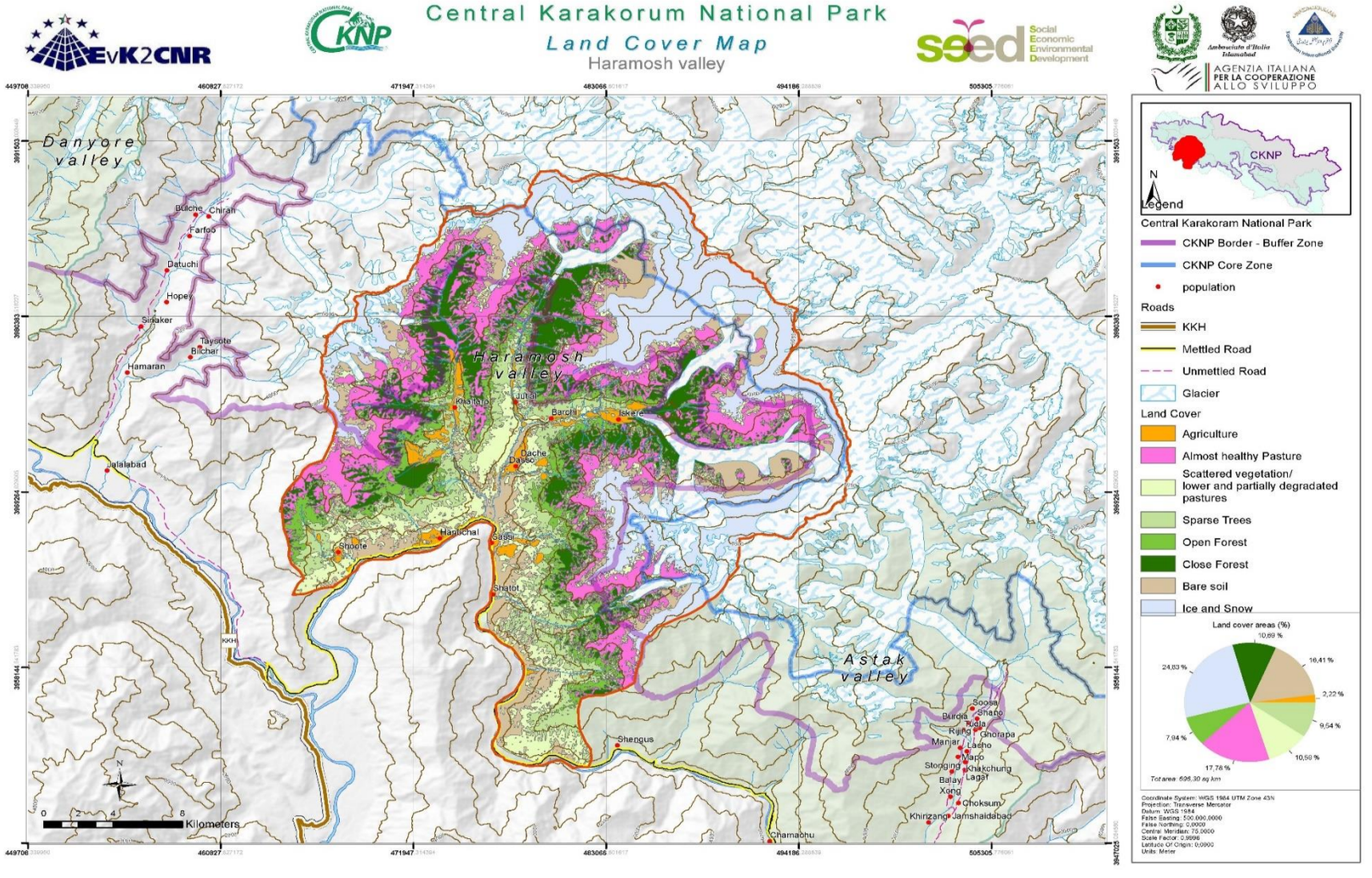


Exhibit 7: Land cover of Haramosh

In Haramosh valley local farmers have developed terraced patches of agriculture fields through land reclamation at different altitudes around their settlements which is forest rich 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, farmer plant fruit and nut trees along the edges of terrace rises, thereby allowing 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 Haramosh valley to avoid erosion and increase in fertility.

Two types of agriculture systems naming subsistence and commercial agriculture are common in the local community. Production of wheat, barley, vegetables and fodder is as limited as their family's need which plays a key role in ensuring household food security. Potato, cherry, apricot, almond, and walnut are notable cash crops for the farmer and generates good amount of profit (Exhibit No. 8).

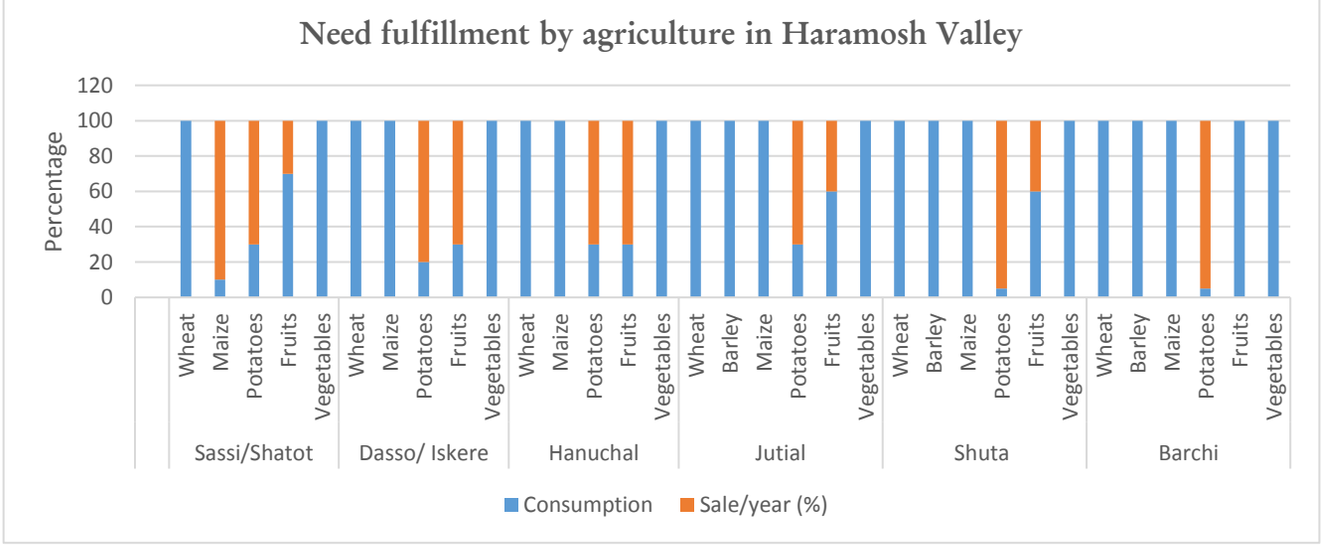
Owing to population expansion traditional agriculture practices are insufficient to fulfill the food security. Also, land pieces divide further due to distribution of assets among heirs as a tradition. Added to these, weather conditions are often adverse and can result in total or partial crop failure from hail, flood or landslide. To rectify these problems local community is reclaiming the natural mountainous patches and replacing the natural flora with agricultural crops as fast as the increasing population. This process reflects an unsustainable approach of the local community towards management of natural resources.

Exhibit 8: Economic benefits of agriculture production

Village	Crops	Consumption /year (%)	Sale/year (%)	Av. Income/HH/year	Av. Value/HH/year
Sassi/Shatot	Wheat	100	0	26,534	50,000
	Maize	10	90		
	Potatoes	30	70		
	Fruits	70	30		
	Vegetables	100	0		
Dasso/ Iskere	Wheat	100	0	29,421	60,000
	Maize	100	0		
	Potatoes	20	80		
	Fruits	30	70		
	Vegetables	100	0		
Hanuchal	Wheat	100	0	26,000	50,000
	Maize	100	0		
	Potatoes	30	70		
	Fruits	30	70		
	Vegetables	100	0		

Village	Crops	Consumption /year (%)	Sale/year (%)	Av. Income/HH/year	Av. Value/HH/year
Hanuchal	Wheat	100	0	26,000	50,000
	Maize	100	0		
	Potatoes	30	70		
	Fruits	30	70		
	Vegetables	100	0		
Jutial	Wheat	100	0	33,500	55,000
	Barley	100	0		
	Maize	100	0		
	Potatoes	30	70		
	Fruits	60	40		
	Vegetables	100	0		
Shuta	Wheat	100	0	25,000	60,000
	Barley	100	0		
	Maize	100	0		
	Potatoes	05	95		
	Fruits	60	40		
	Vegetables	100	0		
Barchi	Wheat	100	0	18,750	150,000
	Barley	100	0		
	Maize	100	0		
	Potatoes	5	95		
	Fruits	100	0		
	Vegetables	100	0		

Exhibit 9: Need fulfillment by agriculture in Haramosh Valley, 2016



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 are adaptation strategies for livestock herding. However, the livestock population highly depends on pastures of Haramosh valley due to insufficient fodder from the agriculture fields as compared to the livestock heads. Moreover, the pastorals also collect the huge amount of fodder from pastures during late summer and autumn season for over-wintering. Haramosh valley lies between the elevation ranges of 14,000-21,000m asl, which at dry sites is an ideal ground for xeric vegetation such as *Capparis*, *Ephedra*, *Carduus* and *Artmesia spp.* shrub land occasionally with scattered Juniper stands. Juniper stand density is low and stand dynamic is slow (scatter regeneration) as observed during the survey of the area. Fresh saplings of xeric vegetation are preferred by both the domestic and wild goats and sheep, while Artemisia provides forage during the autumn and winter when fresh fodder is occasional.

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 Markhor, Ibex, and several small rodent species and ultimately increasing prey density for wild carnivores. But on the other hand decreased economic incentives by livestock in annual income per household increases the dependence of local community on the wood and non-wood products. This dependence of 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 make 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 10: Contribution of livestock in economics of Haramosh Valley

Villages	Kind of livestock	Population per village	Av. Income per HH	Rearing trend
Sassi/Shatot	Goat	0	30000	Dec
	Sheep	1200		
	Cattles	8400		
	Yaks	0		
	Equids	0		
Dasso / Iskere	Goat	4900	50000	Dec
	Sheep	12700		
	Cattles	2370		

Villages	Kind of livestock	Population per village	Av. Income per HH	Rearing trend
	Yaks	60		
	Equids	33		
Hanuchal	Goat	10000	55000	Dec
	Sheep	50000		
	Cattles	4000		
	Yaks	150		
	Equids	0		
Jutial	Goat	2300	40000	Dec
	Sheep	1000		
	Cattles	680		
	Yaks	0		
	Equids	0		
Shuta	Goat	1000	50000	Dec
	Sheep	1400		
	Cattles	2000		
	Yaks	300		
	Equids	0		
Barchi	Goat	5000	45000	Dec
	Sheep	10000		
	Cattles	1270		
	Yaks	0		
	Equids	0		

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

1. Man power of the Haramosh valley has the tendency to acquire education and join more profitable alternative livelihood options with less risks.
2. Haramosh valley has two strata of villages. Villages at higher villages have prolonged winters and very short summer and spring season. The temperatures drop below the freezing point resulting dried out vegetation cover and snow-covered pastures. Pastorals faces scarcity of fodder for livestock due to which animals produce a reduced amount of meat.
3. The villages at lower elevation have longer growth season but these areas suffer from water scarcity, high livestock pressure and more erosion. Therefore, the pastures and ultimately livestock productivity is continuously declining. During the winter animals feed on dry fodder which is less nutritious as compared to fresh saplings. To survive with scarce fodder animals, utilize their fat reserves and become unhealthy and weak. It leads to the economic capsizal for the owner.

4. Pastorals are aware about the changing patterns of 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.

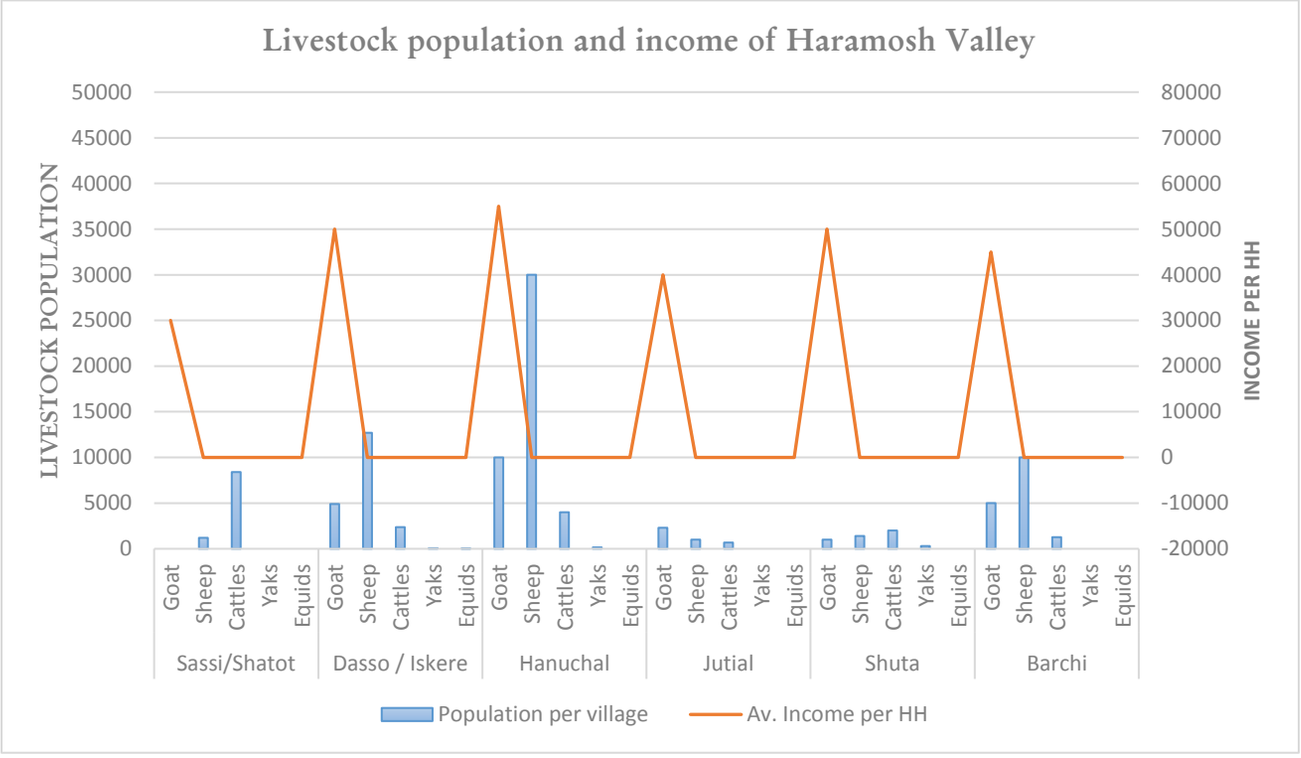


Exhibit 11: Livestock population and income of Haramosh Valley, 2016

Disease spread is common and frequently spreads from shared places such as grazing areas such as pastures, water points and other such places. It benefits the infectious agents to spread quickly and infect healthy animals. Pastorals can't avoid the situation owing to insufficient fodder production from their farms. This condition becomes worse when precautionary measure of such zoonotic diseases is unknown and allow the exponential blowout of infectious agents from diseased animals.

The common livestock in this low-lying valley is goat and sheep particularly due to scarcity of fodder and unavailability of vast pastures. These animals required less forage than large animals such as cattle, yaks, donkey and mules.

There is huge dependence of livestock on the pastures for fodder. With the increase in human population and ultimately livestock population the pressure on pastures have been increased, 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.

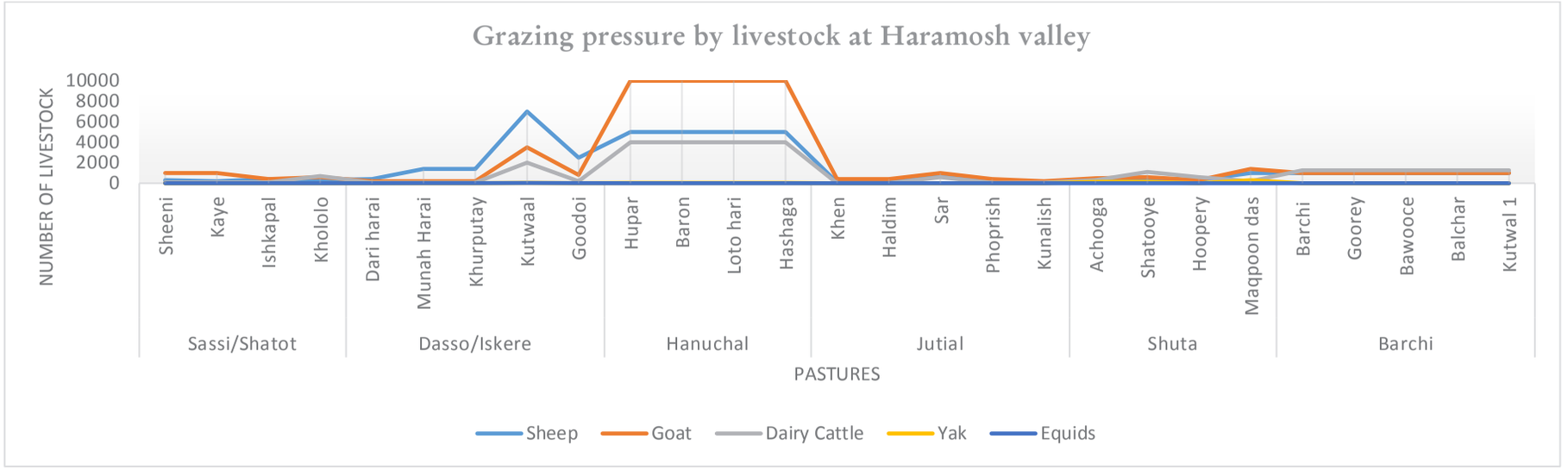


Exhibit 12: Grazing pressure by livestock on pastures of Haramosh Valley

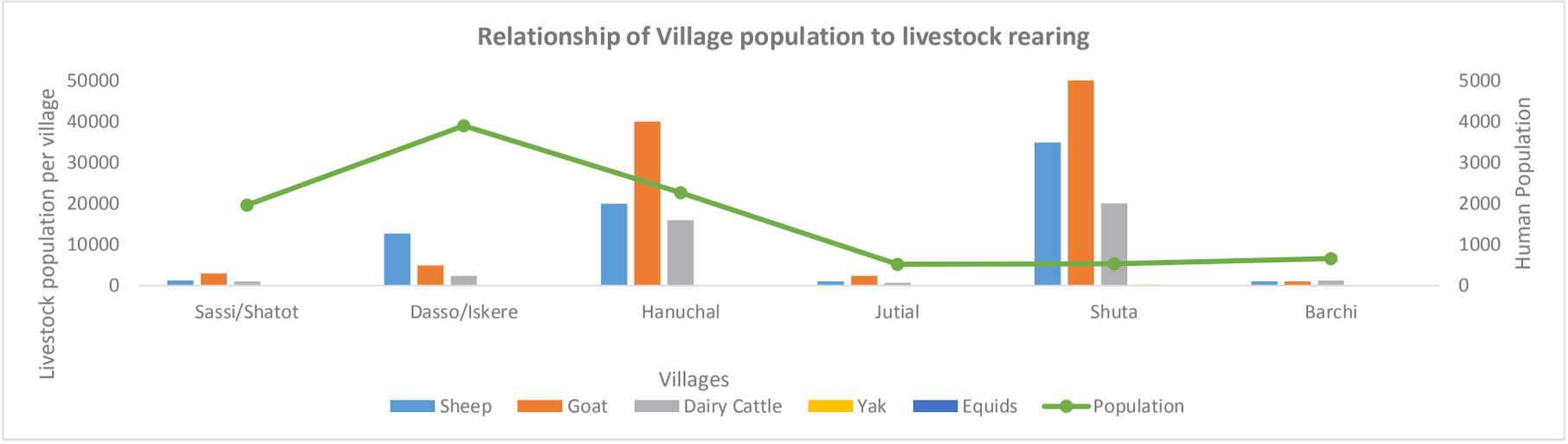


Exhibit 13: Relationship of human population to livestock grazing at Haramosh Valley

2.5. Pastures

Animal rearing dominates land use with pastures and water management being guided by customary rules in Haramosh Valley. Pasture sharing within two or more villages ensuring the common access rights also guided by customary rules. Shared pasture often borders two or more villages. Local community depend upon pastures for livestock herding, fuel wood collection, medicinal plants harvest, honey and other consumable products on the basis of rights to access.

Local community of Haramosh reported only vertical transhumance patterns in the area during FGD interviews with seasonal movements from top mountain pastures to downside. Vertical transhumance either guided by shepherd or family members is customary practice to avoid grazing of livestock on fields. During springs, when the fields are ploughed and grains are sowed. Consequently, household's livestock is moved out of villages to the lower pastures, free of snow, to protect cultivated areas from animal browsing. As the season advance, livestock is gradually moved at higher elevation to the summer pasture (July-August) above the timberline (4500 m a.s.l.). In the meantime, crops are grown and finally harvested. Then, livestock gradually return to lower pastures and to stables at village levels (November). There, they stay during all winter (November – March) until successive spring, feeding on the crop residuals and hay collected during summer stored and dried by the households. Farm protection from browsing prior to its movement during early spring, linear hedge of Russian olives is common on the terraces of agriculture patches.

It is customary to keep all the dairy products as a payment or exchange the 50% for a certain amount of grains in the case when livestock is herd by shepherd in the pasture. Such pastures have only few huts in them. Contrary to it, villages where number of animals is not very large, several families might join together their livestock, each keeping them for one/two weeks or pre-settled time. Usually several huts are located in such pasture zones.

Another customary practice exercised to avoid the livestock of the neighboring villages which don't have access rights on particular pasture is the penalty. If livestock of one village moves to pasture of neighboring village intentionally, then penalty has been fixed by village community according to the loss.

At present, highest concentrations of livestock fed upon pastures of Haramosh village. The FGD interviews indicates that only all the pastures in Haramosh valley are degrading gradually. Decline in health of pastures is direct indicator of unsustainable harvesting practices due to increasing local population (Exhibit No. 14) fueled by climate change.

Uncontrolled grazing and other consumable products irrespective of decreasing productivity allows 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 14: Assessment of grazing pressure from each livestock classes on pastures of Haramosh Valley

Pastures	Village	Facilities	Other Uses	Status	Grazing Period	Livestock Classes				
						Sheep	Goat	Dairy Cattle	Yak	Equids
Sheeni	Sassi/ Shatot	Accommodation for shepherd, night sheds and fences	Fuel wood only	D	Jun-Sep	300	1000	100	–	--
Kaye						200	1000	100	–	--
Ishkapal						400	400	100	–	--
Kholoolo						300	600	700	–	--
Dari harai	Dasso/Iskere		Fuel wood, and Medicinal herbs	PD		400	200	50	15	--
Munah Harai					May - Nov	1400	200	60	05	02
Khurputay						1400	200	60	05	02
Kutwaal						7000	3500	2000	30	25
Goodoi						2500	800	200	5	4
Hupar	Hanuchal	Fencing and Sheds	Fuel wood and Medicinal herbs	PD	May-Sep	5000	10000	4000	40	--
Baron						5000	10000	4000	40	--
Loto hari						5000	10000	4000	40	--
Hashaga						5000	10000	4000	40	--
Khen	Jutial	Fencing and Sheds	Fuel Wood Collection			80	400	--	–	--
Haldim						80	400	--	–	--
Sar						800	1000	600	–	--
Phoprish						40	400	30	–	--
Kunalish						20	200	50	–	--
Achooga	Shuta	Accommodation for shepherd, night sheds and fences	Fuel wood and Medicinal herbs	PD	Feb-Dec	300	500	300	150	--
Shatooye				PD	Feb-Dec	400	600	1100	150	--
Hoopery				PD	Mar-Sep	300	300	600	–	--
Maqpoon das				PD	Jan-May	1000	1400	200	300	--
Barchi	Barchi			PD	Nov-May	1000	1000	1250	–	--

Pastures	Village	Facilities	Other Uses	Status	Grazing Period	Livestock Classes				
						Sheep	Goat	Dairy Cattle	Yak	Equids
Goorey						1000	1000	1250	--	--
Bawooce						1000	1000	1250	--	--
Balchar						1000	1000	1250	--	--
Kutwal 1						1000	1000	1250	--	--

2.6. Fuel Wood Collection/ Timber Harvesting

Haramosh valley which lies at humid south west side of CKNP has comparatively rich forest with approximately 128.5 km^2 vegetation cover and its average ABG is 1,005,445 Mg or 7827.5 MgKm-2 and CAI of 6064.7Mg/year (Ferrari, 2014). Vegetation cover is 52% (19% grasslands, 13% close forest, 6.8% open forests, 6.7% for both scattered and sparse vegetation). Most of the high value timber (mainly Pine and Spruce) is located in the southern valleys of Gilgit district. Haramosh presents 32% of total CKNP AGB possess almost half of total CKNP AGB. Similarly, largest increment is clustered in Haramosh which is 28% of total CKNP CAI (Ferrari, 2014).

Poplar varieties are common plantations that in Haramosh 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 as reported by local community. Walnut (*Juglans regia*) is also cultivated on the private lands for valuable timber and fruits. Old apricot trees either having low productivity due to age or disease are also harvested for same purpose.

As a consequence of increasing population expansion of villages is common phenomenon in Haramosh like other valleys and thus construction of settlements/houses is also on rise. The timber for construction purposes is either purchased from Gilgit timber market or from natural/artificial plantations (Exhibit No. 15). Haramosh which is forest rich villages timber harvesting is usually regulated and represent an important share in total household livelihood revenues. All the timber harvested in the valleys shall be considered illegal, as local laws allow the cutting of trees only if previously marked and signed by forest officials. However, in practice, this is hardly happening and locals decide by themselves where and how much to cut (FGD interview, 2016). 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 Haramosh valley. From a large tree, locals usually obtain around 50 logs. The trees harvested for timber in each village of Haramosh valley are listed in Exhibit No. 16. The value of a large tree harvested, divided into logs and transported to the nearest city (Gilgit), can vary between 100,000 Rupees (Picea) and 125,000 (Pinus).

Exhibit 15: Forest cutting at Haramosh

The preferred firewood among trees is Juniper but individual interviews by local community shows that some of them are aware of importance of Juniper and fulfill their harvest needs from other tree species, but this is not the case with majority of population of Haramosh. Additionally, fruit trees pruning residuals are often being used which is frequently in Haramosh Valley. 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. Considering wood consumptions, the amount of firewood yearly used is mentioned in Exhibit No. 17, which shows that even dense forest systems may experience pervasive and severe levels of small-scale chronic disturbance by this huge harvest. It is pushing forest rich areas towards fragmentation.

Exhibit 16: Timber harvesting and use at Haramosh Valley

Village	Houses constructed in last 5 years (2010-2015)	Number of trees used	Tree species used
Sassi /Shatot	75	4	Pine, Juniper, Blue pine
Dasso / Iskere	70	10	Pine, Blue Pine
Hanuchal	5	2	Pine
Jutial	7	5	Pine
Shuta	10	3	Pine
Barchi	60	4	Pine

Customary laws are not being followed completely in the Haramosh valley for exploitation of natural resources. They allow the collection of fuel wood and timber from marked trees up to need basis only and its sale is banned but illegal trade to the local markets of Gilgit are taking place. Moreover, customary laws have no rules regarding the types of floral species that can be harvested therefore juniper conservation is becoming an issue. Juniper is harvested extensively by local community without taking into consideration its deliberate growth. There are several other gaps in customary laws which provoke the need of revitalization of these 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 17: Summary of fuel wood harvest and consumption in Haramosh Valley (Kg/HH/yr)

Village	HH	Consumption per HH			Consumption per Village		
		W	S	Total	W	S	Total
Sassi /Shatot	230	1200	450	1650	276000	103500	379500
Dasso / Iskere	340	2800	1400	4200	952000	476000	1428000
Hanuchal	270	4000	1200	5200	1080000	324000	1404000
Jutial	60	1600	800	2400	96000	48000	144000
Shuta	61	2800	1400	4200	170800	85400	256200
Barchi	80	2400	800	3200	192000	64000	256000

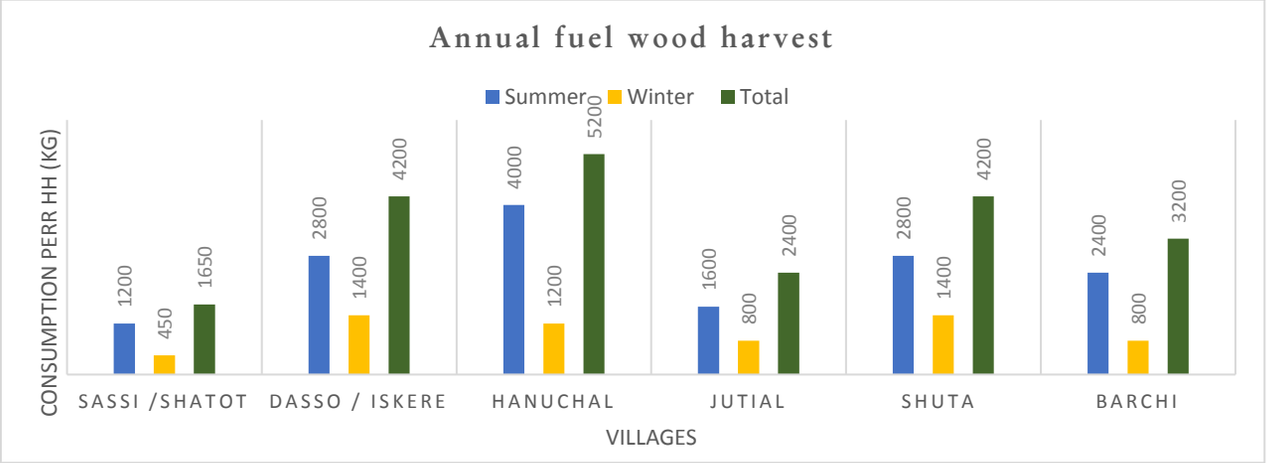


Exhibit 14: Annual fuel wood harvest, Haramosh Valley

Exhibit 18: Breakup of fuel wood harvested from multiple sources (Kg/yr/HH)

Sources /Villages	Sassi/Shatot		Dasso/Iskere		Hanuchal		Jutial		Shuta		Barchi	
	W	S	W	S	W	S	W	S	W	S	W	S
Artemisia	120	80	200	70	180	72	140	56	100	35	110	44
Sea buckthorn	180	80	200	90	160	64	180	72	172	60	158	63
Shrubs/Grasses	500	80	450	202	420	168	480	192	360	126	356	142
Dung	80	0	100	45	500	200	0	0	0	0	0	0
Juniper	1000	400	1200	720	2400	960	800	360	400	152	200	0
Natural forest	120	80		0		0		0		0	600	210
Fruit trees	400	80	800	440	1600	640	800	360	800	304	260	104
Other riparian vegetation	600	168	100	28	800	320	800	360	1000	380	400	140
Plantation	400	80	1600	640	800	320	1000	450	970	369	1020	459
Market	200	80	150	52.5	315	123	95	43	0	0	0	0

2.7. Mining

The presence of unique and specialized geological features designates the entire region of GB having most suitable geological environments as compared to the rest of the world where mineral deposits of economic grade are being extracted. These include metallic, non-metallic, energy minerals, precious/dimension stones and different rocks of industrial use. Adequate deposits of dimension stones are found in Ghizer, Skardu, Hunza, Nagar and Gilgit Districts, besides serpentinite deposits at District Skardu. Presently these are being mined using indiscriminate blasting techniques which not only destroy this natural resource but also results in wastage of more than 75% of the total yield.

Mining sector contributes a lot to the household economics of the local community of whole Haramosh valley except Shuta. These mining activities serve as a source of livelihood since 1930 as reported by the local community. These villages of Haramosh valley are rich in deposits of precious stones such as Ruby, Black Tourmaline, Topaz, Aquamarine, Fluorite, Morganite and Quartz (Exhibit No. 19). These mineral deposits are located in the mountains and peaks which are communal areas and divided among the valleys by their customary rules. Within valley, groups involved in mining from each village have divided their mines and all of these groups keep these activities confined to their own mines. The group size varies from 5-10 but there is no fixed group size. These groups learn to excavate by hit and trial methods instead of any proper training. They also don't obtain the true price of their products due to low quality, lack of value addition and awareness.

Exhibit 19: Economic revenue from mining in Haramosh Valley, 2016

Village	Since	No. of Mining Groups	Mining Products	Revenue/Year/Village (Rs.)	Revenue/Year/Group (Rs.)
Sassi/Shatot	1952	20	Aquamarine, Topaz, Black Tourmaline, Ruby	25,000,000	1,250,000
Dasso/Iskere	1930	25	Aquamarine, Topaz, Tourmaline	5,000,000	200,000
Hanuchal	1940	5	Fluorite	300,000	60,000
Jutial	1930	5	Fluorite	300,000	60,000
Shuta	--	--	--	--	--
Barchi	1930	6	Beroj, Topaz, Quartz, Morganite, Tourmaline	800,000	133,334
Total	--	**61**	--	**31,400,000**	--

2.8. Tourism

Haramosh peak and Kutwal Lake is an attractive tourist point owing to its pristine beauty but due to improper road trek and damage during rainy season Kutwal Lake makes the place inappropriate for the tourists. Tourist groups trek from Arindo to Haramosh which is almost 5 days trekking period. The CKNP Use Right shares 3.1% of CKNP entry fee as the share of Haramosh valley. Tourism industry is economically significant for Barchi and Jutial village but its trend is decreasing in the lower villages due to unavailability of tourist spots. The LSO shares the information about the tourist spots of the villages and support the tourist services by establishing the contacts between tourists and local community. Local community of Dasso village also earn by renting camps, porting, guiding and cooking for tourist and expeditions. In Dasso village three guides and seven porters are earning their livelihood during the season and their earning depends upon the number of days they serve, number of tourists and earning per day. Rest of the villages of Haramosh valley don't offer any tourist services due to a less number of tourists.

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.

3.1. Climate Change in the Perspective of Indigenous knowledge

People at Haramosh 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 impact can be reversed by timely actions. Change in length of season has been reported by the local community with increased temperatures and prolonged summer in Haramosh valley. Local community has also reported an increase in the frequency as well as magnitude 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

Gradual increase in temperature has been reported by local community during last 30 years the most visible evidence of temperature increase is the earlier melt out of snow cover and glaciers across the region. 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 have but also increased summer drought stress, vulnerability to insect pests. Shift in season along with increased extreme events have also been reported by local community during interviews.

3.3. Precipitation

In addition, changes in climate, such as reduced snowfall and reduced 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.

3.4. Drought

Drought is considered as the most damaging and costliest type of natural disaster, especially in the CKNP valleys where water quality and quantity is regulated solely by the precipitation with a far-reaching impact on economic, environmental and social aspects leading to food and water insecurity, reduced agricultural productivity, damage to forests, pastures, wildlife and livestock. The community faces highest economic loss in agriculture due to drought.

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.

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

Devise the research to determine natural indicators to measure the intensity of drought for local community.

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 Haramosh. 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 35% since last 30 years. However, the flood frequency is also reported to be increased by the local community by 29% since last 30 years.

3.6. Landslides

According to the FGD's in survey conducted to gather information about the driving factors of climate events by local community, it is assessed that landslides have increased considerably (42.5%) since last 30 years. These landslides wither soil from mountains, pastures and less vegetated areas and make the land barren. It destroys the soil compactness and infrastructure facilities such as roads, bridge, and sometimes houses or other building along the edges.

Exhibit 20: Climate change at Haramosh Valley in the perspective of indigenous knowledge

Factors	Status	Change (days/%age)	Trend		
			30 y ago (1985)	10 y ago (2006)	Future prediction
Rain	Decrease	43	More rains as compared to present	Decrease	Decrease
Snow	Decrease	55	More snow as compared to present	Decrease	Decrease
Temperature	Increase	8.3	Less as compared to present	Increase	Increase
Summer season duration	Increase	10	Summer starts early and ends late. Temperature is comparatively high in summer now a day	Increase	Increase
Winter season duration	Decrease	10	Winter starts late and ends early. Winter is not as colder as it was before.	Decrease	Decrease
Glacier recession	Increase	30	Glaciers were stable	Increase	Increase
Land slides	Increase	42.5	They were not frequent as now	Increase	Increase
Flood frequency	Increase	29	Less flood as compared to present	Increase	Increase
Flood magnitude	Increase	35	Less magnitude as compared to present	Increase	Increase
Drought	Increase	33	Less drought as compared to present due to less snow	Decrease	Increase
GLOF	Never occurred				

3.7. Pastures

Regional climate scenarios for CKNP valleys shows prolonged growing seasons and shifts in temperature and precipitation as currently happening in the valleys around CKNP are likely to

affect plant phenology and growth. 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 40% degradation has been observed. However mid and low land grazing areas have declined 50% which is more than alpine regions because of high livestock pressure.

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 pastures of the area. Since a higher amount of carbon is stored in soils than in the aboveground biomass above tree line indicates that alpine ecosystems may turn into carbon sources rather than sinks.

Exhibit 21: Impact of climate change on pasture at Haramosh Valley

Pastures	Status	Change (days/ %age)	Trend			Adaptation Measures for conservation by local community
			30 y ago	10 y ago	Future prediction	
Alpine and sub-alpine pastures	Degrading	40	Less degraded as compared to present	Degrading	More degradation	Due to unavailability of alternative grazing areas they can't restrict the use of degrading pastures and hence no adaptations by local community practiced yet
Mid and low land grazing	Degrading	50	Less degraded as compared to present	Degrading	More degradation	

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 Haramosh. 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.

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 Haramosh 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 Haramosh valley represents a mix of woody and non woody vegetation. Major floral species are Pine, Junipers, Poplar, Fraxinus, Olea, Berberis, Wild Rose, Cotoneaster, Sea buckthorn, Artemisia, Stipa.

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

Rising temperature and CO_2 as a consequence of climate change has impacted the local forest ecosystem of Haramosh by providing prolonged growth season which seems to enhance its productivity apparently. But this rising temperature can lead to phenological 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.

The nullahs 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 Haramosh 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 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

In Haramosh valley, faunal biodiversity which was once common is now at decline. Ranging from trophy species such as Markhor and Ibex irrespective of conservation efforts the number is continuously decreasing. It indicates that either climate is posing pressure on the survival of species or species may have the difficulty in adapting to the changing climate. In either case comprehensive study is required to assess the breeding potential and adaptability of the species in changing climate.

Considering the birds and butterflies it has 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 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 Haramosh 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.

3.8.4. Fishery

Climate change is likely to affect fisheries and aquaculture, their dependent communities and related economic activities along three main pathways. Haramosh valley is not dependent on the fishery for subsistence and therefore local community has no idea about the impact of climate change on the fishery.

Exhibit 22: Impact of climate change on biodiversity of Haramosh Valley

Biodiversity	Status	Altitudinal Shift	Trend			Adaptation Measures by Local Community
			30 y ago	10 y ago	Future Prediction	
Agriculture crops and fruit trees	Degrading	N/A	Pests and crop infections were not frequent Artificial fertilizers were not required	New pest varieties have been reported	Weeds will become common Irregular precipitation patterns will lead to productivity decline with same seed varieties	Increase in cropping area by leveling to enhance productivity Use of fertilizers and new seed varieties have been increased to remove pests
Natural Forest	Degrading	Reported for some non woody vegetation	Forest patches were dense and healthy	Degrading	More degradation	No adaptation yet
Wildlife						
Ibex	Decreasing	Increasing	Population was good in number	Less population due to hunting and habitat shrinkage	Population will increase due to the conservation efforts	Poaching and Illegal hunting is controlled due to trophy hunting initiatives but it is not the part of customary laws
Urial	N/A	–	--		--	--
Markhor	Decreasing	Increasing	Population was so less that it was rarely seen	Population was good and is increasing continuously	Population is increasing but at low rates than it should be	Illegal hunting and poaching have been controlled to ensure the population increase

Biodiversity	Status	Altitudinal Shift	Trend			Adaptation Measures by Local Community
			30 y ago	10 y ago	Future Prediction	
Birds	Decreasing	–	Population and diversity were good	Bird population and diversity was less	Bird population can either decrease due to removal of natural vegetation or it can be expected to increase due to increase in their prey	No adaptations
Butterflies	Decreasing	–	Butterflies of several types were common	Due to absence of flowering plants butterflies are no more common	They will decrease because of land erosion and shrinking of natural vegetation areas	Not adaptation has been done yet
Fishery	N/A					

3.9. Water

Owing to the recent climate changes the water availability has been changed. Snow fall has declined up to 55% according to the perception of local community but rain fall has increased. 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.

3.10. Tourism

Mountain areas are sensitive to climate change. Implications of climate change include less snow, altered rain timings, receding glaciers, melting permafrost and more extreme events like landslides. However, climate change is a severe threat to snow related sports such as skiing, snowboarding and climbing. 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. Haramosh valley has very few tourist spots and don't depend on tourism for livelihood considerably.

CONSERVATION MANAGEMENT ISSUES & PROBLEM OF HARAMOSH VALLEY

4. MANAGEMENT ISSUES AND PROBLEMS

Present scenario of Haramosh 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 Haramosh 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

In Haramosh valley traditional varieties of fodder, crops, fruit trees and commercial trees are cultivated. These agriculture issues reported by the local community, although belongs to several sectors but all are aiding in declined agriculture production.

1. **Small land pieces for agriculture:** The arable land of Haramosh valley is continuously shrinking due to its encroachment by expanding human settlement, commercial buildings, especially at Haramosh village. This shrinking is being aided by the division of available land of forefathers divided among the generations and declines the agriculture productivity.
2. **Irrigation and water rights:** Customary rights, 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. Situation becomes worse during the winter season which fosters low availability of water in streams. Moreover, division of water quantity between old and new villages is also an issue. Newly established villages don't acquire the water up to the demand and agriculture along with other water dependent sectors get worse effects.
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 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 Haramosh 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 risks are wide spread, and they are transforming the socio-environmental infrastructure of economic development. Whether they are included or not in the development of national adaptation strategies, rural populations continue to employ diverse climate adaptation strategies to withstand climate induced vulnerabilities inimical to their livelihoods. Apparently, climate change is exacerbating the challenges faced by the agriculture sector, negatively affecting both crop and livestock systems in Haramosh region. 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 tomato and potato because that are short-duration.

4.2. Pasture

Majority of the pastures of Haramosh valley is declining at rapid rates. The pasture sustainability is also facing lot of pressures from livestock more than thier carrying capacity, medicinal plants extraction, landslides and floods.

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. All the pastures of valley are showing decline in productivity due to unsustainable use. 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 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. Local community of the Haramosh valley reported various 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. Recent kills at Haramosh valley are not reported recently but due to currently non-functional 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 re-growth after each grazing period to ensure the health of grazed plants.
6. **Harvest of medicinal plants:** Haramosh pastures and forest areas are the rich sources of these medicinal herbs. Local community uses them for curing different aliments. 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 disturb the water quality and quantity both. The local community at Haramosh valley depends upon the precipitation patterns for water. Due to delayed rain timings and less annual snowfall local community is frequently facing drought and water shortage for irrigation especially villages at low elevation. 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 hotels and increasing tourist pressures. 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 unanimously reported about the water quantity as "Either lot of water or no water". As an adaptation to this issue they exploit the water points which are often far flung and also take their livestock to such areas. But irrigation becomes an unsolved issue because it demands the on-site availability of water.
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 Haramosh valley for subsistence purposes at the cost of degenerating forest.
2. **Harvest pressure:** Heavy collection of timber and non-timber products, from the forests allow the community to fulfill their needs. With continuously increasing population dependence of local community is also increasing on these natural resources.

   Harvesting is not limited only to timber and fuel wood but accounts for herbs as well. Another non-wood forest product that assume an economical significance for local communities is morel mushroom. Collected in spruce and pine forests from late spring until early autumn, they are dried and sold in Gilgit market city. The average price for a kg of good quality dry mushroom can reach 11000/12000 Rupees. No large-scale processing or drying facility is available and usually only few households (mainly shepherd or young people) is actively searching for them during most of the season.

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 has 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.

Following issues are being reported by the local community.

1. **Interpretation of existing tourist spots:** Tourist spots must be interpreted to increase the inflow of tourist at Kutwal Lake and nearby forest areas.
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:** Disaster prone areas are needed to be identified and mentioned on the site maps to be **articulated** into tourists planning for visit to the valley. This will prevent adverse impacts on tourists and give them an everlasting memory about the area.

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 industry provides some of the valleys around CKNP with a good opportunity to earn livelihood through the excavation of precious and semi-precious stones.

"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. **Illegal hunting:** Hunting is associated with the culture and considered as a symbol of bravery. Although, it has been regulated and controlled to some extent due to the conservation efforts by renowned organizations, but still recent reports and VCSDP interviews frequently report the incidents of illegal hunting of the wildlife. Trophy species are killed illegally but rarely due to their **economic** return but situation is worse for the other species such as wild carnivores and especially wild birds.
2. **Weak law enforcement:** Customary practices address the usage or exploitation of wild fauna but lack the conservation mechanism. Statutory laws regarding efficient use and conservation exist but their weak implementation leads to the un-sustainable use of wildlife.
3. **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 Markhor, Urial and Ibex due to the history of population surge.
4. **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.
5. **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.
6. **Habitat degradation and isolation:** Human population is continuously increasing at Haramosh regions 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 for the impact of habitat degradation on genetic health of wildlife species.
7. **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 HARAMOSH 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 needs four tiers. (i) Technological developments, (ii) government programs and insurance (iii) farm production practices, and (iv) farm financial management.

1. **Population expansions:** Government housing schemes are encroaching the rural and natural areas to accommodate the exponentially increasing population. The relevant planning department ignores importance of arable areas and allow its utilization for buildings therefore shrinking the land. To avoid this 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 only. The little economic innovation lies in the sale of dry fruits and crops such as maize during which million rupees' products are wasted annually. 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.

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 modeling 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.
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 loss.
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.

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.

5.2. Pasture

1. **Up gradation of customary laws/practices:** Customary practices should be amended in such a way that ensure 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.
2. **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.
3. **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. Also the implementation of Rangeland policy must be ensured to mitigate the unsustainable practices.
4. **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.
5. **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.

6. **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.
7. **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.
8. **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.
9. **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.
10. **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.
11. **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.

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 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:** To give relief to the local community of the Haramosh valley from the floods and landslides, 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 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. **Out-of-forest firewood plantation diffusion:** Keeping in view the unsustainable use of local community, it seems to be important to encourage out-of-forest firewood plantation diffusion, through highly productive and easy to maintain short rotation coppice systems. Those interventions shall be prioritized in all the villages of Haramosh valley at low elevation villages, where with sufficient watering, production capabilities are higher.
3. **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.
4. **Regulation of timber harvest:** Timber harvesting needs to be managed according to sound silvi-cultural principles as target diameter, planning of harvesting in time and space, specie-specific treatments for Pinus, Picea and Juniper respectful of the different ecologic needs of these species.
5. **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.

6. **Restoration cum conservation:** Several sustainability practices are being carried out in Haramosh valley 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.
7. **Adoption of alternative fuel devices:** Incentives in the adoption of fuel-efficient cooking stove should be encouraged instead in high altitude villages in especially Jutial and Barchi where fuel harvest is high due to harsh and long winter season as compared to low lying villages.
8. **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 seems 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 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:** The specific tourism products that pre-dominate tourism establishments and enterprises are (a) Accommodation (hotels, lodges, motels, guest houses, etc.) (b) Food and beverages (restaurants, cafes, etc.) (c) Adventure tourism (water rafting, water cruises, para gliding, etc.) (d) Wildlife safaris (nature walks, game drives, safaris etc.). Surge in tourist flow has been reported recently but related infrastructure is in shortage and needed to be developed to ensure the provision of facilities for tourist influx by public and private department and economic diversification.

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 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.

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, 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 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 a 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 HARAMOSH 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 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.
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 HARAMOSH 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
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	Poor implementation of conservation	Lack of awareness about	2.2.1. Preview the existing capacity of	Suggested for inclusion in revised	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
		sustainability of local social originations	interventions implementations and subsequent sustainability	sustainability avenues	relevant LSOs for the identification of gaps	MP/OP activities			
					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	Suggested for inclusion in relevant community developmen t plans	Dasso and Sassi	Urgent	Long term
					3.1.2. Provision of Medicines		-do-	-do-	-do-
					3.1.3. Provision of new diagnosis equipment		-do-	-do-	-do-
			Lack of access community health facilities		3.1.4. Establishment of new dispensaries	Suggested for inclusion in relevant community	Hanuchal, Jutial, Shuta & Barchi	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
						developmen t plans			
			Unhygienic practices by locals		6. Awareness conferences about hygienic practices	Suggested for inclusion in revised MP/OP activities	All	Urgent	Short term
					3.1.6. Disseminatio n of brochures and pamphlets to educate community about prevention from sporadic diseases	Suggested for inclusion in revised MP/OP activities	All	Urgent	Short term
					3.1.7. 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	

S. No.	Sector	Management Objectives	Conservation/ Development Issues/Gaps	Root Cause(s)	Proposed Management Action	Ref. to MP/OP	Village/s	Priority	Time Scale
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 No. 14.2 Activity 14.2	Jutial & Barchi	Urgent	Short term
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	Hanuchal	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

S. No.	Sector	Management Objectives	Conservation/ Development Issues/Gaps	Root Cause(s)	Proposed Management Action	Ref. to MP/OP	Village/s	Priority	Time Scale
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	Suggested for inclusion in revised MP/OP activities Activity No. 17.1.1.	All	Medium	Medium term
					6.1.2. Capacity building of farmers about modern techniques to enhance productivity.		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

S. No.	Sector	Management Objectives	Conservation/ Development Issues/Gaps	Root Cause(s)	Proposed Management Action	Ref. to MP/OP	Village/s	Priority	Time Scale
				Lack of jobs and economic opportunities in agriculture and related crops	6.1.6. Improvement of existing economic opportunities	Suggested for inclusion in revised MP/OP activities	All	Medium	Medium Term
					6.1.7. Creation of new job to enhance economic capacity of the local community	-do-	All	Urgent	Long term
					6.1.8. Provision and Installation of fruit processing unit	-do-	Dasso	Urgent	Long term
				Less arable land per household	6.1.9. Development of barren land patches	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
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 revised MP/OP activities	Sassi/Shatot	Urgent	Medium term
					7.1.2. Establishment of new vet facilities	Suggested for inclusion in revised MP/OP activities	Hanuchal, Jutial, Shuta & Barchi	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

S. No.	Sector	Management Objectives	Conservation/ Development Issues/Gaps	Root Cause(s)	Proposed Management Action	Ref. to MP/OP	Village/s	Priority	Time Scale
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
					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 Revive the use of indigenous grazing system	-do-	All	High	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
			Unknown Carrying capacity	Lack of Research studies	8.1.5. Research studies about the carrying capacity and adaptability of Pasture to climate change	Activity No. 9.2.	All	Urgent	Long Term
					8.1.6. 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	Suggested for inclusion in revised MP/OP activities	All	Urgent	Long Term
					9.1.2. Promotion of farm forestry	-do-	All	Urgent	Long Term
					9.1.3. Develop restricted forest zones to ensure regeneration and a total ban on Juniper harvest	Activity No. 9.1.	All	Urgent	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
					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	-do- -do-	All All All	Urgent Urgent Urgent	 Long Term Short Term
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	10.1.1. Dedicated zones for wildlife, restrict grazing in those areas 10.1.2. Improve habitat connectivity in existing fragmented habitats 10.1.3. Habitat modelling for near	Suggested for inclusion in revised MP/OP activities -do- -do-	All All All All	High High High High	Long term Long term Mediu m 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
					threatened wildlife species	-do-			Medium term
				Lack of eco-tourism opportunities	10.1.4. Identification of healthy population of endangered species reintroduction	-do-	All	High	Short term
					10.1.5. Establishment of water point	Activity No. 6.1	All	High	Long Term
					10.1.6. Improve watch and ward mechanism with inclusion of local SOs	-do-	All	High	Long term
					10.1.7. Awareness raising through seminars, and wildlife clubs in schools	-do-			
					10.1.8. Dedicated research projects				
11.	Tourism	11.1. Promotion of tourism as a sustainable economic avenue	Loss of economic opportunities	Insufficient facilities of road and stay	11.1.1. Maintenance of road throughout the touristic season	Suggested for inclusion in revised MP/OP activities	All	High	Short term
							Barchi and Shuta	High	

S. No.	Sector	Management Objectives	Conservation/ Development Issues/Gaps	Root Cause(s)	Proposed Management Action	Ref. to MP/OP	Village/s	Priority	Time Scale
			Loss of support for conservation and development opportunities	Lack of interpretation of resources i.e. Hot springs Lack of mechanism to attract tourist/visitor	11.1.2. Development and dissemination of brochures for interpretation of tourist opportunities 11.1.3. Water supply, waste disposal improvement in washroom condition 11.1.4. Community based residence and restaurants 11.1.5. Establishment of bath rooms and rest areas.	-do- -do- -do- -do-	All All All	Urgent Medium	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 -do-	High High	Long 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
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	-do- -do- -do-	Dasso All Dasso	Medium Medium Medium	Short term Short Term Long Term

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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 Gilgit, 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 Gilgit and CKNP Directorate. The DFO Gilgit 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 Gilgit and endorsed by the chairman of DCC with recommendations from CKNP Director and DFO Gilgit. The DCC Gilgit 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 Gilgit, 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 Gilgit, 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 Gilgit 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

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Required follow up actions

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Signature of the visitor.....