PAKISTAN NATIONAL SNOW LEOPARD ECOSYSTEM PROTECTION PRIORITIES

GLOBAL SNOW LEOPARD ECOSYSTEM PROTECTION (GSLEP) PROGRAMME

Second Draft

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Climate Change Division
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Valuing the Snow Leopard Ecosystem

The snow leopard is an iconic flagship species of the mountains of central Asia. The best estimate of global snow leopard population is 4,000–6,500 individuals (McCarthy and Chapron, 2003) and the species is categorized as "endangered" in the International Union for the Conservation of Nature (IUCN) Red List, and listed in Appendix I of the Convention on International Trade in Endangered Species (CITES) (IUCN, 2012).

An estimated 200–420 snow leopards exist in Pakistan's northern mountains across Khyber Pakhtunkhwa (KPK), Gilgit-Baltistan (GB), and Azad Jammu and Kashmir (AJK). A national-level assessment deemed the species "critically endangered" (Sheikh and Molur, 2004) within the country. While small, Pakistan's snow leopard population represents the world's third largest by size, tied with India, highlighting the country's importance for conserving the species worldwide.

Within Pakistan, the GB province contains the largest proportion (> 60%) of the country's snow leopard population (Hussain, 2003) which is largely concentrated in the province's two largest and adjoining national parks, Khunjerab National Park (KNP) and Central Karakoram National Park (CKNP). To the north, KNP and CKNP border important snow leopard habitat in China, home to the largest population of the cats throughout its 12-country range. Given the large home ranges of individual cats—studies show that snow leopards can have a home range of up to 1,000 km^2 and travel up to 200 km in a single foray (McCarthy, 2000; McCarthy et. al., 2010; Sharma et al., 2010)—it is fair to assume that the Karakoram range in Pakistan helps form a large wildlife corridor important for the overall genetic flow between snow leopards in Pakistan, China, and India.

The total snow leopard habitat available in Pakistan is about 80,000 km^2 (Fox, 1989) and encompasses four high mountainous systems, namely the Hindu Kush, the Pamirs, the Karakorams, and the Himalayas (**Figure 1.1**). These majestic ranges are home to some of the world's most fascinating and endangered wild species, including the markhor (*Capra falconeri*), Marco Polo sheep (*Ovis ammon polii*), musk deer (*Moschus chrysogaster*), Himalayan lynx (*Lynx lynx*), blue sheep (*Pseudois nayaur*), brown bear (*Ursus arctos*), Indian wolf (*Canis lupus*), Himalayan ibex (*Capra sibirica*), and the snow leopard, which is taken as an indicator of this mountainous ecosystem.

Apart from this unique assemblage of fauna, these mountainous systems have supported socially secluded and diverse human culture dwellings in the valleys for centuries. Thus, the high mountain ecosystems are vital for the co-existence of both human tribes and wildlife. The following factors further highlight the importance of these mountainous ecosystems:

Generally, snow leopard habitat is a hub of unique biodiversity and ecosystem functions and services, due to its remoteness and comparatively little development. Functions and services include watershed function, genetic resources, wild cultivars of agriculture, traditional knowledge, customary laws, and spiritual and cultural values;

The prominent flora found in snow leopard habitat include Picea smithiana, Pinus willachiana, Cedrus deodara, Quercus balloot, Taxus baccata, Betula utilis and Juniperus communis. In addition, around 78 species of medicinal and aromatic plants occurring in its habitat form the active trade and serve as major means of livelihood for local communities sharing habitat with snow leopards;

Approximately 80% of the GB population is engaged in subsistence agriculture although agricultural production is constrained by many factors; paucity of cultivable land remains the limiting factor besides harsh climate in winter other factors include poor storage and processing. Cultivation is dominated by cereals production,fruits, vegetables, and fodders, and plays a pivotal role in the local economy;

Rangelands occupy over 22% of the mountainous areas of the Gilgit Baltistan (GoP and IUCN, 2003), and similar expanse of rangelands is expected in parts of the snow leopard range. They provide critical grazing areas for livestock, protect water catchments, and support a rich diversity of flora and fauna;

Livestock is central to the local agricultural economy and plays a vital role in the region's food security. It accounts for more than 40% of household farm incomes and each household maintains a herd ranging from four to 20 individual goats and sheep. An estimated livestock population of 4.56 million is dependent on alpine pastures (GoP and IUCN, 2003);

The Forestry Sector Master Plan estimates that there are some 381,200 hectares (ha) of scrub forests in GB. The natural forests play a vital role in protecting the Indus River watershed, supporting a rich diversity of flora and fauna, serving as an important source of forage and pasture for livestock populations timber and firewood, supplying an important array of non-timber forest products (NTFPs), including medicinal plants, spices, honey, and mushrooms, and have tremendous potential for recreation and the development of ecotourism (GoP and IUCN, 2003);

Forests and agriculture in these mountains provide subsistence for more than nine million people. Sixty percent of mountainous communities are directly dependent on natural resources;

Hydropower generation lies in mighty Indus and its tributaries that flows throughout the snow leopard habitat. Despite the high potential for hydropower generation, only a fraction is utilized. The total capacity amounts to 31,000 megawatts (17,000 MW, 5,000 MW, and 9,000 MW in GB, Chitral, and Swat, respectively). With an extreme shortage of power there is a high demand for construction of more hydropower projects and most of them are likely to be located inside the SL habitat

Cultural diversity in the range is immense and abode for one of the world's oldest known civilization that still survives in the Kelash valleys of Bamburet, Barir, etc. Ecotourism potential is immense, however very little is tapped currently. Domestic tourism is an important source of livelihood for local people;

Besides aesthetic and cultural values, these mountains have intrinsic spiritual and religious values;

In short, humans and snow leopards share a habitat that provides a life support system both directly and indirectly for the local population. For the national economy this habitat provides off-season vegetables and fruits while remains a net importer of cereals. The trade in medicinal plants is huge but authentic figures are not available. it is believed that a huge quantity is traded illegally.

Trophy hunting is Pakistan is a success story that is widely acknowledged globally and more than seventy percent of trophy hunting quota in the country is allocated to the snow leopard range. Local communities benefit directly from the 80-90 percent share of the legal hunting of snow leopard prey species—markhor, ibex, blue sheep—which delivers an annual cash income of at least USD I m $ million in permit fees with a multiplier effect that has not been qualified so far. . This can be considered a cash injection into the national economy, as well. National and international tourism is the main business of communities in snow leopard habitat.

The species also serves as a link with the international community and possesses potential for trans-boundary agreements and means of commitment though compliance with multilateral environmental agreements (MEAs). Pakistan like other range states is a party to a number of MEAs; CMS deals specifically on migratory species across international borders. Transboundary issues related to biodiversity are gaining wider acceptance including the creation of trans-boundary protected area systems. Snow leopard is a flagship species that cannot be conserved without international cooperation

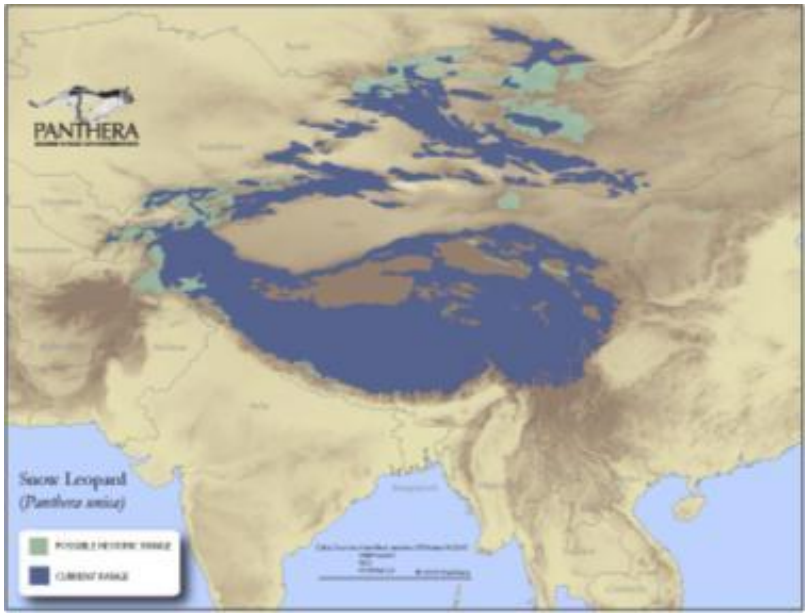
The apparent benefits in addition to the ecosystem services, appreciation value, satisfaction value, and biodiversity value are given in **Table 1.1**.

Table 0.1: Generic Quantification of Ecosystem Services in Snow Leopard Habitat

	Value	Generic Quantification	Source
1.	Medicinal and aromatic herbs currently collected and marketed by local communities	Annual income of approximately USD 4 million from 78 medicinal and aromatic plants species	Value chain development of medicinal and aromatic plants, NRSP-HDOD December 2013
2.	Tourism including hotels, facilities, services, and guiding in and around snow leopard habitat	Approximately USD 0.5 million, annually (335 hotels, guiding, and services)	Data from Chamber of Commerce, major hotels, and discussions with tour operators

	Value	Generic Quantification	Source
3.	Power generation supply	Direct power supply to approximately four million people	February 2001 - Hydropower resources of Pakistan, Private Power Infrastructure Board, Ministry of Water and Power, Government of Pakistan
4.	Cash income from trophy hunting of prey species	USD 1 million from sport hunting of markhor, ibex, and blue sheep	Annual report 2011, Program for Mountain Areas Conservation (PMAC)
5.	Services	Water, fuel wood, meat, wool, and wild fruits for 0.9 million people	Based on population dataanalysis

Figure 0.1: Snow Leopard Distribution Map



Awareness and Outreach

Environmental education (EE) was defined in the Tbilisi Declaration as: "...a learning process that increases people's knowledge and awareness about the environment and associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action." [34] Prior to this definition, the IUCN described EE as: "...the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among men, his culture, and his biophysical surroundings. EE also entails practice in decision-making and self-formulation of a code of behavior about issues concerning environmental quality." [35]

Education and awareness, particularly at the local level, are critical factors in generating support among local communities for conservation and management initiatives. In a natural environment, the quality of

34 UNESCO, Tbilisi Declaration 1978.

35 Neal P. and Palmer J. Editors, 1990: 2. http://www.glocom.org/special_topics/colloquium/20030723_iguchi_environmental3/.

local communities is dependent upon the resource generating ability of natural systems. The long- and short-term consumption choices of local communities can either enhance or compromise the ability of natural systems to meet their needs, the needs of their neighbors, and the needs of future generations. Education and awareness efforts can assist local communities in safeguarding existing resources, improving the ecology, and mitigating the hardships caused by the lack of awareness and knowhow.

Past Efforts in Snow Leopard Range

The environmental education background paper prepared by the IUCN (Abbas, 2003) for GB indicates that there is plenty of basic information on the environment in the existing curriculum of schools. This includes information on forests, agriculture, and industries. However, the link between the environment and the impact of its degradation on human life is not clearly defined. Curriculum development is a federal responsibility in Pakistan. However, due to growing awareness of the linkages between poverty and environmental degradation, the Education Department of GB redeveloped the primary-level curriculum by incorporating environmental issues under the Northern Areas Education Project (NAEP) funded by the Department for International Development (DFID)-UK and implemented by the British Council. The study also showed that numerous intergovernmental organizations or non-government organizations (NGOs) such as the Aga Khan Education Service (AKES), the World Wide Fund for Nature-Pakistan (WWF-P), and IUCN, are involved in the sector. However, the existing EE initiatives taken by various formal and non-formal sectors are activity based and there is a lack of coordination among the organizations and government departments undertaking these initiatives. Thus, the paper drew upon the roles and responsibilities of key development actors regarding the implementation of the development strategy.

Future Possibilities

In order to be effective, it is essential that the awareness and education plan target diverse population groups that have different interests and stakes in the snow leopard range. Four target audiences have been identified:

- Wildlife staff: Staff involved in the management of the wildlife and protected areas (PAs), including game watchers, rangers, game inspectors, and field officers;
- Local communities: Sedentary and migratory communities, i.e., communities permanently and periodically dependent on the resources of the snow leopard range;
- Visitors: National and international visitors to the snow leopard range;
- The general public: Potential visitors, armchair travelers, schoolchildren, and religious groups;
- Business interests: Local and outside, who have an impact on the snow leopard range.

Since members of the general public are potential visitors, the general public and visitor categories will be grouped together during the initial implementation of the awareness and education strategy.

Another potential group is the corporate sector, including national and multinational companies. Funding conservation and development initiatives can benefit both the snow leopard and the corporate sector; the conservation cause will gain access to additional funds and corporations can earn public goodwill.

The most suitable tools to educate each population group about conservation in general and the snow leopard in particular, are given in the following sections.

The Wildlife Staff

It is essential to utilize and build the human capital of the management organization of natural resources to effectively fulfill the short- and long-term goals of conservation. Various mechanisms have been defined below to enhance the capacity of field- and office-based wildlife staff.

Networking

WWF-P has pioneered EE in the mountainous areas of KPK and GB where fragile ecosystems are under stress due to population increases and the opening-up of the region after the construction of the Karakoram Highway (KKH). Similarly, a number of conservation education initiatives have been undertaken by organizations such as the Karakoram Area Development Organization (KADO), the Snow Leopard Trust (SLT), the Hunza Education Resource Project (HERP), the Himalayan Wildlife Foundation (HWF), the Aga Khan Rural Support program (AKRSP), AKES, and IUCN.[36] Networking and coordination will help ensure cooperation, introduce wildlife department staff to a cumulative learning process, and avoid duplication of efforts.

The relevant wildlife authorities will liaise with other organizations and departments involved in conservation activities in exchange for information and research findings.

Annual Training Workshops

A variety of training courses will be conducted to enhance the capacity of local staff. Training will cover the following topics:

- Issues related to conservation of the snow leopard and its habitat;
- Significant features of the snow leopard ecosystem, including the area's geology and geomorphology, the faunal and floral complex, ecological systems, and historic background;
- Species management and biodiversity conservation;
- Community participation and sustainable development;
- Sustainable development and poverty alleviation;
- Visitor and tourism management;
- Understanding and responding to climate change impacts;
- Field investigation techniques;
- Monitoring.

Additional subject areas may be considered based on available budgets and need for training. Visual and verbal aids will be used as supporting materials during lectures since a large proportion of the lower field staff is likely to possess lower educational qualifications. Teaching aids such as guidebooks, posters, and flip charts have been developed under various projects and should be utilized for wildlife stafftraining. Annual training workshops will be conducted for field staff in joint or divisional sessions based on logistical requirements and limitations.

A minimum of one training workshop in a year will be organized for field staff.

Preparation of Manuals

Awareness and education manuals for field staff and teachers will be developed in the long term (after year 3). Training manuals may cover the following areas:

- Improved monitoring and evaluation
- Enhancing community participation
- Data collection techniques.

Existing manuals from various sources (the Nature Conservancy, SLT, WWF-P, IUCN, etc.) will be collected, archived, and adapted for use where applicable. The preparation of awareness and education manuals requires great care and effort; the material may be culturally inappropriate or even socially unacceptable if developed out of the context of local social practices and knowledge. The material must convey the message in a clear and unambiguous manner, and should be suitable for wide distribution.

Local Communities

As already stated, local communities include both sedentary and migratory communities living within snow leopard range. The awareness and education status of local communities will be improved using the tools described below.

[36] For further details regarding EE initiatives undertaken in the northern areas, see the background paper titled *Environmental Education* published by IUCN in 2003.

Teacher Training Workshops

It is necessary for teachers to be adequately trained in conservation and environmental values. To this end, training workshops will be conducted for school teachers. Teacher training will include material for improving teachers' knowledge base and assist them in teaching students in a more effective manner. Training teachers is one of the ways of ensuring that conservation education becomes part of the classroom teaching process and is integrated into the local school system. Gaining the support of schoolteachers and their students will help change the outlook of future community members and provide a focus for the more immediate spread of information.

The training will cover snow leopards and their conservation issues, the faunal and floral complex of the area, human culture and historical background, natural resource exploitation, and possible mitigation measures. As stated earlier, teachers will also receive training regarding the involvement of students in conservation activities; students will be encouraged to plant trees and form nature clubs. Special emphasis will be given to involving female teachers in the conservancies so that female students can also get involved in environmental activities such as nature study expeditions and tree planting.

The aim is for trained teachers to conduct school awareness and education programs by imparting information regarding the fauna, flora, cultural heritage, historical features, and major environmental issues. Lectures will be delivered using the following tools:

- Slide shows
- Posters and postcards
- Field visits

Lectures will also touch upon how major environmental issues can be addressed at a local level. Thematic posters will be used to decorate the walls of classrooms.

Educators and teachers in mountainous areas are rarely exposed to short-term refresher or tailor-made courses. However, a few exceptions do exist: the AKES arranges short-term courses for its teachers and teacher training educational aids have been developed by WWF-P under the Mountain Areas Conservancy Project (MACP) through which 1,100 teachers were trained in EE methods.

School Activities

Schoolteachers will organize annual debates, drawing competitions, and environmental conservation examinations on various aspects of biodiversity conservation. Nature clubs are another tool that may be used.

Community Outreach

All community outreach activities will be carried out in cooperation with existing decision-making structures, such as village councils, village organizations (VOs), or valley conservation committees (VCCs), as appropriate. Various community outreach activities are described below.

Trained program staff and teachers will jointly conduct informal awareness and education programs for communities. Awareness programs will be organized at a time when migratory communities are in the snow leopard range, to maximize participation. Mobile film shows and slideshows may be held in villages in local schools or other socially acceptable venue. Topics for discussions may be as varied as growing vegetables using household wastewater, environmental conservation and poverty alleviation, fruit orchards, farm forestry, growing off-season vegetables, and social organization. Brochures and pamphlets on natural resources management will be prepared in Urdu as well as English. Separate sessions will be organized for men and women where required. The assistance of local community members, including female teachers (if available) will be sought.

Based on the background paper prepared by IUCN, there is a need to initiate linkages with the religious clergy of each sect. In the snow leopard range, every sect has its own system of religious education and these institutions are present in the remotest villages in the mountains. MACP has prepared a publication illustrating the need for environmental conservation and its link with the teachings of Islam titled *Islam and Conservation*. The book has already been translated into Urdu and is publicly available. Attempts will be made to establish links with the religious clergy in order to encourage them to address local environmental issues in their sermons.

Another effective method of community outreach is demonstration projects. By using concrete examples, trainers will demonstrate initiatives that have a positive impact on the environment, to the local people. Under the NDO's conservation project, 50 households in Minapin village constructed pit latrines following the success of the initiative in the Rakaposhi base camp where the need and functionality of the project was demonstrated to the villagers.

Visitors and General Public

Awareness and education tools for the general public and visitors to the mountainous area and national parks will include the items described below.

Brochures

Brochures containing information on snow leopards and the importance of their ecosystem and general biodiversity in their range will be prepared for distribution to visitors at check posts, information centers, tourism agencies (PTDC and various private tour organizers), hotels, airlines, and car rental services in Pakistan.

Website

A dedicated website will be developed for the snow leopard program. It will provide information on the program, its ongoing activities, snow leopard ecology, and conservation issues.

Mass Media Coverage

The snow leopard program will be introduced to the general public in radio and television shows and in newspaper articles and advertisements. Detailed advertisements will be placed in two major national newspapers and in two international magazines one month prior to the peak tourist season.

Video CDs

Video CDs covering the topics of natural history and culture and history will be dubbed in both Urdu and English. Professional organizations or individuals will be hired to prepare the CDs which will be available for sale at information centers, the Northern Areas Forestry, Parks, and Wildlife Department(NAFWD) offices in Skardu and Gilgit, and the Lok Virsa office in Islamabad. These CDs will also be utilized as one of the tools for the awareness and education of field staff and local communities.

Thematic Posters

Thematic posters depicting specific ideas will be designed, produced, and displayed. Posters could be designed either by students/amateur artists in a poster competition, or by professionals. In the case of a poster competition, all entries will be displayed at an exhibition and the winning entries mass-produced for display at information centers and schools. Posters will also be available for sale at information centers and other relevant outlets.

Threats to Snow Leopards

The strategic plan for snow leopard conservation in Pakistan (Khan, 2008) acknowledges the principle that the right of the snow leopard and its prey to survive is more generously guaranteed if the right of pastoral communities to optimize their economy, is accepted and supported. Over nine million people in the snow leopard range predominantly exercise agro-pastoral livelihood systems with a heavy dependence on livestock. Annual predation pressure on livestock in the snow leopard range is estimated to be 1.3 (range = 0.7–3.3) animals per family, which is about 30% of the cash income that communities gain through livestock marketing (Snow Leopard Foundation [SLF], unpublished data). This predation equates to an estimated annual economic loss of USD 119 (PKR 11,400) per household which is more than one household's monthly income. This level of predation has serious economic repercussions and grades Chitral among the highest human-snow leopard conflict zones in Pakistan. The average income of pastoral communities is estimated to be PKR 4,000–6,000 which is far below the national average for Pakistan (PKR 9,170 PKR, Ehlers and Kreutzmann, 2000). Over 50% of families live below the poverty line

and this percentage has increased in recent decades. Economic hardship is one of the root causes prompting herders to kill snow leopards to protect their livestock. In addition (although considered a lesser threat), to compensate for livestock losses and supplement their incomes, herders in the region have also historically poached snow leopards for their pelts and body parts to sell on the black market. There was a pelt market in Peshawar that used to trade pelts of snow leopards and other wildlife; this market has been shut down by the Wildlife Department. However, wildlife officials believe snow leopard poaching still exists, but on a relatively smaller scale. The exact magnitude of this problem is difficult to assess, however, two snow leopards were trapped in separate events in the first quarter of 2011 and one died.

Local communities continue to threaten snow leopard prey populations in various ways. Prior to the establishment of PAs and trophy hunting programs in the area, communities supplemented their agricultural income by poaching ungulates. Conservation initiatives by various conservation organizations are helping reduce this problem through the promotion of regulated, fee-based sport trophy hunting. These programs have helped wild ungulate populations grow in certain valleys and have also increased snow leopard acceptance. However, other threats to wild ungulates persist. Recently, over ten markhor in Toshi Game Reserve, Chitral died due to a disease that is likely to be transmitted from livestock. Livestock disease is prevalent in the entire snow leopard range. Disease can account for tens to hundreds of livestock mortality in a given year, according surveys conducted in certain villages. The annual average loss to disease in Chitral district was estimated to be 7.1% of livestock holdings, ranging between 3.7%–11% in different valleys (SLF, unpublished data).

The transmission of contagious diseases from domestic to wild ungulates is well documented (Foreyt and Jessup, 1982; Frölich et al., 2002; Hudson et al., 2002). This transmission is known to threaten snow leopards and their prey (Dagleish et al., 2007; Ostrowski et al., 2012), though further study is required to explore its actual prevalence and significance. For example, Shimshali yak herders in GB have reported several hundred blue sheep (*Pseudois nayaur*) carcasses with skin lesions since 1996. Dagleish et al. (2007) identified the disease as sarcoptic mange, a highly contagious disease caused by *Sarcoptes scabiei*. An outbreak of pneumonia in 2010 claimed about 20% of markhor populations in Tajikistan (Ostrowski et al., 2012). The study reported *Mycoplasma capricolum* as the sole infectious agent. Similarly, about 12 young markhor were found dead in the Tooshi Game Reserve, Chitral in March 2012. A postmortem of an infected animal carried out at the Veterinary Research Institute, Peshawar, suggested a mixed infection of contagious caprine pleuropneumonia (CCPP) and enterotoxaemia. This situation is a serious threat to snow leopards as it can cause infectionsand prey depletion.

There are over 20 PAs of different sizes and categories within the snow leopard range (**Figure 3.1**). However, in most cases, their efficiency is compromised by the lack of management infrastructure, management plans, and baseline information on biological and other natural resources. These factors make them ineffective in protecting snow leopards and their habitat. These PAs are generally not large enough to protect the home ranges of individual cats. Their landscape-level movements require multiple measures including the demarcation and creation of additional PAs, linking existing PAs, and cross-border cooperation for trans-boundary protection.

Finally, education and awareness, particularly at the local level, are critical factors for generating support among local communities for conservation and management initiatives. Education and awareness efforts can assist local communities in safeguarding their livestock by teaching them measures that can reduce predation incidence. Awareness regarding the snow leopard and its significance may also enhance the acceptance of the species and mitigate potential conflict with local communities.

Although threats differ substantially across snow leopard range, an overall ranking of the threats based on their area of influence, intensity of threat, and the urgency to address them, is given in**Table 3.1**. Major threats identified for snow leopards, their habitat, and prey include:

- Habitat loss and degradation;
- Livestock-based livelihood impacting prey base;
- Retaliatory killing of snow leopards;
- Weak institutional capacity;
- Poor enforcement;

- Wildlife diseases;
- Lack of awareness;
- Climate change.

It is also noted here that threats are not static and have been and will change with time. Therefore, understanding these patterns of threats is important.

Figure 0.2: Protected Areas in Snow Leopard Range in Pakistan

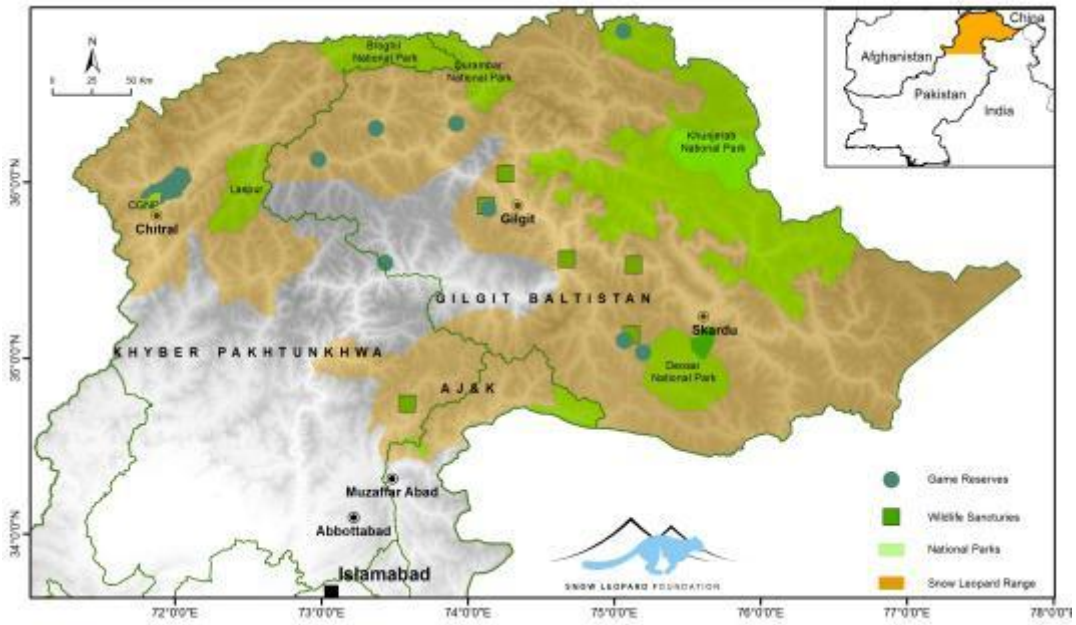


Table 0.2: The Snow Leopard Threat Ranking Prepared for the SLSS (2011–13) Process

Threat	Area	Intensity	Urgency	Total Ranking
Category 1: Habitat and Prey-Related				
Habitat degradation	4	4	3	11
Habitat fragmentation	3	4	3	10
Prey reduction due to illegal hunting	5	5	5	15
Prey reduction due to competition with livestock	4	5	4	13
Prey reduction due to legal hunting	2	1	0	3
Prey reduction due to disease	3	4	5	12
Fencing that disrupts movements/natural migration	1	1	1	3
Category 2: Direct Killing or Removal of Snow Leopards				
In retribution for livestock depredation	5	4	5	14
Poaching for trade in hides/bones	4	3	5	12
Zoo and museum collection of live animals	0	0	0	0
Traditional hunting of snow leopards	0	0	0	0
Secondary poisoning and trapping of snow leopards	1	2	3	6
Diseases of snow leopards	5	2	4	11
Potential threat from legal hunting of snow leopards	3	1	1	5
Category 3: Policy and Awareness Issues Affecting the Conservation of Snow Leopards, prey, and habitat				
Lack of appropriate policy	5	2	2	9
Lack of effective enforcement	5	4	4	13
Lack of trans-boundary cooperation	5	2	2	9
Lack of institutional capacity	5	4	4	13
Lack of awareness among local people	5	4	4	13
Lack of awareness among policymakers	5	3	3	11
Category 4: Other Issues				
War and related military activities	5	3	1	9

Threat	Area	Intensity	Urgency	Total Ranking
Human population growth (rapid)/poverty (indirect threat)	5	4	1	10
Feral dogs attacking snow leopards and prey	5	1	1	7
General poaching and wildlife trade by migrant workers	5	3	3	11
General poaching by military personnel	5	2	2	9
Emerging threats				
Climate change	5	3	3	11
Growing livestock populations and intensifying human-wildlife conflict	5	5	5	15
Large-scale development projects	4	3	3	10
Direct and indirect impacts due to mineral exploration and mining (local)	3	3	3	9
Impacts due to hydroelectric projects	3	3	3	9
Impacts due to roads or railroads	3	3	3	9
Disturbance related to Cordyceps collection	0	0	0	0
Other: (write below and add rank values)				

Threat values

0 or 1 = no and low threats; 2 or 3 = intermediate threat level; 4 or 5 = high threat level

Area

Rank each threat according to how widespread it is (where 5 indicates that it occurs across most or all snow leopard range within the country and where 1 indicates that it is extremely limited in areal extent)

Intensity

Threats ranked from 5 = the most destructive impact to 1 = the least negative impact

Urgency

Rank each threat identifying if it needs immediate and urgent attention (very time sensitive) (value = 5) to being of least concern or urgency (value = 1)

Dealing with Threats

Pakistan's snow leopard range remains a major focus of conservation efforts by the government and leading conservation organizations like IUCN, WWF-P, HWF, the Snow Leopard Trust (SLT), and the Wildlife Conservation Society (WCS). Although the snow leopard was not the prime focus in the majority of large projects undertaken in northern Pakistan in the past, they have contributed to the cause of snow leopard conservation in various ways ranging from enhancing awareness to improving habitat quality and prey base.

IUCN has had a longstanding presence in the snow leopard range and has managed various projects with impacts on the landscape level. Noteworthy projects include the Pakistan Protected Areas Management Project (PAMP), the Hindu Kush-Karakoram-Himalaya (HKKH) Partnership Project,[37] the Program for Mountain Areas Conservation (PMAC), and MACP.

WWF-P has also worked extensively in the area and many its programs are relevant to snow leopard conservation. Initiatives under the "Saving Wetlands Sky High Program" include livestock vaccination campaigns, corral improvement, breed improvement programs, fodder cultivation on barren lands, and afforestation schemes. WWF-P is carrying out community mobilization, education and awareness, scientific research on snow leopard populations, and protection of snow leopards and their prey against poaching, through the US Agency for International Development (USAID)-funded project, "Community-Based Conservation of Snow Leopards and Improved Watershed Management." The Pakistan Wetlands Program executed by WWF-P also contributed to snow leopard conservation by collecting scientific information on snow leopard habitat and enhancing awareness about conservation issues.

[37] Institutional consolidation for the coordinated and integrated monitoring of natural resources towards sustainable development and environmental conservation in the HKKH mountain complex

WCS works with 65 communities across four districts in GB and has helped select, train, and equip over 100 community wildlife rangers to monitor wildlife such as snow leopards and key prey species such as markhor and ibex. This work has seen protection put in place across all program communities, and populations of markhor, urial, and other species are already experiencing significant increases. WCS also has done significant trans-boundary work in the region, including a large conservation program across the border in the Wakhan of Afghanistan where it has been camera trapping, collaring, and studying snow leopards since 2007. WCS's strong experience in community-based conservation places it in a strong position to deliver on national snow leopard strategy implementation efforts in GB.

HWF focuses on the protection and enhancement of wildlife and natural resources to support community livelihoods and on preserving them for the benefit of future generations. HWF supports governments by helping them rationalize their policy and legislative frameworks and building their capacities for sustainable development. Examples of HWF activities include the establishment and development of Deosai National Park in GB to protect the threatened Himalayan brown bear, and Musk Deer National Park and Poonch River National Park in AJK to protect the threatened Mahseer fish. It also supports the Capital Development Authority (CDA) in managing the Margallah Hills National Park in Islamabad. HWF was also instrumental in a landmark revision of AJK wildlife legislation to provide for the sustainable management of wildlife in the state.

A dedicated program for snow leopard conservation was initiated by SLT in partnership with WWF-P and the KPK Wildlife department, in the late 1990s. The program started exploring the status of the cat in Pakistan and introduced community-based conservation programs in Chitral district, KPK. A major breakthrough in this direction was the inception of SLF in 2008 which was set up as a dedicated institution to scale up snow leopard conservation work in Pakistan. SLF started implementing the snow leopard conservation strategy through three-year planning cycles and expanded the conservation program geographically and thematically. Focusing on three thematic areas (science and research, community-based conservation, and awareness and education) Pakistan's snow leopard program has achieved the following milestones:

- About 20% of the snow leopard range in Pakistan has been explored using state-of-the-art research tools—camera trapping, genetics, occupancy modeling, and global positioning system (GPS) telemetry—to assess the status, distribution, abundance, and threats to the snow leopard and its prey base;
- Innovative community-based conservation programs to enhance tolerance for snow leopards have been implemented in 21 priority sites in the Hindu Kush and Karakoram mountain ranges;
- Various local and national-level trainings have been conducted to build the capacity of government organizations and NGOs in snow leopard research;
- Relevant departments at local universities have been engaged in snow leopard research and about 20 graduate and postgraduate student research projects have been facilitated through the snow leopard conservation program in the last five years.

Past and ongoing community-based conservation programs are considered vital but inadequate considering snow leopard range size and the magnitude of the problem. The scaling up of such conservation efforts from limited villages and valleys to a wider landscape is highly desirable. However, efforts are constrained by the resource requirements for achieving such an objective.

Based on the conservation experiences of various stakeholders, some known good practices relevant to snow leopard conservation are described below and could be considered for replication.

Trophy hunting

Pakistan is a pioneer in the application of community-based trophy hunting programs to the conservation of biodiversity in mountain ecosystems. The program's primary objective is the conservation of large mammals such as Caprinae and their habitats. This is achieved through a system that benefits local communities by providing incentives to conserve their wildlife resources. The annual income from one trophy hunt in snow leopard range is approximately USD 1 million.

While trophy hunting seems to be a promising approach, Pakistan aims to develop and maintain an effective trophy hunting program as part of its overall biodiversity strategy. However, the link between these programs and predator conservation is still debated. Improvements are warranted in the design

and implementation of the program so that it contributes to the protection of entire ecosystems (including predators) rather than benefiting just wild ungulates. Nevertheless, the program has great potential in changing public attitudes towards wildlife.

Livestock vaccination

Herders kill snow leopards in retaliation for livestock lost to predation and have a general intolerance towards predators. However, it was found that 3–5 animals die of disease for every one killed by a wild predator. This led to a discussion on possible conservation-based incentives with local communities where it was discovered that herders were more willing to tolerate occasional losses to wild predators if fewer domestic animals were lost to disease. Thus, the idea of a 'Snow Leopard Friendly Livestock Vaccination Program' was born. Most families in northern Pakistan cannot afford vaccines and herd protection (which is managed and pastured communally). In addition, trained vaccinators are limited, making delivery inefficient. To overcome these obstacles, the Snow Leopard Friendly Livestock Vaccination Program makes vaccines readily available to rural communities and trains local vaccinators. In return, communities agree to refrain from killing snow leopards and their primary prey and pledge to limit herd sizes through signed conservation agreements so that livestock do not compete with wild snow leopard prey. SLF is managing this program in 12 communities in Chitral district and six valleys in GB. WWF-P has initiated livestock insurance schemes in the adjacent valleys of Khunjerab, Deosai, Qurumbar, and Central Karakoram National Park in GB under the Saving Wetlands Sky High Program and the Social Economic and Environmental Development (SEED) project for CKNP.

Predator proofing corrals

Goats and sheep are kept in walled pens when not grazing. When snow leopards attack, livestock cannot escape, resulting in catastrophic losses. This is reduced considerably by proofing the corral from all sides with wire mesh on the roof, a single/strong wooden door, and by reinforcing walls with stones/cement. SLF is building predator-proof corrals in four communities in Chitral with USAID support. The Snow Leopard Conservancy has also supported similar initiatives in GB.

Livestock insurance scheme

It is a great economic and emotional loss to families when they lose livestock to predators (estimated annual loss of 0.7–3.3 animals per family). A lack of safety nets and workable strategies to protect livelihoods and/or compensate for damages exacerbates the root causes of human-carnivore conflict in the area. Communities often claim compensation for predation, hold protests, and try to influence political and administrative leadership in resolving carnivore conflicts.

A deep conservation engagement is necessary to reduce negative sentiment and provide families with the economic and emotional tools necessary to tolerate predators. The livestock insurance scheme is one such tool where a community-managed insurance fund is established. It is equivalent to the average annual economic loss to predation per community and allows families to file claims right away. Our experience has shown this to be the most expedient way to jumpstart the program, build trust among families, and encourage premium payments. Our projections show that the insurance fund can become self-sustaining within one year, given the following conditions: 1) 50% or more of households from each community participate; 2) all participating households successfully pay their membership fees and premiums; 3) in the first year, losses are compensated at a rate of 25% of agreed market value up to a total of no more than 50% of the insurance fund; and 4) there are no catastrophic losses of livestock. SLF is managing this program in six communities in Chitral and GB and the project (supported by the Snow Leopard Conservancy) has also implemented livestock insurance schemes in Baltistan.

Snow leopard enterprise

The program is based on the premise that people provided benefits of wilderness will protect wildlife. In this program, local skills in handicrafts are enhanced and products are marketed to improve livelihoods. A contract specifying the number and type of products to be made, the price of each product, and conditions relevant to environmental protection, is signed with participating communities. Twenty percent of the total product price is provided as a bonus if there are no cases of poaching of snow

leopards or their prey. A snow leopard conservation fund of ten percent of the total product price goes to nature conservation activities. This program is being managed in two communities in Chitral and products are marketed in the USA by the SLT. There is great potential to expand this program by linking it with the local market.

One of the major lessons learnt during the past implementation of several conservation initiatives in the country was that of valuing the local perspective. Most wildlife conservation and natural resource management programs implemented in the mountain environment traditionally ignored local perspectives. Biologists, foresters, and wildlife and park managers are not trained in sociology and anthropology and do not always realize that the social dimension is equally important.

Efforts in the field sometimes ignore this issue and desired outputs are not realized. The urgency lies in thorough exploration of local perspectives directly involving primary stakeholders, including herders, pastoralists, nomads, and traditional transhumance practitioners.

Organization, Empowerment, and Supportof National institutions for conservation: strengths and weaknesses

Several types of institutions in Pakistan are directly or indirectly involved in conservation. These include the Office of the Inspector General of Forests Climate Change Division, Provincial Wildlife Departments, IUCN-The World Conservation Union, World Wide Fund for Nature, Snow Leopard Foundation, Wildlife Conservation Society, Himalayan Wildlife Foundation, Zoological Survey Department, academia, Pakistan Science Foundation, Aga Khan Rural Support Program, Planning commission, FPA and MACF Fund for Protected Areas and Mountain Areas conservation Fund and local community institutions.

These institutions are evaluated below, based on their strength and weakness:

Organization	Strengths	Weaknesses
Climate Change Division, Government of Pakistan	• One of the most directly relevant institutions for coordination • Facilitate development of policies and legislation • Mobilize funds	• Resource deficient both human and financial • Lack of backup support of scientific institutions except for ZSD that is again resource deficient like scientific, quarantine, technical groups etc
Planning Commission	• Resourceful government institution • Centrally placed at both the federal and provincial level	• No experience of ground implementation • No access to communities in remote locations
Provincial wildlife departments	• Operate within the habitat and are accessible by local communities	• Lack of trained human resources and equipment • Limited financial resources
Pakistan Science Foundation	• Access to financial resources • Institutional sustainability	• Limited capacity in snow leopard conservation • Poor access to remote areas
Quaid-I-Azam University (QAU)	• Best institute in the country in human resource development and capacity building • Best capacity for research in the natural and social sciences • Human resource availability	• No experience in community-based project management
Zoological Survey department	• Mandated for assessing the status of flora and fauna, nationwide • Attached department of the Climate Change Division	• Lack of resources and capacity • Poor access to remote areas
Pakistan Museum of Natural History	• Trained manpower in surveying and preserving flora and fauna	• No experience in community-based project management
IUCN	• Access and influence in the national and international community • Strength in developing legislation	• Limited experience in snow leopard conservation

Organization	Strengths	Weaknesses
WWF-P	• Experienced in awareness and conservation programs • Access to remote communities	• Limited capacity, especially in policy formulation and research
SLF	• Networking with snow leopard range communities • Experience in snow leopard conservation and research • Well-trained staff	• Limited resources
AKRSP	• Rural development • Participatory management • High acceptance in the mountain regions	• Poor experience with conservation • Work with interest groups rather than resource rights holders
WCS	• Long association with communities • Experienced in trophy hunting and forest conservation • WCS's experience and contacts in Afghanistan and Tajikistan put it in a position to assist Pakistan in building an effective trans-boundary coalition for snow leopard conservation across the region	• Limited resources
HWF	• Long experience in nature conservation and parks management	• Limited experience in snow leopard conservation

Developing collaborations and strong partnerships between the organizations mentioned above can lead to an effective arrangement for snow leopard conservation in the country, as it would bring together the strengths of each while compensating for their weaknesses.

Proposed Implementation Design for the program

Effective project implementation will necessitate the mobilization of a diverse range of skills outside the traditional conservation sector. Many of these skills will be provided by cooperative partner agencies, including public sector institutes, line departments, and conservation organizations. Execution and implementation arrangements proposed for the project are based on the model tested in several community-based conservation projects implemented by the Climate Change Division in the past.

Execution Arrangements

The project will be nationally executed by the Government of Pakistan with overall responsibilities vested with the Climate Change Division (CCD). The CCD will collaborate closely with the governments of GB, KPK, and AJK and with public institutions such as Quaid-e-Azam University (QAU), the Pakistan Museum of Natural History, and the Zoological Survey of Pakistan. The CCD will create a **Snow Leopard Ecosystem Cell** within the forestry wing to coordinate the project.

Within the provinces, the program will be implemented by the Forest, Parks, and Wildlife department of GB, the Wildlife department of KPK, and the Wildlife and Fisheries department of AJK in collaboration with relevant stakeholders.

Program Steering Committee

A program steering committee (PSC) will be established to provide policy guidance to the program and monitor progress and performance. The PSC will facilitate the interagency coordination of the program at the national level, provide avenues for maintaining interprovincial linkages, and ensure that the lessons learned from implementation are integrated into Pakistan's overall conservation program. The following will be involved:

- Secretary, Climate Change Division (Chair, PSC);
- Chief, Environment, Planning, and Development Division, Government of Pakistan;

- A representative of the World Bank;
- National Focal Person;
- National Program Coordinator (Secretary, PSC);
- The heads of the respective wildlife departments (AJK, GB, and KPK);
- Joint Secretary, Economic Affairs Division;
- A representative from QAU;
- Director, Zoological Sciences Division, PMNH, Pakistan Science Foundation;
- Chief Executive Officer, SLF.
- Country Representative, IUCN;
- Chief Executive Officer, WWF-P;

The National Program Coordinator/PSC Secretary will be responsible for organizing meetings, recording minutes, and ensuring that directions are implemented.

The frequency of PSC meetings will be decided by the Chair, but the committee will be convened at least once a year following the preparation of an annual program report (APR). The PSC will be responsible for the following activities:

- Program review and coordination;
- Coordination of government actions and provision of policy guidance;
- Facilitation of policy and legislative reform to support community management of wild resources for sustainable use;
- Monitoring efforts to establish financial mechanisms;
- Ensuring adherence to World Bank guidelines for the administration of program funds.

Program Management Committees

Program Management Committees (PMCs) will be formed in AJK, GB, and KPK to supervise program implementation, ensure that program targets are met, and monitor on-ground impacts.

In KPK, the PMC will comprise the Chief Conservator of Wildlife (Chair), the Conservator of Wildlife, Northern Circle, representatives of SLF, IUCN, and WWF-P, the National Program Coordinator, representatives of conservancy management committees, and the Regional Program Coordinator (Secretary).

In GB, membership will include the Chief Conservator of Forests and Wildlife (Chair), the Director of Planning and Development, the Conservator of Wildlife, the Program Manager, representatives of SLF, WCS, and WWF-P, the National Program Coordinator, representatives of conservancy management committees, and the Regional Program Coordinator (Secretary).

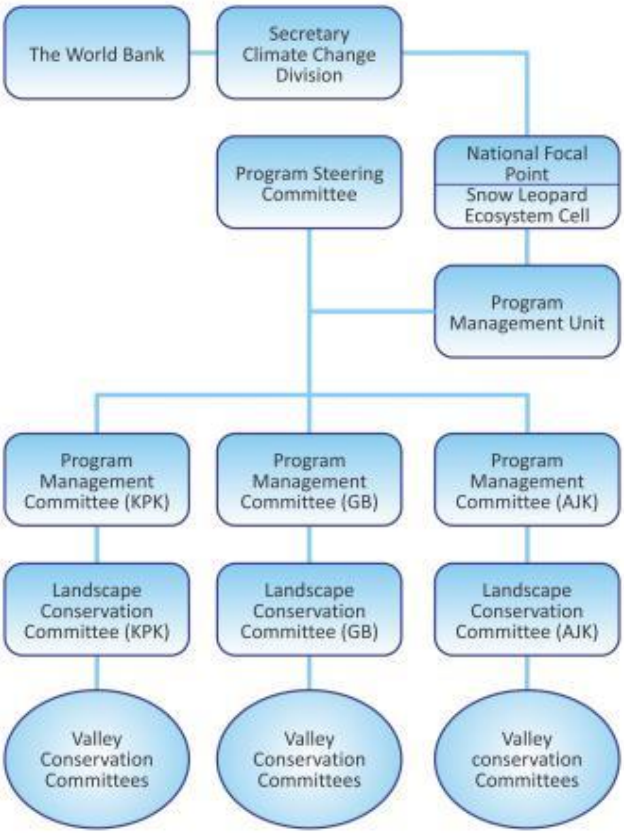
The AJK PMC will comprise the Director General of Wildlife and Fisheries (Chair), the Director of Planning and Development, the Divisional Forest Officer of Wildlife, the National Program Coordinator, representatives of HWF, SLF, and WWF-P, representatives of conservancy management committees, and the Regional Program Coordinator (Secretary).

The PMCs will be responsible for:

- Monitoring the results of efforts to strengthen community-based organizations at program sites;
- Coordinating institutional arrangements;
- Coordinating policy and legislative development to provide support to conservancies for conservation efforts;
- Overseeing awareness and education activities;
- Ensuring that partner agency programs are fully integrated into the program framework;
- Monitoring the results of demonstration projects for sustainable use and supporting their integration into wider development programs within the conservancies;
- Monitoring technical assistance provided by the contracting agencies, including all institutional strengthening services provided to local communities and government bodies;
- Monitoring all training activities.

Ground implementation will lie with the respective wildlife departments in each province with support from other public and conservation organizations. In view of the nature of skills required to implement the program, the expertise needed in participatory learning and planning methodologies, institutional strengthening, conservation awareness, technical disciplines related to sustainable use, and financial mechanisms for conservation, SLF will play a lead role in implementing activities in close coordination with the Snow Leopard Ecosystem Cell. SLF will be accountable to the PSC and PMCs for operation and performance, including accounting and funds management, field personnel for work in program sites, developing MoUs with partner agencies for joint implementation, managing technical equipment, and reporting to the World Bank and the government on the progress of implementation.

Figure 0.3: Program Organogram



LEGAL FRAMEWORK FOR EMPOWERMENT OF COMMUNITY FOR CO-MANAGEMENT

Extant legislative and regulatory frameworks were instituted in the early 1970s. They were based on management concepts assuming that community and wildlife areas are distinct from one other, and on the premise that conflicts between wildlife and communities do not exist. The fact that the notifications of a large number of PAs in the country (including in the snow leopard range) completely ignore the presence of a large resident and migratory human community that has formal and usufruct rights, has received little attention from managers and policymakers. Experience gained in conservation and participatory management has led to a rethinking of policies and basic changes in the legislative frameworks for biodiversity management.

This learning has led to the recognition of community members' role as co-managers in new legislation (provincial Model Wildlife Law). AJK has approved the Model Wildlife Law while GB and KPK are heading

in the same direction. This law facilitates empowerment and benefit sharing of community organizations through the following steps:

- It recognizes community representative organization(s) in an area as management partner(s) for the management of biological diversity and accords recognition and legal status
- It recognizes the sharing of benefits accrued from the sustainable commercial use of elements of biodiversity in an area equitably among the community and the government
- Allows declaring any landscape, which supports or has the potential to support significant biodiversity for sustainable multiple use management, including biodiversity conservation in collaboration with the local communities and Government, as a "Conservancy." A conservancy may include one or more protected areas and accommodates all such uses that enhance biodiversity conservation

It allows the establishment of a conservancy management committee for each conservancy as a co-management partner for the sustainable (multiple) use of biological diversity which comprises community representatives, select civil society organizations, and relevant government departments, and may be assigned such roles, functions, and financial management system as deemed appropriate.

The strengths and weaknesses of the Model Wildlife Law are summarized below:

Strength	Weaknesses	Opportunities
• The main legislative framework of the Law is prepared through a participatory process involving all relevant stakeholders	• A lack of awareness at the broader level	• Periodic events for raising awareness at all levels • Translation of the law into the national language (Urdu) for greater understating and clarity
• Recognition of local communities as co-management partners	• Poor capacity of local community groups	• Capacity building opportunities for field staff of wildlife/forest departments and local community members
• Acceptance of the government to amendments pertaining to greater community participation in the legal framework	• Delayed approval process of the framework at the higher levels	• Sensitization of the policymaker on participatory management legislation
• Workable partnership for all stakeholders	• Limited clarity among the relevant departments and local community groups on resource use	• Consensus building process among all stakeholders
• Delegation of powers to community guides and guards for arresting persons involved in illegal hunting practices	• Poor enforcement and implementation of penalties	• Coordination among the judiciary and wildlife management authorities for the effective and efficient implementation of penalties
• Provisions of the conservancy category as a resource management area	• A lack of rules for further resource use within the conservancies	• Develop rules and zoning systems governing individual resources within a conservancy like forests, hunting procedures, land development, pasture management, community use zones, recovery zones, etc.
• Provisions of killing predators in lieu of self-defense and damages	• Manipulation of the self-defense provision for retaliatory killing and trade of animal pelts and other parts	• Clarification of self-defence
• Broader provisions for private game reserves and community-controlled hunting areas	• Poor monitoring and limited evaluation of the areas designated as private game reserves and controlled hunting areas	• Developing biological criteria for declaring private game reserves and controlled hunting areas with periodic evaluation of the resources

Research and Training

Traditional wildlife management in Pakistan was based on policing by employing staff without relevant education and training in scientific wildlife management. The limitations of this approach were exposed when small populations of some highly valuable species became extinct despite extensive protection efforts. This led to the realization that the reasons for the extinction of small populations are highly complex and can only be explored through scientific data. Subsequently, a new approach, the "small population paradigm" (Caughley and Gunn, 1996), came under consideration that stipulated concrete research in wildlife management. This has motivated scientists to undertake management-oriented research and has generated an interest in research among wildlife managers looking for effective management interventions backed by sound science.

- Research contributes to science-based management by
- Providing baseline conditions of natural resources
- Improving understanding of ecosystem function and dynamics
- Quantifying the impact of management interventions
- Providing necessary materials for education and training programs

It is now clear that the management of threatened species and ecosystems does not rest solely on biological data; it is also an intensely human endeavor that is profoundly influenced by how society values these areas and how it perceives its role in sustaining ecosystems now and in the future. By ignoring or marginalizing the human dimension, we risk causing prolonged and counterproductive user conflicts, legal challenges, procedural delays, and ineffective outcomes for both the ecosystems and the human users they support. Recognizing this, it is important now to actively develop the social science foundation needed to ensure that policy- and operational-level decisions are sound, science-based, equitable, and effective in order to meet the conservation and management objectives set for the conservation program.

Research Priorities

The snow leopard is an elusive species, lives in low densities, and roams across wide landscapes. For example, the home range of a snow leopard collared by SLT in Chitral in 2006 was calculated as 1,600 km^2. The vastness of the area coupled with extreme ruggedness and poor accessibility implies that any field-based research is logistically expensive and physically demanding. Therefore, considerable financial resources and trained manpower are required to explore the entire range systematically to achieve a thorough understanding of snow leopard ecology. Consequently, snow leopards and their ecosystem remains one of least studied subjects in the world.

Major information gaps relevant to conservation are:

- A lack of reliable snow leopard population estimates for their range in Pakistan. Current estimates are based on anecdotal information and extrapolations from limited data
- Limited and outdated information on snow leopard distribution in Pakistan; there is no clear understanding of delineation of populations, sub-populations, and the connectivity between them
- No information available on the genetic health of snow leopard populations, which confines the understanding of genetic limitations that snow leopard populations might be facing due to presumed small sizes
- Gene flow among populations does not only ensure connectivity among populations, but also maintains the genetic health of small populations. There is currently no information available on this aspect
- A lack of a comprehensive understanding of the ecological and sociological aspects of human-snow leopard conflicts which precludes the development of a multi-faceted strategy needed to effectively mitigate threats to snow leopards

- A lack of information on snow leopard prey dynamics. This limits our understanding of the minimum natural prey biomass needed to support a viable population of snow leopards
- An inability to monitor snow leopard population trends which in turn limits our ability to assess the effectiveness of interventions
- An inability to monitor changes in threats to snow leopard populations which limits our ability to assess the effectiveness of interventions
- A lack of information on competition between livestock and natural prey and its impact on snow leopard depredation rates. This limits our ability to recommend appropriate conservation strategies
- A lack of information on vital rates which precludes an assessment of population viability or an evaluation of the impact of threats
- A lack of information on snow leopard social structure and behavior, which limits our understanding of snow leopard population dynamics
- A lack of information on movements and dispersal patterns, which limits our understanding of snow leopard meta-population dynamics and habitat protection needs
- A lack of information on snow leopard habitat use which limits our ability to develop predictive models of snow leopard presence/absence and precludes a priori prioritization of survey areas and conservation efforts
- A lack of information on the role of livestock husbandry practices in reducing snow leopard depredation
- An inability to accurately identify snow leopard scats in the field which reduces the effectiveness of presence/absence surveys based on scats and limits the usefulness of raw data based on scats for assessing relative abundance or assessing snow leopard diet
- Limited information on disease prevalence in snow leopard habitat which limits our ability to understand threats to snow leopards and their prey and ecosystem
- As a key component of the snow leopard program, a comprehensive research program will be initiated to address the aforementioned gaps in information by employing the latest research techniques, including molecular genetics, camera trapping, and telemetry

Training Program

The total snow leopard habitat available in Pakistan is about 80,000 km^2, which is not only home to some of the world's most fascinating and endangered wild species, but has supported socially secluded and diverse human culture dwellings in the valleys for centuries. Thus, the high mountain ecosystems are vital for the coexistence of humans and wildlife. Understanding and maintaining a delicate link between the competing interests of conservation and rural economy is essential to sustain this coexistence. A step in this direction is the development of capacity of community activists/workers and relevant government agencies in understanding the natural and social/political dynamics of ecosystems and managing emerging conflicts. Unfortunately, the majority of conservation workers from the mountainous areas and wildlife and forest department staff do not qualify for regular degree programs despite the fact that they are actual players on the ground. Acknowledging the importance of these professionals and a need for their capacity building, a certificate/diploma program in nature conservation will be initiated at QAU, Islamabad, a highly ranked university already running graduate and postgraduate programs in the natural, social, and environmental sciences. The proposed diploma course will be open to all, however scholarships will be provided to wildlife department staff members, local community members, and conservation organization staff working in the snow leopard range, to encourage their participation.

The staff of the wildlife departments, local communities, and other stakeholders identified in Section 5 will be afforded maximum participation in research and conservation to help build their capacities. In