

National Snow Leopard Ecosystem Protection Priorities

India

EXECUTIVE SUMMARY

Snow leopard habitats in India are spread over the northern Himalayan mountains of the states of Jammu and Kashmir, Himachal Pradesh and Uttarakhand in western Himalayan region and Sikkim and Arunachal Pradesh along the eastern Himalayan areas. The range occupied by snow leopard has immense ecosystem significance in terms of values for watershed services, biodiversity, aesthetics and resultant interface of people with nature for life support systems and cultural diversity. Therefore ecological integrity of the snow leopard habitats has attributes related to the socio-cultural wellness of the area as well as economic well-being of the populations in the watersheds downstream. Conservation of Snow leopard is a concern due to a range of traditional and modern threats in its habitats varying in the regions. Prominent among these threats include conflicts with herders, sometimes leading to retaliatory killings, poaching for bones and skin, reduction in wild prey due to poaching and competition with livestock, habitat degradation due to anthropogenic pressures and in the recent years, increasing infrastructure development pressures. Shortage of frontline staff along with challenges of capacity upgradation needs for changing paradigms, poor infrastructure/logistic support and science based information for adaptive management are the factors related to the efficacy of management efforts.

Recognizing these issues and the uniqueness of the area, the Ministry of Environment & Forests (MoEF), Government of India, embarked upon a process of consultations with States and numerous agencies since 2004 that resulted in the formulation and launch of the Project Snow Leopard (PSL) in 2009. PSL is a strategy for planning and implementation of knowledge and landscape based participatory conservation initiatives using snow leopard as a flagship. The PSL suggests preparation of scientific management plans for carefully identified priority landscapes, that are zoned and threats mitigated through participatory approaches, collaborations and enforcement. This initiative has provided a timely thrust to the conservation needs of this flagship species representing the Indian high altitudes.

India has strong wildlife legislations and snow leopard is conferred the highest level of conservation status. The country also has policies geared to enable participation at different levels. There are a few scientific institutions that are partnering with State Forest Departments to help design and implement better programmes for snow leopard conservation.

Some quality research from the area are available, but it is suggested that in the near future robust data are generated on snow leopard and prey abundance, diets and other aspects of ecology so that these are available for adaptive management. The PSL provides a strong strategy framework for participatory planning and implementation of programmes. One landscape in each of the five States is being selected and management plans are being prepared by the Forest/Wildlife Departments in collaboration with scientific agencies. In the National Snow Leopard Ecosystem Priorities, actions will be largely in tune with the PSL. The conservation action is proposed to use about 60% of the allocated resources. Investment on capacity enhancement and research is contemplated to use about 30% of the resources and better coordination of the programme at the Federal level will take the remainder 10% of the allocations. 'Good practices' discussed in the PSL and the Global Snow Leopard Initiative will assist in sound implementation of the conservation programmes. Committees constituted at the national, state and landscape levels, with assistance of organizations such as the Wildlife Institute of India, would be monitoring the programme to ensure effective implementation of the various activities.

Introduction

Snow leopard inhabits the rugged high Himalayan ranges in India, spread over the landscapes over about 130,000 km² in five provinces. The habitats are spread along the northern borders in two distinct

landscapes comprising the contiguous terrain of J&K, HP and Uttarakhand in western Himalayan range, and Sikkim and Arunachal Pradesh in eastern side, with Bhutan in between. Within these landscapes, coarse estimates suggest occurrence of 400 to 700 snow leopards (c. 10 % of global estimates) in about 2% of its global range⁷. Although the range already covers some 20 odd wildlife protected areas, most of the snow leopard and its prey occur all over the larger landscape in the sub-alpine and alpine regions of the Greater Himalaya and Trans Himalayan regions.

Forming an estimated 1,30,000 km² within India, these areas generally comprise the non-forested or sparsely-forested high altitude alpine and subalpine regions of the Himalaya and Trans-Himalaya, above elevations of c. 3,200 m in the Western Himalaya and above c. 4,200m in the eastern Himalaya. In each of the five Himalayan States, the proportion of area falling under the purview of the potential snow leopard habitat ranges between 20 to 60% (Table 1).

In the alpine and higher altitudes of its range, snow leopard shares its habitat with human populations including seasonal migrants and permanent inhabitants. The life support for these populations generally includes subsistence agro-pastoralism for which the area is critical for cultivation, pastures and other biomass collection. This interface between people and wildlife results in certain traditional threats to snow leopard. In recent years some development activities in the higher altitudes are also expected to impact the habitats. Tourism, by bringing more information and awareness on nature, is a sector, which ensures close interaction between the society and nature and in turn impacts conservation in many aspects.

The area calculations are indicative based on GIS based calculations and may not be accurate.

Table 1: Snow Leopard Range in the five Himalayan States* of India.

State	State's Area(km ²)	Potential Area Under PSL (km ²)	% of total area of State
Jammu & Kashmir**	1,52,582	76,601	50
Himachal Pradesh	77,060	28,843	37
Uttarakhand	71,648	14,271	20
Western Landscape	3,01,290	1,19,716	
Sikkim	9,075	2,390	26
Arunachal Pradesh	1,05,173	4,736	5
Eastern Landscape	1,14,248	7,126	
Total	4,15,538	1,26,842	31

*The figures for the Western Himalaya include areas above 3,200 m and those for the Eastern Himalaya are above 4,200 m. Estimates are based on Digital Elevation Model from Shuttle Radar Topography Mission (SRTM).

** Includes area only within the LOC and the LAC

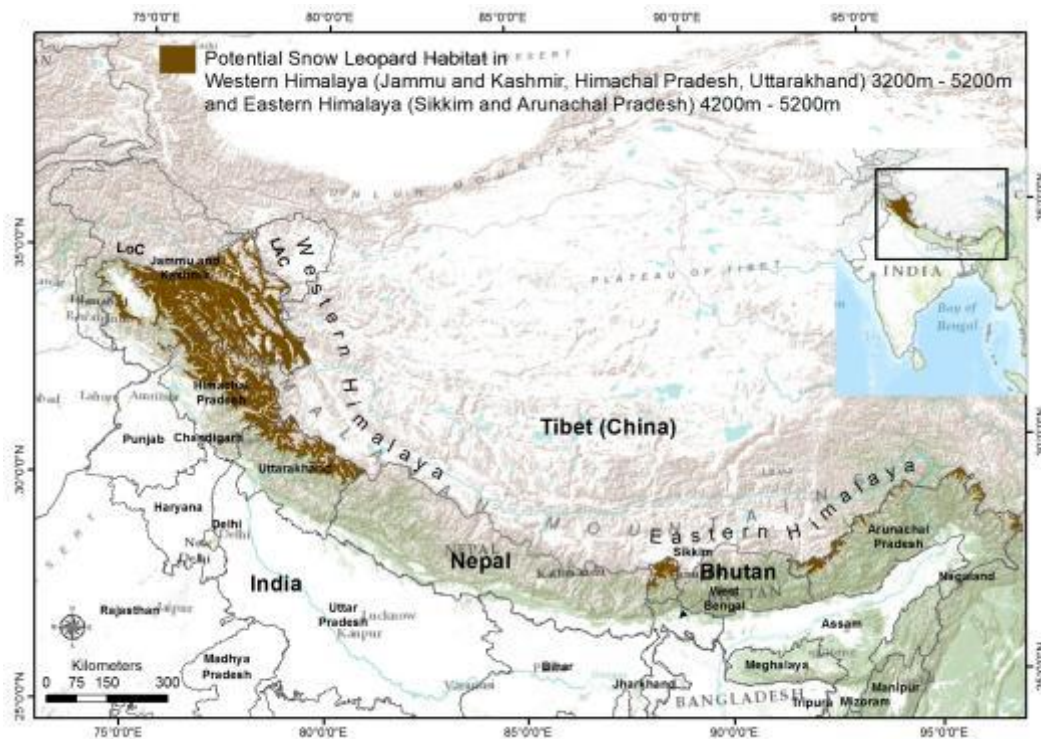
Objective and relevance of the national snow leopard ecosystem priority strategy

It is in view of the growing interaction of such ecosystems with the human beings that the flagship wild species of alpine - the snow leopard - has been recognised as its core and need has been felt for concerted efforts for understanding the habitats and plan for its conservation in most appropriate and sustainable way. National Snow Leopard Ecosystem Priority Strategy (NSLEP) NSLEP represents a road map for this effort.

⁷ Snow Leopard Trust (<http://www.snowleopard.org/learn/cat-facts/habitat>)

A flagship species recovery programme called the Project Snow Leopard (PSL) is already under implementation in the country aimed at strengthening the population status of the species and conservation of its habitats with active cooperation of the local inhabitants and scientific institutions. PSL has established the mechanism for participatory planning and implementation of conservation in large landscapes, and the NSLEP will strengthen it further. An important aspect of this strategy will be to bring to the fore the importance of the landscape and the charisma of this species, to enable the civil society to appreciate and support the conservation efforts.

Figure 1: Snow Leopards range in the Indian Himalayan Region



Snow leopard ecosystem services

High altitudes of Central Asia and the Himalayas, which form the home range for snow leopards, offer several vital ecosystem services. In India, the snow leopard habitat includes areas roughly above 3,200 meter altitude in the Himalaya and Trans-Himalaya biogeographic zones.⁸ These mountain ecosystems are extremely important and provide a large number of ecosystem services, not only to the people living in these regions, but also to the people living in the lowlands. Following the Millennium Ecosystem Assessment of mountain habitats evaluation of three main types of ecosystem services⁹ for the community, nation and region can be identified.

- Provisioning services such as extractive resources that primarily benefit the communities (water for drinking and irrigation, biomass etc.) and ecosystem production (agricultural production for local subsistence, rangelands for animal husbandry and medicinal plants; and non-timber forest products);
- Regulating and supporting services such as biodiversity, watershed and hazard prevention, climate modulation, migration (transport barriers/routes), soil fertility, soil as storage reservoir for water and carbon, and so on; and

⁸PSL (2008). *The Project Snow Leopard*. Ministry of Environment & Forests, Government of India, New Delhi.

⁹Millennium ecosystem assessment. 2005. *Ecosystems and human well-being. Current status and trends assessment*. Chapter 24. Island press.

- Cultural services such as spiritual role of mountains, biodiversity, recreation, local health traditions, related traditional knowledge, cultural and ethnological diversity.

Provisioning services

Most of the alpine regions constitute upper catchments of all major rivers of northern India. Perennial rivers such as the Indus, Ganga, Yamuna, Sutlej, Teesta, and Brahmaputra, have their main catchments in the Indian Himalayan high altitudes and supply drinking water, irrigation, and opportunities to generate electricity to the entire northern and northeastern regions of India. These resources accordingly contribute to the nation's food security¹⁰ also apart from providing the local provisioning services.

These Himalayan states have tremendous potential for hydroelectricity, a crucial need for the country's economy. Even though these hydro projects are mostly downstream, the primary glaciers and watersheds are in the snow leopard range. The current production is reported as of the order of 13,400 MW in western Himalayan snow leopard range states and 975 MW in Eastern range states. Identified capacity for large hydel projects has been projected about 6 times, amounting to potential of expansion of 94% in Arunachal Pradesh, 74% in Jammu-Kashmir and Uttarakhand, 39% in Himachal Pradesh, and 30% in Sikkim respectively, from their current levels of power generation.¹¹ However, feasibility of use of this potential lies in the analysis of ecological and socio-cultural impact on the landscape.

The people of these regions are mainly agro-pastoralists. The traditional subsistence crops grown here are barley, wheat, buckwheat and black pea. Some areas also cultivate various millets, corn and rarely, rice. The major cash crops grown are green pea, potatoes, apples, wheat, and apricots. A broader look at the information available on official district websites for agricultural and horticultural produce across 12 districts falling within snow leopard ranges and taking into account the current market price for these commodities, as published by the Ministry of Agriculture, the quantum of annual revenues generated is about US\$ 60 million.¹²

The region supports a number of traditional transhumant pastoralists. These are represented by castes or ethnic groups with a strong traditional association with livestock-keeping, where a substantial portion of the group derive over 50% of household consumption from livestock products or their sale, and where over 90% of animal consumption is from natural pasture or browse, and where households are responsible for the full cycle of livestock breeding.¹³ In the five snow leopard States, these include the *Gujjars* from Jammu and Kashmir, Himachal Pradesh, and Uttarakhand; *Changpas* from Ladakh; *Gaddis* and *Kinnauras* from Himachal Pradesh; *Bakkarwals* from Jammu & Kashmir and Himachal Pradesh, *Bhotiyas* from Uttarakhand; *Bhutias* from Sikkim; and *Monpas* from Arunachal Pradesh.⁵ Many of these pastoralists are transhumant, *i.e.* they graze their livestock in the high altitudes in summer and in the foothills in winter, while others such as *Changpas* were truly nomadic traveling to several seasonal camps through the year on the Tibetan Plateau. There is increasing trend in most pastoralists, with considerable economic transformations occurring, to resort to sedentary life.

While there is a paucity of compiled information on livestock holdings by these transhumant pastoralists, information on livestock holdings in each of these States is available through the 18th Livestock census conducted in 2007. In Himachal Pradesh, a total of 1,108,075 livestock is recorded in Chamba, Kinnaur, Lahaul and Spiti, the main areas of snow leopard occurrence in the State.¹⁴ In Uttarakhand, livestock population in the range districts of Bageshwar, Pithoragarh, Uttarkashi and Chamoli districts is 1,150,438.¹⁵ In the corresponding district North Sikkim the number amounts to 43,870 livestock¹⁶ while

¹⁰PSL, Same as 2

¹¹Central Electricity Authority, http://www.cea.nic.in/archives/hydro/status_hep/dec12.pdf

¹² Data compiled from State Government NIC Websites

¹³Sharma, P.V, Köhler-Rollefson, I, Morton, J. 2003. *Pastoralism in India: A scoping study*. Centre for Management in Agriculture, Indian Institute of Management (IMM), Ahmedabad, India and League for Pastoral Peoples, Ober-Ramstadt, Germany.

¹⁴Department of animal husbandry.Government of Himachal Pradesh.Livestock census 2007.Retrieved on 20/2/2012 from <http://hpaqrisnet.gov.in/animalhusbandry/Ahd%20Docs/18th%20Livestock%20Census-2007.aspx>

¹⁵Department of animal husbandry.Government of Uttarakhand.Livestock census 2007.Retrieved on 20/2/2012 from <http://www.ahduk.org/census.html>

for the two districts of Dibang Valley and Tawang in Arunachal Pradesh, the number adds up to 55,690 livestock.¹⁷ The livestock in these areas represent major economic activities that sustain several forms of livelihoods including those based on crafts and skills. The economic activities related to the pastoralism include the wool-based crafts and trade including the well-known *pashmina* wool.¹¹ Rearing for milk, milk products and meat are the other important economic activities of herders.

A variety of high altitude plants, some of which are rare, are also harvested from the alpine and steppes for use in local traditional medicines as well as supply for various formulations in various industries of pharmaceuticals and indigenous systems of medicine.²

Regulating and supporting services

The snow leopard habitats are represented in the Trans Himalayan as well as the high altitude areas (> 3,000m) of the Himalayan biogeographic regions. In these regions wildlife is distributed across the landscape and not restricted to protected areas¹⁸. The area supports 350 documented species of mammals, 1,200 species of birds, 635 species of amphibians and reptiles. This habitat of snow leopard (*Panthera uncia*), is shared by at least two species of bear (*Ursus* spp.), wolf (*Canis lupus*), red panda (*Ailurus fulgens*), mountain ungulates such as wild yak (*Bos grunniens*), chiru or Tibetan antelope (*Pantholops hodgsoni*), Tibetan argali (*Ovis ammon*), Tibetan gazelle (*Procapra picticaudata*), Ladakh urial (*Ovis vignei*), four species of musk deer (*Moschus* spp), the *hangul* or Kashmir red deer (*Cervus elaphus*), three species of goral (*Naemorhedus* spp), serow (*Capricornis thar*) Himalayan tahr (*Hemitragus jemlahicus*) and takin (*Budorcas taxicolor*) to name a few. The high altitude lakes and bogs are breeding grounds for avifauna such as the black-necked crane (*Grus nigricollis*), bar headed geese (*Anser indicus*), brahminy ducks (*Tadorna ferruginia*), and brown-headed gulls (*Larus brunnicephalus*). Numerous endangered and medicinal plants occur in these areas.¹⁹ Over 335 species of wild relatives of cultivated crops are found in the region.²⁰ Wild relatives of all major domesticated livestock, namely, cattle, equids, sheep and goats, also occur in this region. The biodiversity resources of the area not only provide life support to the people in the area, but also serve as the critical gene pool for biodiversity based solutions for a variety of concerns of humanity.

These mountains play a key role in the water cycle with feedback to the regional climate and by modulating the runoff regime. The critical role of mountains in maintaining water quality and quantity cannot be overstated. Mountain vegetation and soil plays a key role in reducing or mitigating risks from natural hazards.²¹

Cultural services

The lifestyle, religious and spiritual beliefs, traditional agriculture, food, marriage systems, governance of societies inhabiting these areas are all unique and generally gel well with the ecological aspects of the landscape.

India is a religiously diverse country and the birthplace of four major religions: Hinduism, Sikhism, Buddhism and Jainism. Himalayan ranges harbor many mystical and sacred linkages to several religions and beliefs. Nature and wildlife conservation has been part of several such religious beliefs and practices, which have benefitted species such as the snow leopard and its prey. The region continues to inspire scholars, artists, poets, spiritualists, and the citizens at large. Today, the extent of tourism and pilgrimage is rapidly expanding.

¹⁶Department of animal husbandry.Government of Sikkim.Livestock census 2007.Retrieved on 20/2/2012 from http://sikkim.nic.in/ahvs/ahvs_state.asp

¹⁷Department of animal husbandry, dairying and fisheries.Ministry of agriculture, Government of India.Livestock census 2007.Retrieved on 20/2/2012 from <http://dahd.nic.in/dahd/WriteReadData/7.%20Part%20IV%20Livestock%20Census%20BAHS%202012.pdf>

¹⁸PSL, Same as 3.

¹⁹Pei, S. 1996. (ed.) *Banking on Biodiversity, Report of the Regional Consultation on Biodiversity Assessment in the Hindu Kush-Himalayas*, ICIMOD

²⁰Arora, R. and Nayar, L. 1984 *Wild relatives of crop plants in India*. NGPR Science Monograph, New Delhi

²¹PSL, Same as 2.

Uttarakhand harbours several ancient shrines at very picturesque locations at as high altitudes as 4,632m (Hemkund Sahib). Himachal Pradesh has strong Buddhist traditions in the remote valleys of Lahaul, Spiti and Kinnaur with splendid gompas and monasteries. Dharamsala, the centre of Tibetan exile and the residence of the Dalai Lama, attracts numerous pilgrims and tourists from the world over. Ladakh, in the State of Jammu and Kashmir is renowned for its well-preserved Tibetan Buddhist culture and has all four Tibetan Buddhist sects. Sikkim is the seat of the Karmapa sect of Tibetan Buddhism and Arunachal Pradesh has the famous Tawang Monastery.

In the entire length and breadth of the Indian Himalayas, the two mountainous States of Himachal Pradesh and Uttarakhand experience perhaps the highest concentrations of pilgrims in the world. It is estimated that pilgrimages and or religious tourism accounts for approximately 18–20% of total tourist flow.²²

Apart from religious pilgrimage based tourism, nature tourism has gained a substantive momentum in recent years. Tourism as such has been contributing substantially in the economy of the range states accordingly. In terms of revenues, tourism alone accounts for 6% of the national GDP²³.

The trans-Himalayan habitats that support snow leopards are ecosystems of immense value. While a comprehensive economic evaluation of these services would call for thorough research, a rapid estimate of the economic value of some prominent services generated from these habitats is provided below.

Table 2: Rough estimates of the economic value of snow leopard range in India.

Service	Estimation Method	Approx. Economic Value
Hydro Electricity	<ul style="list-style-type: none"> The current electricity production capacity of mega projects (greater than 25 MW) across 12 districts falling within snow leopard ranges is 14,367 MW.²⁴ Assuming a conservative load factor of 35%²⁵ these plants account for power generation of 44,049 million-units (MU) of power that translates to revenues of USD 3 billion (accounting the cost of power at USD 0.069 per kWh²⁶). 	USD 3 billion
Agriculture	<ul style="list-style-type: none"> Based on agricultural and horticultural produce published on official district websites and taking into account the current market price for these commodities, as published by the Ministry of Agriculture, the quantum of annual value generated is at least USD 60 million.²⁷ 	USD 60 million
Livestock	<ul style="list-style-type: none"> Taking a look at the information published on official district websites for livestock holding across 12 districts falling within snow leopard ranges the livestock population accounts to 3,140,511.²⁸ Valuating the cost of equines (horses/pony/mules/donkeys etc) at USD 460, of cattle at USD 266, and of sheep, goats and pigs at USD 55 the net value of within snow leopard range districts sums up to USD 411 million. Most of this stock is resident. 	USD 411 million
Tourism	<ul style="list-style-type: none"> Only looking at pilgrimage loads in these areas, State Tourism Development Board approximates that nearly 10.4 million domestic tourists and 55,000 international tourists visited Uttarakhand in 2001.²⁹ 	USD 375 million

²²Singh, S. (2005) *Secular pilgrimages and sacred tourism in the Indian Himalayas*. *Geojournal*, 64: 215-223

²³Ministry of tourism. Government of India. Retrieved on 14/2/2013 from <http://business.gov.in/outerwin.php?id=http://tourism.gov.in/>

²⁴ http://www.cea.nic.in/archives/hydro/list_station/dec12.pdf

²⁵Calculated based on the target for hydro-projects 2009-10 as published http://www.cea.nic.in/archives/col18/dec09/opm_04.pdf

²⁶ Central Electricity Board – Average Domestic Tariffs for the first 50 kWh: <http://ceb.intnet.mu/>

²⁷ Data compiled from State Government NIC Websites

²⁸ Data compiled from State Government NIC Websites and sources of data in public domain

²⁹Uttarakhand Tourism Development Board. Retrieved on 14/2/2013 from <http://uttarakhandtourism.gov.in/>

Service	Estimation Method	Approx. Economic Value
	<ul style="list-style-type: none"> Tourism alone accounts for 6% of the national GDP³⁰. This accounts to revenue of USD 120 per tourist, calculated based on the number of international and domestic tourists in India and the national GDP between 2000-2010. Based on the tourist numbers for the major pilgrim centres, this amounts to annual turnover of over USD 375 million per year 	

Thus, the value of various ecosystem and other services across major districts of the snow leopard range in India roughly amounts to at least **USD 4 billion**.

Generating value based support for conservation of the snow leopard ecosystem

Past efforts

There is considerable literature in India about the value of the Himalaya, especially in context of providing water to the populous Indo-Gangetic plains and regulating India's monsoons and climate in general. The floral wealth in terms of its importance for medicinal plants is also fairly well known. Information on biodiversity and ethno-biology is also well known. However, information on endangered species such as snow leopard is extremely scarce. Himalayan ecology has always been of utmost importance in the economic context in view of the facts that it provides the basis for the whole agro-economy of the southern alluvia of the rivers originating here. Accordingly dedicated institutions like Wadia Institute of Himalayan Geology, GBPI Institute of Himalayan Environment and Development, Snow and Avalanche Study Establishment (SASE), are engaged in studies related to various aspects of Himalayan landscapes. International Centre for Integrated Mountain Development (ICIMOD), located in Kathmandu, Nepal functions on larger landscape of Hindukush Himalayan region. In the National Action Plan on Climate Change, a dedicated National Mission for Sustaining the Himalayan Ecosystem has been taken up for dealing with the concerns related to climate change. Thus while the Himalayan landscapes are focus of attention from ecological and economic viewpoints, snow leopard, being the flagship life form of higher alpine, is to be the focus of attention as an indicator of the ecological niches it occupies.

Snow leopards constitute a valuable component of Himalayan biodiversity and are afforded the highest conservation category under law; little information on the species was available till recently. In 1986 the J&K Department of Wildlife Protection collaborated with the International Snow Leopard Trust to hold an international snow leopard symposium, which gave a boost to snow leopard conservation in India. A 'Snow Leopard Scheme' was conceived to improve conservation initiatives in the country and the Wildlife Institute of India (WII) launched its first collaborative survey on snow leopard distribution in western Himalaya. This was followed by a telemetry study on snow leopard in Ladakh.

With the emergence of credible information on snow leopard and successful conservation models, various agencies have initiated conservation education programmes targeting local communities. Among the notable efforts, NCF-SLT, WWF India and Snow Leopard Conservancy-India Trust (SLC-IT) have initiated awareness programmes targeting school children and youth covering many sites in the western Himalaya.

Future Possibilities

Effective implementation of the Project Snow Leopard and awareness programmes targeting all relevant sections of society are the priority areas for disseminating information and generating support for snow leopard conservation.

³⁰ Ministry of tourism, Government of India. Retrieved on 14/2/2013 from <http://business.gov.in/outerwin.php?id=http://tourism.gov.in/>

PSL is likely to gain momentum with States gaining from additional technical inputs and funds for the development and implementation of the management plans. With more upcoming plans for research and conservation, there is a good scope for studies and dissemination of credible information on snow leopard ecology, threats and conservation issues.

With the increasing awareness about the ecological and economic importance of Himalayan Ecosystem in context of ecosystem services flowing from this area, sustenance of the life forms as the indicator of its state of integrity needs to be communicated effectively. It is in this context that a strong communication strategy is needed to be formulated and adopted. It is therefore important that the sections of the local population, like the community, Government departments, developmental agencies, military and other stakeholders are targeted with information on snow leopards and their threats. The indulgence of corporate entities engaged in natural resource use based enterprises, particularly in the command area of the snow leopard range, can play a very critical role in conservation of these ecosystems. Such participation can be through their corporate social responsibility (CSR) and environmental offsets based on comprehensive programmes. Government agencies with help from NGOs and corporates too can develop large-scale campaigns to reach out to the nation.

Most of the snow leopard range in India is spread along international borders with Pakistan, Nepal, Bhutan and China and most of the border areas are manned by the Indian Army and paramilitary forces. Therefore the border forces are critical stakeholders and programmes will need to be carried out to specifically involve these organisations by creating awareness and developing a sustained partnership for conservation.

Threats

Snow leopard and its habitats face threats from a variety of traditional and modern factors, and in India the importance of these vary between States. Primarily, for the snow leopard habitats being in the most difficult terrains of Himalaya, with perhaps least human population density and minimum conflicts of development related environmental impacts, the traditional threats to ecological resources are far less compared to rest of India. Nevertheless, considering the critically vulnerable nature of the ecosystems, endangered status of the flagship species i.e. snow leopard, and overlap of habitat and life support systems for human as well as this species pose definite threats which can be and are needed to be managed.

For the local communities inhabiting the snow leopard range in India livelihood is based on conditions of very sparse resources. Usually a fraction of the area is arable (in Spiti for example, it is 0.24% of the geographical area), and irrigation is primarily from snowmelt in summer. Cultivation thus is limited to 3-4 months in summer when people grow staple cereals and recently, some cash crops. The surrounding rangelands, however allow them to maintain a variety of livestock. Winters are harsh and people need to stock enough fuel wood for warmth and cooking and fodder for stall-feeding their livestock. The entire region is still considered to be rather remote and development of infrastructure and industry has been slow. However, there is considerable pressure in recent years to bring the remote border regions more in the national mainstream and thus developmental attention to these areas has enhanced. Further, much of the snow leopard range in India is in, or near the borders and there has been a recent thrust to improve access and infrastructure in these areas due to national security concerns.

Traditional Threats

- Unsustainable livestock grazing in some areas impacts the population status of wild ungulates, the pre base of snow leopard.
- Biomass extraction for fuel and other uses near the habitations also lead to pressure on the availability of resources for wildlife including wilderness status in some areas.
- In some areas livestock depredation by wild carnivores leads to threat perception among the people towards these life forms, which can result into retaliatory killing of the predators.
- Poaching, though not very common, does exist in parts of the landscape, of ungulates for meat more than of the predators. Neighbouring range countries of Pakistan, China, Nepal and Bhutan share the concern of illegal trade and related threat to Snow Leopard with India, while other

countries like Bangla Desh and Myanmar are also used as routes for smuggling of wildlife products.

Emerging Threats

- With the thrust on infrastructure and general development, parts of habitats are being lost resulting in fragmentation.
- Influx of migrant labourers in the region to enable all the construction work may also put pressure on local resources, and on the socio-cultural and ecological integrity of the area. They are also involved at times in poaching, even in areas where this was traditionally absent.
- As the fallout of increased migrant population and tourism, garbage accumulation often causes problem of free ranging dogs in and around the centers of activity, not only causing direct harm to the livestock, but also increasingly attacking wildlife including carnivores.
- Climate Change: Higher Himalayan ranges including the habitats of snow leopard are intrinsically very vulnerable to the microclimatic changes also, atmospheric temperature being the main determinant of survival. The life forms, though have high adaptation potential to climatic variations, in such altitudes, tend to evolve responses to such changes by migration and phonological changes to suit the changes. The life forms in the snow leopard range in India are also facing these threats of changing weather patterns affecting agriculture, and these shifts in temperature and precipitation can influence wildlife too.

Capacity and Awareness Related Threats

- Primary mandate for conservation of wildlife and nature lies with the State Forest or Wildlife Departments. While the policies for management of forests and wildlife prescribe participatory engagement with communities and other stakeholder agencies, the modalities are often impaired by limited capacity of the establishment to plan and effectively implement meaningful participatory conservation programmes.
- In the forest administration in the areas of snow leopard range, the staff strength is generally poor and ill equipped, which limits their ability to respond to the conservation needs.
- There is a general lack of awareness regarding conservation challenges to this fragile landscape among the local communities, local Government agencies, and general public as well, which can result in insufficient support for conservation.

Threat mitigation: dealing with the threats

The traditional threats to snow leopard are related more to the state of landscape and are to be managed by addressing the issue of conservation oriented sustainable land use. Since there is a significant interface between the communities and wildlife in the region, use of approaches that effectively involve these communities will be critically important. There are some successful models from India on experimental/ pilot scales on enhancing local livelihoods (eg. SLC-IT, NCF-SLT), managing conflicts (NCF-SLT, SLC-IT, WII, WWF), maintaining small incentive based community managed reserves (NCF-SLT and SLC-IT) and conservation planning (WII and NCF-SLT) that can be replicated over larger parts of the landscape. These and other best practices, as known from time to time in other SL range countries, will be suitably implemented in the area.

Wildlife management department of Jammu and Kashmir has provided a successful model for engagement of local communities in conservation by linking their strengths of traditional culture and skills to ecotourism like wilderness and snow leopard tracking, thereby evolving stakes in its conservation.

Participation in conservation planning needs to be expanded from just local communities to involve other agencies too. It is important that landscape level participatory management is encouraged where conservation is carried out with greater acceptance locally.

With increased immigration of outside labour and increased local poaching in some areas, enforcement too becomes important. Since the Snow Leopard range is almost along the international borders, some pockets are susceptible to illegal wildlife trade. In the circumstances the interface between the Forest/Wildlife Departments and other paramilitary border forces needs to be strengthened for collaborating in recognizing and dealing with such issues. Curbing wildlife trade is an area where trans-boundary collaboration can be very helpful.

Many of these ideas are incorporated in the PSL that provides the background, framework and activities to take this forward. The PSL notes that threats need to be understood well for each site, monitored and the response needs to be adapted to the current threat. Good monitoring can also help in averting the threat altogether. It was also noted that most of the time threats need a multipronged and multilevel approach.

Institutional analysis

India has a forest management establishment that has existed over a century with practices of conservation under strict laws³¹. The focus however was mostly on use of forest tracts and management of game. Organised forest protection and management systems came into existence in 19th century with creation of the Imperial Forest Department in 1864 and the Indian Forest Act of 1878, which formed the basis for the subsequent Indian Forest Act of 1927. However, these measures were for overall management of forest wealth as the primary objective rather than protecting species.³²

India today possesses a century old forest and wildlife establishment, which caters to the needs of forest management. The responsibility of forest and wildlife management lies with the states and the Central Government oversees the practice from national policy and priorities viewpoints. The management units are constituted of forest and wildlife reserves with varying administrative and legal categories of interventions prescribed. The states maintain the forest establishment of an approximate ratio of 1 person for every 10 km² of forests. However, in the snow leopard areas the ratio is much poorer (eg. 1 staff for every 200 to 600.km²). Teams of officials are entrusted with the responsibility of protection, management, investigation of offences and prosecution in the courts of law.

Each management unit is covered under a management plan or working plan, which is prepared through a well laid process of assessments, analyses and interpretation, in view of the well-considered objectives of management, by a consultative process among managers, professionals and stakeholders.

Scientific institutions for support to forestry and wildlife include the Indian Council for Forestry Research and Education (ICFRE), the Wildlife Institute of India, several state forest research institutes and several dedicated institutions outside government like Bombay Natural History Society, Nature Conservation Foundation, World Wildlife Fund/ TRAFFIC INDIA, Wildlife Trust of India etc. The interface is evolving in a robust manner and several experts from such institutions take active part in policy level deliberations within the government like National Board for Wildlife.

In order to encourage partnerships between the forest departments and local communities the National Forest Policy of 1988 and the Joint Forest Management Guidelines of 1990 provide policy and organizational support. Among the legal provisions, Indian Forest Act 1927 and several state Forest Acts are in place, which primarily provide for organization of forests for management in private as well as public custody, legal provisions including protection related regulations and powers/ responsibilities of the administration for that. Corresponding law for wildlife management is the Wild Life (Protection) Act 1972, which provides for the establishments like National Board for Wildlife, National Tiger Conservation Authority, Central Zoo Authority, Wildlife Crime Control Bureau, and setting up of National Parks, Sanctuaries, Community Reserves and Conservation Reserves etc. for conservation of specific biomes. It

³¹Rangarajan, M. (2001). *India's Wildlife History*, (1st edition), New Delhi: Permanent Black

also provides regulation for trade and varying degree of protection to specific life forms facing threat in conservation status. The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 empowers communities to sustainably use and manage the forest commons. The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), 2005 undertakes to provide a 100-day employment guarantee every year to adult members of any rural household, and provides opportunity to the state forest departments to engage local communities to work for conservation activities while providing wages. Thus several policy and legal provisions already provide enabling environment for an inclusive conservation efforts.

Special legal instruments for conservation and sustainable management are in place in form of robust impact assessment and regulatory regimes. Under the Environment (Protection) Act 1986, Environment Impact Assessment regulations prescribe appraisal by expert groups and clearance from the EIA Authorities before any high impact development projects is initiated. In case of requirement of use of forest lands for any non-forestry purpose, prior concurrence of Central Government is mandatory under the Forest (Conservation) Act 1980, for which, an expert Forest Advisory Committee considers the proposals and makes independent recommendations to the Central Government for decision. If location of such projects is within a wildlife reserve (Protected Area) or immediate vicinity thereof, prior recommendation of the National Board for Wild Life is mandatory under the Wildlife (Protection) Act 1986. These instruments attempt to work out reasonable balance for sustainable development and environmental integrity.

While the empowerment of the communities for co-management of wildlife and the support mechanism for building community organizations have been facilitated in the legal and institutional framework, the system does face several operational challenges. The success of community-based conservation in the snow leopard areas have to be seen in the background of the locational circumstances as the areas of habitations adjoining snow leopard habitats are generally in remote locations, official presence in such areas is meager and contexts for strong initiatives seldom exist.

Cause of snow leopard conservation may provide this context, by effective communication of urgency by dedicated scientific and social institutional efforts for justifying the momentum for conservation.

The challenge of capacity building is faced by the Forest Department too, especially in countering illegal wildlife trade in wild species, which pose a significant threat. Species such as the tiger, leopard, rhinoceros, elephant, bear and even snow leopard are in demand in the international market, though there is little internal demand.²⁶ The threats emanating from often overseas sources of demands of contrabands can only be dealt in close cooperation of agencies such as the Border Security Force, which guards the borders and border trade vigilance intelligence agencies like Customs that can check trans-boundary wildlife trade. Thus, capacity building, at various levels and on various subjects is probably the greatest need in improving the success of conservation initiatives. The issue of cooperation among the neighbouring countries for dealing with trans-boundary crimes is an important area to be considered.

With regard to the snow leopard, the Wildlife (Protection) Act, 1972 classifies it along with other flagship species like tiger under Schedule I, thus ensuring the highest level of protection. However, recognizing the urgent need to further reinforce protection of this enigmatic felid and the unique high altitude landscape that houses it, **Project Snow Leopard** was initiated by Government of India with a species specific focus. The project extends across important landscapes in all the range states and aims to *safeguard and conserve India's unique natural heritage of high altitude wildlife populations and their habitats by promoting conservation through participatory policies and actions*.³³ So while this region has probably been one of the least accessible regions of the country with limited wildlife research being carried out, the initiation of this project has triggered focus and interest in regular and long term monitoring of species in several states.

For implementation and management, Project Snow Leopard advocates a landscape-level approach that calls for identification of biologically important landscapes (mostly >1,000 km²) and the development of scientific, participatory and landscape based management plans for such identified landscapes by

²⁶Illegal Wildlife Trade in India: World Wildlife Fund – India website

³³PSL.Same as # 2.

respective Forest Departments. Operation and monitoring for the implementation is at four distinct levels:

- National level: For interstate coordination, resource mobilization, dealing with issues of transboundary implications and overall monitoring.
- State level: Landscape level Management planning and coordination among the management units, forging partnerships with neighbouring states, expert scientific, social and other agencies for coordinated action in field.
- Management unit level: Interaction and activities led by field officers of the forest department, in collaboration with the related sectors of the district administrations, local community-based democratic organizations and expert scientific, social and cultural groups active in the management unit areas.
- Village and village cluster level: Interaction and participation in local planning and participation in implementation by the community based organization representatives along with front line staff of Forest Departments.

Research & capacity: research and training

The key research and training priorities are:

- Snow leopard and prey distribution and abundance in identified landscapes and monitoring changes in population over time
- Identification of threats at different scales and monitoring
- Snow leopard ranging, movements and prey-predator relationships
- Habitat monitoring and experimental research on restoration of degraded landscapes
- Snow leopard and other large carnivore – human conflict monitoring and mitigation

The Key capacity enhancement priorities are:

- Management planning
- Participatory engagement with communities
- Wildlife monitoring for Forest frontline staff and selected local members of the village level committees
- Enforcement and control of illegal wildlife trade for forest, police and armed forces
- Implementation of protocols for monitoring and restoration of habitats

It is important to understand where snow leopard and their prey occur, their status, changes that have taken place and the threats responsible for it. Hierarchically identifying suitable landscapes and potential 'core units' within these, are important. Further, there are numerous aspects of research that include prey ecology, predator ecology, prey-predator relationships, movement of wildlife in landscape with high human interface, understanding threats, local dependence, local policies, etc., which need to be encouraged. There is a growing, but still small body of research studies from agencies such as NCF-SLT, WII and WWF regarding these issues but the spatial spread of these is relatively small.

Owing to provisioned field presence, the Forest Dept. staff can be useful in collecting information and data after some sustained training and development of simple protocols. They can bring in a remarkable scaling up of the area that can be covered by monitoring studies. Scientists need to be available to analyze these large volumes of information. In recent years India has had a tremendous experience of such multi-scale, multi-party exercises such as the All India tiger population estimation and monitoring by the National Tiger Conservation Authority (NTCA), WII and other partners. In case of snow leopard NCF has embarked on a similar approach in the State of Himachal Pradesh, North Sikkim and Arunachal Pradesh while WII & WWF are working in Uttarakhand, West Sikkim and Jammu & Kashmir. These experiences need to be tested and replicated in other parts of the snow leopard range in the country to get robust national estimates of abundance and threats at a scale where action will be more meaningful for conservation of populations. An enabling environment exists for such collaborative action and can be pursued effectively.

Coordination and cooperation among Government and other agencies in conservation landscapes is crucial so that they can encourage convergences and mainstreaming of biodiversity concerns in development, while having dialogue to avoid divergences or find solutions to it.

Strategy, program and costs

It is recognized that the conservation strategy must be multipronged, with simultaneous action on the identified threats and also on recognition of the species survival as the indicator of the ecological integrity of the SL landscape and habitat. Accordingly the action can be on two broad aspects. One deals with setting up enabling processes for effective knowledge generation, coordination, capacity and planning, and second, for actually carrying out the conservation action by people with the right capacity. The strategy therefore will be to take simultaneous action on several fronts as outlined below. Proposed activities and year wise costs for each component of the strategy are provided in the Annexure.

- **Initiate a robust regime for knowledge generation:** To primarily include inventory and assessment of the status of habitat and the species, including the factors including anthropogenic ones, which will determine main focus of activities for conservation. This component also includes baseline studies for future monitoring of the flagship species and its habitat. Tentative cost for the period 2014 – 2020 is \$ 3.45 m.
- **Policy Actions or Institutional Strengthening Actions:** In this component, actions will include training and capacity building regime for stakeholder partners for snow leopard conservation including forest staff, community institutions, security and intelligence agencies for dealing with illegal trade, civil society organizations etc. committed for conservation of snow leopard.
- **Forging an effective communication strategy for other stakeholders** like border security agencies, infrastructure development partners, people's representatives of every level of democratic institutions and development sectors will be a part of this component. It will also include building up community or social institutions for a participatory campaign for conservation of snow leopard. Projected cost for the period till 2020 is \$ 2.46 m.
- **Identify One Representative Landscape in Each State and Prepare Management Plan:** In this component, a priority landscape will be identified in each range state based on the inventory as given in component I above, and management plan will be prepared for it with expert assistance. One management unit in each of the five range states will be entrusted the task of taking up the conservation actions in identified priority landscapes for snow leopard conservation. Estimated cost for this component for the projected period is \$ 0.59m.
- **Conservation Actions (Using best practices with participatory approach & improved capacity):** This component includes use of existing information and experience on best practices for evolving and implementing measures for threat mitigation, livelihood support for local communities, conflict mitigation actions reducing antagonism and retaliatory killing of snow leopard and long term habitat improvement programs. These activities will be jointly taken by Forest/Wildlife Dept., Village Committees and all other agencies involved in the project. This component is expected to cover the cost of \$2.45 m till the year 2020.
- **Trans Boundary Actions:** This component includes working on the information on triggers of illegal trade on the products derived from the habitats of snow leopard, and seeking inter-governmental cooperation mechanisms available for control of illegal trade (eg. SAWEN and Interpol), and developing coordinated habitat management with neighbouring snow leopard countries. Nepal, China, Bhutan and Pakistan will be the prominent partners in this effort. This component will need \$ 0.38 m.

Monitoring progress and evaluating results

Monitoring of the conservation status and that of the action based on the NSLEP strategy are two different but interlinked parts of strategy itself. Following actions are envisaged in these areas for the action plan period.

- **Scientific monitoring of SL, habitat, and threats:** The first component of the knowledge generation and its use contains as its intrinsic part, action on monitoring of the SL in its different aspects. The component includes generation of baseline information, collection of data by

inventory and other means, and analysis thereof for assessing the trend and impact of action over the plan period. This information will be vital for mid-term appraisal and mid-course correction of the strategy, as and when required. Assessment of population, indicators of habitat and threats will be repeated periodically.

- Monitoring implementation progress through Key Indicators: The proposed 4 tier mechanism for conservation action at various levels also includes coordination at national and state level. This coordination task will also include monitoring of the progress of tasks defined and implemented. In the individual annual action plans of the range states, clear actions, deliverables, indices and indicators of success will be provided against which the progress will be monitored.
- The PSL includes Monitoring & Evaluation of management plan implementation by qualified agencies.

The cost of this aspect, covering part b and c above is estimated as \$ 0.75 m for the plan period. A mid-term appraisal with evaluation will take place in year 5 wherein the strategy will be reviewed based on the outcomes of actions of first 4 years.

Summary of costs and financing possibilities

Based on the activities listed above and likely trend of the costs including the efforts necessary in terms of personnel, investment and training/ communication requirements, costs for a seven years programme have been worked out as provided in the Annexure. A total of US \$ 10.08 million have been projected as the requirement for undertaking the conservation programme on a legitimate efforts level.

As the present strategy indicates actions based on knowledge and information gathered from the assessments and analysis envisaged in the plan itself, resource mobilization part and sources thereof are not yet definitely decided. Thus the projected financial resources can be partially borne by the Central Government, state governments and all other partners in the conservation efforts. The projected amount is relatively on higher side from the allocations provided at present, but can be borne for the tasks provided, from several existing sources. Global efforts for contribution for conservation from interested donors would go in long way for recovery of this species from brink of extinction.

Overall approximate proportion of the projected outlays will be as follows.

- support to the states for activities on the snow leopard conservation (60%)
- capacity enhancement and knowledge generation (30%)
- general coordination and transboundary efforts at the Centre (10%)

Model of assistance to the management units from federal budget already exists in form of the Centrally Sponsored Scheme format programme. While about 50% of the projected requirements can be met from this programme, participation of the research institutions, civil society and corporate adaptation of the habitats is possible. Communication strategy will incorporate the outreach to the corporate world for participation in conservation by contributing to the programme. Evolution of a workable participatory model for management and convergence of the assistance thus available will be a part of the programme.