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# Reconciling Sustainable Development of Mountain Communities With Large Carnivore Conservation

## Lessons From Pakistan

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While the world is becoming increasingly interconnected and interdependent, physically and culturally, the wildlife of remote mountain regions is being affected both positively and negatively by such interconnectedness. In

the case of snow leopards, the conservation impact has been largely, and rather unexpectedly, positive: Species-focused conservation projects, such as Project Snow Leopard (PSL) in Gilgit-Baltistan, remain mainly externally driven initiatives. PSL, initiated as a small pilot project in 1998, has relied on an approach that includes the use of an insurance scheme, the deployment of mitigation measures, and the empowerment of local governance. This approach has been successful in reducing the conflict with snow leopards and has built greater tolerance toward them. PSL is managed by local communities and cofinanced by them. PSL communities throughout the region are bearing the burden of carnivore conservation, and they are unwittingly subsidizing their populations by “feeding”

them their livestock even though they are an economic threat to them. In this article, we argue that external intervention in the form of efforts that help alleviate the consequences of conflict through local empowerment have had a positive impact on the local mountain societies. We also show that such interventions have resulted in tangible conservation results, with the number of snow leopards staying at least stable. Our experience also shows that while the incentive component is critical, it is also part of a larger approach—one that includes developing and supporting local governance structures, improving access to education, and offering a range of tools to reduce the conflict that can be implemented locally. Finally, we suggest that investing in this approach—one that recognizes the species and local-context complexities surrounding the implementation of conservation incentives—can continue to inform international practices and guidelines for reducing human–wildlife conflicts worldwide.

**Keywords:** Carnivores; conflict; conservation; incentives; livestock; insurance scheme; community empowerment; Pakistan.

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## A geography of conflicts

In a region where three of the world’s highest mountain ranges—the Himalayas, the Karakorams, and the Hindu Kush—collide, in Gilgit-Baltistan of northern Pakistan, small independent communities eke out a living. The incredible geographic variation found there has led to an equally diverse assemblage of biodiversity, ethnicities, and languages due to the region’s isolating mountains and remote location. Because of the importance of natural resources to small mountain communities in this region, it is also a critically important conservation landscape. These small mountain communities are faced with many challenges: the severity of the geography, their isolation, the absence of access to external markets, and the threat

of natural disasters that strike with little or no warning (Kreutzmann 1993; Uhlig and Kreutzmann 1995; Edwards 2006).

Compounding some of these effects, the mountains and valleys where these communities live are also home to two carnivores, snow leopard and wolf, which prey upon domestic livestock, often causing economic damage and threatening village-level food security. For these communities, livestock is an important component of their livelihoods and in many cases the major one (Figure 1). Retaliatory killing often occurs in response to the depredations that herders suffer. A decline in the availability of wild ungulates, a key component of the snow leopard diet, due to extensive hunting practices has caused a significant shift in predation pressure toward

**FIGURE 1** Yak on one of the summer pastures of Hushey. (Photo by Tanya Rosen)



domestic stock. While Himalayan ibex (*Capra sibirica*) and in some areas *markhor* (*Capra falconeri*) remain important food staples, along with other small mammals and birds, snow leopards feed to a large degree on domestic livestock, including yak, goat, and sheep (Mishra 1997; Anwar et al 2011).

Depredations occur mostly in the winter, when snow leopards break into corrals and barns, and in June, when livestock's arrival on the high summer pastures coincides with the increasing dietary demands of a snow leopard feeding cubs. A heavy government penalty for killing snow leopards makes farmers reluctant to tell outsiders about any killings, thus making it hard to determine how many snow leopards are actually being killed due to human–wildlife conflict. However, in many situations snow leopards have been caught alive and local farmers have specifically sought the assistance of local conservation organizations to help release the leopards back into the wild.

Based on interviews (Hussain 2003), many farmers and communities have understood that they could benefit from protecting the snow leopard rather than killing it. The loss of livestock to snow leopards is a random risk: a snow leopard does not choose the owner of the animals it kills. Therefore, over the years, the probability of being hit by such a loss is randomly but evenly distributed among the farmers, a pattern that is most pronounced on summer pastures where the livestock herds are managed communally by a pool of men or women.

This has emerged as a powerful argument in favor of collective coverage of farmers' individual risk, which led to the launch in 1998 of a pilot project in Skoyo, in the Rondu valley, called Project Snow Leopard (PSL). PSL's approach relied on the idea of setting aside a collective pool of money equal to the value of the average annual

loss rate. This would allow the community to spread the risk and reduce the impact of losses. The project also increasingly relied on a broader approach extending beyond an insurance scheme to the deployment of mitigation measures, such as the use of predator-proof corrals, and community empowerment, through the establishment of Snow Leopard Conservation Committees that effectively manage the project.

Thirteen years later, the project has expanded into 10 villages in 3 valleys (Figure 2) and has enjoyed a good share of success in reducing conflicts with snow leopards by building greater tolerance toward them. The affected communities of Gilgit-Baltistan have understood the value the international community places on snow leopard; they have adapted by largely accepting the presence of snow leopards and are now participating in a mutually respectful partnership that merges local and global worldviews of conservation and more harmonious coexistence with carnivores.

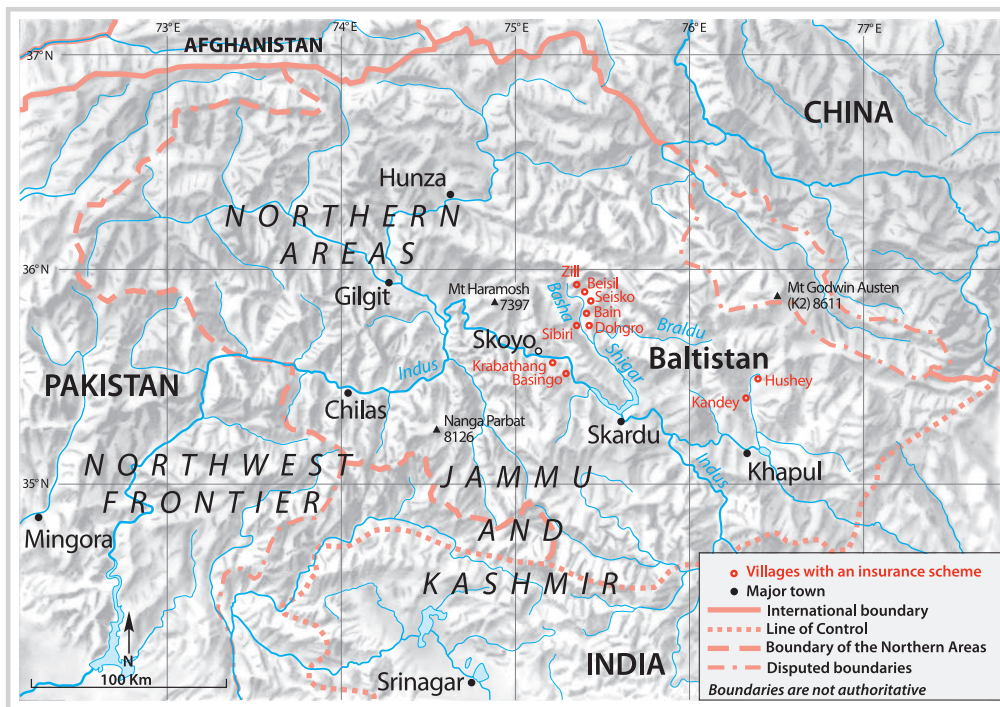
In this article, we briefly discuss the literature on the incentives deployed as a tool for building support for carnivore conservation; we also describe the evolution of PSL, its expansion and impact on the local snow leopard population, and socioeconomic changes in the villages. We discuss challenges faced, limitations of the current approach, and opportunities for further improvement. Finally, we highlight the influence of PSL on carnivore conservation efforts in mountain communities worldwide.

### Human–wildlife conflicts: Are incentive measures effective?

Conflicts between humans and wildlife are escalating, as human activities and wildlife increasingly encroach upon each other. Conflict arises when wildlife species,



**FIGURE 2** Map of the region, with location of villages with an insurance scheme. (Map based on original map by Andreas Brodbeck published in Hussain 2000: 227)



particularly carnivores, pose a real or perceived threat to life and property. Myth, folklore, religious, and economic convictions create a powerful incentive among humans to resolve this conflict by eliminating the species in question. Wolf eradication in the United States is a prime example of this (Coleman 2004). Attitudinal studies show that people with negative attitudes toward certain wildlife species are more likely to respond to future damage by retributive killing or supporting killing by others (Don Carlos et al 2009; Liu et al 2010); as a result, they may contribute to the decline of these populations (Kellert et al 1996; Ogada et al 2003). That makes human-wildlife conflicts one of the key drivers of biodiversity loss, along with illegal trade in endangered species parts (World Bank 2005; Simms et al 2011) and ongoing habitat loss. Policies and laws seeking to address conservation by creating protected areas and conservation corridors have occasionally exacerbated such conflict, often by ignoring the needs of local people and the impacts on livelihoods by proposed measures aimed at exclusively protecting wildlife.

As the Convention on Biological Diversity, at its 10th Conference of the Parties in 2011, has come to recognize, there is a need to develop best practices to address conflicts among biodiversity conservation, sustainable use, pastoralism, and agriculture.

In developing these best practices, there is ample literature on incentives devised to promote carnivore conservation (Ciucci and Boitani 1998; Ferraro and Kiss

2002; Cilliers 2003; Hussain 2003; Mishra et al 2003; Agarwala et al 2010). However, reducing conflict with carnivores and increasing their acceptance by pastoralists rests not only on implementing the right set of incentives but also on identifying the appropriate local context-relevant incentives in combination with empowering local decision-making processes. Initiatives and lessons that put conservation more in the hands of those people negatively affected by human-wildlife conflicts empower them and thus are more likely to have beneficial and lasting conservation impact.

However, a tacit aversion to compensation as an incentive for reducing human-wildlife conflict remains entrenched within many conservation institutions, both nationally and internationally. This is due to the poor performance of some compensation programs that either inadequately compensate people for losses or do not sufficiently protect wildlife. For instance, in government-run programs, the typical lengthy and time-consuming procedures for payouts make it difficult to file claims, and governments have little capacity to verify claims. In addition, the low amounts paid to claims make most compensation programs ineffective (Mishra 1997; Jackson and Wangchuk 2001) and may result in intensified human-wildlife conflict.

Criticism of compensation schemes does not change the basic fact that conservation costs and benefits are unevenly distributed and that such discrepancy must be resolved if wildlife are to be conserved. Verdale and

Campos argue that compensation should be seen as a subsidy that society should pay for “keeping the wildlife alive” (2004: 3). Nyhus and Tilson, reporting on tiger–human conflict from the Sumatra region in Indonesia, suggest that “If carried out effectively, compensation can shift the economic responsibility for carnivore conservation away from farmers toward the supporters of carnivore conservation” (2004: 72).

Madhusudan noted that in rural southern India, villagers “seem willing to make small investments to protect their livestock and crops from wildlife” (2003: 474). Studies also indicate that small farmers’ tolerance toward wildlife increases as their losses are compensated (Ogada et al 2003; Holmern et al 2007). In contrast, Lamarque et al (2009) wrote that the International Union for Conservation of Nature’s African Elephant Specialist Group and Human–Elephant Conflict Task Force also advise against using compensation for elephant damage and argue that it can only at best address the symptoms and not the cause of the problem. Similarly, Naughton-Treves et al (2003) noted that farmers in the western United States who were compensated by the federal or state government for their losses were not entirely satisfied. They report no difference in attitudes toward wolves among ranchers who had received compensation and those who did not.

Beyond the recognition that the dynamics of addressing conflicts in the United States bear many differences with those in Central Asia, what makes the conflict more intractable in parts of the United States and incentive measures likely less effective is the possibility that such conflict has been heavily litigated in the courts, rather than on the ground by working closely with ranchers, engaging them as stakeholders, and recognizing that their livelihoods are deeply affected by the wildlife that such laws seek to protect. The US compensation programs—implemented to correct economic losses suffered by ranchers from wolf and bear depredation of cattle and intended as incentives for coexistence—were not perceived as such by some ranchers, who viewed the compensation program as offending the value of ranching. Rather than seeing the survival of these species at risk, ranchers are angered by regulations and the protection offered brown bears and wolves under the Endangered Species Act.

Finally, many studies of human–wildlife conflict focus on local people’s attitudes toward wildlife. Perhaps an equally insightful study would be to assess local people’s attitudes toward conservationists and the role of conservation institutions. Such a change in focus would highlight the dissonance between the meaning and significance of wildness to local societies and to outside conservationists. Nowhere is this disjuncture more prominent than in the debate over how to resolve the conflict between rural herders and snow leopards.

PSL, started as a species-focused conservation project, was mainly externally initiated. It was driven by the desire

to help local communities adapt to living and raising livestock in the presence of snow leopards. However, participating communities rapidly took ownership of the project and recognized the value of conserving the species as a way of improving their livelihoods. While the financial incentives provided under the insurance scheme play a critical role, the increased exposure to exchanges and interactions with foreign visitors and organizations have not changed the way local farmers in Baltistan view snow leopards but at least shed light on how the rest of the world sees them: not as a nuisance but as a highly charismatic species. This gradual awareness by the local communities of how snow leopards are perceived worldwide, coupled with a sense of ownership of the project, has created a new dynamic of acceptance of the presence of this carnivore.

### PSL: Assessing progress 13 years later

In Pakistan, snow leopards occur throughout the mountains of the Northern Area, with an estimated population totaling around 400 individuals (Hussain 2003). As already mentioned, snow leopards often kill domestic livestock, thereby threatening livelihoods of local farmers who generally retaliate by killing the suspected predator. The typical local farmer in northern Pakistan is poor, with an average annual per capita income around US\$ 400. A large majority of the local community are agropastoralists, and their livestock represents a significant asset in their overall economic holdings (Ives 2001; Kreutzmann 2005). In addition, livestock plays a key role in the household economy of local people by insulating them against unexpected times of scarcity. These farmers demand that those calling for protection of the snow leopard provide the means to compensate them for any financial loss they have to bear because of these predators. Consequently, they look to state, national, and international conservation institutions and to private entities for such support. Given that there are legal prohibitions against killing of wildlife, even though the laws are hard to enforce, the demands of the villagers are genuine. Retaliatory killing of snow leopards often results from a rational choice by local farmers: They are unwilling to subsidize the well-being of a rare animal because it causes economic losses to them. This kind of scenario sets the incentive structure within which the human–wildlife conflict is framed. The farmers have a strong incentive to kill a snow leopard and thus safeguard their livelihoods yet have no incentive to conserve it.

The main component of PSL is a community-managed and community-operated village-based livestock insurance scheme against losses arising from snow leopard predation. PSL’s approach and design of the insurance scheme has been described in detail by Hussain (2000; Box 1).

**BOX 1: How the insurance scheme works**

All households in the participating village take out an insurance policy on their livestock; this is how it works:

- The premium rate is set at 1% of the small livestock's (ie sheep and goats) current market value. The justification for this rate is based on surveys conducted by PSL that show average annual livestock loss to snow leopard in conflict areas is about 2% of the total herd size, or 2% of the financial value of an animal.
- The villagers' own premium payment covers about 50% of the costs of the average annual losses from snow leopard depredation.
- The remaining 50% cost is covered by PSL.
- Insurance premiums by villagers are paid annually by each livestock owner into Fund 1, which is managed solely by the villagers.
- A second monetary corpus, Fund 2, is established to help cover the remaining costs of any livestock losses to predators. This is financed through proceeds from grants solicited from various national and international donors.
- Fund 2 is kept in a separate account at the local bank and jointly managed by PSL and villagers.
- Premium payments deposited in Fund 1 are held collectively in a bank, with records of individual payments maintained separately within the village.
- The total premium amount of each member contributed through Fund 1 is based on the number of livestock owned.
- The model assumes that the average rate of loss will remain at 2% and that PSL will continue to generate funds to finance compensation payments, as well as the corpus for Fund 2 (Hussain 2000).

In addition to the insurance scheme, PSL implements—through separate funding—small-scale, community-based infrastructure initiatives and provides financial contributions for predator-proofing communal corrals, remote camera-trap monitoring of the snow leopard population, snow leopard diet and population studies using DNA, and improved access to education in the Basha valley as part of a broader incentive package for snow leopard conservation.

PSL expanded in 2004 into 6 villages, mainly in the Shigar and Basha valleys, and in 2006 into a total of 10 villages, the current number supported (Figure 2). Since 2007, PSL has paid out compensation for 184 animals, totaling PKR 360,000, or about US\$ 4000 (January 2012 exchange rate). Since 2010, PSL has provided insurance to more than 400 households in 8 villages, insuring more than 3000 head of livestock. Local communities have paid more than PKR 160,000 (US\$ 1695) in premium payments in 2010. Since 2006, some US\$ 13,000 have been spent on corral improvement and small-scale infrastructure projects, with another US\$ 4200 spent on education. The total area of snow leopard habitat in the PSL's project area is about 5000 km<sup>2</sup>, whereas the total habitat of snow leopards in Pakistan is about 40,000 km<sup>2</sup>.

Our research on population estimates based on extraction of DNA from fecal material (Anwar et al 2011)

showed that at least 19 individual cats were represented in 49 confirmed snow leopard scat samples. This is a strong indication that the density of snow leopards in the area is approximately 0.38 snow leopards per 100 km<sup>2</sup>. The research also showed that most of the biomass consumed (70%) was domestic livestock, including sheep (23%), goat (16%), cattle (10%), yak (7%), and cattle–yak hybrids (14%). Only 30% of the biomass consumed consisted of wild species, namely Siberian ibex (21%), *markhor* (7%), and birds (2%).

Participating communities responded positively to PSL's efforts. During 2010, we conducted a survey in the Basha valley (the villages of Sibiri, Zill, Bain, Seisko, and Beisil). We interviewed 79 individuals (mostly farmers, one hunter, and two porters)—all members of the Snow Leopard Conservation Committees of the participating villages. In the questionnaire administered, we asked 36 questions, including questions on the villages' livestock, the level of conflict experienced with snow leopards, their knowledge of killed snow leopards, and the impact of PSL on reduction in conflict and attitudes toward snow leopards.

Participants indicated that, over a period of 20 years before PSL started working in the valley, 205 snow leopards had been killed; 50% of them described current snow leopard conservation status as “good,” with an additional 35% describing it as “satisfactory.” In particular, 27 respondents indicated that this outcome resulted from the conservation efforts and that the cooperation with PSL “are good.” Asked whether they “feel that the present snow leopard conservation efforts are better than the ones made earlier,” 83.5% responded “yes.” Specifically, 82.2% of the respondents noted that the ibex population had increased, and 79.8% indicated the snow leopard kills had decreased (PSL surveys, unpublished data 2010, available from corresponding author of this article).

During the summer of 2011, we followed up with a series of in-depth dialogues with the Snow Leopard Conservation Committees in the participating communities to understand their level of satisfaction with the insurance scheme and PSL's conservation efforts (Figure 3). We took ethnographic notes of the conversations and views expressed. Participating communities consider the project as their own and appreciate the support provided by PSL, now brought under the umbrella of the Baltistan Wildlife Conservation and Development Organization. One of the most tangible outcomes is the existence of an internal oversight mechanism, where the community acts to prevent fraudulent depredation reports or suspected violations of the core conditions for project participation, including a ban on illegal hunting of wildlife. Communities are becoming more proactive and increasingly assertive in influencing outcomes, and they take responsibility for these. In one instance, in the village of Beisil in the Basha valley, snow leopard conservation helped serve as a



**FIGURE 3** Meeting with the Snow Leopard Conservation Committee in Hushey, Ganche Valley. (Photo by Tanya Rosen)



catalyst for bridging cultural and economic differences among factions within the community.

Snow leopards are no longer trapped, as used to be the case. A Swiss photographer who travelled to Hushey in 1987 to look for snow leopards wrote the following: “We were extremely disappointed to find a number of sliding-door traps, which the poachers used to trap and kill snow leopards. In fact, we later learnt that several snow leopards had been killed in these traps over the previous few years” (Eric Dragesco, unpublished paper April 2012, available from corresponding author of this article).

In socioeconomic terms, since livestock constitutes a great part of households’ income, a reduction in conflict has translated into a decreased loss of income. The introduction of an education component in 2010, as an additional incentive for communities to accept the presence of snow leopards and allowing all girls in Sibiri, Seisko, and Beisil to have access to primary education, is likely to have a profound impact on these communities. Over the years, the hope is that these young, educated girls will promote a conservation ethic in their villages and beyond.

## Challenges

A number of challenges have emerged over the years; PSL is trying to address them. While support for PSL activities remains strong, as highlighted previously, discussions with

the Snow Leopard Conservation Committees have confirmed that some difficulties persist.

First, there is a shared view with the communities that conflicts between people and snow leopards can be reduced but never eliminated, because communities will continue to lose livestock to this predator. For the local people, their positive change in attitude toward a predator so that they view it as worthy of protection does not alter the reality that this species continues to negatively impact the domestic economy of livestock producers.

Second, with mountain communities becoming more accessible, herders may have easier access to potent tools for eliminating predators, such as poison and agricultural pesticides. Based on our 2010 survey, 20 snow leopards are known to have been poisoned around Beisil in the Basha valley. In the villages where PSL operates, there has not been an instance of a snow leopard being subject to chemical poisoning, although such poisons and pesticides have been intercepted by members of the local Snow Leopard Conservation Committees. The threat is thus real.

Third, some communities in the region have a trophy hunting program. In Skoyo, Basingo, and Krabathang, the stakes are high for the local conservancy because they can sell the trophy hunting permit for the prized and endangered *markhor* for several tens of thousands of dollars. With *markhor* being a prey item, the village of

Skoyo lost interest in conserving snow leopards and backed out of participation in the insurance scheme program. Such concerns about the effect snow leopards may have on populations of valued trophy species are not uncommon: in September 2011, similar negative feelings regarding snow leopard predation on *markhor* were expressed by a conservancy in Zighar, Tajikistan. The approach followed to reconcile snow leopard conservation goals with the sustainable use of a highly valued ungulate species involves educating the local communities on the ecosystem health role that predators like snow leopards play. There is also no proof in the concerned areas that snow leopard predation on *markhor* may affect the population to the point where the current quota for trophy hunting would be challenged.

Fourth, PSL has pursued a single-species approach centered on snow leopards. But wolves are increasingly if not, more than snow leopards, intensively preying on livestock. Accessing funding for wolf-related conservation or conflict-mitigation work is difficult, because the wolf does not carry the same conservation significance as the snow leopard does. According to the 2010 survey, four participants said the snow leopard's improved conservation status developed because the communities were united in their efforts. Asked specifically what they were proud of, 35% of them talked about "unity, peace, and absence of conflict" in the villages. However in a situation where livestock can only be insured against snow leopard losses and not against wolf-induced losses, divisions have emerged within the community, thereby potentially eroding support for snow leopard conservation. In Hushey in February 2011, one part of the livestock herd that escaped from a corral was killed by a snow leopard and the other by a wolf pack. In September 2011, in Zill, Basha Valley, 170 sheep and goats died as a result of such interaction with wolves. Finding ways to broaden the focus of the insurance program and obtain funding to support other incentive-based activities may have to be considered over the long term as a strategy for ensuring that all community members are participating in the conservation programs and that divisions do not compromise them.

Fifth, PSL has an ecotourism arm: a local trekking company called Full Moon Night Trekking (FMNT) (Hussain 2000) started to attract tourists willing to trek where snow leopards are and visit the villages where PSL is active. When established, the goal was for profit from ecotourism to be 100% devoted to subsidizing the insurance fund and for FMNT to hire guides from the project villages to generate local income. Unfortunately, because of the often more perceived than real security concerns in Gilgit-Baltistan, logistical difficulties in accessing the region (irregular flights from Islamabad to Skardu as an alternative to a 31-hour-long drive on the Karakorum Highway), FMNT so far has attracted few trekking tourists. The situation slightly improved during

the summer of 2011. In the wake of the recent sectarian tensions in Gilgit-Baltistan, the outlook for the summer of 2012 remains unclear.

## Conclusion

While the introduction of the insurance scheme has generated the goodwill of the local communities not to take retaliatory measures against predating snow leopards, not to kill the snow leopard prey illegally, and to be proactive about mitigating potential conflict, it is the use of mitigation measures, such as predator-proof corrals, that has contributed to a reduction of conflict (PSL surveys, unpublished data 2010, available from corresponding author of this article), especially in the winter in villages where such predator-proof corrals have been built. This leads to the assumption that the combined use of incentive schemes with the establishment of a sound governance and oversight body and of mitigation measures constitutes the most viable option for establishing the grounds for the coexistence of people and carnivores like snow leopards. While no baseline information exists on the status of snow leopards in the project areas prior to PSL's intervention, based on local knowledge, the population of snow leopards and its prey have increased.

PSL's innovative approach has inspired similar efforts in other regions (Gurung et al 2011). The Wildlife Conservation Society (WCS) launched a pilot insurance scheme project in the Wakhan corridor of Afghanistan (Simms et al 2011). Similarly, in western Montana, WCS and its partners are looking into ways of implementing modified versions of the insurance scheme to increase rancher tolerance for wolves.

The PSL's philosophy shows that cost-effective methods of compensating local farmers can be developed that are partly financed by the villagers and run efficiently with no reported frauds. The willingness of most farmers to share in the cost is reflective of their genuine intention to resolve conflict without having to eliminate wildlife. Human-wildlife conflict for many small farmers like those in northern Pakistan is essentially an economic issue, and one that can be effectively resolved through developing durable funding channels and local institutions for disbursing funds in a fair and inexpensive manner.

More importantly, what PSL's experience shows is that while the incentive component is critical, it is also part of a larger approach—one that includes developing and supporting local governance structures, improving access to education, and offering a range of tools to reduce the conflict that can be implemented locally. International practices and guidelines developed with a view of reducing human-wildlife conflict should recognize the species and local-context complexities surrounding the implementation of conservation incentives and broader initiatives and should promote local participatory approaches that seek to empower communities to coexist with wildlife.



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