Environmental Challenges 4 (2021) 100175

Contents lists available at ScienceDirect

Environmental Challenges

journal homepage: www.elsevier.com/locate/envc

# Community-based trophy hunting programs secure biodiversity and livelihoods: Learnings from Asia's high mountain communities and landscapes

Lipy Adhikari[a], Babar Khan[a,*], Srijana Joshi[a], Long Ruijun[b], Ghulam Ali[a], Ghulam Muhammad Shah[a], Muhammad Ismail[a], Kosar Bano[a], Rehmat Ali[c], Garee Khan[d], Binaya Pasakhala[a], Ajaz Ali[a]

[a] International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, GPO Box 3226, Nepal
[b] State Key Laboratory of Grassland and Agro-Ecosystems, International Centre for Tibetan Plateau Ecosystem Management, School of Life Sciences, Lanzhou University, Lanzhou, 730000, Gansu, China
[c] World Wide Fund for Nature Pakistan, GCIC complex, NLI colony Jutial, Gilgit, Pakistan
[d] Department of Earth Science, Karakoram International University, Gilgit, 15100, Pakistan

ARTICLE INFO

*Keywords:*
Biodiversity
Conservation
Community based trophy hunting
Sustainable use
Livelihood
Benefit flow
Human wellbeing
HKH mountains
Pakistan
Tajikistan

ABSTRACT

The benefits for biodiversity and human wellbeing are debated for many countries. Some communities in rural mountain areas of the world consider trophy hunting as an integrated conservation and development strategy to protect biodiversity and sustain livelihood. This review will provide the evidence that has been gathered to discuss the benefits of CHTP in the HKPL landscape focusing on Pakistan and Tajikistan". Trophy hunting, which is intensely debated these days, is perhaps confused with the underlying philosophy of community-based trophy hunting programs. This paper seeks to inform these discussions with a fresh perspective on CTHP based on first-hand experience and learning from the high mountain landscapes and communities of Asia - *Pakistan and Tajikistan*. The article essentially reviews the effectiveness of CTHP model for conserving rare and threatened wildlife populations, protected and conserved areas, and community welfare and economic uplift. Results reveal that CTHP has been instrumental in halting illegal hunting and poaching wildlife and eventually increasing their populations in many important yet isolated habitats while improving community livelihood and local economy. The CTHP forms a vital part of the rural socio-ecological resilience for remote and isolated mountain communities. It has offered economic incentives for an integrated conservation and development paradigm to combat wildlife poaching and illegal trade and diversify livelihoods harness vital biodiversity conservation values. The paper also elaborates on the societal impact of financial flows and their use for improved lives and enterprises. There are however, some significant problems related to trophy hunting programmes, including the lack of accurate information to understand the effect of trophy hunting on herd structure and size, weak policy implementation, lack of transparency and corruption. Regular monitoring of wildlife, understanding population dynamics, appropriate allocation of hunting quotas, hunting revenue, proper evaluation, and careful documentation of CTHP processes and their impacts are urgently required to make CTHP more effective and sustainable.

## 1. Introduction

Some of the rural communities consider trophy hunting an effective conservation tool to protect rare and unique wildlife species in remote areas (Harris and Pletscher, 2002; Lindsey et al., 2006, 2007; Damm 2008) unlike the others who regard trophy hunting as an extension of colonialism (Mkono, 2019; Nowak et al., 2019). Historically, trophy hunting industry dates back to the early 20th century and is commonly practiced worldwide (Baker, 1997; Di Minin et al., 2016a). A well-managed trophy hunting programme is a significant source of income for local governments and communities as it offers necessary incentives to conserve globally important wildlife populations (Damm, 2008). In some areas, positive population impacts of trophy hunting programs have been demonstrated for some species, including Rhinos, Markhor,

* Corresponding author.
*E-mail addresses:* Lipy.Adhikari@icimod.org (L. Adhikari), Babar.Khan@icimod.org (B. Khan), Srijana.Joshi@icimod.org (S. Joshi), longrj@lzu.edu.cn (L. Ruijun), Ghulam.Ali@icimod.org (G. Ali), GhulamMohammad.Shah@icimod.org (G.M. Shah), Muhammad.Ismail@icimod.org (M. Ismail), Kosar.Bano@icimod.org (K. Bano), garee.khan@kiu.edu.pk (G. Khan), Binaya.Pasakhala@icimod.org (B. Pasakhala), Ajaz.Ali@icimod.org (A. Ali).

https://doi.org/10.1016/j.envc.2021.100175
Received 9 February 2021; Received in revised form 6 June 2021; Accepted 8 June 2021

Argali, Bighorn sheep, and many African ungulates (Funk, 2015; Khan et al., 2019; Roe and Cremona, 2016), while providing income for marginal and disadvantaged rural communities (Dickman et al., 2019; Funk, 2015). In such cases, trophy hunting has been used purely as a conservation tool for achieving overall biodiversity conservation goals inside a Community Conservation Area (CCA). Studies also reveal that trophy hunting in some parts of Africa was even better than tourism in terms of revenue it generated to incentivize conservation of endangered and threatened species (Baker, 1997) and in some other areas more land was protected under community conservation programs with provisions for trophy hunting than national parks (Dickman et al., 2019). Carbon and development footprints of trophy hunting programmes had also been lower than that of tourism (Di Minin et al., 2016a). It is a growing industry with a revenue of at least US$201 million per year in South Africa (Harris and Pletscher, 2002; Lindsey et al., 2007, 2006). Trophy hunting accounted for about 89% of the total revenue compared to 2% for ecotourism in Zimbabwe (Frost and Bond, 2008). Similarly, trophy hunting in Namibia led to the creation of community conservancies where local communities reap many social and economic benefits (Naidoo et al., 2016). Studies also suggest that restricting trophy hunting would adversely affect conservation (Maxi Pia Louis, 2019), and accelerate the loss of biodiversity (Di Minin et al., 2016b; Mbaiwa, 2018), restrict rewards, and demotivate local communities (Conrad, 2012).

Although studies suggest that trophy hunting can benefit biodiversity (Baker 1997; B. Khan, et al., 2014; Naidoo et al., 2016; Nawaz et al., 2016) but hunting of fellow sentient beings for pleasure and trophies is often questioned, which limits its usefulness as an effective conservation tool (Costanza et al., 2016; Crosmary et al., 2015; Di Minin et al., 2016b; Muposhi et al., 2016; Rashid et al., 2020a). Apart from ethical obligations of trophy huntig to human communities and wildlife populations, the flaws in wildlife use regulations, revenue generation from TH programs, and its distribution are amongst the main debates about reforming the trophy hunting industry (Muposhi et al., 2016). Studies indicate that in hunted populations, animals showed clear signs of disturbance i.e., smaller group sizes, lower calf recruitment rates, and high nervousness than conspecifics in the absence of trophy hunting (Hariohay et al., 2018; Khan et al., 2019; Rashid et al., 2020). The private sector is said to reap more from trophy hunting fees than local communities (Nowak et al., 2019), which adversely affects wildlife conservation and management of protected areas (Di Minin et al., 2016a). The continuing loss of important wildlife species intended for trophy hunting is another major challenge (Craigie et al., 2010), which appears to be one of the key causes of declining lion populations within and outside Tanzania's protected areas (Packer et al., 2011).

Despite several studies on positive or negative impacts of trophy hunting programs there exist huge knowledge gaps regarding the consequences of trophy hunting (Macdonald et al., 2017, 2016). Moreover, conservation policies that are not based on scientific evidence also threaten critical habitats and biodiversity, and risk disempowering and impoverishing rural communities. Mal-practices, weak governance, corruption, and lack of monitoring, in some of the hunting areas, have failed to ensure merit in quota allocation, transparency in benefit sharing, and pragmatism *(covering social, economic, cultural and ecological dimensions)* of trophy hunting programs (IUCN, 2016).

Like many isolated and remote areas, communities of Hindu Kush Karakoram and Pamir mountain ranges in western Himalayas, have a long tradition of subsistence and commercial hunting (Corlett, 2007). The people and the wildlife have co-existed in these landscapes since centuries. There was a large dependency of local people on subsistence hunting of ungulates for livelihoods; especially during harsh winters, meat from ungulates was the only source of protein for mountain people, and hence many rare species were over harvested to the verge of extinction (Khan et al., 2021).

In Southern China, which is also a part of the Hindu Kush Karakoram Pamir Landscape (HKPL), the Chinese government had banned all types of hunting except for trophy hunting by foreign hunters who paid fees for a limited number of trophy animals (Zhigang et al., 2012) but now China's wildlife law prohibit hunting of protected species (Li, 2007). In Pakistan and Tajikistan, trophy hunting with community participation was introduced in the late 1990s, primarily as a conservation tool, to combat illicit hunting and poaching of wild animals by locals for meat and money from pelts and trophies (Shackleton, 2001; Mallon, 2013; B. Khan et al., 2014; Nawaz et al., 2016;Rashid et al., 2020). Pakistan's community-based trophy hunting program (CTHP) offers financial incentives to local communities in recognition of their contribution to wildlife protection in their respective Community Conservation Areas (CCA), who being poor, marginal and disadvantaged, depend largely on locally available natural resources for their livelihood (Kifayat et al., 2014). In order to protect wild animals, especially ungulates, in their natural habiats, local communities together with provinicial wildlife authorities, created Community Conservation Areas (CCA), under CTHP, with well-defined boundaries, established governance Committees, and approved management plans for conservation and community development. Approval of the management plan of the CCA followed by a notification by the government in the official gazette empowers the local people in the management process (Zaman et al., 2019). A larger part of the trophy hunting fee goes directly to the local communities (B. Khan et al. 2014; Nawaz et al., 2016), where the government pays 80 percent of the trophy hunting permit fees to the concerned CCA within a period of 45 days after the hunting season is over. Trophy revenue received by conservation communities is used for collective social, economic, and environmental development activities, such as repairing irrigation channels for irrigation of pastures and agricultural fields, building community schools and basic health units, providing educational stipends and scholarships to needy students, giving soft loans to women for micro businesses, and improving farm-to-market connectivity through village link roads. Socio-economic development activities (projects) are identified, by the respective Village/Valley Conservation Committee (VCC) in consultation with VCC member households, agreed in resolution, and implemented as community projects. Therefore, CTHP has become a significant source of revenue (>30%) for conservation and management of wildlife populations and their habitats in the rugged, remote and vast wildernesse of Pakistan (Shackleton 2001;Jackson 2004).

This paper reviewed the trophy hunting models currently being practiced in Gilgit-Baltistan, Khyber Pakhtunkhwa and Torghar area of Balochistan, and Wakhan in Tajikstan, for their strengths in social, economic, and ecological impacts (Damm, 2008; B. B. Khan et al., 2014; M. Z. B. Khan et al., 2014; Nawaz et al., 2016a), and their weaknesses in addressing their associated ethical, legal, scientific, policy, and administrative gaps and challenges (Hariohay et al., 2018; Rashid et al., 2020a), which if not managed, can cause selection pressure on wildlife toward or against certain attributes with consequences for evolution (Coltman et al., 2003). The paper also highlights the opportunities for future adoption of successful conservation tools and approaches in the HKPL region (Wu et al., 2014), benefiting both the high mountain ecosystems and dependant local communities.

## 2. Methodology

### 2.1. Study area

The Hindu Kush Karakoram Pamir mountain region called *Bam-e-Dunya* in Persian meaning "roof of the world" is a transboundary landscape, spreading over 67,506 km$^2$ covering parts of Afghanistan (16%), China (36%), Pakistan (33%), and Tajikistan (15%), predominantly a highly fragile alpine ecosystem, meeting at Pamir plateau. The Hindu Kush Karakoram Pamir landscape (HKPL) harbors keystone and flagship species, including snow leopard (*Panthera uncia*) and Marco Polo sheep (*Ovis amongst polii*) amongst others. The six contiguous protected areas, namely Afghanistan's Wakhan National Park, Pakistan's Khunjerab National Park, Qurumber National Park, and Broghil National Park, China's

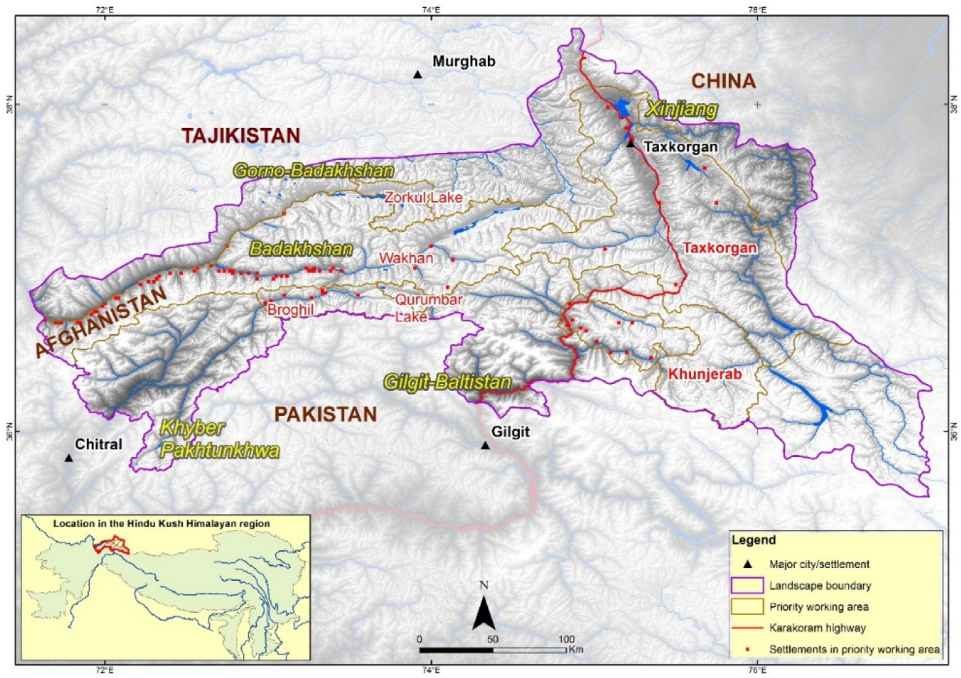


**Fig. 1.** Map of Hindu Kush Karakoram Pamir Landscape (Bam -e- Dunya) in western Himalaya.

Taxkorgan National Nature Reserve, and Tajikistan's Zorkul Nature Reserve, form the core zone of HKPL. HKPL is unique and has high cultural, economic, social, and environmental values, apart from being a significant source of ecosystem services, for local people, mainly water, fodder, fibre, medicine and firewood for domestic energy, all derived from its rich biodiversity and landscapes characterized by snow, ice, glaciers, pastures, forests and cold deserts (Wu et al., 2014). It is home to a diverse and pluralistic ethnic community of over a million Wakhi, Tajik, Kyrgyz, Serakuli, Kho, Burusho, Sheen, Yashkun, Pamiri, and Kazakh people, mostly poor and disadvantaged (Kifayat et al., 2014), coexisting with Pamirian wildlife i.e., argali sheep (*Avis amon polii*), markhors (*Capra falconeri*) and snow leopards (*Uncia uncia*), since ages. Once a part of the ancient Silk Route, HKPL is now a gateway to emerging opportunities like trade, tourism, commerce, conservation, and cultural exchange amongst the neighbouring countries (Fig 1).

### 2.2. Data collection

This article is based on review of peer-reviewed journal articles, published and unpublished reports mainly by government and international organizations, newspaper articles and blogs. The major search engine used was google scholar and Scopus. The wildlife hunting and revenue data were obtained from the information archives of the Forest and Wildlife Departments of Gilgit-Baltistan, Khyber-Pakhtunkhwa and Balochistan (Pakistan) and the State Forest Agency of Tajikistan. Ungulate populations were determined by wildlife authorities together with local communities and INGOs, mostly using direct count methods (Lewis and James, 1970) whereas, trophy hunting records for hunts (species, age, horn size) and fee (US $) were extracted from the trophy hunting records maintained by the wildlife authorities of GB, KP, and Balochistan governments.

## 3. Results and discussion

### 3.1. History

#### 3.1.1. Pakistan

The mammalian fauna of Pakistan is rich and diverse, with 173 species, of which 12 are critically endangered, 11 are endangered, 14 are vulnerable, and ten are near-threatened (CITES, 2020). Pakistan has a large range of wild sheep and goats, including 7 species and 11 subspecies, and is recognized worldwide for the preservation of Caprines (Shackleton, 2001; Nawaz et al., 2016). Hunting had been a common practice across Pakistan since ancient times, with different vocabularies, by locals and foreigners alike for various reasons. Still, the history of trophy hunting dates back to 1983, when the Wildlife Wing of the Khyber Pakhtunkhwa (then called North-West Frontier Province) provincial Forest Department introduced a state-led trophy hunting program for markhor (*C. f. cashmiriensis*) under its "Chitral Conservation Hunting Program" (Jackson, 2004; Mir, 2006; Shackleton, 2001). The program lasted for a few years until hunting of all big game animals was prohibited all over Pakistan, due irregularities, and export of trophies was completely banned (Mallon, 2013; Mir, 2006). However, after the 10th CITES meeting, the program was resumed in the designated community conservation areas, to incentivise participation of local communities' in conservation programs, and foreign hunters were allowed to export up to six markhor trophies (heads with horns) every year from the country (Shackleton, 2001). Table 1 shows an account of caprinae species and sub-species exported from Pakistan during 2000 – 2019.

The Government of Gilgit-Baltistan (then known as the Northern Areas Administration) initiated Pakistan's Community-based Trophy Hunting Program (CTHP) model in 1989, jointly with the Aga Khan Rural Support Program (AKRSP) and the World Wide Fund for Nature Pakistan (WWF-Pakistan) from Bar Valley, Nagar, primarily as a conservation trade-off, to pursue community support for wildlife conservation initiatives in the area. The CTHP is purely an incentive-based conservation program, with provision of trophy hunting in designated Community Conservation Areas (CCA) only, designed to strike a balance between conservation needs of the fragile mountain ecosystems and livelihood needs of the poor and disadvantaged mountain communities (Kifayat et al., 2014), who had been relying on ecosystem services, including wildlife, to meet their food espeically protein intake. Conservation organizations like WWF and IUCN then replicated the program in other parts of GB including Gojal, Shinaki, Skardu, Astore, and Qurumber valley under different projects (Jackson 2004; Khan et al., 2019). Now there is a strong network of 59 protected areas, including 49 community conservation areas (CCA), covering around 30% ($n = 72{,}496$ km$^2$) of Gilgit-Baltistan's total land area. Likewise, there are

**Table 1**
Export of Wild animals (Bovidae) from Pakistan (2002 – 2019).

| Species | 2000 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Boselaphus tragocamelus* | | | | | | | | | | | | | | | | 1 | 1 | | | |
| *Antilope cervicapra* | | | | | | | | | | | 0 | 2 | 0 | 2 | 1 | 2 | 3 | 6 | 1 | 0 |
| *Boselaphus tragocamelus* | | | | | | | | | | | | | | | | 1 | 1 | | | |
| *Capra falconeri falconeri* | 5 | 5 | 5 | 5 | 10 | 8 | 8 | 11 | 6 | 13 | 8 | 6 | 7 | 8 | 14 | 9 | 6 | 7 | 4 | 4 |
| *Capra falconeri megaceros* | | | | | | | | | | | | | | | | | | 2 | | |
| *Capra hircus aegagrus* | | | | | | | | | | | | | | | 24 | 21 | 18 | 24 | 21 | |
| *Capra ibex sibirica* | | | | | | | | | | | | | | | 15 | 5 | 11 | 16 | 17 | |
| *Gazella bennettii* | | | | | | | | | | | | | | | | 5 | 2 | 1 | | |
| *Ovis aries* | 1 | 2 | 1 | 2 | 14 | 21 | 20 | 26 | 29 | 27 | 21 | 22 | 29 | 24 | 31 | 28 | 24 | 1 | 21 | |
| *Ovis bochariensis* | | | | | | | | | | | | | | | | | 4 | 16 | 13 | |
| *Ovis vignei* | | | | | | | | | 1 | | | | | | | | | | | |
| *Pseudois nayaur* | | | | | | | | | | | | | | | 4 | 1 | 1 | 5 | 7 | 2 |
| *Uncia uncia* | | | | | | | | | | | | | | | | | | | | |

Endangered Near threatened Vulnerable Source: (CITES 2020)

about 165 protected & conserved areas in Khyber Pakhtunkhwa, covering 17,208 km$^2$ area and 38 Protected & Conserved Areas > 52,307 km$^2$ of Balochistan's land. The CCAs, with allocation of some area for community led trophy hunting, are notified and governed by the provincial wildlife authorities under the local Wildlife Act (1975) and amendments made thereunder (2015) by the provincial governments. The National Council for Conservation of Wildlife (NCCW) had been regulating the hunting permits for CITES-listed species but after the 18th Constitutional Amendment, CITES national office allocates hunting permits to provinces for CITES-listed species. The rest of the hunting process is facilitated jointly by the provincial wildlife departments and local communities. In Pakistan, trophy hunting quotas are set based on biannual wildlife census (spring and rut season). One out of four (25%) of total trophy size males, which in any case should not exceed 2% of total population, is allocated for CTHP, with due consideration of 1:6 male to female sex ratio, in a population while allocating quotas to ensure population viability (Zaman et al., 2019).

Before inception of CTHP in Pakistan, poaching of wildlife, especially that of mountain ungulates (ibex, markhor, urial, blue sheep) for meat (food) and sale (cash), was quite common. Excessive harvesting had pushed markhor, urial, and blue sheep to verge of extinction from the locale. CTHP, through its TH revenue, has enabled locals develop and diversify their income sources, ultimately preventing poaching and subsistence hunting in CCAs (Khan et al., 2021). Hunters turned to wildlife guardians, poaching was controlled, and populations of ungulates eventually increased. Now, markhor and snow leopard, once endangered, are listed as "near threatened" in IUCN Red list (2015). Peoples' tolerance towards predators has improved a lot, except in places where attack of common leopard (Panthera pardus) on humans is increasingly reported.

#### 3.1.2. Tajikistan

There are 51 mammal species in Tajikistan, of which four are endangered, six are vulnerable, and three are near threatened (CITES, 2020). Trophy hunting was initiated in Tajikistan in 1993, but the Safari Club International introduced conservation-hunting in 2011, in partnership with the Russian Academy of Sciences and State authorities, to conserve and manage remnant populations of Argali sheep (*O. a. polii*) (Mallon, 2013) in Tajikistan. The program remained suspended for almost two years (2008–2009) in response to global concerns about the country's overhunting of argali sheep. It was resumed in fall 2010 following the December 2009 survey results (Valdez et al., 2016). The CITES trade data shows the export of five Caprinae species from Tajikistan, predominantly of *argali and ibex* during 2000–2019 (Table 2).

State agencies in Tajikistan, such as the Environmental Protection Committee, State Forest Department, and Academy of Sciences, do not fully cooperate with the community-led conservancies and private hunting concessions. As a result, hunting pre requisits like management plans and wildlife surveys, are rarely enforced. Wildlife surveys are carried out by project teams alone and lack reliability (Rosen and Stefan, 2012) . The State Forest Agency has the mandate to allocate hunting areas, but the district administration also assigns hunting grounds without documentation and communication with the competent authority (Michel and Rosen, 2016). Regardless of the hunting area, herd structure, season, and market demand, quotas are set arbitrarily for Ibex and Argali sheep often irrespective of animal populations, market demand, and hunting time and season that challenges the sustainability of trophy hunting programmes. Twelve foreign hunters lawfully hunted 11 Siberian ibex during the three hunting seasons from 2012/13 through 2014/15 in community-based conservancies. Hunting tourism generates much more income for conservancies and community members than nature tourism in Tajikistan (Michel and Rosen, 2016).

### 3.2. Socio-ecological benefits

Wildlife have great cultural significance for local communicties. For example, ungulates are associated with fairies in folklore; a symbol of majesty. Although hunting used to be for subsistence; communities performed special rituals before embarking on hunting expeditions. Flare horned markhor is Pakistan's national animal. Since CTHP is operational, poaching of wild animals in the community conservation areas has decreased, resulting in an increase in not only the populations of wild ungulates (i.e., markhor, ibex, urial and blue sheep) across the range (Ghafoor 2014; Khan et al., 2011; Nawaz et al., 2016) but also that of carnivores (snow leopard, wolf, and lynx) in the region, particulary that of markhor in the community conservation areas of Khyber Pakhtunkhwa and Gilgit-Baltistan (Fig 2 and Fig 3). The population of Astore markhor (*C. f. falconeri*) in Gilgit-Baltistan increased from 1900 in 2012 to 2800 in 2016. The population of Kashmir markhor (*C. f. cashmiriensis*) in Khyber Pakhtunkhwa increased from 2493 in 2009–10 to 4878 in 2016–17 (Khan et al., 2016); Nawaz et al., 2016c). Markhor and snow leopard listed as endangered earlier is upgraded to "near threatened" species by IUCN in 2015 (Jabeen et al., 2015). In Balochistan, the population of Sulaiman markhor (*C. f. megaceros*) increased from 1742 in 2000 to 3518 in 2011. There is no more hunting for subsistence (food) by locals.As a result, the socio-economic outlook of the participating communities has also improved (Muhammad et al., 2019; Rasheed et al., 2012). Studies suggests CTHP has also been instrumental in changing local people's negative attitude towards endangered carnivores such as the Snow leopard (Nawaz et al., 2016) and its natural prey in CCAs (B. Khan et al., 2014; Nawaz et al., 2016b). Given an increase in a healthy population of its natural prey, snow leopards are showing less predation of livestock. For example, Torghar Conservation

**Table 2**
Export of Caprinea species from Tajikistan (2002 – 2019).

| Species | 2000 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Capra falconeri falconeri* | | 1 | | | | | | | | | | | | | 1 | 2 | 5 | 7 | 6 | |
| *Capra falconeri heptneri* | | | | | | | | | | | | | | | | | | | 6 | 1 |
| *Capra ibex sibirica* | | | | | | | | | | | | | | | 21 | 39 | 43 | 77 | 68 | 22 |
| *Ovis ammon p* | 25 | 4 | 11 | 25 | 7 | 30 | 28 | 10 | 9 | 16 | 10 | 76 | 55 | 59 | 45 | 60 | 51 | 80 | 76 | 21 |
| *Ovis aries* | 2 | | | | | | | | | | | 5 | | | | | | | | 1 |

Source: (CITES 2020)

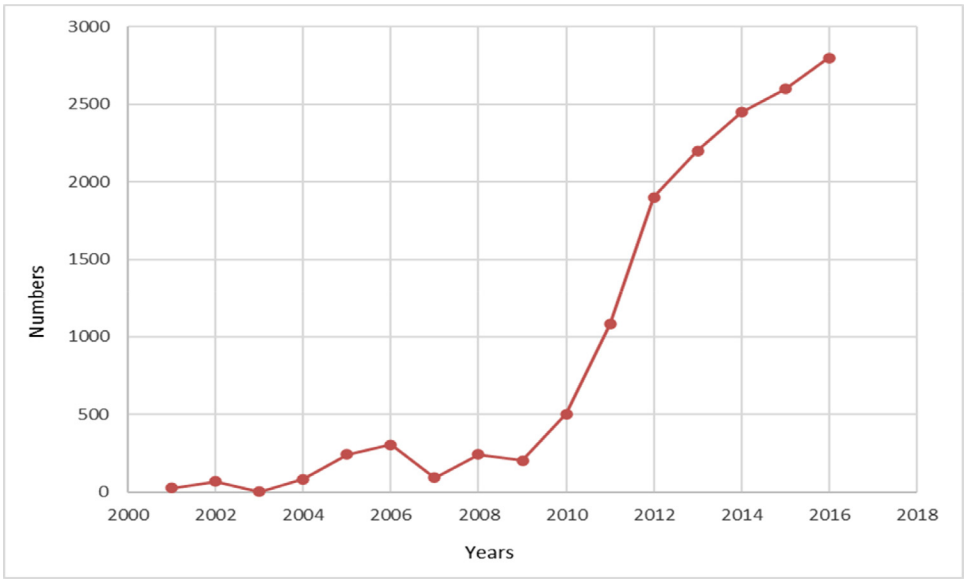


**Fig. 2.** Post CTHP population of Astore markhor (*Capra falconeri falconeri*) in Gilgit-Baltistan, Pakistan. Source: GB Forest and Wildlife Department, Government of Gilgit-Baltistan, Pakistan (2020).

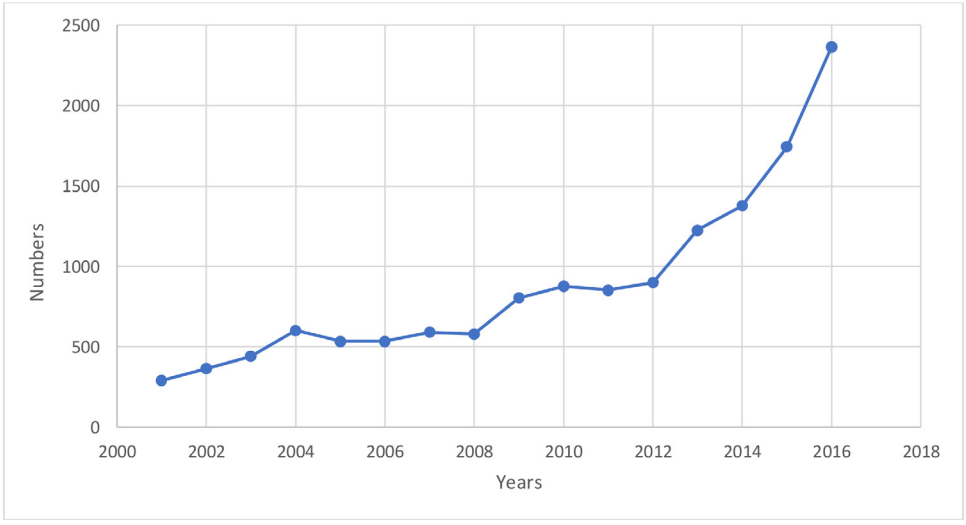


**Fig. 3.** Post CTHP population of Kashmir markhor (*Capra falconeri cashmeriensis*) in Khyber Pakhtunkhwa, Pakistan. Source: KP Wildlife Department, Government of Khyber-Pakhtunkhwa, Pakistan (2019).

Program in Balochistan, with provision of trophy hunting in CCAs, not only helped control poaching and illegal hunting of Balochistan urial and Sulaiman markhor by local tribesmen and outsiders (Funk, 2015; Valdez et al., 2016) but also cascaded protection and eventually restored decreasing numbers of the other associated wildlife species in the project area (Ahmed et al., 2001; Woodford et al., 2004). Similarly, the population of trophy size markhors (>9 year age/horn size > 40 inches) in remote Kaigah valley of Kohistan (Khyber-Pakhtunkhwa) has increased by 5.13% over the last eight years (Ghafoor, 2014). Community-led trophy hunting programmes showed an evident impact on the conservation of CITES-listed markhor populations in Gilgit-Baltistan (Fig 2) and Khyber-Pakhtunkhwa (Fig 3) and helped protect its associated biodiversity in the area (Johnson 1997; Woodford et al., 2004; B. Khan et al. 2014).

The increase in markhor numbers in Pakistan led to improving its conservation status in the IUCN Red List (2018) from endangered to a near threatened species since 2015. Since trophy hunting programme is a significant source of income for the local communities and the governments, other forms of hunting are fully restricted, and poaching has reduce significantly in all community conservation areas (Muhammad et al., 2019; Nawaz et al., 2016b). People are more involved and dedicated to conservation efforts, and their attitude towards wildlife has favourably changed (B. Khan et al. 2014a, Ali 2015). Likewise, herders in Baltistan's remote communities are highly motivated to

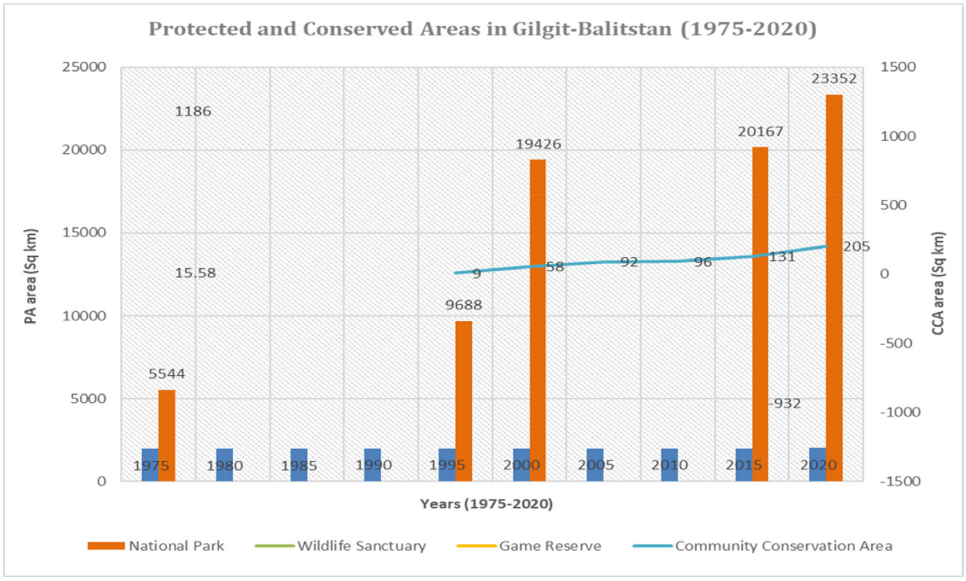


**Fig. 4.** Protected and Conserved Area (Km$^2$) in Gilgit-Baltistan, Pakistan
Source: GB Forest and Wildlife Department, Government of Gilgit-Baltistan, Pakistan (2020). Trend line shows a phenomenal increase in protected and conserved areas in Gilgit-Baltistan, Pakistan.

protect ungulates in their vicinity (Hussain, 2003). As a result of CTHP, socio-economic conditions have improved but people's attitude towards wildlife has also changed positively and the species abundance in the area has increased manifolds (Figs. 2 and 3). The programme has also resulted in an increase of protected area coverage in Pakistan, where several critical micro-habitats, not-protected previously under any category of protected areas, are protected under community conservation areas [Fig. 4].

Tajikistan has three types of hunting regimes, including private commercial concessions, family-based hunting areas, and the recently formed "community-based conservancies" that offer economic incentives to local people for their anti-poaching efforts to protect trophy animals, i.e., ibex (*C. ibex sibirica),* Argali sheep (*O. a. polii*) and Bocharan markhor (*C. f. heptneri*) in their respective regions (Rosen and Michel 2012). The commercial trophy hunting concession of Murghab, covering ~2000 km$^2$ area in the Southeastern Pamirs, is reported to be the most effective conservation area amongst all private hunting concessions of Tajikistan. About 1500 Argali sheep were counted by Fedosenko and Lushchekina in 1995 (Fedosenko and Lushchekina 2005); 2200 in 2005 (Schaller and Kang 2008); 8649, 8392 and 7663 in (Valdez et al., 2016) in 2009/10, 2010/11 and 2011/12 surveys, respectively (Fig. 5).

Recent research showed a higher density of wild ungulates and snow leopards in the hunting concessions that suggests trophy hunting is an effective instrument for predators and their prey to achieve conservation goals (Kachel et al., 2017). Other studies revealed that the population of Tajikistan Markhor had increased in the community conservation areas due to TH incentives and improved community care for wildlife (Michel et al., 2015a).

### 3.3. Economic benefit

With the 80% share of trophy hunting revenue going to local communities for wildlife conservation, livelihood improvement, and social development programs, CTHP has become a sustainable livelihood strategy, which has played an important role in changing community's perception about wildlife, especially large predators. It has encouraged local communities to protect biodiversity in general and trophy animals in particular, in their respective community conservation areas, making conservation programs sustainable (Ghafoor, 2014).

Hunting permits allocated by CITES national office to provinces for 12 markhors (four each of *Astore markhor, Kashnir markhor and Sulaiman markhor)* are auctioned by the provincial wildlife authorities along with hunting permits for non CITES-listed species, i.e., Balochistan urial, Blue sheep, and ibex through provincial bids. Local and foreign hunters and outfitters participate in auctions and buy permits for trophy hunting. Eighty percent of the income earned from trophy hunting goes to local communities, whereas the wildlife department retains 20 percent of the revenue for monitoring, equipment, and logistic expenses. Trophy hunting fee varies from species to species across conservancies, depending on the time and place of hunting and the hunter's origin. The official records from wildlife and trophy hunting archives of the provincial Wildlife Departments showed that an international hunter pays US$ 60,000–100,000 for a Markhor, US$ 8000–10,000 for a Blue sheep, and US$ 2500–3000 for an ibex. In contrast, a local hunter can pay PKR 50,000–110,000 (~US$ 350–700) for an ibex but can not avail a permit for Markhor and Blue sheep (Jackson, 2004). Studies show that the hunting fee for Ibex and Blue sheep have not changed significantly, while the hunting fee for Markhor has markedly increased from US$ 25,000 in 1999 to US$ 55,000 in 2005–06 (Ali 2008; Woodford et al., 2004) and US$ 100,000 in 2018–19 (Khan et al., 2019). Until the year 2000, community share was 75% of the total hunting fee, but it was increased to 80% in conformity with CBD COP11 commitments for more community benefit unde sustainable resource use regime (Jackson, 2004; Shackleton, 2001). Revenue generated through trophy hunting of Markhor in Toshi, Goleen, and Kaigah community conservation areas during 1998 - 2007 was around US$ 1.056 million, including US$ 843,300 community share (Ali 2008). Revenue generated through the trophy hunting programs was comparatively higher in 2013–14 and 2018–19 both for Khyber Pakhtunkhwa and Gilgit-Baltistan, approximately 1–2% of the total revenue from tourism sector (ICIMOD, 2021). Since the beginning of CTHP, GB and KPK have received a total of US$ 7.40 million, and local communities received some 5.9 million USD for nature conservation, community welfare, and socio-economic development activities in the region (Figs. 6, 7, 8, & 9).

In Tajikistan, trophy hunting activities in private and commercial concessions have already proved their marketability (Michel and Rosen, 2016; Rosen and Stefan, 2012). Although distribution of trophy hunting fees between government and local communities varies from place to place, but on average, government receives a bigger share (60%) as compared to what local communities receive (40%) out of total revenue earned from hunting in community conservation areas. The larger government share aims at improving wildlife protection and habitat management. In contrast, the community share (40%) is used for the community's livelihood development and income diversification

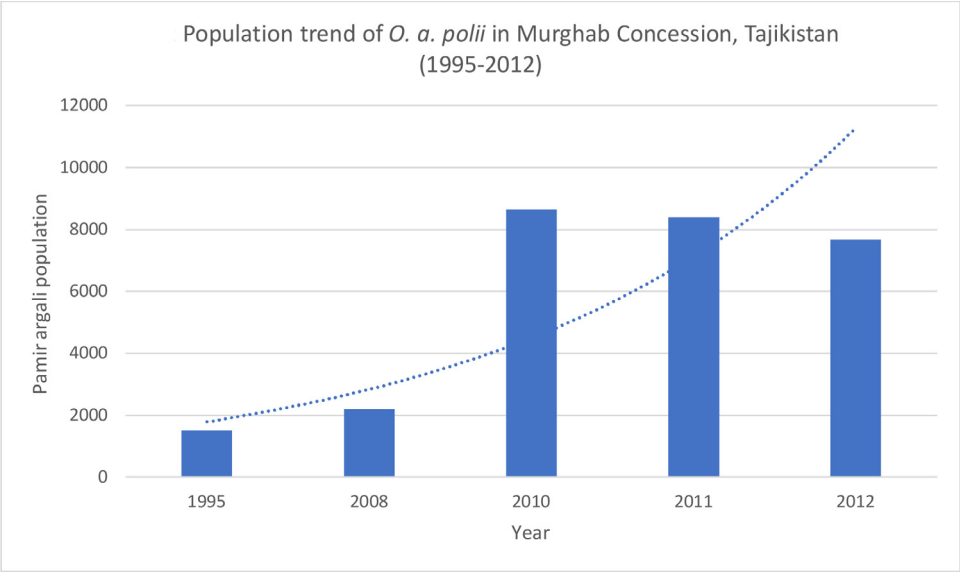


**Fig. 5.** Population trend of Marco Polo Sheep (*Ovis ammon polii)* in Murghab Concession, Tajikistan (1995–2012). Source: Fedosenko. and Lushchekina2005; Schaller and Kang (2008) and (Valdez et al., 2016).

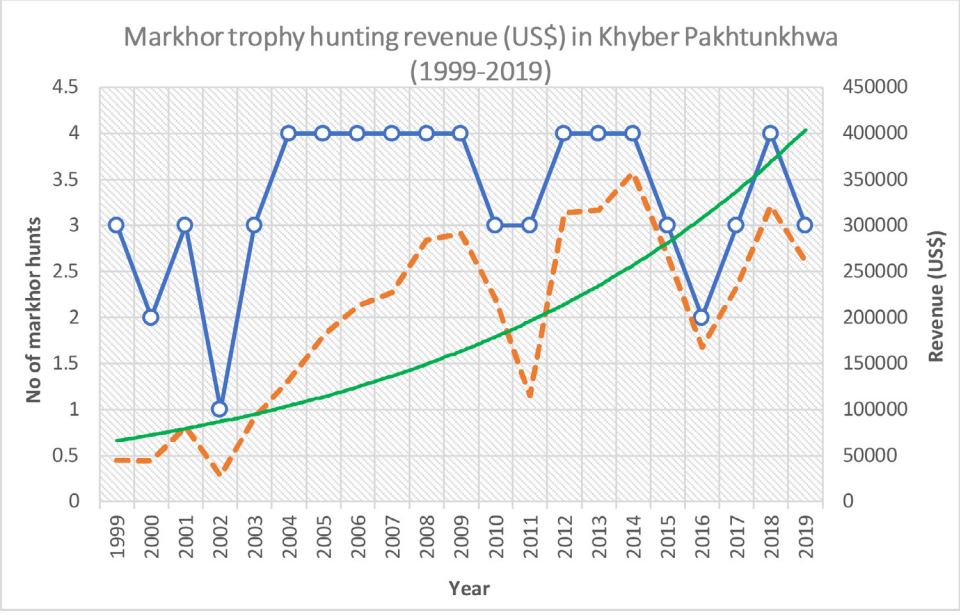


**Fig. 6.** Markhor trophy hunting and revenue (US$) in Chitral, Khyber Pakhtunkhwa, Pakistan (1999–2019). Source: Markhor trophy hunting records of Wildlife Department, Government of KP (2019).

programs. In 2010–11, the government received some 770,000 USD for 51 Argali hunting permits (Rosen and Stefan, 2012), 60% of which was supposed to be invested in community development and nature conservation programs in the conservation area (Rosen and Stefan, 2012). Like Pakistan, trophy hunting fees vary from time to time and place to place. Hunters pay up to US$ 100,000 for a markhor hunt.

### *3.4. Livelihood enhancement and community wellbeing*

Community-based trophy hunting programs benefit both the wildlife species and local communities by integrating the principles of sustainable natural resource use and participatory rural development for the good of both nature and people, particularly in the remote and disadvantaged mountain societies of South and Central Asia (Funk 2015; Khan et al., 2011; Rasheed and Ahmed, 2015). In Pakistan, 80 per cent of the CTHP revenue from CCAs goes directly to local communities, which is partly utilized for conservation activities i.e., wildlife watch & ward, livestock vaccination, and habitat improvement etc., (30%) and community welfare, livelihood improvement, and poverty alleviation programs (70%) in community conservation areas. For instance, in Torghar Conservation Project, community share of trophy hunting fee was used to generate employment opportunities for villagers as community wildlife guards, micro-enterprise development, afforestation, fodder cultivation, kitchen gardening, beekeeping, maintaining roads and water channels, and raising orchards to increase household income and improve livelihood (Ahmed et al., 2001; Rasheed et al., 2012; Shackleton, 2001; Woodford et al., 2004). Likewise, in Tushi Conservation area of Chitral, CHTP revenue was invested in construct and repairing irrigation courses, building a Basic Health Unit (BHU), and training rural women as Traditional Birth Attendants (TBA), benefiting 94% of the local population (Tahir and Ahmed, 2015). Education aids and scholarships were offered to needy students for education. Interest-free loans have been given to skilled women for agri-businesses and micro-enterprises in Gojal, Hunza (Khan et al., 2011; Nawaz et al., 2016). In Baltistan, trophy income was invested in collaborative projects on constructing primary school building and establishing Participatory Learning Centers at Kachura and Hushey villages. In Gilgit, conservation communities have used CTHP revenues to construct and repair jeepable roads, sus-

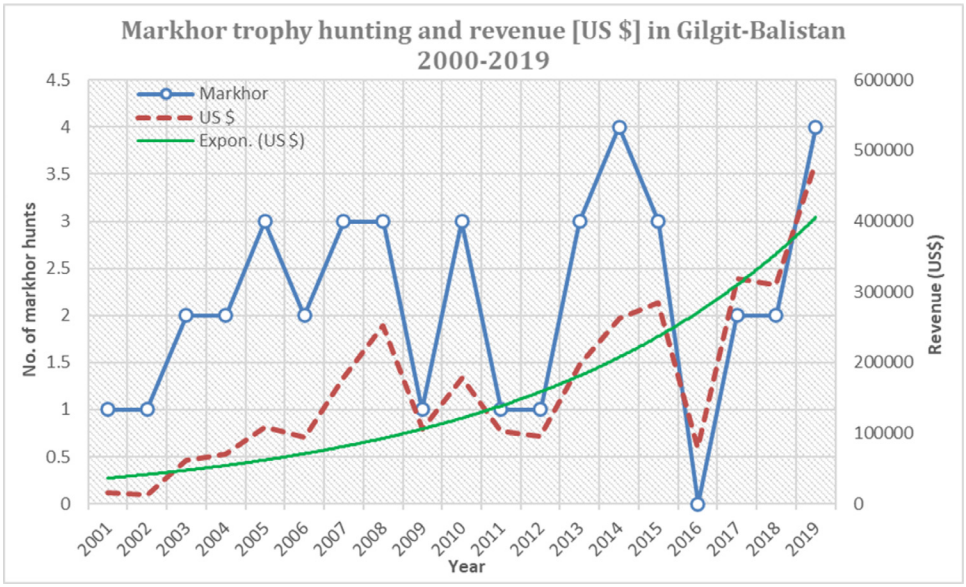


**Fig. 7.** Markhor trophy hunting and revenue (US$) in Gilgit-Baltistan, Pakistan (2000–2019). Source: Trophy hunting records of Forest and Wildlife Department, Government of GB (2019).

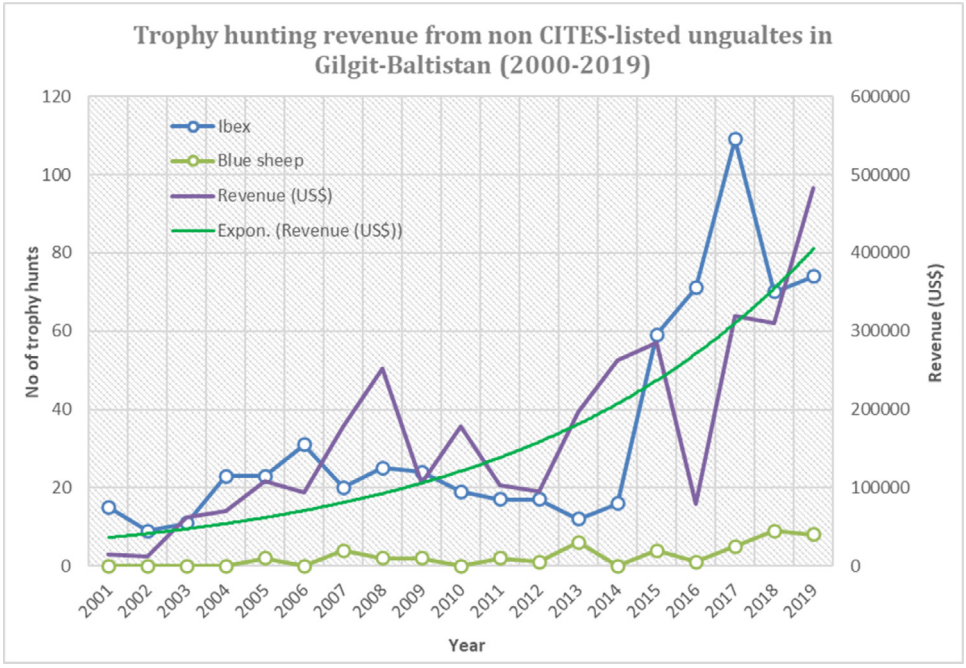


**Fig. 8.** Trophy hunting revenue from non-CITES-listed ungulates in Gilgit-Baltistan, Pakistan [2000–2019]. Source: Trophy hunting records of Forest and Wildlife Department, Government of GB (2019).

pension bridges, and pony-tracks for improved connectivity and ecotourism (Mir, 2006). Khunjerab Villagers Organization (KVO) has set new horizons of participatory rural development by establishing a hostel for girls at Gilgit town. For their educational activities, the borders receive transport facilities solely from the money created by the trophy hunting programme for their education (Wood, 2006). In Gojal, women in particular, get a 20 percent share of each hunt for the Women Conservation Fund (WCF), which provides micro-credit services and low-interest loans to women for small agribusinesses and value addition. A significant portion of the income from CTHP was also distributed as "cash for a livelihood" by the Sakwar (65%) and KVO (20%) communities to their member households.

In Tajikistan, trophy hunts of Bocharian markhor generated an estimated US$ 100,000 per hunt (McEnroe, 2017; Rosen and Stefan, 2012). Fifty percent of the trophy hunting revenue was used directly for species conservation, i.e., protection and habitat improvement. The rest is contributed to raising awareness about the conservation value of markhor and harnessing local support to protect other associated species and their habitats. In all the four community-led conservancies, recovery of Markhor populations has been successful mainly because of the trophy hunting revenue, employing local people as wildlife guards, and funding a range of community development initiatives. In other places, trophy hunting fees were used to improve habitats and to pay community wildlife guards for anti-poaching tasks. Trophy hunting fee has also been used to provide clean water, health services and educational facilities (IUCN, 2016). In private and community concessions, trophy hunting revenue was allocated for prey-animal surveys and snow leopard camera-trapping studies. The prestigious Markhor Prize was also given to Tajikistan to recognize its successful markhor conservation through community-based trophy hunting programs (Michel et al., 2015).

### 3.5. CHTP governance and policy

In Pakistan, wildlife resources are conserved and managed primarily under the provincial Wildlife Act (1975), whereas, CITES law (2012) applies to CITES listed species. National Council for Conservation of Wildlife - a constitutional body formed in 1974, was responsible for policy and governance of CITES-listed species till recent past. It was the only wildlife-related multi-stakeholder forum until the 18th Constitutional Amendment (2010), which led the foundation of "Community-based Trophy Hunting Program" for Markhor in the early 1990s, with the permission of CITES COP10, to incentivize local communities for conservation of wildlife in designated Community Conservation Areas. CITES national office now regulates the hunting of CITES-listed species, whereas, the provincial wildlife departments manage populations of non-CITES species. Recently, a draft National Wildlife Policy (2018) has also been prepared by the federal ministry to address emerging issues like illegal wildlife trade and human-wildlife conflict. The policy also calls on state bodies to work closely with conservation NGOs to ensure transparency and productivity in trophy hunting programmes.

In community-based conservation, governance of natural resources starts from the ground up and involves the following networks and linkages across various levels of organization with the objective that income from nature management serves the twin goal of conservation of biodiversity and improving the lives of local people:

1. Gilgit-Baltistan Wildlife Management Board, based on annual wildlife census data, allocates hunting permits to conservation communities for non-CITES listed species, whereas National Council for Conservation of Wildlife (NCCW/CITES focal point) allocate permits for markhor – a CITES listed species in Pakistan.
2. Provincial Forest, Wildlife and Parks departments, conduct joint wildlife census surveys (Govt+Community+NGO) every year, determine trophy quotas, auction trophy hunting permits, collect and disburse hunting fees.
3. Private Outfitters / tour operators, coordinate with potential hunters and facilitate TH process in the field and help in acquiring export permits for trophies.
4. Local communities, offer hospitality, transport, and guidance in CCAs, and help government in protection of wildlife, especially trophy animals.

Since 2019, Government of Gilgit-Baltistan (Pakitan) has decided to retain 100% hunting permit fees in case of non-hunt unless for reasons as given below. The hunter may, however, avail the chance anytime within the same trophy hunting season again. This amount will be distributed in equal halves, otherwise, between Community and Department (Zaman et al., 2019).

In Tajikistan, no clear legal and administrative instruments are available for trophy hunting. Tajikistan is yet to become a CITES signatory. A proposed law on hunting and the hunting industry aimed at streamlining existing laws and regulations, including the community based trophy hunting clauses, is being debated (Mallon, 2013). Currently, the Committee on Environmental Protection (CEP) is responsible for managing wildlife and protected areas, setting up a Commission to allocate hunting permits for trophy hunting, and assigning hunting areas to private commercial concessions and community conservation areas in Tajikistan.

### 3.6. Challenges

Conflict, competition, and habitat fragmentation are amongst the primary drivers of biodiversity loss and declining terrestrial wildlife populations in the HKH region (Bolch et al., 2019; UNEP, 2020). Well-regulated, community conservation programs, with sustainable resource use provisions, have played an essential role in delivering conservation and livelihood benefits to biodiversity and communities (IUCN, 2016). Contrarily, unregulated and poorly managed hunting programs can lead to several social and ecological challenges including rapid declines in globally significant populations of rare and unique wildlife species (Nordbø et al., 2018) even in conserved and protected areas. There has been increasing pressure and campaigns to ban trophy hunting, but there are evidence that resources generated through trophy hunting helps to prevent habitat conversion and biodiversity loss and provide support in conservation actions in protected areas (Dickman et al., 2019). Community based trophy hunting progams have been recognized as vital conservation tools for wildlife management in Pakistan and Tajikistan. However, there are serious technical, administrative, and legal issues as well that limit and challenge the overall efficacy of community-based trophy hunting programs in the region (Khan et al., 2011; Khan et al., 2012; Michel and Rosen, 2016; Muhammad et al., 2019; Nawaz et al., 2016), including but not limited to the following discussed here:

1. Community organizations, management plans, and regular wildlife surveys are the pre-requisites of community-based trophy hunting programs, but these requirements are not fully enforced. In some areas, wildlife surveys are still conducted nn-scientifically, and almost exclusively and hence are non-reliable (Rashid et al., 2020a). Lack of high-quality data impedes scientific analyses and understanding of trophy hunting impacts on ramnant populations of target species, and therefore result in a lack of informed decisions and focused conservation policies, which is likely to have a more negative impact on group tendencies, herd dynamics and its viability, as often people are inclined towards protecting one animal on the stake of others. A study conducted to estimate the snow leopard population in the Baltistan district of Gilgit-Baltistan between 1998 and 2001 suggested that non-targeted conservation policies, particularly those for trophy hunting of ungulates, could be one of the reasons contributing to the decline snow leopards in that period (Hussain, 2003; Jackson, 2004). In comparison, trophy hunting concessions for Ibex and Argali sheep have shown greater densities of the threatened Snow Leopards in Tajikistan than surrounding areas with no practice of trophy hunting, probably due to greater prey densities and controlled poaching (Kachel, 2014). There should be minimum survey standards for community conservation areas, including robust scientific methods and protocols for essential pre hunting wildlife surveys. Staffs of the responsible state agencies (Wildlife departments) and community guards should be trained in necessary wildlife survey skills and management techniques, i.e., species identification, counting, sex & age determination, and data recording (Jackson, 2004; Khan et al., 2011; Rahman and Din, 2016).
2. Allocation of hunting quotas and permit to commercial and non-commercial hunting areas has been a severe challenge to the success of CTHP in both Pakistan and Tajikistan. In Pakistan, issues concerning trophy hunting fee refund, uncertain weather, failure to show up, missed hunting, lack of hunters, and increasing competition amongst communities to obtain more permits than others have surfaced over time. Conservation communities demand allocation of more and more hunting permits often irrational of the number, size, and structure of species herds in their areas – primarily based on total numbers in the herd or total population rather than considering the herd structure and critical male: female, female: kid and male: trophy size male ratios. There are several examples of over harvest and under-age harvesting of Ibex in community conservation areas. Excessive culling of large males from the herd may have severe genetic and biophysical implications affecting the viability of remaining populations (Ejaz and Din, 2016). Moreover, the hunting season should be pre-determined scientifically, and hunting regulated accordingly. Extended hunting season can have detrimental effects on the health, vigour, and growth of animals left in the herd and adversely affect the new recruitment.

Similarly, in Tajikistan, allocation of hunting permits to private and community hunting areas is more on a first-come, first-served basis and often influenced by political and financial powers in the case of higher competition for hunting blocks. Legal and institutional ambiguity further complicates the situation and paves the way for corruption. The State Forest Agency is formally authorized to assign hunting grounds, but district authorities also assign hunting areas without proper documentation and prior coordination with the competent authority. Quotas are set arbitrarily often irrespective of animal populations, market demand, and hunting time and season. Likewise, an association of private concessions has the right to distribute argali permits countrywide, often allocating no permits to community-based conservancies (Michel and Rosen, 2016).

There is a dire need for a transparent and pragmatic approach for quota allocation, under one single state authority, purely based on total population, herd structure, and trophy size animals in the herd derived from scientific census records, on merit. Quotas for hunting must be allocated well ahead of time to ensure proper negotiation and preparation for the hunting program.

3. Another community conservation dilemma is about the community interest, which revolves around trophy animals. They are keen to protect them against direct and indirect killing and least committed to safeguarding predators and their associated biodiversity. Climate change and human encroachment have intensified human-wildlife conflicts on shared habitats, enormously increasing competition (B. Khan et al., 2014) while increasing chances of pathogen transfer and zoonosis (Dagleish et al. 2007), which if not taken holistically, may have unprecedented socio-ecological implications for both humans and biodiversity in the mountain areas. There is an increasing need to protect both the prey and the predators for a holistic biodiversity conservation program.
4. Allocation of trophy hunting fees to local administration, meagre though, has been of great significance to arouse and maintain their interest in wildlife conservation both in Pakistan and Tajikistan. In both countries, investment by beneficiaries in the management of key wildlife populations and their habitats is still insufficient. So far, local authorities lack an adequate budget for proper monitoring and regulation of trophy hunting areas. However, in Pakistan, local communities get 80% of the total hunting fee lack Investment Plans for effective utilization of trophy hunting revenues. In theory, they are supposed to invest at least 30% of total earned income in protecting and conserving wildlife populations and their habitat (Khan et al., 2011).

In Tajikistan, the lack of local budget authority and transparency constrains the use of hunting revenues for community development. Despite having much less funding, conservation areas are still practical. They perform their activities either voluntarily or in the context of other activities, i.e., livestock grazing.

This demands for devising and enforcing a comprehensive, equitable resource sharing mechanism for distribution of trophy hunting revenues between conservation communities and local authorities, with proper investment plans in place, for inclusive and integrated conservation and development targets and agreed monitoring and accountability measures for the wise and judicious use of hunting revenues, for better management of community-based trophy hunting programs benefiting both the local people and biodiversity.

5. Illegal and unreported hunting of threatened wildlife species is another serious threat to remaining populations of ibex, snow leopard, Marco Polo sheep, and other wildlife species (Michel et al., 2015a). Corruption and lack of transparency are still threatening the conservation effectiveness of community-based conservancies (IUCN, 2016). In some CCAs, internal control, peer pressure, and community support are insufficient to ensure compliance, and the work is further hampered by outsiders and influencers, including police and other officials, poaching or hunting without authorization by the conservancies (Michel and Rosen, 2016; Rosen and Stefan, 2012).

Therefore, it requires proper incentives, education, organic and instrumental leadership from communities and government, appropriate policy, and shared control and authority with the community to control illegal hunting (Ullah and Yong 2020). A successful trophy hunting program must ensure transparent systems for quota allocation, fund utilization, and required knowledge and capacity to implement conservation plans (Ali 2015; Khan et al., 2011; M.Z. Khan et al. 2014; Muhammad et al., 2019).

6. In most cases, trophy hunting programs have failed to integrate gender effectively. Women in Gilgit-Baltistan and Chitral lack control of land and other natural resources, and therefore, their contributions seldom influence conservation decisions at scale. Although they participate in VCC meetings and other social activities at the village level, their voices rarely echo high-level decision forums. Taboos and cultural obstacles are blamed for this negligence by authorities and CBO management (Tahir and Hameed, 2015). Women are engaged in livestock rearing, growing vegetables, and other on and off-farm tasks in addition to routine household activities. From conceptualization to implementation and monitoring of the program, their engagement will improve the process and help achieve conservation goals more effectively. In Gojal, where women actively participated in conservation discourse, speak highly of the programme's impact on their lives and livelihoods (Wood, 2006).
7. The absolute dependence of conservation communities on trophy hunting revenues for income generation is potentially dangerous, both socially and economically. Such a total reliance on trophy hunting may gradually shift their focus from routine livelihood activities in Pakistan. It may stop progressing further to explore additional and alternative options and opportunities beyond their conventional livelihood strategies and economic system, which can be a potential issue if, for some reason, trophy hunting ceases to be a viable option, as it was for some time post 9/11. A situation like this may lead either to enhanced poverty and unemployment or accelerate illegal hunting of wild animals (Khan et al., 2011). Covid-19 pandemic and the subsequent restrictions on importing trophies into the Europe and US during 2020 also risk sustainability of CTHP.

Likewise, most community conservancies in Tajikistan receiving minimal cash income often rely on their staff motivated by the occasional tourism and hunting income, meat obtained in hunts, and some subsistence hunting. Achieving the latter's sustainability is a challenge as wildlife populations in conservancies are too limited to support large harvests, and subsistence hunting poses a risk of reducing trophy hunting opportunities.

While still serving local communities' interests through sustainable use practices, it is high time for the governments to manage community hunting areas as "sites of special scientific and tourism interest" to promote conservation and diversify income options for long-term sustainability. Biodiversity credit programs can be one such opportunity for future consideration.

### 3.7. Future direction

Although very few studies have been conducted on ungulate population status in the HKPL region (Salas et al., 2018; Wang et al., 2018). Some of the accessible ones suggest a dramatic decrease in Marco Polo sheep in Khunjerab National Park over the past two decades (Haider et al., 2018). Some others attribute increasing sheep population in conservancies to sustainable resource use programs (Michel et al., 2015a). There are issues in some areas about the sustainability of

species-specific hunting programs. Wildlife surveys are typically performed by wildlife watchers and community watchers, which usually take three to four days and report animal sightings in sample habitats. Because of the lack of robust wildlife tracking systems, accurate data is seldom available, and quota allocation is often unclear. Research collaboration at the landscape level for scientific and joint monitoring of wildlife, habitat mapping, and cross-border movement of trophy animals is urgently needed to set agreed scientific standards for conservation hunting programs. Scientific data on the population and distribution of trophy species will serve conservation goals and can be used to allocate quotas for trophy hunting (Raza et al., 2015). Very little is known about the community perspective of trophy hunting revenue and its use in community development programs. Future emphasis should be on understanding the complex socio-ecological aspects of mountain ecosystems, building transparent, inclusive and equitable benefit sharing systems at local levels, and promote thinking beyond trophy hunting programs, to build adaptive capacities for resilient mountain societies and ecosystems.

## 4. Conclusions

In conclusion, the community-based trophy hunting programs offer numerous economic and ecological benefits, including finances for the protection and conservation of threatened and endangered wildlife species and livelihood support to local communities. The trophy hunting programs in Pakistan and Tajikistan have served two goals, although they differ slightly in design: increased populations of key wildlife species and improved economy and community wellbeing. However, it is crucial to improve the present arrangements to a more robust and pragmatic conservation approach where conservation focus is inclusive, holistic, and broadly ecosystem-based, rather than focusing on a species, with a viable incentive package benefiting biodiversity [*species, habitats, and ecosystems*] and local communities (Khan et al., 2011; Muhammad et al., 2019; Rashid et al., 2020). Via community-based trophy hunting programs in Pakistan and Tajikistan, the principle of involving local communities in wildlife conservation has been a successful conservation model for mountain regions, which can be replicated in other parts of HKPL and beyond to benefit biodiversity and local communities.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## CRediT authorship contribution statement

**Lipy Adhikari:** Writing – original draft. **Babar Khan:** Methodology, Writing – original draft, Writing – review & editing. **Srijana Joshi:** Conceptualization, Writing – review & editing, Methodology. **Long Ruijun:** Conceptualization, Supervision. **Ghulam Ali:** Writing – review & editing. **Ghulam Muhammad Shah:** Data curtion. **Muhammad Ismail:** Writing – review & editing. **Kosar Bano:** Writing – review & editing. **Binaya Pasakhala:** Writing – review & editing. **Ajaz Ali:** Writing – review & editing.

## Acknowledgments

The core funds of ICIMOD, contributed by Afghanistan, Australia, Austria, Bangladesh, Bhutan, China, India, Myanmar, Nepal, Norway, Pakistan, Switzerland, and the United Kingdom, partially supported this study. Swedish International Development Agency (SIDA), Austrian Development Agency (ADA), and the German Federal Ministry for Economic Cooperation and Development through its German Agency for International Cooperation financed the study and made this publication possible. The views and interpretations in this publication are those of the authors. They are not necessarily attributable to ICIMOD and do not imply the expression of any opinion by ICIMOD concerning the legal status of any country, territory, city or area of its authorities, or concerning the delimitation of its frontiers or boundaries, or the endorsement of any product.

## References

Ahmed, J., Tareen, N., Kahn, P., 2001. Conservation of Sulaiman Markhor and Afghan Urial by Local Tribesmen in Torghar, Pakistan. Lessons Learned: case Studies in Sustainable Use. 12. Int. Union Conserv. Nat. Noragric 13–50.

Ali, H., 2015. Socio-economic Benefits of Community Based Trophy Hunting Programs. Environ. Econ. 6, 9–17.

Ali, S., 2008. Conservation and Status of Markhor (*capra falconeri*) in the Northen parts of North West Frontier Province. The University of Montana Missoula, MT, Pakistan.

Baker, J.E., 1997. Trophy hunting as a sustainable use of wildlife resources in southern and Eastern Africa. J. Sustain. Tour. 5, 306–321. doi:10.1080/09669589708667294.

Bolch, T., Shea, J.M., Liu, S., Azam, F.M., Gao, Y., Gruber, S., Immerzeel, W.W., Kulkarni, A., Li, H., Tahir, A.A., Zhang, G., Zhang, Y., 2019. Status and Change of the Cryosphere in the Extended Hindu Kush Himalaya Region. The Hindu Kush Himalaya Assessment doi:10.1007/978-3-319-92288-1_7.

CITES, 2020. CITES Trade Database [WWW Document]. URL https://trade.cites.org/ .

Coltman, D.W., O'Donoghue, P., Jorgenson, J.T., Hogg, J.T., Strobeck, C., Festa-Bianchet, M., 2003. Undesirable evolutionary consequences of trophy hunting. Nature 426, 655–658. doi:10.1038/nature02177.

Conrad, K., 2012. Trade bans: a perfect storm for poaching. Trop. Conserv. Sci. 5, 245–254. doi:10.1177/194008291200500302.

Corlett, R.T., 2007. The Impact of Hunting on the Mammalian Fauna of Tropical Asian Forests. Biotropica 39, 2092–2303.

Costanza, R., Daly, L., Fioramonti, L., Giovannini, E., Kubiszewski, I., Mortensen, L.F., Pickett, K.E., Ragnarsdottir, K.V., De Vogli, R., Wilkinson, R., 2016. Modelling and measuring sustainable wellbeing in connection with the UN Sustainable Development Goals. Ecol. Econ. 130, 350–355. doi:10.1016/j.ecolecon.2016.07.009.

Crosmary, W.G., Côté, S.D., Fritz, H., 2015. Does trophy hunting matter to long-term population trends in African herbivores of different dietary guilds? Anim. Conserv. 18, 117–130. doi:10.1111/acv.12144.

Damm, G., 2008. Recreational Trophy Hunting:"What do we know and what should we do?". Best Pract. Sustain. Hunt. 5–11.

Di Minin, E., Leader-Williams, N., Bradshaw, C.J.A., 2016a. Banning Trophy Hunting Will Exacerbate Biodiversity Loss. Trends Ecol. Evol. 31, 99–102. doi:10.1016/j.tree.2015.12.006.

Di Minin, E., Leader-Williams, N., Bradshaw, C.J.A., 2016b. Trophy Hunting Does and Will Support Biodiversity: a Reply to Ripple et al. Trends Ecol. Evol. 31, 496–498. doi:10.1016/j.tree.2016.03.010.

Dickman, A., Rosie, C., Paul, J.J., Maxi, P.L., Dilys, R., 2019. Trophy hunting bans imperil biodiversity. Science (80-.) 365, 873–875.

Ejaz Ur Rahman and Jaffar Ud Din, 2016. Pre Trophy Hunting Quota Allocation Survey of Himalayan Ibex in Chipursan Valley, District Hunza, Gilgit-Baltistan rut Season Survey report. Wildlife, Dep. Gilgit-Baltistan For. Complex, Jutial, Gilgit.

Fedosenko, A.K., Lushchekina, A.A., 2005. Population Status of the Pamir argali (Marco Polo sheep) in Tajikistan.

Frost, P.G.H., Bond, I., 2008. The CAMPFIRE programme in Zimbabwe: payments for wildlife services. Ecol. Econ. 65, 776–787. doi:10.1016/j.ecolecon.2007.09.018.

Funk, S., 2015. Challenging the Win-Win Proposition of Community-Based Wildlife Management in Tanzania A case of Burunge WMA. University College London, UK.

Ghafoor, A., 2014. Sustainabilty of Markhor trophy Hunting Programme in District Kohistan Pakistan. Universiti Sains Malaysia.

Haider, J., Khan, M.Z., Anwer, M., Ali, S., Ali, H., 2018. Population status and migration trends of Marco Polo argali (Ovis ammon polii) in Pakistan. Mammalia 82, 481–485. doi:10.1515/mammalia-2017-0121.

Hariohay, K.M., Jackson, C.R., Fyumagwa, R.D., Roskaft, E., 2018. Trophy Hunting Versus Ecotourism as a Conservation Model? Assessing the Impacts on Ungulate Behaviour and Demographics in the Ruaha-Rungwa Ecosystem, Central Tanzania. Environ. Nat. Resour. Res. 8, 33. doi:10.5539/enrr.v8n2p33.

Harris, R.B., Pletscher, D.H., 2002. Incentives toward conservation of argali Ovis ammon: a case study of trophy hunting in western China. Oryx 36, 373–381. doi:10.1017/S0030605302000728.

Hussain, S., 2003. The status of the snow leopard in Pakistan and its conflict with local farmers. Oryx 37, 26–33. doi:10.1017/S0030605303000085.

ICIMOD, 2021. Assessment of Organic Potential in Gilgit-Baltistan - Final (unpublished). Kathmandu, Nepal.

IUCN, 2016. Briefing paper: Informing decision On Tropy Hunting.

Jackson, R., 2004. Pakistan ' s Community-based Trophy Hunting Programs and Their Relationship to Snow Leopard Conservation Prepared by : Rodney Jackson 18030 Comstock Ave, Sonoma, CA 95476 Email : Rodjackson@Mountain.Org For consideration By The Snow Leopard Network (SL. Ratio 1–8.

Johnson, K.A., 1997. Trophy hunting as a conservation tool for Caprinae in Pakistan. In: Freese, C.F. (Ed.), Harvesting Wild Species: Implications for Biodiversity Conservation. The Johns Hopkins University Press, Baltimore, pp. 393–423.

Kachel, S.M., McCarthy, K.P., McCarthy, T.M., Oshurmamadov, N., 2017. Investigating the potential impact of trophy hunting of wild ungulates on snow leopard Panthera uncia conservation in Tajikistan. Oryx 51, 597–604. doi:10.1017/S0030605316000193.

Khan, A.A., Babar, K., Muhammad, A., Garee, K., 2011. An Assessment of Community Based Trophy Hunting Programme in Gilgit-Baltistan, Pakistan.

Khan, B., Ablimit, A., Nawaz, M.A., Ali, R., Khan, M.Z., Jaffar, U.D., Karim, R., 2014a. Pastoralist experience and tolerance of snow leopard, wolf and lynx predation in Karakoram Pamir Mountains. J. Biodivers. Environ. Sci. 5, 214–229.

Khan, B., Abubakar, S.M., Shrestha, K., 2021. The Story Behind Why Gilgit-Baltistan allows Trophy Hunting. The Express Tribune 25 March 2021.

Khan, M.Z., Begum, F., Riaz, M., Khan, B., Karim, R., Ali, K., Aman, S., 2019. Predicting the potential impacts of trophy hunting on population structure of himalayan ibex (capra sibirica) in Northern Pakistan. Polish J. Ecol. 67, 264–270. doi:10.3161/15052249PJE2019.67.3.008.

Khan, M.Z., Khan, B., Ahmed, E., Khan, G., Ajmal, A., Ali, R., Abbas, S., Ali, M., Hussain, E., 2014b. Abundance, distribution and conservation of key ungulate species in Hindu Kush, Karakoram and Western Himalayan (HKH) mountain ranges of Pakistan. Int. J. Agric. Biol. 16, 1050–1058.

Khan, W.A., Khan, B., Iqbal, S., 2012. First record of Tibetan lark (Melanocorypha maxima) in Pakistan. Pak. J. Zool. 44, 1462–1464.

Kifayat, U., Khan, F.A., Ahmed, E., 2014. (PDF) Determinants of Poverty in Mountain Region of Gilgit-Baltistan. Pakistan. Dev. Ctry. Stud. 4, 10–19.

Li, P.J., 2007. Enforcing wildlife protection in China: the legislative and political solutions. China Inf 21, 71–107. doi:10.1177/0920203X07075082.

Lindsey, P.A., Alexander, R., Frank, L.G., Mathieson, A., Romañach, S.S., 2006. Potential of trophy hunting to create incentives for wildlife conservation in Africa where alternative wildlife-based land uses may not be viable. Anim. Conserv. 9, 283–291. doi:10.1111/j.1469-1795.2006.00034.x.

Lindsey, P.A., Frank, L.G., Alexander, R., Mathieson, A., Romañach, S.S., 2007. Trophy hunting and conservation in africa: problems and one potential solution. Conserv. Biol. 21, 880–883. doi:10.1111/j.1523-1739.2006.00594.x.

Macdonald, D.W., Johnson, P.J., Loveridge, A.J., Burnham, D., Dickman, A.J., 2016. Conservation or the Moral High Ground: siding with Bentham or Kant. Conserv. Lett. 9, 307–308. doi:10.1111/conl.12254.

Macdonald, D.W., Loveridge, A.J., Dickman, A., Johnson, P.J., Jacobsen, K.S., Du Preez, B., 2017. Lions, trophy hunting and beyond: knowledge gaps and why they matter. Mamm. Rev. 47, 247–253. doi:10.1111/mam.12096.

Mallon, D., 2013. Trophy Hunting of CITES - listed species in Central Asia. TRAFFIC 1–54.

Maxi Pia Louis, D.R.A.D.R.C.P.J.J., 2019. Trophy Hunting Bans Imperil biodiversity, Science.

Mbaiwa, J.E., 2018. Effects of the safari hunting tourism ban on rural livelihoods and wildlife conservation in Northern Botswana. South African Geogr. J. 100, 41–61. doi:10.1080/03736245.2017.1299639.

McEnroe, A., 2017. Conservation focus the markhor miracle: Bring species back from the brink 83–96.

Michel, S., Rosen Michel, T., Saidov, A., Karimov, K., Alidodov, M., Kholmatov, I., 2015a. Population status of Heptner's markhor Capra falconeri heptneri in Tajikistan: challenges for conservation. Oryx 49, 506–513. doi:10.1017/S0030605313000860.

Michel, S., Rosen, T., 2016. Hunting of Prey Species: a Review of Lessons, Successes, and Pitfalls – Experiences from Kyrgyzstan and Tajikistan. In: Snow Leopards: Biodiversity of the World: Conservation from Genes to Landscapes, pp. 236–244. doi:10.1016/B978-0-12-802213-9.00016-X.

Michel, S., Yakusheva, N., Pesch, M., Baldus, R.D., 2015b. The Current Situation of Wildlife Management in Central Asian Countries.

Mir, A., 2006. Impact Assessment of Community Based Trophy Hunting in MACP Areas of NWFP and Northern Areas.

Mkono, M., 2019. Neo-colonialism and greed : africans ' views on trophy hunting in social media. J. Sustain. Tour. 27, 689–704. doi:10.1080/09669582.2019.1604719.

Muhammad, Z., Farida, B., Muhammad, R., Babar, K., Rehmat, K., Karamat, A., Safina, A., 2019. Predicting the potential impacts of trophy hunting on population structure of himalayan ibex (capra sibirica) in Northern Pakistan. Polish J. Ecol. 67, 264–270. doi:10.3161/15052249PJE2019.67.3.008.

Muposhi, V.K., Gandiwa, E., Bartels, P., Makuza, S.M., 2016. Trophy Hunting, Conservation, and Rural Development in Zimbabwe: issues, Options, and Implications. Int. J. Biodivers. 2016, 1–16. doi:10.1155/2016/8763980.

Naidoo, R., Weaver, L.C., Diggle, R.W., Matongo, G., Stuart-Hill, G., Thouless, C., 2016. Complementary benefits of tourism and hunting to communal conservancies in Namibia. Conserv. Biol. 30, 628–638. doi:10.1111/cobi.12643.

Nawaz, M.A., Din, J.U., Shah, S.A., Khan, A.A., 2016a. The Trophy Huntign Program: enhancing Snow Leopard Prey Population through Community Participation. In: Snow Leopards Biodiversity of the World: Conservation from Genes to Landscapes, pp. 219–229. doi:10.1016/B978-0-12-802213-9/00016-X.

Nawaz, M.A., Din, J.U., Shah, S.A., Khan, A.A., 2016b. The Trophy Hunting Program: Enhancing Snow Leopard Prey Populations Through Community Participation, Snow leopards doi:10.1016/B978-0-12-802213-9/00016-X.

Nordbø, I., Turdumambetov, B., Gulcan, B., 2018. Local opinions on trophy hunting in Kyrgyzstan. J. Sustain. Tour. 26, 68–84. doi:10.1080/09669582.2017.1319843.

Nowak, K., Lee, P.C., Marino, J., Mkono, M., Mumby, H., Dobson, A., Harvey, R., Lindsay, K., Lusseau, D., Sillero-Zubiri, C., 2019. Trophy hunting: bans create opening for change. Science (80-.). 366, 434–435. doi:10.1126/science.aaz4135.

Packer, C., Brink, H., Kissui, B.M., Maliti, H., Kushnir, H., Caro, T., 2011. Effects of Trophy Hunting on Lion and Leopard Populations in Tanzania. Conserv. Biol. 25, 142–153. doi:10.1111/j.1523-1739.2010.01576.x.

Rasheed, T., Ahmed, Hameed In Bhatt, Pathak Broome, S.N., K., A., B., T., 2012. C.C., Areas in South Asia. Case Studies and Analyses from Bangladesh, India, Nepal, P. and S.L., Kalpavriksh, N.D., 2012. Community Conserved Areas in South Asia.

Rashid, W., Shi, J., Rahim, I.ur, Dong, S., Sultan, H., 2020a. Issues and Opportunities Associated with Trophy Hunting and Tourism in Khunjerab National Park. Northern Pakistan. Animals 10, 597.

Rashid, W., Shi, J., Ur Rahim, I., Dong, S., Sultan, H., 2020b. Issues and Opportunities Associated with Trophy Hunting and Tourism in Khunjerab National Park. Northern Pakistan 10, 597. doi:10.3390/ani10040597.

Raza, G., Mirza, S.N., Anwar, M., Hussain, I., Khan, S.W., Ahmad, K., Nawaz, M.A., Ahmad, N., 2015. Population and distribution of himalayan ibex, Capra ibex sibrica, in Hushe Valley, Central Karakoram National Park, Pakistan. Pak. J. Zool. 47, 1025–1030.

Roe, D., Cremona, P., 2016. Informing decisions on trophy hunting:A Briefing Paper regarding issues toRoe, D., & Cremona, P. (2016). Informing decisions on trophy hunting:A Briefing Paper regarding issues to be taken into account when considering restriction of imports of hunting tr, IUCN Briefing Paper.

Rosen, T., Stefan, M., 2012. Analyzing Gaps and Options For Enhancing Argali Conservation Within the Context of the Convention On the Conservation of Wildlife Species doi:10.13140/2.1.2423.2004.

Salas, E.A.L., Valdez, R., Michel, S., Boykin, K.G., 2018. Habitat assessment of Marco Polo sheep (Ovis ammon polii) in Eastern Tajikistan: modeling the effects of climate change. Ecol. Evol. 8, 5124–5138. doi:10.1002/ece3.4103.

Schaller, G.B., Kang, A., 2008. Status of Marco Polo sheep Ovis ammon polii in China and adjacent countries: conservation of a Vulnerable subspecies. Oryx 42, 100–106. doi:10.1017/S0030605308000811.

Shackleton, D.M., 2001. A Review of Community-Based Trophy Hunting Programs in Pakistan. Mt. Areas Conserv. Proj. 59.

Kachel, Shannon M., 2014. Evaluating the Efficacy of Wild Ungulate Trophy Hunting As a Tool For Snow Leopard Conservation in the Pamir Mountains of Tajikistan.

Tahir, R., Ahmed, H., 2015. Tushi-Shasha and Sustainable Use A Grafted Model of Indigenous Management.

Ullah, I., Dong Yong, K., 2020. A Model of Collaborative Governance for Community-based Trophy-Hunting Programs in Developing Countries _ Enhanced Reader.pdf. Perspect. Ecol. Conserv. 18, 145–160.

UNEP, G.-.A., GMBA, M.R.I., 2020. Elevating Mountains In The Post-2020 Global Biodiversity Framework.

Valdez, R., Michel, S., Subbotin, A., Klich, D., 2016. Status and population structure of a hunted population of Marco Polo Argali Ovis ammon polii (Cetartiodactyla, Bovidae) in Southeastern Tajikistan. Mammalia 80, 49–57. doi:10.1515/mammalia-2014-0116.

Wang, M., Blank, D., Liu, W., Wang, Y., Yang, W., 2018. The group pattern of Marco Polo sheep in the Chinese Pamir plateau. Eur. J. Wildl. Res. 64. doi:10.1007/s10344-018-1235-5.

Wood, G., M., A., 2006. Sustaining livelihoods and overcoming insecurity. In: In Valleys in Transition: Twenty Years of AKRSP's Experience in Northern Pakistan. Oxford University Press, Oxford, pp. 54–119 The Canadian.

Woodford, M.H., Frisina, M.R., Awan, G.A., 2004. the Torghar Conservation Project: management of the Livestock, Suleiman Markhor (Capra Falconeri) and Afghan Urial (Ovis Orientalis) in the Torghar Hills, Pakistan. Game Wildl. Sci. Game Wildl. Sci. 21, 177–187.

Wu, N., Ismail, M., Joshi, S., Khan, B., Kotru, R., Ning, W., Phuntsho, K., Qamar, F.M., Shaoliang, Y., Sharma, E., Weikang, Y., 2014. Understanding the Transboundary Karakoram-Pamir Landscape, 84.

Zaman, S., Chaudhary, J.A., Abbas, S., Ghaznavi, M., Essa, M., Raja, M.A., 2019. Safeguarding Biodiversity Conservation Through Sustainable Use in Gilgit-Baltistan: Guidelines for Streamlining the Community-Based Sustainable Trophy Hunting Programme in Gilgit-Baltistan, Pakistan.

Zhigang, L., Jiang, J., Chunwang, L., Rober, Z., Jenkiins, W., Zheng, J., 2012. International trophy hunting in China. Oryx 46, 169–174.

Craigie, I.D., Baillie, J.E.M., Balmford, A., Carbone, C., Collen, B., Green, R.E., Hutton, J.M., 2010. Large mammal population declines in Africa's protected areas. Biol. Conserv. 143, 2221–2228. doi:10.1016/j.biocon.2010.06.007.

Lewis, A, James, C., 1970. Wildlife Census Methods :. A Resume Methods 6, 356–364.

Khan, B., Ablimit, A., Khan, G., Jasra, A.W., Ali, H., Ali, R., Ahmad, E., Ismail, M., 2016. Abundance, distribution and conservation status of Siberian ibex, Marco Polo and Blue sheep in Karakoram-Pamir mountain area. J. King Saud Univ. - Sci. 28, 216–225. doi:10.1016/j.jksus.2015.02.007.

Jabeen, N., Ajaib, M., Siddiqui, M.F., Ulfat, M., Khan, B., 2015. A survey of ethnobotanically important plants of District Ghizer, Gilgit-Baltistan. FUUAST J. Biol 5, 153–160.

Rasheed, T., Hameed, A., 2015. Tushi-Shasha and Sustainable Use A Grafted Model of Indigenous Management. In (ed) Bhatt, S., N. Pathak Broome., A. Kothari and T. Balasinorwala. 2012. Community Conserved Areas in South Asia. Case Studies and Analyses from Bangladesh, India, Nepal, Pakistan and Sri Lanka. Kalpavriksh, New Delhi.

Ejaz Ur Rahman and Jaffar Ud Din, 2016. PRE TROPHY HUNTING QUOTA ALLOCATION SURVEY OF HIMALAYAN IBEX IN CHIPURSAN VALLEY, DISTRICT HUNZA, GILGIT-BALTISTAN RUT SEASON SURVEY REPORT. Wildlife, Dep. Gilgit-Baltistan For. Complex, Jutial, Gilgit.

Dagleish, M.P., Ali, Q., Powell, R.K., Butz, D., Woodford, M.H., 2007. Fatal Sarcoptes scabiei infection of blue sheep (Pseudois nayaur) in Pakistan. J. Wildl. Dis. 43, 512–517. doi:10.7589/0090-3558-43.3.512.