

**BLACK-NECKED CRANE CONSERVATION
ACTION PLAN FOR BHUTAN
(2021 - 2025)**

Department of Forests and Park Services
Ministry of Agriculture and Forests
Royal Government of Bhutan

in collaboration with

Royal Society for Protection of Nature

Plan prepared by:

1. Jigme Tshering, Royal Society for Protection of Nature
2. Letro, Nature Conservation Division, Department of Forests and Park Services
3. Tandin, Nature Conservation Division, Department of Forests and Park Services
4. Sonam Wangdi, Nature Conservation Division, Department of Forests and Park Services

Plan reviewed by:

1. Dr. Sherub, Specialist, Ugyen Wangchuck Institute for Conservation and Environmental Research, Department of Forests and Park Services.
2. Rinchen Wangmo, Director, Program Development Department, Royal Society for Protection of Nature.

Suggested citation:

BNC 2021. Black-necked Crane Conservation Action Plan (2021-2025), Department of Forests and Park Services, Ministry of Agriculture and Forests, and Royal Society for Protection of Nature, Thimphu, Bhutan



DIRECTOR

དཔལ་ལྷན་འབྲུག་གཞུང་། མོ་ནམ་དང་ནགས་ཚལ་ལྷན་ཁག་།

ནགས་ཚལ་དང་གླིང་ཀ་ཞབས་ཏྲོག་ལས་ཁུངས་།

Royal Government of Bhutan
Ministry of Agriculture and Forests
Department of Forests and Park Services
Thimphu



MESSAGE FROM THE DIRECTOR

The Department of Forests and Park Services has been mandated to manage and conserve Bhutan's rich biodiversity. As such the department places great importance in the conservation of the natural resources and the threatened wild fauna and flora. With our consistent conservation efforts, we have propelled into the 21st century as a champion and a leader in environmental conservation in the world.

The conservation action plans important to guide our approaches towards conserving the species that are facing considerable threat. Over the past five years, the Department of Forests and Park Services has developed action plans for key species such as tiger, snow leopard, elephant and red panda. Considering the importance of avifaunal conservation, the Department, in collaboration with Royal Society for Protection of Nature is pleased to develop the first conservation action plan for the threatened Black-necked Crane.

The Black-necked Crane holds an important socio-cultural value in Bhutanese society with the bird often appearing in our folklores, songs and beliefs. The fact that the bird is a winter visitor to Bhutan and its requirement of specialized habitats in wetlands draws our special attention to enhancing conservation efforts. This action plan will be implemented by various field offices under the Department of Forests and Park Services, and I look forward to continued support and collaboration from the Royal Society for Protection of Nature. I am certain that our collective efforts towards conservation of this heavenly bird will yield results that will depict harmonious co-existence of wildlife and communities.

Lastly, I would like to express my appreciation towards my colleagues from the Department and the friends from Royal Society for Protection of Nature for collectively putting your efforts towards development of this important document and wish you all the best in its successful implementation.

Tashi Delek

Lobzang Dorji



། རྒྱལ་འཛིན་རང་བཞིན་སྲུང་སྐྱོབ་ཚོགས་སྒྲིག་འཛུགས།

Royal Society for Protection of Nature

Under the Royal Patronage of Her Majesty Gyaltsuen Jetsun Pema Wangchuck
Inspiring personal responsibility and actively involving the people of Bhutan in Conservation of the Kingdom's Environment

MESSAGE FROM THE EXECUTIVE DIRECTOR

Black-necked Cranes are the heavenly ambassadors and indicators of healthy agricultural land and its surrounding ecosystems including wetlands, ponds and water bodies. However, with changing perceptions on conservation of wetlands and rapid economic development across the habitats, Black-necked Crane faces various threats posed by both anthropogenic and natural forces.

In Bhutan, only 2.93 % of the surface is arable land. This percentage is decreasing annually through rural-urban migration, leaving the cultivable land fallow. While the post-harvest agricultural fields are the main foraging grounds for Black-necked Cranes, intensive use of chemical inputs have emerged as a growing challenge for the cranes and their habitat. Therefore, efforts to conserve arable land and to promote healthy agricultural practices are critical both for the welfare of humans and cranes.

In 1987, under the Royal Command, the Royal Society for Protection of Nature was established with the solitary purpose to monitor Black-necked Cranes and manage their habitats. Since then, in partnership with Department of Forest and Park Services, RSPN has implemented diverse conservation measures for Black-necked Crane through education, community participation and research. In particular, RSPN has been instrumental in the conservation of wetlands and the cranes in Phobjikha valley, which is the largest wetland and the largest habitat of the cranes in Bhutan. One such significant conservation initiative is the institution of the annual Black-necked Crane Festival, which was initiated in 1998 mainly to educate locals and visitors on conservation of cranes. Today the festival attracts several hundreds of international tourists and thousands of Bhutanese. The festival is also a subtle reminder to locals and conservation partners on the importance of wetlands and the Black-necked Cranes.

The Royal Society for Protection of Nature has accorded high priority in bringing on board all the stakeholders in every aspect of its conservation activities. We hope this action plan will further strengthen our partnership and commitment towards the conservation of this special species and their habitats in Bhutan.

Tashi Delek!

Kinley Tenzin (PhD)

ACKNOWLEDGEMENTS

This Conservation Action Plan is an outcome of the collective effort and contribution from many institutions and individuals. We would like to acknowledge the support rendered by everyone.

We are thankful to the contribution of all the focal persons from various parks and divisions, who attended the Black-necked Crane Conservation Coordination Workshop at Lamai Gonpa, Bumthang. At the individual level, we remain indebted to David Hecht, University of Georgia and Attila Biro, Szent Istvan University for their efforts towards developing this action plan.

The conservation action planning and publication has been generously supported by the International Crane Foundation (ICF) based in Baraboo, USA. We thank George Archibald, co-founder of ICF for his continued support in Black-necked Crane conservation in Bhutan.

We look forward to continued support from our partners towards implementing the actions prescribed in this plan, so that Black-necked Cranes thrive in Bhutan through our collective conservation efforts.



TABLE OF CONTENTS

1. EXECUTIVE SUMMARY	7
2. BACKGROUND	9
2.1 Species description and ecology	9
2.2 Current distribution, range and habitat history	10
2.3 Ecological significance of Black-necked Crane conservation	17
2.4 Socio-ecological and cultural value	17
2.5 Review of conservation efforts for Black-necked crane in Bhutan.....	19
2.6 Current conservation efforts	20
3. THREATS AND CHALLENGES FOR BLACK-NECKED CRANE CONSERVATION IN BHUTAN	24
3.1 Land use change	24
3.2 Changing farming practices	25
3.3 Eutrophication of wetlands	25
3.4 Unsuitable grazing levels of the roosting sites	26
3.5 Disturbance	26
3.6 Predation	26
3.7 Climate change	27
3.8 Infrastructure development	27
3.9 Limited research and information gap	27
3.10 Poor coordination amongst stakeholders	27
3.11 Limited community awareness and participation	27
3.12 Limited resources	28
4. ACTION PLAN	29
4.1 Vision	29
4.2 Goal	29
4.3 Objectives, outputs and actions	29
5. IMPLEMENTATION AND MONITORING PLAN	35
5.1. National policies and regulations	35
5.2. Institutional arrangement	35
5.3. Work plan and budget	36
5.4. Monitoring and evaluation	36
5.5. Logical framework and implementation plan	37

1. EXECUTIVE SUMMARY

Black-necked Cranes (BNC) are revered for their magnificence and worshipped as religious symbols in various cultures wherever they are found. Ecologically, cranes serve as an umbrella species ensuring conservation of biodiversity at a broader ecosystem perspective. In Bhutan, over 600 Black-necked Cranes migrate to several valleys of Bumthang, Lhuntse, Trashigang and Wangduephodrang every winter between October and March. The conservation of BNC in Bhutan started as early as 1986 and provided highest protection under Schedule I of the Forest and Nature Conservation Act, 1995. Of late, efforts have been made towards habitat improvement, enhancing community support and research.

Yet this beautiful bird is globally threatened due to loss of habitat, climate change and human disturbances. In Bhutan, BNCs face increasing threats from infrastructure development, changing land use patterns and agricultural practices, predation by stray dogs, eutrophication of wetlands and climate change. The BNC conservation is challenged with limited research and resources, poor coordination amongst stakeholders, poor awareness and participation by the communities.

In order to maintain a viable wintering population of BNCs in Bhutan, this conservation action plan will strive to mitigate threats and challenges faced by BNC through improvement of habitat, enhancing community support and stakeholder coordination and increasing research and knowledge base. Besides intending to address the direct threats to BNC conservation, the plan also strategizes to incentivize communities living in all the habitats. In addition to charting out measures to mitigate and resolve conflicts, the plan focuses on preventing conflict through habitat improvement, restoration of degraded sites and ensuring safe habitats for the BNCs.

The Black-necked Crane Conservation Action Plan for Bhutan will be implemented from the year 2021 to 2025 for a period of five years with an estimated cost of Nu. 67.67 million. The financing and implementation of this action plan will be a collaborative effort by the Department of Forests and Park Services and the Royal Society for Protection of Nature. The plan implementation will be monitored and evaluated as per the indicators and targets as outlined in the logical framework.

LIST OF ACRONYMS

APIC	Agency for Promotion of Indigenous Crafts
BNC	Black-necked Crane
BPC	Bhutan Power Corporation
BWS	Bumdeling Wildlife Sanctuary
DoA	Department of Agriculture
DoL	Department of Livestock
DoPFS	Department of Forests and Park Services
GPS	Global Positioning System
ICF	International Crane Foundation
IEC	Information, Education and Communication Materials
LG	Local Government
MoAF	Ministry of Agriculture and Forests
MoE	Ministry of Education
MoU	Memorandum of Understanding
NCD	Nature Conservation Division
NEC	National Environment Commission
PES	Payment for Ecosystem Services
PTT	Platform Telemetry Transmitters
REC	Royal Education Council
RSPN	Royal Society for Protection of Nature
RGoB	Royal Government of Bhutan
RUB	Royal University of Bhutan
TCB	Tourism Council of Bhutan
UWICER	Ugyen Wangchuck Institute for Conservation and Environmental Research

2. BACKGROUND

2.1 Species description and ecology

There are 15 different species of cranes in the world today, spread across five continents. All belong to the bird order Gruiformes and the bird family Gruidae. The Black-necked Crane (BNC) *Grus nigricollis* Przewalski, 1876 is one amongst them. Adults of both sexes are morphologically alike, with a bare red crown and lores sparsely covered by hair-like feathers. The rest of the head and the upper part of the neck are black, except for a small white or light grey spot extending backward from the rear and lower edges of each eye. The bill is grey-green, with a yellowish tip. The iris is yellow. The tail is black and the upper tail coverts are greyish. The legs and toes are black. Males have a wingspan of 569-677 mm, while the wingspan of females' range from 585-628 mm. Juveniles have black and gray body plumage and cinnamon-brown head (Birdlife International, 2016).



Figure 1a. Black-necked Crane (Adult)

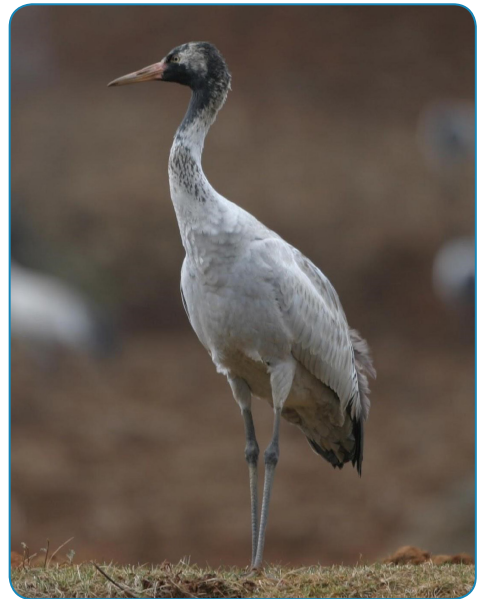


Figure 1b. Black-necked Crane (Juvenile)

There are three annual phases to the life history of cranes – their winter life, annual migration and summer life. In winter and during migration, the cranes are often social and live in flocks. During the daytime feeding hours in winter and through the breeding periods in spring and summer, crane families are solitary and drive away all other cranes from their feeding areas.

Domestic crops are the main component of the winter diet of the BNC (Bishop et al. 1998; Dong et al. 2016). They feed mostly on left-over grains in the harvested

fields of wheat, barley and buckwheat. The consumption of invertebrates, such as insects, earthworms and snails is crucial for their survival, supporting their fitness by providing more protein and calcium (Dong et al. 2016). Additionally, they are also known to feed on herbaceous plants, especially soft shoots found at the roots of the local dwarf bamboo, tubers and seeds. By defending their food, the adult cranes assure provision for their young ones. The defence of their land is proclaimed by a trumpeting duet of both male and female cranes.

2.2 Current distribution, range and habitat history

A Russian naturalist, Count Prezhwalski, first identified the Black-necked crane in 1876 near Lake Koko Nor in North-east Tibet in 1876. Geographically, they are endemic to the Qinghai-Tibetan Plateau and adjacent southern regions of the Himalaya covering Ladakh in India (Birdlife International, 2016). It breeds in alpine bog meadows and riverine marshes, favouring lacustrine marshes from 2,600-4,900 m and migrate to lower altitudes including Bhutan to spend their winter. As such, the bird is described as being native to China, India, and Bhutan (Birdlife International, 2016) The global population is estimated at c.10,000-10,200 individuals in total (Li et al 2014), roughly equivalent to c.6,600-6,800 mature individuals. The population is presumed to be decreasing and considering numerous threats from change in agricultural practices, infrastructural development, and climate change, the BNC is listed as Vulnerable in the IUCN Red list of Threatened Species (Birdlife International, 2016).

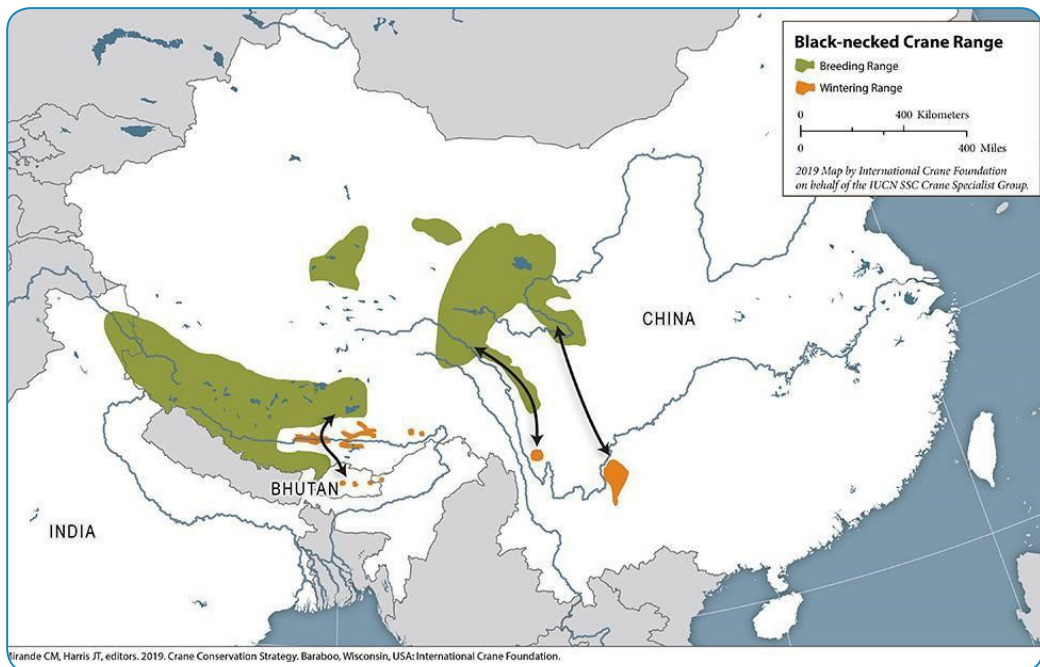


Figure 2. Map showing breeding and wintering range of BNC

A small population of about 600 Black-necked Cranes migrate to several valleys in Bhutan every winter between October and March (Phuntsho and Tshering, 2014). There are three main wintering habitats of the species in Bhutan: Phobjikha in the west, Bumthang in the central, and Bumdeling in the east (Lhendup and Webb 2009; Namgay and Wangchuk 2016). Among these three, Phobjikha receives the highest number of wintering cranes (437 individuals out of the total 555 national count of 2018-2019 winter) followed by Bumdeling valley in Trashiyangtse district with 119 individuals in the same winter months. In Bhutan, historical reports from elders suggest that large numbers of BNC once wintered in Paro, Bajo in Wangduephodrang, and Chokhor valley in Bumthang. Undoubtedly, the declining number of cranes visiting these areas can be partially attributed to human disturbance and development that altered suitable wintering habitats.

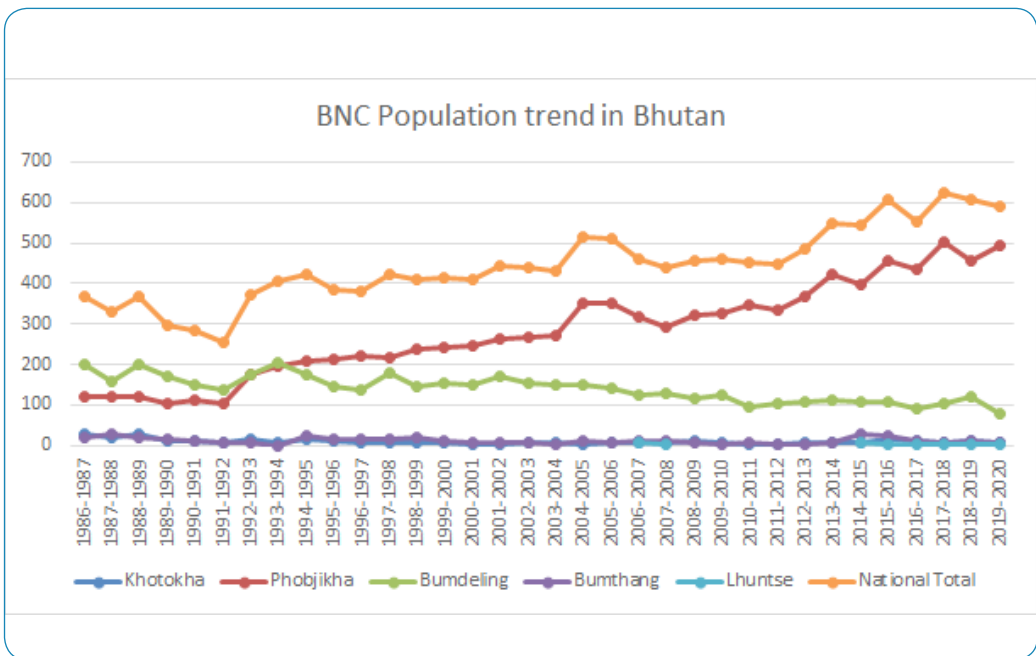
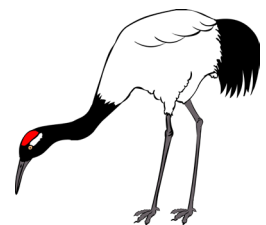


Figure 3. Annual BNC count in Bhutan from 1986 to 2019



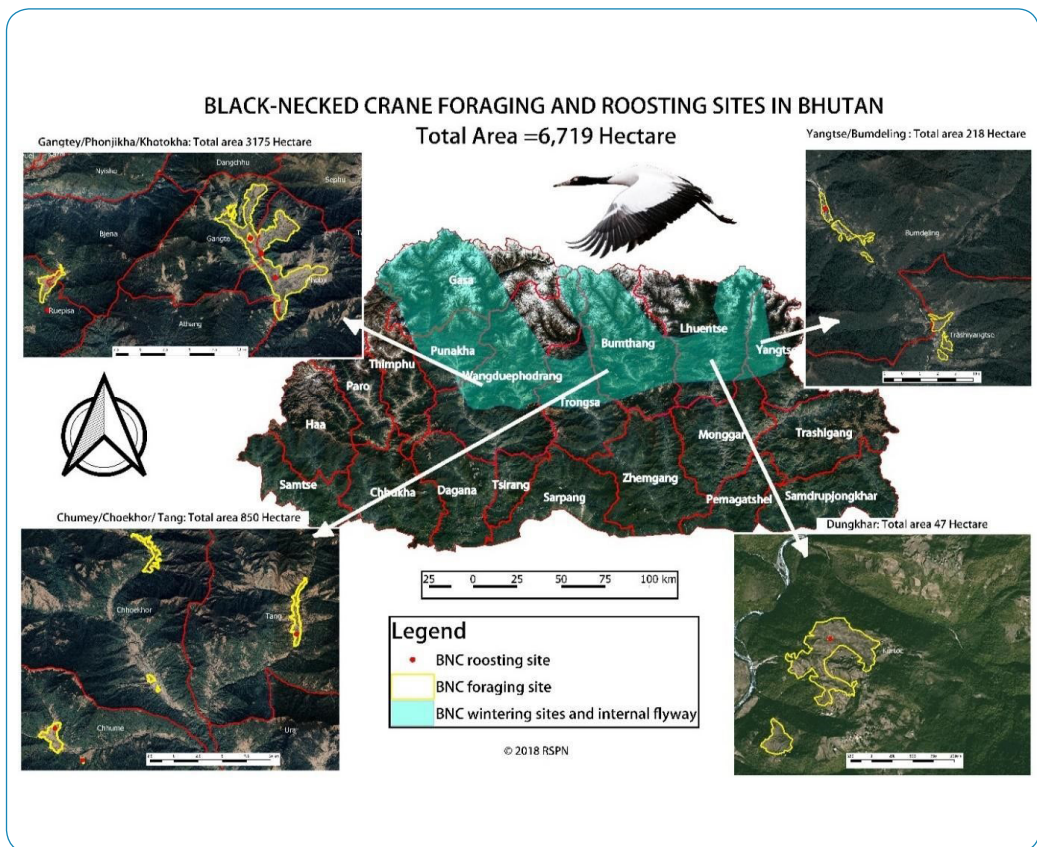


Figure 4. Black-necked Crane foraging and roosting sites in Bhutan

2.2.1 Phobjikha

The valley is known for its iconic environment and the largest high-altitude natural wetland in Bhutan, supporting a diverse array of floral and faunal species. This critical wintering habitat for BNC is shared with more than 5000 residents whose livelihoods primarily depend on agriculture and livestock rearing. The picturesque valley, the flocking of BNC, and cultural heritage of the area have attracted a growing number of tourists every year.

The growing popularity with visiting tourists has also invited numerous negative impacts, endangering the fragile habitat of the BNC. For example, tourist accommodations, large hotels, and restaurants continue to be built throughout the valley, putting pressure on limited natural resources.

The wetland of Phobjikha is part of the RAMSAR network (RAMSAR, 2016), as well as it has a protection status called Nature Conservation Area.



Figure 5. Lush green forest surrounding the high-altitude natural wetland of Phobjikha Valley

2.2.2 Khotokha

Located at a lower altitude (2,617 masl) than Phobjikha valley, Khotokha valley is another important winter habitat for BNC in the western region. Although the valley receives very few individuals every winter, the consistent usage of the habitat indicates the sustained health of the wetland and associated foraging habitats. It is important to continue monitoring and management of this wetland habitat in the future. Recognizing the significance of the area, Khotokha valley was also declared as one of the RAMSAR sites, a wetland of international importance in 2012 (RAMSAR 2012).

2.2.3 Bumthang

Bumthang was one of the best-known wintering sites for perhaps hundreds of BNC, especially in the Chokhor valley. In recent decades, however, a large town, (Chamkhar) has developed in the part of the valley beneath the historic Dzong. Undoubtedly, as a consequence of development disturbances, the cranes largely abandoned the Chokhor valley and are now found in smaller numbers in Chumey and Tang valley.

Chumey valley is a potential BNC habitat that can accommodate more birds than they do presently. Therefore, it is very crucial that appropriate actions are implemented in the valley to safeguard the habitat for BNC conservation in this valley. Thangbi valley is considered as the least-threatened crane habitat in Bhutan. However, it is home for only a small number of cranes. The third wintering habitat is located in Tang valley, with a few individuals every year. Decreasing number of cranes visiting these valleys over the years has been a concern (Kuensel, 2016).

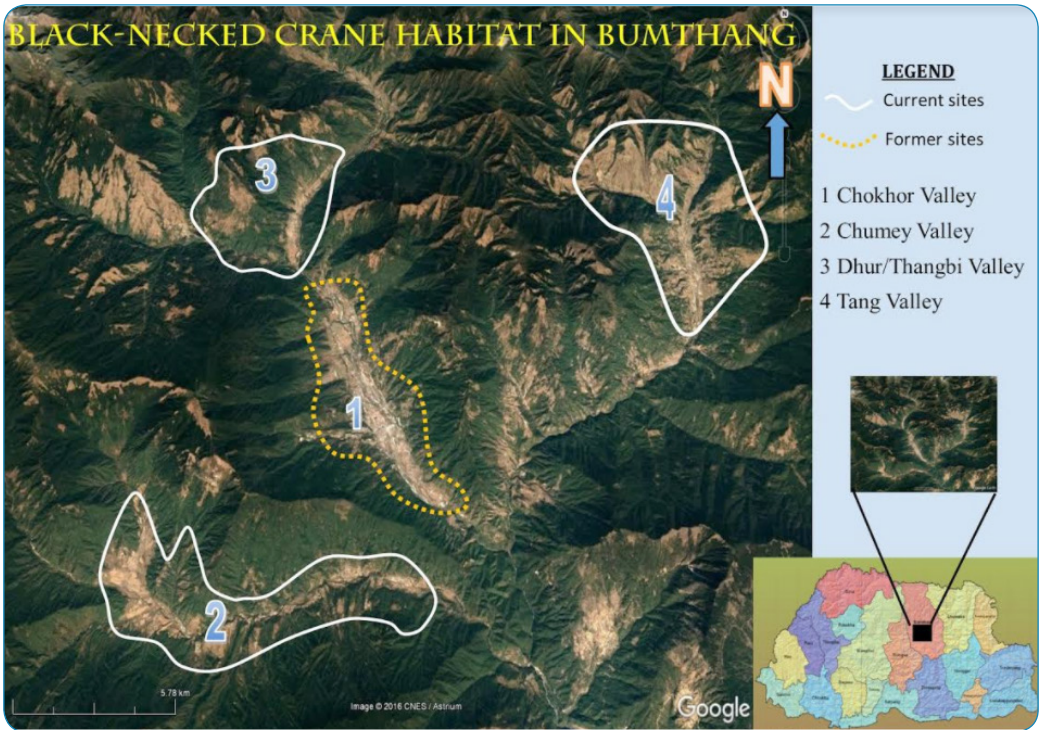


Figure 6. Black-necked Crane habitat in Bumthang

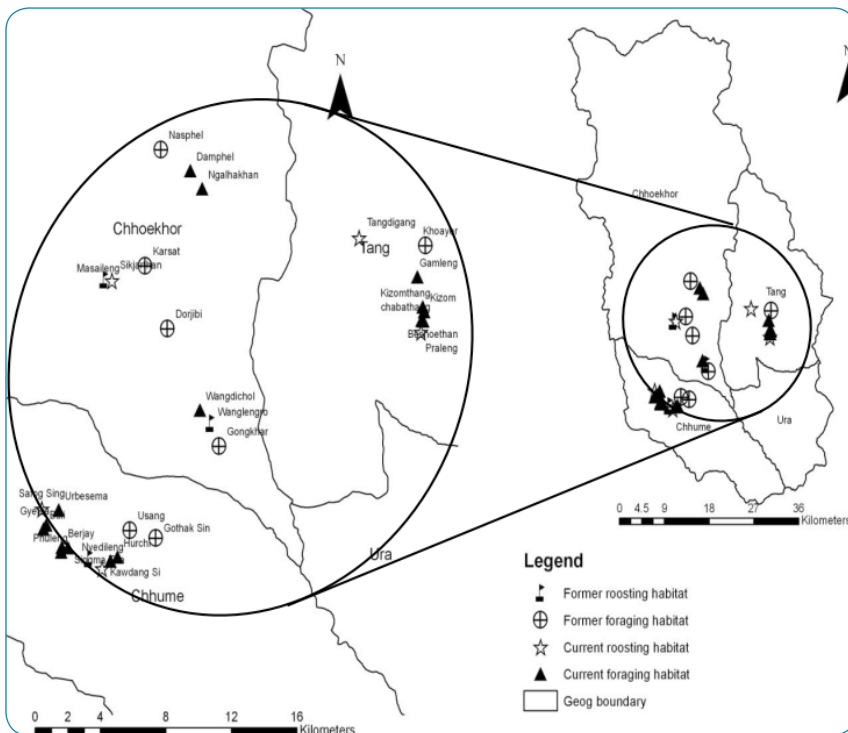


Figure 7. Current and former roosting and foraging habitats of BNC in Bumthang (Phuntsho and Tshering, 2014)

2.2.4 Bumdeling

At 1,900 masl, the wintering area in Bumdeling is at a much lower altitude than at the other wintering sites across Bhutan. Whereas rice cannot be grown at the other sites, it is the major cultivated crop in the Bumdeling valley. Post-harvest waste rice is a major food item for the cranes throughout the winter.

Warmer winters in recent years have allowed farmers to plant winter crops following the rice harvest. While this change indicates the capacity for adaptive agricultural practices on behalf of the local community, this also reduces food availability for cranes. Perhaps because of these changes, the crane population has decreased from a high of over 200 cranes in 1987 to just over 100 during the winter of 2018-2019 in Bumdeling and the Eastern region.

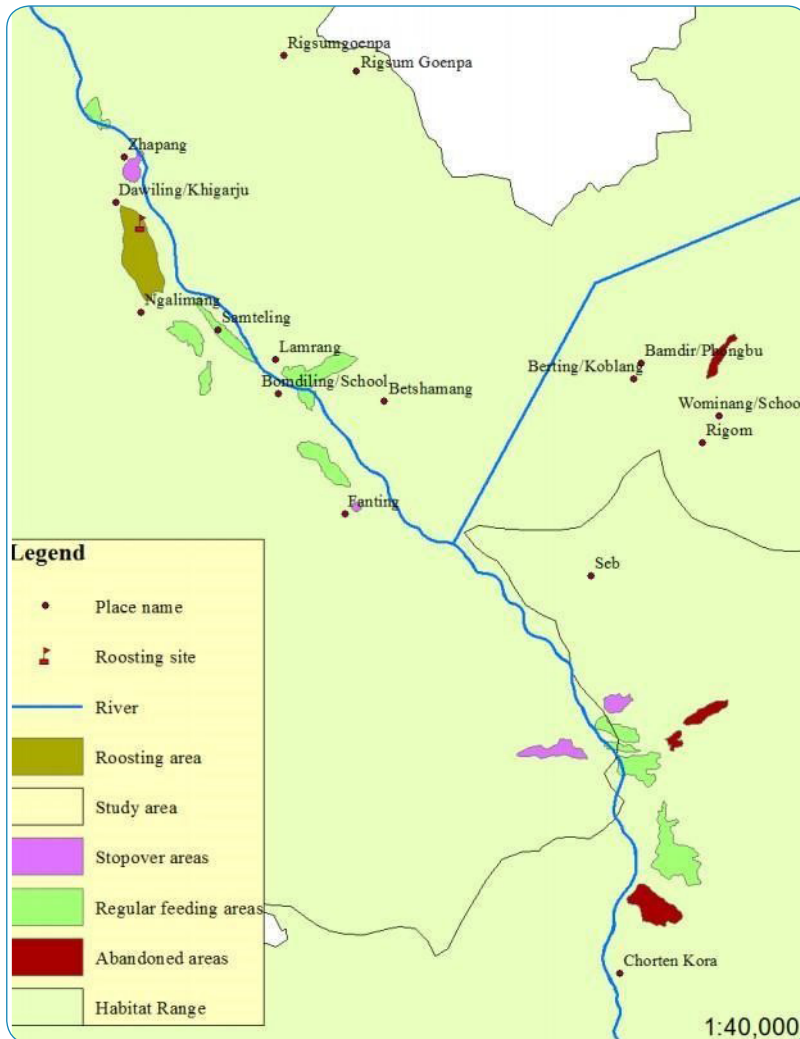


Figure 8. Identified roosting and feeding areas of BNCs in Bumdeling (Drukpa, 2016)

Another possible factor for the decline in the wintering crane population of the valley might be attributed to the flash flood of the mid-1990s, which washed away most of the roosting and feeding areas, in addition to productive agricultural land. More than 1000 acres of privately-owned land has been left unusable after thick sand deposits and associated land degradation. The Bumdeling Wildlife Sanctuary's (BWS) effort to construct flood-controlling walls could not be continued due to the lack of an adequate budget. This intervention managed to redirect only a portion of the river, and may be a uniquely vulnerable site to future extreme weather events.



Figure 9. Overview of Bumdeling wetland

2.2.5 Migration routes and important stopover sites

Four migration routes of Black-necked Cranes can be distinguished in Bhutan for their annual migration. The cranes of Phobjikha and Khotokha migrate through Gasa, or in rare cases through Paro. They spend approximately two weeks in Gasa and one week in Tshokhana in late October during the migration. The wintering habitats of Bumthang receive birds coming from the Gasa route and the Lhuntse route as well, while the cranes of Bumdeling use either the Lhuntse route or the Trashiyangtse route.

Lhuntse has four important stopover sites, which host cranes for a limited amount of time. As the region is marked by dense forests, steep slopes, and deep river gorges, and does not host similarly expansive high-altitude wetlands found in Bumthang or Wangdue Phodrang, the few BNC that winter in this region are dependent on rice terraces and agricultural waste-grain as

their primary food resource. The four sites are Dungkar and Shamling in Kurtoe Gewog, Bapdong in Khoma Gewog, and Tangmachu in Menbi Gewog. Out of these Dungkar hosted a pair with chicks every winter for the last few years (2014 - 2018). Although the rest of the sites hosted cranes for only a few days, they served as crucial stopovers for internal migrations.

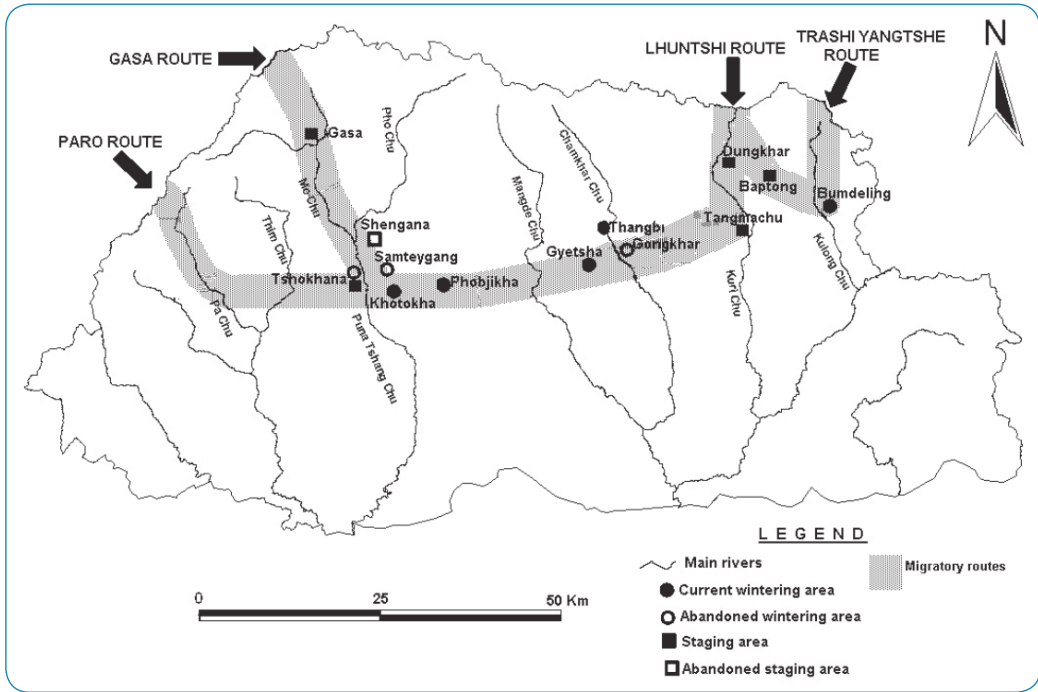


Figure 10. Migration routes and stopover sites of BNCs in Bhutan (Lhendup and Webb, 2009)

2.3 Ecological significance of Black-necked Crane conservation

As an umbrella species, its protection plays a major role in ensuring the conservation of biodiversity in the related habitats as well. The RAMSAR protection status of the wetlands of Phobjikha, Khotokha and Bumdeling is mostly the result of the wintering of the cranes in these areas and all the measures taken to mitigate the threats to the species are supporting the conservation of other species in these habitats.

Black-necked Crane is also a key species in the sub-alpine wetland ecosystems, regulating the population of many invertebrate species and supporting the proper functioning of these ecosystems through a trophic cascade.

2.4 Socio-ecological and cultural value

Culturally, they are widely considered sacred or heavenly birds that bring blessings through their circling flights as they descend into or climb from the

valleys. Not only have these perceptions and experiences translated into a community-held reverence for the species, but it also seems to have resulted in ad-hoc habitat protection, as well as a documented minimization of human-caused disturbances across their wintering habitat range.



Figure 11. A mural painting of local woman weaving alongside a family of cranes in Phobjikha at the BNC visitor center

Cranes have influenced many cultures, oral histories, and social lives of societies around the globe because of their majestic features, long life span, unique calls, and graceful movements. They are often depicted in paintings, songs, folk stories and other artifacts. In Bhutan, BNC has a sacred identity in the Bhutanese culture and often appears in folklore, songs, and historic texts. They are revered as heavenly birds. One common reverence of the crane in Bhutanese folklore is made in 'Tshering Namdruk', more commonly known as the six symbols of longevity. This folk-story and legend is frequently the subject of paintings, where cranes are featured alongside a Brahmin, the tree of longevity, a conch-shell-shaped unalterable rock, water, and deer. These symbols feature prominently in other aspects of Bhutanese living cultural heritage, as do depictions and symbolizations of the BNC. Ecologically, cranes serve a role as an umbrella species, from a broader ecosystem perspective. The species'

reliance on wetlands makes them ideal ambassadors for the conservation of healthy wetlands, grasslands, and working agricultural landscapes across their home-range.

The intricacies and details of their socio-ecological and cultural value in Bhutanese life could well be expanded upon. Broadly speaking, BNCs, as with other species, have been afforded traditionally governed protected status in Bhutan and Tibet as a result of the positive socio-cultural value held by communities who live in close proximity to their critical habitats. As such, ground-realities and future perception studies that investigate the socio-cultural complexities of BNC conservation should also be considered part and parcel of holistic strategies for the conservation in the region at large.

2.5 Review of conservation efforts for Black-necked cranes in Bhutan

Black-necked Cranes are protected throughout Bhutan and listed under Schedule I as protected bird species, both in the Forest and Nature Conservation Act of Bhutan, 1995 (RGoB, 1995) and the Forest and Nature Conservation Rules of Bhutan, 2017 (DoFPS, 2017). Little is known about the cranes in Bhutan prior to the efforts of Dasho Paljor J Dorji (popularly known as Dasho Benji), in Phobjikha Valley in 1986. Recognizing the importance of the habitat for the wintering cranes, the Royal Government of Bhutan (RGoB) designated Phobjikha valley as a Conservation Area in 1999, with the Royal Society for Protection of Nature (RSPN) as the focal agency for management. The second most important habitat came under strict protection with the establishment of BWS in 1995.

In the Phobjikha valley, RSPN identified an opportunity to benefit both cranes and humans by promoting developmental activities that aided conservation. The program mainly focused on conserving the crane's winter habitat while economically empowering the local community through promoting sustainable livelihood approaches.

Under the species-based conservation program of RSPN, the conservation of two flagship species in the country, White-bellied Heron (*Ardea insignis*) and BNC, are prioritized. Subsequently, a Memorandum of Understanding (MoU) was signed between RSPN and the DoFPS to enhance knowledge, identify and implement appropriate conservation measures of the two species and their habitats. The MoU further stated to promote biodiversity and ecosystem conservation through collaboration in the field of species and habitat, water resource management and research between participants.

Some of its programs include community-based sustainable tourism, community-based solid waste management, environment and health, alternative energy, capacity development, women and energy, water and energy and community forest development. Research components include, transboundary migratory study, habitat study, annual population monitoring and rehabilitation of roosting areas.

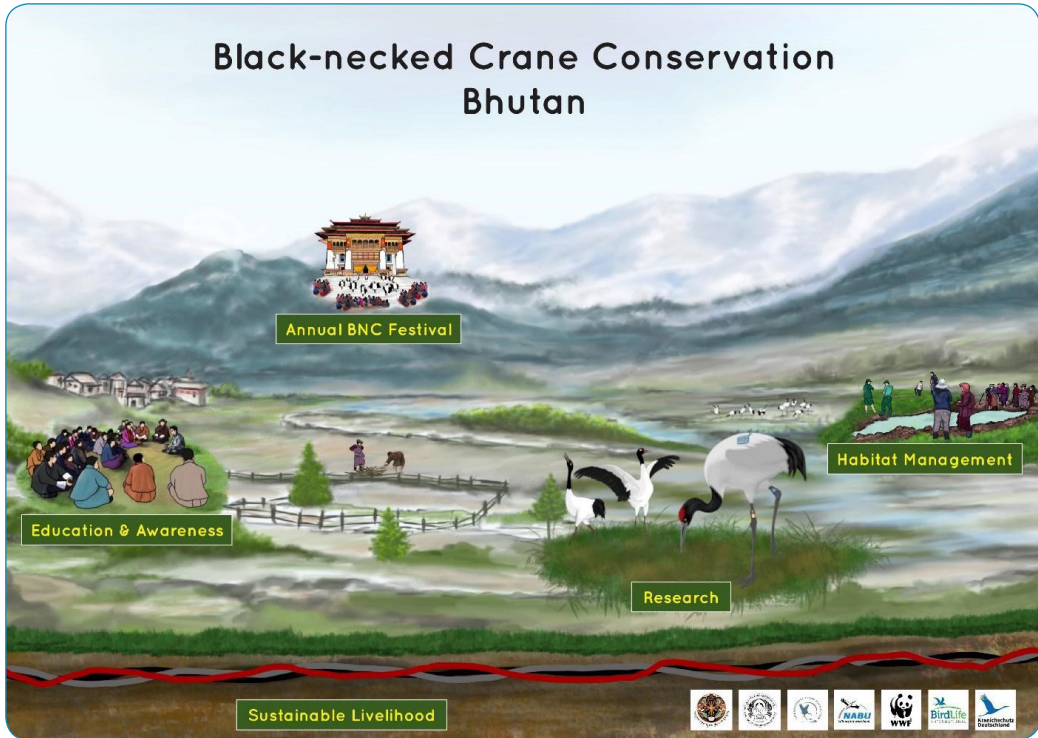


Figure 12. A representation of the BNC conservation program in Bhutan

2.6 Current conservation efforts

i. Habitat restoration

In collaboration with the local farmers of Bumdeling, RSPN, International Crane Foundation (ICF) and BWS have embarked on habitat restoration in Bumdeling. Flood affected paddy fields are being reclaimed and restored, by removing flood debris from the fields and by proper terracing. An agreement was signed with the land owners not to abandon and to cultivate paddy while leaving fallow in the winter to allow cranes to freely forage for dropped grains. A total of 10 acres have been restored so far as a pilot project, with plans to initiate more in the future, if the project is successful.

Similarly, currently used paddy fields with no proper fencing were installed with electric fencing as an incentive to the farmers to continue farming. The

initiative has covered more than 110 acres of farmland, benefitting about 113 households.



Figure 13. Electric fencing around a paddy field in Bumdeling

ii. Threat mitigation

Since stray dogs in all the habitats were rated to be an emerging issue and a potential threat to the cranes, dog sterilizations are being carried out in collaboration with DoFPS and the Department of Livestock. To minimize threats from the wild predators, annual roost maintenance is being carried out in the three major habitats (Phobjikha, Chumey and Bumdeling). The maintenance work involves removal of vegetation and creating shallow ponds of areas ranging from 20 X 20 meters to 50 X 50 meters.



Figure 14. Maintenance of BNC roosting site in Phobjikha by the local people

In Phobjikha, electric cables were laid underground to avoid collision, which also ensured minimal degradation to the aesthetic values of the valley's environment. However, in other habitats, there are still overhead cables which are considered to be a significant threat to the BNC.

iii. Research

Very limited scientific research has been carried out related to the Black-necked Cranes and their habitat in the country. Few migratory studies have been conducted in the past by RSPN, Ugyen Wangchuck Institute for Conservation and Environmental Research (UWICER) and ICF. The first study was carried out in 1998, where two cranes in Bumdeling and one crane in Phobjikha were tagged with Platform Telemetry Transmitters (PTT). Currently RSPN, in collaboration with UWICER, Nature and Biodiversity Union (NABU), Crane Conservation Germany, ICF, and BWS, continues to broaden knowledge on the migratory routes, summer and breeding grounds, and habitat preferences of the BNC. So far, 28 BNC have been marked and tagged with Global Positioning System (GPS) and PTT transmitters in Bhutan, 18 in Phobjikha and 10 in Bumdeling. The results indicated that there are several migration routes across the border.



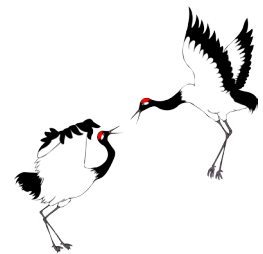
Figure 15. A team of researchers with a GPS tagged crane in Phobjikha

In Bumdeling, a collaborative research on the dietary composition of BNC is being conducted. The research aims to enhance knowledge on diet and habitat preferences in Bumdeling, which would lead to policy implications in protecting these important habitats.

In Phobjikha, electric cables were laid underground to avoid collision, which also ensured minimal degradation to the aesthetic values of the valley's environment. However, in other habitats, there are still overhead cables which are considered to be a significant threat to the BNC.

iv. Sustainable livelihood initiatives

To ensure community's support and participation in conservation, community's livelihood needs are required to be integrated in the conservation programs. In Phobjikha, RSPN's conservation and sustainable livelihood program has been supporting farmers in accessing additional and alternative livelihood options such as community based tourism, alternative energy (fuel efficient stoves, solar lighting systems), establishment of community forests, and annual BNC festival.



3. THREATS AND CHALLENGES FOR BLACK-NECKED CRANE CONSERVATION IN BHUTAN

Like many other vulnerable and endangered species, loss of habitat and environmental degradation are perhaps the primary threats BNCs are facing today. Anthropogenic pressures and subsequent ecological change catalyze these threats. These pressures are more serious in the wintering areas, where wetlands have been extensively impacted by irrigation projects, dam construction, drainage and conversion to agriculture, river channelization, heavy grazing pressure, sedimentation, industrial pollution, and other factors.

Since 1990, when the first comprehensive winter counts of BNCs were made on their wintering grounds in China (and subsequently in Bhutan), the global population has increased from around 7000 to about 11,000 birds. In Bhutan, this included a doubling of cranes wintering in the country, from around 300 to over 600 cranes. This apparent increase can be attributed to improved and more widespread population monitoring and counting protocols, as well as to actual increases in protective mechanisms and conservation intervention in China. Geologically, while climate change brings with its widespread global uncertainties and numerous negative externalities, melting of glaciers is known to produce larger wetlands, and thus more breeding habitat for cranes. Although protection for wildlife has continued to improve in China, some wetlands are expected to disappear after the glaciers are completely melted, and after “perched” ice (those sitting atop permafrost) disappear with the permafrost.

Threats

3.1 Land use change

While responsible tourism across the BNC wintering range in Bhutan provides a number of community benefits, growing popularity of crane-centered tourism has also invited numerous negative impacts. Historically, a central impact has been tourism-associated development endangering the fragile habitat of the BNCs. For instance, for tourist accommodations, large hotels and restaurants have and continue to be built all over the Phobjikha valley.

Land use change for developmental purposes, such as the drainage of wetlands for agriculture and construction caused the abandonment of former roosting sites, such as Chamkhar, Tshokhana and Samtengang. The wintering habitat in Bumdeling is more threatened by land use change, caused by settlement expansion and development than any other current crane habitat in Bhutan

(Lhendup and Webb, 2009). Abandonment of paddy fields due to poor fertility, erosion and wildlife damage is another threat in Bumdeling by decreasing the feeding area (Drukpa, 2016).

In Phobjikha, potato farming started in the early 1980s and soon became the most important income source for the local communities, with around 97% of the households involved. Between 1978 and 2010, the area of the wetland in Phobjikha decreased by 1%, mostly due to the expansion of farmlands. While the government restricted farming in the wetland, local communities complain about the lack of compensation for their losses of farmland.

3.2 Changing farming practices

While traditional practices leave fallen grains of rice and barley in the fields after early harvesting, there is a change in this practice in some areas, reducing the food availability for the cranes. The replacement of food grains with potatoes has a similar impact. The intensification of agriculture allows the extension of farming season throughout the winter months in the BNC habitats with moderate climate, leading to a decrease in the feeding areas. To avoid the loss of feeding areas, the government discourages winter cropping in Bumdeling. However, local farmers are not compensated for their loss of income, so winter cropping of mustard and other vegetables still happens occasionally despite the ban (Lhendup and Webb, 2009).

In Phobjikha, most of the farmers increasingly use pesticides for potato cultivation for better harvests. These chemicals easily disperse through the air during application and move to the wetlands with groundwater as well. Accumulation in the trophic network is common for many of these chemicals and it can have a significant effect on the health condition and reproduction of the crane and related species.

3.3 Eutrophication of wetlands

Cross contour line potato rows are commonly applied due to the high precipitation in the growing season. It leads to soil erosion and eutrophication of the wetland. A significant increase in the usage of chemical fertilizers was experienced in the last 15 years, from approximately 20% to 90% of the farmers in Phobjikha (Namgay and Wangchuck, 2016). The increasing usage of detergents with high phosphorus content by local households combined with a lack of channeling system, and other practices, such as overgrazing of the grasslands on the surrounding mountainsides or unsustainable forestry can contribute to the eutrophication process as well.

Eutrophication changes the soil, water quality, water cover and species composition of the wetlands, affecting the suitability of the habitat for BNCs, as well as many other species, which are specialised to nutrition-poor conditions.

3.4 Uncontrolled grazing pressure

There is a lack of information on the optimal grazing pressure in the wintering sites of BNC. However, both overgrazing and undergrazing can affect the suitability of these habitats for the cranes by changing the structure and species composition of the grassland. Heavy grazing pressure can lead to degradation in a long-term, while undergrazing can lead to succession. An optimal grazing pressure during the summer period is crucial for the production of a sufficient amount of new bamboo shoots in the winter, which is an important food source for the cranes. As grazing pressure is less monitored and it can constantly change, uncontrolled grazing levels is a potential threat for the species.

3.5 Infrastructure development

Consultation meetings with the community in Phobji-Gangtey revealed that farmers faced the issue of their crop predation by wild animals. The current wooden and stone fencing is observed to be ineffective and unsustainable. The community's appeal of installing electric fencing was not approved by the relevant agencies, due to the fear of Black-necked Cranes colliding with the electric cables. Therefore, there is a present and emerging need to identify and develop mechanisms to install electric fencing in a way that is conducive to both local farmer interests and BNCs. Power lines can be a threat for the cranes for the same reason. In the most exposed parts of Phobjikha, power lines are now replaced by underground cables.

3.6 Predation

In Phobjikha, annual mortality in the crane population by predation is around 2 to 3%. The main predators identified in the wintering sites are the common leopard (*Panthera pardus*) and stray dogs (*Canis lupus familiaris*). While predation by common leopards is a natural threat, predation by stray dogs leads to an increased mortality rate, especially in Bumthang and Khotokha. Other potential predators are red foxes (*Vulpes vulpes*) and jackals (*Canis aureus*) (Choki et al, 2011).

3.7 Climate change

Changes in climate conditions can alter the species composition, structure, dynamics and ecology of the wintering habitats of the BNC. These ecosystems are not able to shift to higher elevations to follow temperature changes due to their exclusive occurrence in areas with certain topographic and pedologic

conditions. Changes in annual precipitation and precipitation patterns can affect the ground water level of the wetlands in the long term, which has a significant impact on the soil conditions, species composition, structure and functioning of these ecosystems. The occurrence of extreme climate conditions poses a higher risk of habitat degradation or destruction by natural disasters, such as the flash flood that happened in Bumdeling a few decades ago.

3.8 Disturbance

Disturbance by increased vehicular traffic due to increasing number of visitors to Phobjikha and Bumthang is another threat for the cranes. The number of visitors in Phobjikha from late autumn to early spring is increasing year by year, giving a great opportunity to promote crane conservation, however disturbance by bird-watchers can be a significant threat to the species, if tourism is not managed properly.

Challenges

3.9 Limited research and information gap

Understanding the ecology of BNC is an important step in developing appropriate measures to protect their habitats. In Bhutan, apart from few studies carried out on their migratory routes and distribution in the country, comprehensive studies on cranes and their ecology have not yet been conducted. This has often limited appropriate measures taken for conservation.

3.10 Poor coordination amongst stakeholders

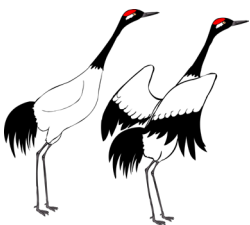
During the consultation workshop in Lamai Gonpa, one of the challenges identified by the participants was the existence of poor coordination amongst the stakeholders. This has often led to duplication in implementing conservation activities or otherwise arose conflicts with other agencies involved in land developmental activities. It was also acknowledged that there is poor transboundary coordination among the range countries.

3.11 Limited community awareness and participation

Although the presence of the species in their locality is adequately acknowledged, conservation requirements of the BNC are still poorly understood by the local communities. Relevant agencies have been constantly involved in raising awareness, however, there need to be more of such initiatives as well as innovative approaches in engaging the locals.

3.12 Limited resources

One of the most pressing challenges in BNC conservation is the inadequate availability of resources, both in terms of financial and technical. RSPN has been consistently involved in mobilizing funds in the country, but most of the funds were project tied and for short terms. This has impacted in continuity of conservation and entails losing of important information.



4. ACTION PLAN

4.1 Vision:

“A viable wintering population of Black-necked Cranes in Bhutan living in a harmonious coexistence with the local communities”

4.2 Goal:

To maintain a viable wintering population of BNCs in Bhutan through improved habitat, enhanced community support and increased knowledge base.

This plan will be implemented according to four objectives alongside a series of concrete strategic actions, and measured through relevant targets and appropriate indicators. Objectives include, **improving** conservation management through habitat mapping, **ensuring** engagement with local communities while supporting sustainable livelihood opportunities, **strengthening** research and knowledge management by supporting interdisciplinary studies, and finally **promoting** BNC conservation education through effective coordination of various stakeholder groups, institutions, and agencies. Applying and implementing actionable steps to assure the protection of the species in Bhutan will help towards accomplishing these objectives.

4.3 Objectives:

Objective 1:

To strengthen BNC conservation through comprehensive habitat assessment, mapping and management

Objective 2:

To promote community engagement and support sustainable livelihood opportunities for communities

Objective 3:

To facilitate interdisciplinary research and knowledge sharing on BNC ecology, conservation and management

Objective 4:

To enhance stakeholder coordination and collaboration for BNC conservation

4.3.1 Objective 1:

To strengthen BNC conservation through comprehensive habitat assessment, mapping and management

Rationale:

In order to ensure the protection of critical wintering habitat sites for BNCs in the country, proper management of habitats must include strategies that consider restoration, invasive species control, and linking national biodiversity policy to local land-use practices.

The first objective provides focus to actions that explore the capacity for improved documentation and regulatory mechanisms in BNC winter population management. In addition to more dedicated mapping efforts and habitat assessments, objective 1 recognizes that conservation will require a synergy between protected area and development management schemes, while paying special attention to emergent threats such as stray dog mismanagement. In order to reach the target response for each strategic action, stakeholders should be mindful to solidify indicators to track progress towards the strategies overarching objectives.

Output 1.1: Black-necked Crane roosting and foraging habitats mapped and assessed

Action 1.1.1: Carry out comprehensive mapping of BNC habitats including stopovers

Action 1.1.2: Conduct biological and ecological assessment of BNC habitats

Output 1.2: Black-necked Crane habitats managed and protected

Action 1.2.1: Develop regulatory frameworks and guidelines for BNC habitat management and conservation

Action 1.2.2: Develop and implement operational plans for managing BNC wintering habitats

Action 1.2.3: Reclaim and improve BNC habitats through appropriate interventions by 2023 including potential historical wintering sites

Action 1.2.4: Assess and mitigate threats posed by stray dogs to BNC population

Action 1.2.5: Assess and mitigate threats posed by overhead power lines in BNC habitats

Action 1.2.6: Identify and mitigate causes of wetland eutrophication

Action 1.2.7: Classify BNC habitats into different management zones to manage human disturbance

4.3.2. Objective 2:

To promote community engagement and support sustainable livelihood opportunities for partner communities

Rationale:

Conservation efforts for BNCs cannot be sustainably governed without support and involvement of local communities. Therefore, conservation programs and management strategies must be linked with investment in local livelihoods, community interests, and cultural beliefs and values.

The second objective recognizes that community engagement and efforts to support sustainable livelihood opportunities are crucial to ensuring the longevity of BNC conservation in the country. In addition to on-going education and awareness campaigns, Objective 2 focuses on concrete actions that actively involve community partners decision-making processes through collaborative knowledge sharing workshops and conservation activities. In order to achieve the target objectives, the broader community must consider local development goals that prioritize livelihood generating activities that either do-no-harm or directly benefit wintering crane populations. These actions may include, but are not limited to, support for organic agriculture, promoting community-based ecotourism, and support payment for ecosystem services that enhance wetland and watershed vitality.

Output 2.1: Strengthened community engagement and sustainable livelihood options

Action 2.1.1: Conduct mapping of all the key community stakeholders

Action 2.1.2: Form and strengthen local conservation support group for BNC conservation

Action 2.1.3: Identify and promote potential nature-based enterprises

Action 2.1.4: Promote ecotourism in priority sites

Action 2.1.5: Identify and establish potential Payment for Ecosystem Services (PES) schemes

Action 2.1.6: Identify and incentivise sustainable farming practices such as post harvest management, organic farming, improving crop varieties, etc.

Action 2.1.7: Establish and strengthen community-based waste management system

4.3.3. Objective 3:

To facilitate interdisciplinary research and knowledge sharing on BNC ecology, conservation and management

Rationale:

In order to effectively engage in BNC conservation, an understanding of its behavioral and habitat ecology must be linked with collaborative research that prioritizes in-depth understanding of the social, economic, and cultural realities of engaged communities.

The objective 3 provides focus to the importance of research in a future-oriented conservation strategy for the species. In addition to continuing ecological studies, objective 3 posits that conservation is a socially, politically, and economically influenced practice. This will require more in-depth and interdisciplinary studies that explore the socio-cultural context of conservation in the region that influence a diversity of enabling factors for the successful implementation of conservation action. Strategic actions will take the form of promoting institutional research collaborations, data management, and information dissemination in the form of reports and peer-reviewed publications. The success of these actions will be measured not only by the quantity of multi-disciplinary research efforts, but the quality of scientific studies and networks created.

Output 3.1: Multi-disciplinary scientific studies carried out on different aspects of BNC conservation

Action 3.1.1: Identify knowledge gaps related to BNC conservation

Action 3.1.2: Carry out research based on findings from the knowledge gap analysis

Output 3.2: Information repository on BNC conservation and management developed

Action 3.2.1: Develop a database on BNC conservation and management

Action 3.2.2: Collate and disseminate all research related to BNCs

Output 3.3: Education and awareness programs conducted

Action 3.3.1: Develop information, education and communication (IEC) materials

Action 3.3.2: Carry out youth engagement and educational programs

Action 3.3.3: Conduct educational and awareness programs for various stakeholders

4.3.4. Objective 4:

To enhance stakeholder coordination and collaboration for BNC conservation

Rationale:

Effective communication and collaboration must exist across stakeholder groups in wintering habitats for BNCs, representing a nation-wide conservation strategy. This will necessarily include capacity building efforts to enhance regional training opportunities and avenues for networking.

The fourth objective recognizes that conservation of the species cannot be done in isolation, and must depend on a diverse and empowered network of stakeholders fostered on stronger communication channels, diligent peer-to-peer and institutional networking, and support for capacity building endeavors. In addition to stronger stakeholder coordination within the country, objective 4 recognizes the need for trans-boundary cooperation between scientists, conservationists, donors, and educators. While select targets are detailed here to provide an idea of possible avenues for improving coordination, we should acknowledge that as situations and circumstances change, so too do we as partners across borders need to adapt to more effectively support conservation for the species, in every capacity. This objective also recognizes lack of consistent funding for implementing conservation programs.

Output 4.1: Stakeholder coordination and collaboration strengthened

Action 4.1.1: Organize and participate in regional, national and local stakeholder consultation and coordination workshops

Action 4.1.2: Build capacity of stakeholders on BNC conservation, prioritizing on need-based partnership

Output 4.2: Strengthened regional coordination and collaboration in BNC conservation

Action 4.2.1: Organize international network meeting/ workshop/ seminars on transboundary BNC conservation

Action 4.2.1: Attend international network meetings/ workshops/ seminars on BNC conservation

Output 4.3: Established consistent funding mechanism for BNC conservation

Action 4.3.1: Raise fund for Black-necked Crane Conservation Endowment Fund

Action 4.3.2: Source project tied funding from local and international donors



5. IMPLEMENTATION AND MONITORING PLAN

5.1 National policies, plans and regulations

Bhutan has a conservation legacy backed by strong national policies and regulations. Bhutan's national developmental processes are guided by the principle of Gross National Happiness envisioned by His Majesty the Fourth King of Bhutan, where environmental conservation is one of its four pillars. Article 5 of the Constitution mandates the government to recognize every Bhutanese as a 'trustee of the Kingdom's natural resources and environment' and the Forest and Nature Conservation Act of Bhutan 1995 accords the highest protection status to the BNC by listing it in Schedule I. The Forest and Nature Conservation Rules and Regulations of Bhutan 2017 imposes a fine of Nu. 100,000.00 (~USD 1500) for killing or illegal possession of BNC which is the highest amongst the crimes against birds (DoFPS 2017). Killing BNC is considered a fourth degree felony under the Penal Code of Bhutan. While BNC conservation areas in Trashiyangtse falls under BWS wherein BNC is identified as one of the flagship species, all major wintering habitats of BNC in Bhutan are also declared as RAMSAR sites, which ultimately helps in securing the habitats of the heavenly bird. The 12 Five Year Plan of the DoFPS mandates development of conservation action plans for key species and considering the importance Black-necked crane has been prioritized.

5.2 Institutional arrangement

The DoFPS within the Ministry of Agriculture and Forests (MoAF) is the institution under the RGoB which is mandated for conservation of biodiversity through insightful application of good science and science based management prescriptions. As such, DoFPS will be the governing body that coordinates the implementation of the BNC conservation action plan in Bhutan. However, RSPN, with track record history of BNC conservation will be the main partner agency for implementing this conservation action plan.

Within the DoFPS, the plan implementation will be coordinated by the Nature Conservation Division in collaboration with the functional divisions, UWICER, field offices and other relevant agencies. However, the field divisions and protected areas in which the BNC habitats fall will take the lead role in implementing the activities projected in the action plan in close collaboration with stakeholders beyond the DoFPS. Field offices include Bumthang Forest Division, Bumdeling Wildlife Sanctuary, Trashigang Forest Division, Wangchuck Centennial National Park and Wangdue Forest Division. The implementation of the research and development component of the plan will be led by UWICER and other academic institutions under the Royal University of Bhutan (RUB).

The Royal Society of Protection and Nature will implement the activities based on its conservation mandates and as per the MoU or equivalent agreements signed with the DoFPS.

Technical and institutional support from stakeholders such as Department of Agriculture (DoA) and Department of Livestock (DoL) under MoAF, Tourism Council of Bhutan (TCB), National Environment Commission (NEC), Clean Bhutan, Bhutan Power Corporation (BPC) and respective Local Government (LG) offices will be sought for effective implementation of the actions prescribed in this conservation action plan.

The development of this conservation action plan, besides taking into account the national requirements, also took inspiration from the International Union for Conservation of Nature's Black-necked Crane Conservation Strategy in identifying the key actions. With many international organizations and institutions contributing immensely toward BNC conservation and knowledge generation, experience sharing with international organizations will be done when necessary and required.

5.3 Work plan and budget

The total estimated cost required to implement this action plan for the duration of five years is Nu. 67.67 million (2021-2025) as reflected in the logical framework. The financing and implementation of this action plan will be a collaborative effort of DoFPS and RSPN. The DoFPS will meet the funding requirements mostly from the Bhutan for Life project for conservation works inside the Protected Areas and RAMSAR sites and source additional funding from donor agencies such as World Wildlife Fund (WWF) Bhutan, Bhutan Trust Fund for Environmental Conservation (BT FEC), United Nations Development Program (UNDP), etc., for conservation areas outside the protected areas. Meanwhile RSPN will secure additional funding from various international partners to secure consistent and sustainable financing for conservation of BNC in the long run.

5.4 Monitoring and evaluation

Based on the annual operation plan developed by the field offices under the DoFPS, the implementation of the plan will be jointly monitored annually by the Nature Conservation Division (NCD) and RSPN. A mid-term review of the plan will be carried towards the end of third year of plan implementation. The logical framework and implementation plan will be used for monitoring and evaluation by using indicators provided.

5.5 Logical framework and implementation plan

Objective/ Output/Action	Objectively verifiable indicators	Means of verification	Target	Implementing agency		Budget estimate (Nu. in millions)	Timeline				
				Lead	Collaborator		Y 1	Y 2	Y 3	Y 4	Y 5
Goal 1: To maintain a viable wintering population of BNCs in Bhutan through improved habitat, enhanced community support and increased knowledge base.											
Objective 1: To strengthen BNC conservation through comprehensive habitat assessment, mapping and management											
Output 1.1: Black-necked Crane roosting and foraging habitats mapped and assessed											
Action 1.1.1: Comprehensive mapping of BNC habitats including stopovers	All historical and current habitats mapped	Habitat map	Map produced by 2021	RSPN	DoFPS	0.40					
Action 1.1.2: Conduct biological and ecological assessment of BNC habitats	Extent of habitat with biological and ecological information	Reports	Report produced by 2022	DoFPS/ RSPN	RUB	2.50					
Output 1.2: Black-necked Crane habitats managed and protected											
Action 1.2.1: Develop and distribute regulatory frameworks and guidelines for BNC habitat management and conservation	Guideline developed	Guideline document	Guideline developed by 2021	DoFPS	RSPN	0.40					
Action 1.2.2: Develop and implement operational plans for managing BNC wintering habitats	Annual operational plan developed	Operational plan	Plan developed and implemented annually	DoFPS	RSPN	0.05					

Action 1.2.3: Reclaim and improve BNC habitats through appropriate interventions by 2023 including potential historical wintering sites	Areas of land reclaimed and improved	Physical verification/ Report	100 hectares by 2023	RSPN	DoFPS	20.0			
Action 1.2.4: Assess and mitigate threats posed by stray dogs to BNC population	No. of habitats with dog population management program implemented	Report on dog population management	Dog population management program conducted annually	DoFPS/ RSPN	DoL	1.00			
Action 1.2.5: Assess and mitigate threats posed by overhead power lines in BNC habitats	1. Key areas identified and measures implemented 2. Frequency of collision with overhead power lines (before and after)	Field verification/ Implementation reports/ Outcome reports	Action completed by 2021	DoFPS/ RSPN	BPC	0.50			
Action 1.2.6: Identify and mitigate causes of wetland eutrophication	No. of mitigation measures identified and implemented	Implementation and monitoring reports	Annual monitoring conducted/ Mitigation measures implemented by 2024	DoFPS	NEC/ RSPN	0.10			
Action 1.2.7: Classify BNC habitats into different management zones to manage human disturbance	BNC habitat classified into zones	Zoned habitat map with management regimes	Habitat zoning completed by 2021	DoFPS	RSPN	0.05			

Objective 2: To promote community engagement and support sustainable livelihood opportunities for partner communities

Output 2.1: Strengthened community engagement and sustainable livelihood options

Action 2.1.1: Conduct mapping of all the key community stakeholders	Key community stakeholders identified and mapped	Report	Report produced by 2021	RSPN	DoFPS	0.02				
Action 2.1.2: Form and strengthen local conservation support group for BNC conservation	Groups formed and active	Meeting minutes/ reports	5 New Groups & 3 existing	RSPN	DoFPS	1.00				
Action 2.1.3: Identify and promote potential nature-based enterprises	Livelihood activities initiated	Field verification/ reports	1 product each in all habitats	DoFPS/ RSPN	APIC	5.0				
Action 2.1.4: Promote ecotourism in priority sites	Community-based sustainable tourism initiated	Field verification/ Reports	1 product each in Khotokha, Bumthang and Trashiyangtse	DoFPS/ RSPN	TCB	3.0				
Action 2.1.5: Identify and establish potential Payment for Ecosystem Services (PES) schemes	PES scheme identified and established	Report/ PES Agreement	1 PES scheme established	DoFPS	RSPN/ LG	0.20				

Action 2.1.6: Identify and incentivise sustainable farming practices such as post harvest management, organic farming, improving crop varieties, etc.	Sustainable farming practices identified and incentivised	Field verification/ Implementation reports	Scheme implemented in all habitats	DoFPS/ RSPN	LG/ DoA	10.00				
Action 2.1.7: Establish and strengthen community-based waste management system	No. of waste management committees established/ strengthened	Field verification/ Implementation reports	1 New (Khotokha) + 3 Existing	DoFPS/ RSPN	LG/ NEC/ Clean Bhutan	2.00				
Objective 3: To facilitate interdisciplinary research and knowledge sharing on BNC ecology, conservation and management										
Output 3.1: Multi-disciplinary scientific studies carried out on different aspects of BNC conservation										
Action 3.1.1: Identify knowledge gaps related to BNC conservation (including disease)	Gaps identified	Report	Gaps identified by 2021	DoFPS	RSPN	0.10				
Action 3.1.2: Carry out research based on findings from the knowledge gap analysis	Research conducted	Reports & Publications	5 studies	DoFPS/ RSPN	RUB	4.00				
Output 3.2: Information repository on BNC conservation and management developed										

Action 3.2.1: Develop a database on BNC conservation and management	Database created	Database	Database developed by 2022	RSPN	DoFPS	0.30			
Action 3.2.2: Collate and disseminate all research related to BNCs	Repository of publications created	Repository	Repository developed by 2022	RSPN	DoFPS	0.25			
Output 3.3: Education and awareness programs conducted									
Action 3.3.1: Develop information, education and communication (IEC) materials	IEC materials developed	Copies of the materials	Materials developed by 2021	RSPN	DoFPS/ REC	1.00			
Action 3.3.2: Carry out youth engagement and educational programs	No. of schools engaged	Reports	20 schools	RSPN	MoE/ DoFPS	1.60			
Action 3.3.3: Conduct education and awareness programs for various stakeholders	No. of awareness programs conducted	Field report	10 events	RSPN	DoFPS/ LG	1.50			
Objective 4: To enhance stakeholder coordination and collaboration for BNC conservation									
Output 4.1: Stakeholder coordination and collaboration strengthened									
Action 4.1.1: Organize national stakeholder consultation and coordination workshops	Number of workshops conducted	Reports	5 workshops	RSPN	DoFPS	2.25			

Action 4.1.2: Build capacity of stakeholders on BNC conservation, prioritizing on need-based partnership	Number of trainings conducted	Reports	10 trainings	DoFPS	RSPN	3.00					
Output 4.2: Strengthened regional coordination and collaboration in BNC conservation											
Action 4.2.1: Organize international network meeting/workshop/ seminars on transboundary BNC conservation	No. of meeting/workshop/ seminars conducted	Meeting minutes/ minutes/ reports	2 meetings	DoFPS	RSPN	4.00					
Action 4.2.1: Attend international network meetings/workshops/ seminars on BNC conservation	No. of meetings/workshops/ seminars	Meeting minutes/ minutes/ reports	3 meetings/workshops/ seminars	DoFPS/RSPN		1.50					
Output 4.3: Established consistent funding mechanism for BNC conservation											
Action 4.3.1: Raise fund for Black-necked Crane Conservation Endowment Fund	Amount of fund raised	Endowment Fund Account	1.5 Million USD	RSPN	DoFPS	1.00					
Action 4.3.2: Source project tied funding from local and international donors	No. of proposals submitted	Project proposals	5 proposals	DoFPS/RSPN		0.50					
Total											67.67

REFERENCES

1. BirdLife International. 2017. *Grus nigricollis* (amended version of 2016 assessment). The IUCN Red List of Threatened Species 2017: e.T22692162A110659467.
2. Bishop, M. A., Zhouma, C., Yanling, S., Harkness, J., & Binyuan, G. (1998). Winter habitat use by Black-necked Cranes *Grus nigricollis* in Tibet. *Wildfowl*, 49(49), 228-241.
3. Choki, T., Tshering, J., Norbu, T., Stenkewitz, U., Kamler, J. F. 2011. Predation by leopards of Black-necked Cranes (*Grus nigricollis*) in Bhutan. 2011. *Forktail* 27 (2011): 117-119
4. DoFPS 2017, Forests and Nature Conservation Rules and Regulations. Department of Forests and park Services, Ministry of Agriculture and Forests, Royal Government of Bhutan.
5. Dong, H. Y., Lu, G. Y., Zhong, X. Y., & Yang, X. J. (2016). Winter diet and food selection of the Black-necked Crane *Grus nigricollis* in Dashanbao, Yunnan, China. *PeerJ*, 4, e1968.
6. Drukpa, S. 2016. A winter 2015-2016 study of black-necked cranes: Habitat mapping and population change of Black-necked Crane in Bumdeling wintering habitat, Eastern Bhutan
7. Kuensel, 2016. Decreasing black-necked cranes concern villagers. <https://kuenselonline.com/decreasing-black-necked-cranes-concern-villagers/>
8. Lhendup, P., Webb, E. L. 2009. Black-necked Cranes *Grus nigricollis* in Bhutan: migration routes, threats and conservation prospects. *Forktail* 25 (2009): 125–129.
9. Li, F. 2014. IUCN Black-necked Crane (*Grus nigricollis*) conservation plan. *Zoological Research* 35(S1): 3-9.
10. Namgay, R., Wangchuk, S. 2016. Habitat Mapping and Assessing Conservation Threats to Black-necked Cranes wintering in Bhutan. Report. Ugyen Wangchuck Institute for Conservation and Environment. Bumthang, Bhutan. DOI 10.1186/s40064-016-1923-0

11. Phuntsho, T., Tshering, J. 2014. Black-necked Crane (*Grus nigricollis*) in Bhutan: Current population status and conservation initiatives. *Zoological Research* 35(S1): 10–19. DOI: 10.13918/j.issn.2095-8137.2014.s1.0010.
12. RAMSAR 2012. Bhutan's first two Ramsar Sites. <https://www.ramsar.org/news/bhutans-first-two-ramsar-sites>.
13. RAMSAR 2016. Bhutan's third Ramsar Site. <https://www.ramsar.org/news/bhutans-third-ramsar-site>
14. RGoB 1995. Forests and Nature Conservation Act, 1995. Ministry of Agriculture, Royal Government of Bhutan. Thimphu, Bhutan.

